SCHOOL-BASED TREATMENT OF HEADACHE IN ADOLESCENTS: AN EVALUATION OF A BRIEF COGNITIVE BEHAVIORAL PACKAGE

A dissertation submitted to the Kent State University College of Education, Health, and Human Services in partial fulfillment of the requirements for the degree of Doctor of Philosophy

By

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SCHOOL-BASED TREATMENT OF HEADACHE IN ADOLESCENTS:
AN EVALUATION OF A BRIEF COGNITIVE BEHAVIORAL PACKAGE (235 pp.)

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The purpose of this study was to expand on previous research evaluating the efficacy of school-based, therapist-assisted treatment of chronic headaches in adolescents. Specifically, this research study identified treatment components from previous studies (i.e., psychoeducation, cognitive-behavioral, relaxation techniques) that were demonstrated to be effective in reducing headache activity (i.e., frequency, intensity, and duration) in participants. This study integrated aspects of these components into a brief treatment package designed to be implemented within the school setting and delivered by a school-based mental health professional. It examined the effectiveness of the treatment package on headache activity in middle school students using a multiple baseline across participants design with continuous measurement of headache frequency, intensity, and duration through baseline, treatment, and follow-up phases. Secondary measures of quality of life and social-emotional functioning were taken at pre- and post-treatment intervals. Measures of social validity and treatment integrity were also utilized.

Results indicated that the treatment program effectively reduced headache activity in all three parameters (frequency, intensity, and duration) with mean Nonoverlap of All Pairs (NAP) scores of 0.93 (medium effect), 0.87 (medium effect), and 0.91 (medium effect), respectively. Secondary outcome measures showed no significant impact on
quality of life as rated by participants and parents. No significant impact was observed on social-emotional functioning as reported by participants. However, significant improvement ($p < 0.01$) was reported on internalizing and total social-emotional functioning by parents following treatment. Additionally, both participants and parents reported high treatment acceptability.

Despite some observed limitations, several implications arose. First, the successful application of a multi-modal treatment approach to headache supports previous research findings. Second, the school-based delivery of the treatment program provided ease of access to a service not readily available to all consumers. Finally, remediation of headache activity and its effect on quality of life and social-emotional functioning requires further investigation. Implications for research and practice are included.
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CHAPTER I

REVIEW OF THE LITERATURE

Overview

The purpose of this chapter is to describe in detail the current state of headache in children and adolescents, its impact on the individual’s quality of life as it pertains to educational functioning, current empirically supported treatment options, and implications for comprehensive treatment. First, the author will review current comprehensive mental health services within the school setting. The next section of the literature review will focus on describing the importance of an ecological-systems approach to mental health service delivery and the role of the school psychologist within such a system. The following section will provide a detailed overview of headache in children and adolescents including epidemiology, classification and diagnostic challenges, and the psychological impact of recurrent headache. Finally, the author will provide a review of the empirically supported treatments for recurrent headache as well as some of the emerging treatment options. The chapter will conclude with a discussion of the rationale for the current study.

Pediatric headache is a common condition afflicting millions of children and adolescents across the globe. Prevalence rates for headaches in children indicate that as many as 20% of 5 year-old children experience headache symptoms, with numbers increasing through childhood whereby the time they reach adolescents, approximately one half of males and three fourths of females report experiencing at least one headache per month and 4.5% of males and 9.4% of adolescent females experience 4 or more headaches per month (Connelly, 2003; Andrasik & Schwartz, 2006). Not surprisingly,
increased and/or sustained headache activity in children and adolescents has been shown to have both acute, and in some, long-term negative consequences affecting the many facets that contribute to the overall quality of life in the individual.

In an early study Koch and Melchior (1969) found increased signs of nervousness, mental instability and immaturity, suggesting that the headache sufferers displayed a decreased resistance to psychological stress and conflict situations. Similarly, more recent studies have found that relative to non-headache individuals, children and adolescents with headache are more likely to have somatic, anxiety and depressive symptoms (Antilla et al., 2004), as well as impaired attention span and hyperactivity-impulsivity (Arruda, Guidetti, Galli, Albuquerque, & Bigal, 2010) as well as adverse effects on environmental (e.g., academic performance, recreation) and social and familial relationships (Bruijn, Locher, Passchier, Dijkstra, & Arts, 2010).

While historically the research has demonstrated a clear association between headache and its adverse effect on the individuals overall well-being, not until recently has the focus of attention shifted to preventative and acute treatment modalities in children and adolescents. There also has been more recent attention paid to the context in which these services are provided. A paradigm shift in the comprehensive treatment of children and adolescents is underway whereby the educational setting is now being viewed as a viable context for the treatment of a myriad of conditions affecting students, including persistent headache.

The Provision of Pediatric Mental Health Services

Over the past few decades, there has been a relative explosion in the prevalence rates of psychiatric and psychosocial problems in the pediatric population (Kelleher,
McInerny, Gardner, Childs, & Wasserman, 2000). Data from the National Survey of Children’s Health (2005) suggest that the most prevalent disorders affecting children aged 6 to 17 years are learning disabilities (11.5%), Attention Deficit Hyperactivity Disorder (ADHD; 8.8%), behavior and conduct problems (6.3%), and depression and anxiety (5.4%). Similarly, the U.S. Surgeon General’s report on children’s mental health (USDHHS, 2000) notes that 20% of children need active mental health interventions, 11% have significant functional impairment, and 5% show extreme functional impairment. It is important to note that these prevalence rates do not include those children and adolescents who might be considered “at risk” and would likely benefit from intervention. Further, as few as one sixth to one third of children and adolescents with diagnosable disorders receive any treatment, and of those who do, less than half receive adequate treatment (Paternite, 2005), with even fewer at risk youth receiving any help whatsoever (Burns et al., 1995; Leaf et al., 1996). Furthermore, of the small percentage who receive some form of mental health services, most receive these services within a school setting (Rones & Hoagwood, 2000; US Public Health, 2000).

Building on the prevalence of mental health disorders and the disparity of services and supports highlighted in the Surgeon General’s report (USDHHS, 1999), the President’s New Freedom Commission on Mental Health (2003) identified a need for and proposed the expansion of mental health services and supports across the country. Specifically, the New Freedom Commission concluded that, “the mental health delivery system is fragmented and is disarray…leading to unnecessary and costly disability, homelessness, school failure and incarceration” (p.4), and articulates six goals and 19 recommendations that target dramatic transformation and improvement of child,
adolescent, and adult mental health systems. The report includes very specific and direct linkage to school mental health programs and services as described in goal 4, “Early mental health screening, assessment, and referral to services are common practice.” To reach this goal, the commission recommended that we “improve and expand school mental health programs” (recommendation 4.2). Both the Surgeon General’s report and the New Freedom Commission identify the overwhelming need for comprehensive mental health services and supports and highlight schools as the key setting for addressing children’s and adolescents’ mental health needs.

Similarly, the No Child Left Behind Act (NCLB, 2002) called for greater emphasis on accountability for student performance, expanded parental options and information, a focus on teacher qualifications, and an emphasis on using strategies and programs demonstrating an empirical basis of effectiveness. While the primary focus of NCLB is on student performance, the legislation also contains opportunities to expand school-based mental health. Specifically, NCLB provides grant-based funding opportunities for the establishment or expansion of existing elementary and secondary school counseling programs, facilitate collaborative partnerships between school and community based mental health programs, and programs geared towards the promotion of school readiness through early childhood social and emotional development to ensure “student access to quality mental health care by developing innovative programs to link the local school system with the local mental health system” (U.S. Department of Education Office of Elementary and Secondary Education 2002, p. 427).

With the reauthorization of the Individuals with Disabilities Education Act (IDEA, 2004), early intervention (pre-referral) services were included, which allowed for
a portion of special education funding to be allocated for evidence-based academic and behavioral supports. To facilitate this, multi-tiered systems of support (MTSS) have been developed to address students’ academic (e.g., Response to Intervention; RTI) and behavioral needs (e.g., Positive Behavioral Interventions and Support; PBIS). Response to Intervention is generally defined as the practice of providing high-quality instruction and interventions matched to student need, monitoring progress frequently to make decisions about changes in instruction or goals, and applying child response data to important educational decisions (Sandomierski, Kincaid, & Algozzine, 2007). Positive Behavioral and Interventions Support is generally defined as a framework for enhancing the adoption and implementation of a continuum of evidence-based interventions to achieve academically and behaviorally important outcomes for all students (Sugai et al., 2000). In both the RtI and PBIS frameworks, a three-tiered prevention approach is utilized: (a) primary tier for all students; (b) secondary tier for individuals whose behavior and/or academic competencies are not successfully responsive to the primary tier and who require more structured intervention practices, feedback and monitoring; and (c) tertiary tier for individuals whose behavior and/or academic competencies are not responsive to the previous supports and require interventions that are specialized, intensive, and individualized (Sugai & Horner, 2009).

Establishment of multi-tiered systems of support from prevention and early intervention, to more intensive treatments and ongoing assessments to monitor improvement and the need for alternative interventions (Kratochwill, Clements, & Kalymon, 2007) provides the necessary supports for all students as recommended by both NLCB and IDEA. Thus, delivering empirically-based mental health programs within the
school context through a tiered model of service delivery may thereby reduce and/or eliminate many of the socioeconomic and systemic barriers that have historically prevented children from receiving the much needed services and supports for mental health concerns (Garrison, Roy, & Azar, 1999). Clearly, there has been a rather substantial portion of the student population across the country that has historically been unable to access mental health services due to various constraints (e.g., lack of availability, cost prohibitive, logistical barriers). As such, schools have been recently recognized as a viable and meaningful venue to evaluate and provide meaningful intervention for the mental health needs of children and adolescents.

**Comprehensive Models of Pediatric Mental Health Services**

In recent reports from the U.S. Surgeon General (USDHHS, 1999), mental health has been characterized along a health-illness continuum. At one end of the continuum, mental health is defined as “a state of successful performance of mental functioning, resulting in productive activities, fulfilling relationships with other people, and the ability to adapt to change and to cope with adversity” (p. 4). At the other end of the continuum is mental illness, which refers to diagnosable mental disorders or health conditions that are “characterized by alterations in thinking, mood, or behavior (or some combination thereof) associated with distress and/or impaired functioning” (p. 5). Falling within the continuum are mental health problems in which “signs and symptoms are of insufficient intensity or duration to meet the criteria for any mental disorder…but may warrant active efforts in health promotion, prevention, and treatment” (p. 5). Health as defined by the World Health Organization (WHO, 1948) is “a state of complete physical, social, and mental well-being and not merely the absence of disease or infirmity” (p. 2). Expanding
on this, Neuman (1990) notes that health is experienced on a continuum whereby the degree of individual wellness that exists at any point in time, ranging from and optimal wellness condition, with available energy at its maximum, to death, which represents total energy depletion. She further states that “health is considered a process based concept of system accommodation to constant change, caused by stressors, in an attempt to reconcile and harmonize the needs of the body, mind, spirit, and environment with a systematic perspective” (Neuman, 1990 p. 129).

This health-illness continuum model has applications to children and adolescents who experience frequent headache and associated headache pains. Specifically, their personal continuum is in constant disharmony potentially affecting multiple aspects of normal functioning, including school performance, interpersonal relationships, and physical and/or psychological well-being, thus prompting a perpetual state of reconciliation within the continuum which makes it challenging to achieve positive healthy outcomes for sustained periods of time.

With the growth and enhancement of behavioral medicine and pediatric psychology, psychologists have experienced increased opportunities to collaborate with other health care disciplines in addressing important health issues for children and adolescents that were historically treated through traditional medical practices that focused on the treatment of the disease (Brown, 2004). Collaborative endeavors between psychology and pediatric medicine have been important in improving health outcomes, preventing disease and injury, and enhancing adaptation to illness (Brown, 2004). Recent reforms in health care have emphasized the importance of improving access to care and reducing costs by shifting the locus of health-related services from secondary
and tertiary care settings to community-based settings, including primary care practices and schools (Power & Blom-Hoffman, 2004). In response these reforms, schools are now being viewed as a unique resource for providing both intervention and prevention services for children and their families (Kolbe, Collins, & Cortese, 1997). Several models of school-based mental health service delivery have been proposed in recent years whereby schools are in the position to serve the often times vast and multi-faceted needs of their student population and their families.

**An Ecological Approach for School-Based Mental Health Services**

Ecological-developmental models encompass an ever-evolving body of theory and research that is concerned with the processes and conditions that govern the lifelong course of human development in the actual environments in which they live (Bronfenbrenner, 1994). Within these models, development is considered to be a progressive and mutual adaptation of the environment and of the individual (Pluymert, 2002). Nastasi et al. (1997) state, “in order to understand and/or change human behavior, one must attend to the ecological contexts in which the individual is socialized (e.g., school, family, community) as well as the interaction of those contexts (e.g., parent-teacher interaction). Furthermore, the individual plays an active role in the development, such as one’s personal qualities and behavior engender certain interactions with the environment” (p. 5). To achieve this, the identification of mental health needs would emerge from an assessment of the individuals functioning and competencies in their natural settings, thus avoiding the often-arbitrary diagnostic constructs prominent in child psychopathology (Jensen & Hoagwood, 1997), whereby the goal of intervention is focused on improved functioning rather than symptom reductions. In addition,
promotion of improved functioning would occur in the setting(s) in which they are problematic, potentially affording “real time” data-based decisions versus recollection of events in traditional clinic-based centers.

**School-Based Mental Health Promotion**

One such model proposed in the literature is the School-Based Mental Health Promotion (SBMHP) model (Nastasi, 2004). Similar to the RtI and PBIS models utilized for academic and behavioral supports, the SBMHP model encompasses the key characteristics of the public health model advocated by the Surgeon General: (1) comprehensive service provision, ranging from prevention to treatment; (2) an ecological perspective that addresses social-cultural as well as individual factors and acknowledges the importance of person-environment interactions; (3) accessibility to services for the general population, in this instance, through school-based services available to all students; (4) science-based practice with ongoing evaluation of services; and (5) surveillance of mental health needs (e.g., through systematic school-based screening of all students; Nastasi, 2004). The SBMHP model for development and delivery of comprehensive mental health services within the school setting is comprised of seven components, characterized as *fundamental* (continuum of care, integrated services, culture specificity) and *foundational* (action research, ecological theory, participation of stakeholders, interdisciplinary collaboration), each of which will be discussed briefly in the following sections.

**Fundamental.** The three fundamental components of the SBMHP model are considered to be essential to the provision of an integrated continuum of comprehensive mental health services. Continuum of Care consists of four leveled treatment
components: (1) prevention, (2) risk reduction, (3) early intervention, and (4) treatment. Prevention (level 1) components are activities directed towards the general population involving building or district-wide educational programs woven into the core curriculum that provide a foundation or further enhancement of knowledge on topics such as social and emotional development, social skills training, and violence prevention. Risk Reduction (level 2) activities are geared toward students who are at-risk for mental health difficulties due to individual or environmental factors. Early Intervention (Level 3) activities are directed towards students who are experiencing mild mental health difficulties with the goal of reducing the risk of developing more moderate to severe mental health problems. The final level in this continuum of services is Treatment (Level 4). Treatment activities are directed toward students who are diagnosed with a specific mental health disorder (e.g., depression, anxiety) and involve the delivery of intensive individualized services by school-based mental health professionals.

The next fundamental component in the SBMHP model is Integration. Integrated service delivery requires the coordination of services within the school and between the community agencies. The purpose of integration and coordination are: (1) to avoid fragmentation and duplication of services; (2) to address the interrelationships among physical, psychological, social, and educational functioning of the child/adolescent, thereby focusing on the individual’s overall functioning; and (3) to address the contextual and social-cultural factors that influence the child/adolescent’s development, thereby focusing also on the ecology of the individual.

The final fundamental component in the SBMHP model is Cultural Specificity, which addresses key concerns raised in a recent report from the U.S. Surgeon General.
(USDHHS, 2001a) highlighting the role of cultural influences on mental health needs and services and further recommended the development of culture-specific approaches that extend beyond the development of targeted interventions for specific racial or ethnic groups. Given the cultural diversity within any school classroom, a culture-specific approach requires consideration of both shared and unique cultural experiences of students and teachers, thus encompassing the unique and shared real-life experiences of the individuals as well as their respective interpretations of these experiences (Nastasi, 2004).

**Foundational.** The four foundational components of the SBMHP model seek to address the potential challenges when developing, implementing, and evaluating school-based comprehensive mental health services. *Action research* involves a pre-recursive process that links theory, research, and practice to effect social change (Greenwood, Whyte, & Harkavy, 1993) that is consistent with the characterization of school psychologists as reflective practitioners who go beyond the application of extant theory and research to practice by using a research process to guide practice (Nastasi, 1998). Action research relies on systematic research methods grounded in qualitative or ethnographic inquiry, specifically, observation, interviews, surveys, and collection of artifacts (Lincoln & Guba, 1985), and incorporates the guidelines set forth in legislation (e.g., IDEA 2004; NCLB 2002) and follows best practice by utilizing a data-based decision making process.

The second foundational component is *Ecological Theory*. The ecology of the child and adolescent is complex and includes the range of contexts in which they function, such as, home, school, community, and peer group. Thus, understanding and
influencing mental health requires attention to the individuals socializing agents, situations, and conditions that exist within these key contexts as well as the interactions across contexts (Nastasi, 2004). Advancements in our understanding of child development have emphasized the importance of linking systems of care and the critical role that schools play in that system (Power & Blom-Hoffman, 2004).

The third foundational component is Participation of Stakeholders. The goals of stakeholder participation are promoting ownership and empowering the key players as well as increasing the sustainability of prevention/intervention efforts (Nastasi, Varjas, Berstein, & Jayasena, 2000). Within this facet of the SBMHP model, Nastasi (2004) notes that the school psychologist might be responsible for facilitating collaboration to (1) identify and define the mental health concerns, (2) gather data about individual and social-cultural factors related to the target concerns, (3) evaluate and interpret data, (4) develop strategies for addressing target concerns, (5) delegate responsibilities for implementing and evaluating intervention efforts, and (6) analyze and disseminate evaluation data.

The final foundational component is that of Interdisciplinary Collaboration. Children’s mental health needs can be multi-faceted involving a complex interplay of biological, environmental, sociocultural, and interpersonal factors. Understanding and addressing the biological, psychological, and sociocultural aspects of mental health requires that psychologists look to other disciplines for theoretical-empirical foundations and research methodologies (Nastasi, 2000). Providing comprehensive school-based mental health services necessitates an extension of traditional collaborative efforts to involve outside service providers with a particular and specific knowledge base that will
facilitate a comprehensive approach to appropriately address the mental health needs of a given population as well as the unique needs of a smaller group or individual (Nastasi, 2004).

**Population-Based and Tiered Models**

In contrast to the traditional clinic-based or referral approach to mental health service delivery where the emphasis of intervention and remediation is focused on the individual and is reactive in nature, a population-based model evaluates the collective needs of the community as a whole and develops and implements programming and supports designed to proactively address community needs. Within the educational context, proponents of this model highlight that psychological wellness is a precondition for students’ success in school and that school mental health providers have a critical role in helping ensure that all students have the psychological competence needed to learn to their potential (Doll & Cummings, 2008). Though the selection of school-wide, small-group, and individualized intervention programming will differ as a function of the community needs, the collective general outcome is the promotion and maintenance of psychological well-being.

Doll & Cummings (2008) identify four key goals in population-based school mental health service delivery: (a) to promote the psychological well-being of all students so that they can achieve developmental competence; (b) to promote caretaking environments that nurture students and allow them to overcome minor risks and challenges; (c) to provide protective support to students at high risk for developmental failures; and (d) to remediate social, emotional, or behavioral disturbances so that students can develop competence. Services delivered within this type of model are
strikingly similar to the three tiered models of academic and behavioral supports that are operationalized via the response to intervention (RtI) and positive behavioral intervention and supports (PBIS) models. Specifically, tier 1 or universal interventions are similar to services that were historically called “Primary Prevention,” but the updated term recognizes that the purpose of these interventions is not simply to prevent problems but also to promote wellness (e.g., empirically validated core curriculum, school-wide positive behavioral supports; Doll & Cummings, 2008) within the entire community. At the second tier, interventions are targeted mental health interventions that are provided to students with demographic risk (i.e., evidence of poverty, family violence, or other characteristics that predict poor outcomes) or functional risk (i.e., evidence of early or emerging symptoms of disturbances) that are more concentrated and intensive than universal interventions and address the needs of students that are not broadly addressed by the community as a whole (Doll & Cummings, 2008). The third tier of interventions represents 1 to 5% of the student population and involves more intensive, individualized supports for students who show evidence of adjustment disturbances so pronounced that they are not able to benefit from schooling without individual accommodations and supports (e.g., behavior plans, direct instruction of coping strategies). The purpose of these supports within a population-based model is to promote the systemic reforms that are necessary for communities’ comprehensive system of mental health services and to proactively promote and support overall wellness (Doll & Cummings, 2008). This model appears to align with those goals and objectives communicated by both the World Health Organization (2000) and Neuman (1990).
A recent policy statement issued by the American Academy of Pediatrics (2004) offers a very similar three-tiered model approach to school-based mental health service delivery. At the first tier, the programs selected should reflect and address the needs of the community at-large, implementing programs that focus aims such as decreasing risk factors and building resilience, including providing a positive, friendly, and open social environment at school whereby ensuring that each student has access to community and family supports that are associated with healthy emotional development (American Academy of Pediatrics, 2004). The second tier consists of more targeted mental health services that are designed to assist students who have one or more identified mental health needs but who are able to function and engage well enough in their academic, social, and other daily activities and may include group or individual therapy for students (American Academy of Pediatrics, 2004). The third tier and most intensive are targeted to the small percentage of students who possess severe mental health diagnoses and/or who evidence significant behavioral and/or mental health challenges. Typically, these students require a multi-disciplinary approach by a team of professionals, which may include special education services, individual and family therapy, pharmacotherapy, and school and social agency coordination (Policy Leadership, 2001; American Academy of Pediatrics, 2004). With these models in mind, several state and local level programs have been initiated to address the multi-faceted and unique needs of child and adolescent mental health. In the following section, a brief review of established school-based mental health programs will be given.
School-Based Mental Health Service Delivery in Action

Baltimore City Schools has implemented an approach to school-based mental health services that aligns with many of the ideals being promoted through national reports and educational legislation. Originating in 1985 in response to numerous medical and health concerns among the adolescent population in the city, the Baltimore City Health Department (BCHD) opened seven school-based health centers (SBHC) in local high schools. With increased service demand and in partnership with the University of Maryland and Johns Hopkins University medical schools, the establishment of expanded school mental health (ESMH) model was developed. Within this expanded model, students and families could receive comprehensive mental health services including assessment, therapy (individual, family, group), staff consultation, and prevention activities within their respective local schools (Weist, 1997).

Currently, 42 elementary schools, 41 middle/k-8 schools, and 22 high schools are offering ESMH services which are available to any student in need and are focused on students enrolled in general education programs, providing a resource for early identification, and intervention prior to onset of more serious debilitating problems develop (Weist, Paternite, Wheatley-Rowe, & Gall, 2009). General outcome studies as to the efficacy of the ESMH model on school climate and special education referrals have been generally positive. In a recent study completed by Bruns and colleagues (2004), they investigated the association between school-based mental health services and their overall impact on school climate and referral patterns for special education eligibility. Results from this study showed that teachers and staff in the selected schools offering ESMH services gave higher ratings on a mental health climate survey and teachers
referred fewer students for special education evaluation because of emotional and behavioral issues when compared to similar schools without ESMH services (Bruns et al., 2004).

**Implications for School Psychologists**

In the United States, schools offer unparalleled access to youth as a point of engagement for addressing their educational, emotional, and behavioral needs with an estimated over 52 million children attending 114,000 schools staffed by over 6 million adults (Paternite, 2005). The profession of school psychology has taken on the unique responsibility for translating and assimilating psychological knowledge, methods, and professional practice into the school setting, with the goal of affecting both the quality of education and the effectiveness of support services for all children, reflecting the interface between education and health (Tharinger, 1995). Moreover, a growing consensus has emerged acknowledging the interrelatedness of children’s health and their school achievement and supporting school-linked services to meet both the physical and mental health needs of children (Allen, Mathews, & Shriver, 1999). Researchers have identified several components of effective comprehensive health and mental health programming for school-aged populations: (a) interagency and interdisciplinary collaboration to address health, mental health, educational, and social service needs; (b) a continuum of services, ranging from prevention to treatment; (c) an ecological focus with attention to the various contexts in which children and adolescents function; (d) empirically based interventions; and (e) systematic program evaluation (Adelman & Taylor, 1998; Nastasi, 2004).
Many schools now offer a wide range of mental health services that were often under-utilized or unavailable to many students and their families. Properly trained school personnel, such as school psychologists, have unequalled access for observing student’s behavior, developing interpersonal relationships, continuously monitoring academic performance and can provide treatment in familiar, naturally occurring settings, greatly increasing the availability to a once vastly underserved population (Masia-Warner, Nangle, & Hansen, 2006). In fact, providing mental health services in the school setting offers some excellent solutions to problems that children and adolescents have in accessing these services, including problems with transportation and financial resources needed to obtain these services in the community (Pluymert, 2002). Additionally, schools also provide excellent settings in which to identify and treat mental health needs as the school environment provides many opportunities to integrate and monitor treatments across home, school, and community settings (Knoff & Batsche, 1990).

Within these briefly, presented models of school-based mental health service delivery are shared commonalities. First, theoretical and practical models for embedding mental health services into school contexts all call for attention to issues of stakeholder engagement (e.g., teachers, parents, administrators, and students). Second, these models all involve effective collaboration that links service delivery and support both within the school environment and with outside service agencies. Finally, these models highlight the delivery of comprehensive and individualized evidenced-based services that can best meet the needs of the students and their families. School psychologists, with their expertise in areas such as evaluation and measurement, systems theory, consultation,
aspects of mental health and their impact on school functioning, and data-based decision making are poised to be the keystone in school-based mental health models.

In the next section, the author will review the current status of pediatric headache, diagnostic classification and considerations, its impact on health and well-being, and viable treatment paradigms.

**Headaches in Children and Adolescents**

Headache is one of the most commonly reported health problems in children and adolescents in both the pediatrician’s office and emergency room settings (Sanmaneechai & Ballaban-Gil, 2013). In fact, it is estimated that general and family physicians are visited over 9 million times per year by patients complaining of headache (Connelly, 2003), and recurrent headache is second only to seizure as the most common reason for referral to a pediatric neurologist (Jay & Tomasi, 1981). Additionally, individuals suffering from recurrent headaches have been shown to demonstrate marked impairments in mental health, interpersonal functioning, and general quality of life both during and between headache attacks (Solomon, 1997; Stewart & Lipton, 1997). While most of the extant literature on headache has focused on adults, there has been an influx of scientific inquiries surrounding the diagnosis and treatment(s) of recurrent headaches in the pediatric population in recent years, yielding surprisingly similar results as their adult counterparts.

**Epidemiology**

For decades, epidemiological research has consistently shown headaches to be one of the primary health complaints among children (Nyame, Ambrosy, Saps, Adams, Dhroove, & Suresh, 2010). In fact, in the United States alone it is estimated that
approximately 2.1 million emergency department visits for individuals under the age of 18 are due to headache complaints (Goldstein, Camargo, Pelletier, & Edlow, 2006).

The first major epidemiological studies of headache in children were first reported by Vahlquist (1955) and Bille (1962) in Sweden. In a study of 9,000 Swedish school children between the ages of 7 and 15 years old, the prevalence of migraine was 1.4% at age 7 years and 5.3% at 15 years of age, with a gradual increase in migraine headache from age 11 with a predominance among girls (Bille, 1962). In a 40-year follow up study with a subgroup of 73 children with pronounced migraine and an average onset of 6 years, Bille (1997) found that 23% of the participants were migraine free before the age of 25 with males comprising the majority of this group. However, he noted that by the age of 50, more than half of the migraine group continued to have migraine attacks. These results suggest that headache symptoms can be a life-long struggle for those affected individuals and that these struggles can start very early in life.

Several more contemporary studies have demonstrated relatively consistent results. Stewart and colleagues (1993) found the incidence of migraine in males with aura peaked around 5 years of age (0.6% of the population pool) and migraine without aura around 10 years of age (1% of the population pool). In females, the incidence of migraine with aura peaked between the ages of 12 and 13 (1.4%) and migraine without aura between the ages of 14 and 17 (1.9%). In a more recent study, Abu-Arafeh and colleagues (2010) report that the prevalence of headache in children up to 20 years of age is at approximately 58% with a 1.5/1 female to male ratio. They further note the incidence of migraine headaches in this population at 7.7%; 9.7% in females and 6% in males across the age range.
The evidence from studies like these clearly demonstrates that headache can begin very early in life and continue well into adulthood. Additionally, females appear to be susceptible to headache, with peak incidence in early adolescence possibly suggesting heightened sensitivity to migraine as they enter puberty. In the following section, headache prevalence is explored.

**Prevalence**

Primary headache disorders are one of the most prevalent health concerns worldwide (Bonfert et al., 2013). It is estimated that 3-4% of the general population suffers from primary chronic headaches (including both chronic migraine [CM] and chronic tension-type headaches [TTH]; Ozge et al., 2013), with strikingly high prevalence rates among children and adolescents. Specifically, 20-30% of children report experiencing headache at least once per week with up to 6% reporting experiencing headache several times per week or even daily (Pavone, Conti, Le Pira, Pavone, Verrotti, & Ruggieri, 2011). The prevalence rates of headache in children (8-12 years of age) and adolescents (13-17 years of age) vary widely depending on the methodology and diagnostic criteria used as well as the setting. In a large study completed by the World Health Organization (WHO, 2000) in 28 countries of 11-15 year-old school children, headache was found to be the most prevalent complaint.

Several studies have reported annual prevalence rates in school-aged children suffering from migraine and tension-type headache ranging from 3-11% and 0.9-24%, respectively (Kernick & Campbell, 2008; Zwart, Dyb, Holmen, Stovner, & Sand, 2004; Abu-Arefeh & Russell, 1994; Laurell, Larsson, & Eeg-olofsson, 2004; Bandell-Hoekstra, Abu-Saad, Passchier, Frederiks, Feron, & Knipschild, 2001), indicating that headache is a
pervasive problem across the globe. Recurrent headache occurring at least once a month has a prevalence rate between 23% and 51% among school-aged children (Kristjansdottir & Wahlberg, 1993; Sillanpää, 1996). Frequent headaches occurring once a week or more have been reported by 7-44% of school-aged children (Bandell-Hoekstra et al., 2001; Brattberg & Wickman, 1991; King & Sharpley, 1990; Kristjansdottir & Wahlberg, 1993; Marklund, 1997). Chronic daily headaches (more than 15 days a month) are reported by 0.2-2.5% of children and adolescents (Abu-Arefeh & Russell, 1994; Newacheck & Taylor, 1992; Sillanpää, Piekkala, & Kero, 1991). The prevalence rates for tension-type headache have recently been found to be approximately 10% among 7-16 year-old Swedish children (Laurell, Eeg-Olofson, & Larsson, 1999) and Bille (1962) reported similar prevalence figures for frequent non-migrainous headaches. A few studies have shown an increased prevalence for migrainous as well as other headaches (Bandell-Hoekstra et al., 2001; Marklund, 1997; Sillanpää & Antilla, 1996).

In a study of preadolescent children (age 5-12 years old), the parents of 1994 children were interviewed using a standardized questionnaire developed from the ICHD-II (Arruda, Guidetti, Galli, Albuquerque, & Bigal, 2010). Using a single diagnosis strategy where only the most severe type of headache classified, the results showed that migraine were found in 3.76% of the children, with 17.1% having probable migraine, and 0.8% having chronic migraine. Similarly, frequent TTH were found in 1.6%, infrequent TTH in 2.3%, and probable TTH in 13.5% of the participants.

The prevalence rates clearly indicate that pediatric headache is a very common disorder which is often accompanied by significant disability, which may have an adverse impact on the child’s life and school performance as well as relationships with family and
peers. Early and accurate diagnosis as well as comprehensive effective treatment are essential to minimize the impact on a child’s quality of life and may in fact result in the prevention of long-term disability. In the next section, the author will review common symptoms and diagnostic considerations.

**Symptoms, Diagnosis, and Classification**

Research on headache etiology, epidemiology, prevalence, and phenotypic expression has seen tremendous growth over the last six decades. In order to facilitate this growth in exploration, diagnostic criteria needed to be established to allow for a systematic and reliable research. The process of describing and classifying headache were traced back some 5,000 years ago to the ancient Egyptians, with the first full description of the disorder credited to the Greek physician Artaeus as early as the first century A.D. (Isler, 1987). A preponderance of research surrounding headache was aimed at the establishment of criteria for the adult population. Vahlquist (1955) established the first classification schema in the pediatric population, followed by several revisions by other independent researchers and committees. In 1988, the International Headache Society (IHS) developed the International Classification of Headache Disorders (ICHD), which established the “gold standard” for diagnosis of headache. While these criteria provided a sound framework for adult headaches, it lacked sensitivity to the different experiences in their respective pediatric counterpart (Lewis, Bigal, & Winner, 2008). As a result, the IHS revised the ICHD in 2004, resulting in the ICHD-II that allowed for use of modified criteria within the pediatric population (Headache Classification Subcommittee of the International Headache Society, 2004).
According to the IHS, headaches are divided into two categories: primary and secondary headache disorders. In primary headache disorders, the headache itself is the primary illness and is not attributable to any other physiological disorder. This primary category is comprised of migraine (with and without aura [i.e., visual disturbances]), tension-type headache, cluster headache, and other autonomic cephalgias with migraine and tension-type being the most prevalent. In secondary headache disorders, headache is the symptom of identifiable structural, metabolic, or other abnormalities such as tumors, environmental poisoning and infections. Secondary headaches can be the preliminary symptoms to a more significant health concerns with red flags that may include significantly pronounced pain, increased frequency or severity, occipital location, awakening from sleep due to headache pain, headache occurring exclusively in the morning associated with severe emesis, and headache associated with straining (Ozge et al., 2011). The next section of the literature review will delineate the signs, symptoms and diagnostic criteria for each of the primary headache disorders.

**Migraine headache.** Migraine headaches are one of the most common chief complaints of children and adolescents when seeking medical attention (Lewis, Bigal, & Winner, 2008). The prevalence in school-aged children ranges from 3.2 to 23% (Ozge et al., 2002; Akyol et al., 2007; Laurell, Larsson, Mattsson, & Eeg-Olofsson, 2006). Migraine attacks have a stereotyped sequence of phases including the premonitory phase, aura, headache and associated symptoms, and recovery (Lewis, Bigal, & Winner, 2008). Parents or caregivers may readily recognize the premonitory phase with behavioral changes including mood changes, irritability, lethargy, yawning, food cravings, and/or increased thirst (Akyol et al., 2007).
Migraine without aura is the most frequent type of migraine in children and adolescents comprising 60 – 85% of diagnoses (Lewis, 2010). The diagnostic criterion outlined by the ICHD-II shown in Table 1 includes episodes of intense, disabling headache, separated by symptom-free intervals. To reach a threshold for diagnosis, the criteria require at least five separate attacks, lasting 1-72 hours; the pain may be unilateral or, bilateral (bifrontal, bi-temporal), with a pain quality that is typically pulsing or throbbing, and pain that is moderate to intense and is aggravated by routine physical activity such as walking or climbing stairs. The accompanying associated autonomic features may include nausea, vomiting, photophobia (e.g., sensitivity to light) and/or phonophobia (e.g., sensitivity to sound). In children, the duration is often shorter, 1 or 2 hours, and the associated features of nausea or vomiting or both are sometimes more prominent than the headache (Solomon & Lipton, 2013). In addition, if the frequency of headache increases to more than 15 days per month, the additional classification of chronic migraine is applied. Finally, the diagnostic criteria state that the headache must not be attributable to another disorder (Headache Classification Subcommittee of the International Headache Society, 2004).
Table 1

*ICHD-II Diagnostic Criteria for Migraine without Aura*

A. At least 5 attacks fulfilling criteria B-D (below)

B. Headache lasting 1-72 hours

C. Headache has at least two of the following characteristics:
   1. Unilateral location, may be bilateral, frontotemporal (not occipital)
   2. Pulsing quality
   3. Moderate or severe pain intensity
   4. Aggravation by or causing avoidance of routine physical activity

D. During the headache, at least one of the following
   1. Nausea and/or vomiting
   2. Photophobia and phonophobia, which may be inferred from their behavior

E. Not attributed to another disorder

The second type of migrainous headache reported, albeit to a much lesser extent is migraine with aura. Approximately 10-30% of children and adolescents with migraine will report visual disturbances, distortions, or obscurations before, or as, the headache begins (Lewis, 2010), then completely disappears. The visual symptoms begin gradually and last for several minutes up to an hour with the most reported forms being binocular visual impairment with scotoma (77%), distortion or hallucinations (16%), and monocular visual impairment or scotoma (7%) (Hachinski, Porchawka, & Steele, 1973). The diagnostic criterion for migraine with aura is outlined in Table 2.
Table 2

**ICHD-II Diagnostic Criteria for Migraine with Aura**

A. At least two attacks fulfilling the following criteria (B-E)

B. Aura consisting of at least one of the following, but no motor weakness

1. Fully reversible visual symptoms including positive features and/or negative features (e.g., flickering lights, spots, or lines)

2. Fully reversible sensory symptoms including positive features (i.e., pins and needles) and/or negative features (i.e., numbness)

3. Fully reversible dysphasic speech disturbances

C. At least two of the following

1. Homonymous visual symptoms and/or unilateral sensory symptoms

2. At least one aura symptom develops gradually over ≥ 5 minutes and/or different aura symptoms occur in succession over ≥ 5 minutes

3. Each symptom lasts ≥ 5 minutes and ≥ 60 minutes

D. Migraine aura fulfilling criteria B and C

E. Not attributable to another disorder

**Tension-type headache.** Although tension-type headache and migraine are the two most common types of primary headaches in children and adolescents, the majority of empirical research focuses on migrainous type headaches (Ozge et al., 2011). Tension-type headache was reported less often in children less than 10-12 years of age and more frequently in adolescents; however, taking into consideration methodological differences and interpretation of results, most of the epidemiological studies found that TTH was the
most frequent headache in children aged 8-12 years old with prevalence ranging from 0.9-72.8% (Ozge et al., 2011).

In 1962, the Ad Hoc Committee on Classification of Headache published descriptions of 15 types of headache. According to the committee, tension headache or muscle-contraction headache was described as an ache or a sensation of tightness, pressure, or constriction, widely varying in intensity, frequency, and duration, commonly suboccipital in location, and associated with sustained contraction of skeletal muscles – usually as part of a physiological reaction to a stressful event (Ad Hoc Committee on the Classification of Headache, 1962).

Children and adolescents who suffer from TTH report similar symptoms as those experienced in their adult counterparts (Lewis, Bigal, & Winner, 2008). The ICHD-II differentiates infrequent episodic TTH occurring less than once a month, frequent episodic TTH present on up to 14 days per month and chronic TTH occurring at least 15 days per month or 180 days per year. The phenotypic expression of TTH is characterized by a bilateral pressing tightness occurring anywhere on the cranium or suboccipital region, with mild to moderate pain intensity and is usually not aggravated by physical activity. Associated symptoms are absent or limited to one out of photophobia and phonophobia in episodic TTH and one out of mild nausea, photophobia and phonophobia in chronic TTH (International Headache Society, 2004; Anttila, 2006). The ICHD-II diagnostic criteria are found in Table 3.
Table 3

**ICHD-II Diagnostic Criteria for Tension-Type Headache**

A. At least 10 episodes fulfilling the criteria B-D

1. Infrequent: <1 day per month; ≥10 episodes
2. Frequent: ≥1 but <15 days per month; ≥10 episodes
3. Chronic: ≥15 days per month for >3 months; ≥180 days per year

B. Headache lasting 30 minutes to 7 days

C. Headache has at least two of the following characteristics

1. Bilateral location
2. Pressing/tightening (nonpulsating) quality
3. Mild to moderate intensity
4. Not aggravated by routine physical activity such as walking or climbing stairs

D. Both of the following

1. No nausea or vomiting
2. No more than one of photophobia or phonophobia

E. Not attributed to another disorder

**Cluster headache.** The third type of primary headache classified by the ICHD-II is the cluster headache (CH). Cluster headache is regarded as the most painful of the primary headaches that usually begins in the second decade of life; the prevalence of childhood onset is approximately 0.1% with a gender ratio of about 3:1 in favor of men (Ozge et al., 2011).
The diagnostic features described by the International Headache Society define two main types of CH: episodic and chronic cluster headache. Episodic CH is defined as occurring in bouts lasting 7 days to 1 year separated by pain free periods lasting 1 month without treatment. A bout is made up, therefore, of many distinct attacks. Chronic CH is defined as attacks occurring for more than a year without remission or remissions lasting less than 1 month without treatment. CH is characterized by severe unilateral, supraorbital, or temporal pain of short duration (15-180 min untreated) that is associated with ipsilateral orbital-nasal autonomic dysfunction or restlessness and occurs primarily at certain times of the day, week, month, season, or year (Steiner & Martelletti, 2011). Additionally, behavior disturbances such as agitation, pacing, rocking, or head banging can help the differential diagnosis (Wheeler & Vasconcellos, 2011).

The CH is also part of a group of primary headaches know as trigeminal autonomic cephalgias (TAC). TAC’s are characterized by unilateral trigeminal distribution of pain that occurs in association with prominent ipsilateral cranial autonomic features (Majumdar, Ahmed, & Benton, 2009). The other disorders in this group are paroxysmal hemicranias, hemicranias continua, and short-lasting unilateral neuralgiform headache attacks (International Headache Society, 2004). Because this group of primary headaches is considered very rare in children and adolescents, there are limited large-scale studies dealing specifically with etiology, pathophysiology, phenotypic expression, and treatment in this age group. What research is present to date are single case reports, each with slightly different presentations. There is however, a shared treatment efficacy with medication use similar to treatment protocols used in the adult population (Majumdar et al., 2009).
**Other primary headaches.** The preponderance of prevalence and epidemiologic studies show migraine and TTH to be the most common type of pediatric headaches. That being said, a brief review of the less commonly reported primary headaches is provided. *Hemicrania continua* (ICHD-2 4.7) is a daily continuous unilateral headache of moderate intensity with the added symptom of eye irritation that is a key finding to help differentiate from migraine or TTH. *Primary stabbing headaches* (ICHD-2 4.1) are manifested by localized stabs of pain lasting one to a few seconds and occur randomly without a consistent location. *Hypnic headaches* (ICHD-2 4.7) awaken individuals from sleep, often at the same time each night, lasting up to 30 minutes. The pain is usually non-specific and is without associated symptoms. Finally, *new daily persistent headache* (ICHD-2 4.8) shares similar symptoms of TTH and migraine; however, the headache itself can last more than 3 months.

Headache pain and associated symptoms can be relatively mild and brief for many. However, for those individuals living with chronic or persistent headaches, the effects can be debilitating to the extent that normal daily functioning is greatly impaired. Left undiagnosed and untreated, living with chronic pain can negatively impact cognitive functioning (e.g., decreased ability to concentrate, memory, arousal) as well as increase susceptibility to mood disorders (i.e., depression and anxiety). In the following section, the author will review the most prominent difficulties associated with living with frequent headache pain.

**Psychological Impact**

During childhood, headache can be the expression of psychological difficulties, such as anxiety and depression, and stressful life events have frequently been implicated
in the onset, exacerbation, and maintenance of headache (Venable, Carlson, & Wilson, 2001). Conversely, headache itself can be the source of stress, leading to functional impairment, which can cause anxiety in both patients and their families (Holmes & MacGregor, 2001). Many studies have reported a close association of psychological impairment with chronic pain and headache. Specifically, internalizing symptoms (i.e., anxiety and/or depression) have been associated with chronic pain as well as adverse effects on social and emotional function and interpersonal relationships, particularly within the family system (Bruijn, Locher, Passchier, Dijkstra, & Arts, 2010).

Coping with headache pain can have a pervasive negative impact on a child’s interpersonal functioning, potentially leading to negative affective states (e.g., depression, anxiety, anger) and increased psychosocial difficulties (e.g., school absences, problematic social interactions; Karwautz et al., 1999; Powers & Andrasik, 2005). Depression and anxiety disorders are thought to be psychological correlates of recurrent headaches in children and adolescents (Powers, Kruglak Gilman, & Hershey, 2006). A review of the extant literature leads one to the conclusion that the true nature and origin of the relationship between recurrent headache and comorbid psychiatric symptoms has yet to be well-defined and understood. Comprehensive treatment packages should not only address the physiological symptoms of headache, but also take into consideration the psychological impact that living with chronic or recurrent pain. As such, any such treatment should possess both physiological and psychological treatment components.

Gladstein and Holden (1996) analyzed behavior patterns in 37 children and adolescents experiencing chronic daily headache in a tertiary headache clinic over a two-year period. The researchers delineated the participants into five distinct groups based on
headache presentation. The groups were: Comorbid pattern, new daily persistent headache, transformed migraine, chronic tension-type, and unclassified. Although they found no significant differences in internalizing or externalizing behaviors between the different diagnostic groups, they did note an inverse correlation with feelings of helplessness and diminished coping skills when a greater number of headache symptoms were present (Gladstein & Holden, 1996). In a similar study, Antilla and colleagues (2004) evaluated the association of psychiatric symptoms in 183 Finnish sixth graders randomly assigned to one of three groups by diagnoses (e.g., migraine, tension-type, headache free). In contrast to Gladstein and Holden’s (1996) work, Antilla et al. found that children with migraine had significantly higher levels of total internalizing and somatic symptoms, as well as high level of social and family problems when compared to the headache free controls. In addition, they noted that those in the tension-type group had significantly higher somatic complaints and family problems than the headache free control group (Antilla et al., 2004). The findings of these two studies, while discrepant in diagnostic severity, indicate that children and adolescents living with headache and associated symptoms demonstrate a decreased ability to effectively employ coping strategies during headache episodes and an increased risk for psychological impairment. Additionally, other studies have documented higher levels of anxiety or depressive symptoms in girls afflicted by headache and a greater number of symptoms of hyperactivity, anger, aggressive behavior or conduct problems in boys experiencing headache (Powers, Gilman, & Hershey, 2006; Egger, Angold, & Costello, 1998).

Though the studies described above highlight the differences in behavioral phenotypes resultant from headache, they do not elucidate whether these differences are
attributable to the respective headache classification. Mazzone and colleagues (2005) attempted to identify if such a distinction could be made. Their study included 114 children with chronic headache age 6 to 16 years referred to a tertiary headache clinic assigned to two groups: tension-type (n=47), migraine (n=67), and normal control (n=36). Their results not only corroborate previous findings of increased internalized and externalized behaviors, but also showed distinct differences between the two headache groups. For example, participants in the tension-type headache group showed elevated scores on indices of global, internalizing and externalizing symptoms as well as hyperactivity, while depression and anxiety scores did not differ between the two headache groups (Mazzone, Vitiello, Incorpora, & Mazzone, 2005). The researchers further highlight that while most of the participants in the headache group demonstrated only subclinical levels of psychological distress, they were consistently higher across domains than their respective normal control group. These findings were contradictory to the previous work by Gladstein and Holden (1996), which suggested higher levels of maladaptive psychological traits among those with migrainous type headaches. Regardless of diagnostic classification, recurrent pains such as headache are often accompanied by cognitive-emotional and behavioral symptoms, which might not exceed the diagnostic threshold of pathology, but represent an additional burden laid upon the child (Kroner-Herwig, 2011).

Psychological aspects of chronic pain such as cognitive and environmental variables can shape perception and maintenance of pain related behaviors in children and adolescents (Ryee, 2011). In fact, headache in the pediatric population can be the expression of psychological difficulties, such as anxiety or depression, and stressful life
events have been frequently implicated in the onset, exacerbation, and maintenance of headache (Mazzone et al., 2005). Conversely, the experience of frequent headache pain can itself be a source of stress, leading to functional impairment, which can cause anxiety in both patients and parents (Holmes & MacGregor, 2001). While diagnostically challenging to determine the magnitude of influence mood-based disorders like anxiety or depression and the frequency, intensity, and duration of headache expression, this bidirectional relationship suggests a negative feedback cycle.

In the child and adolescent literature, the relationship between headache and psychiatric symptoms has yet to be well defined (Powers et al., 2006). Further studies have examined more closely the link between headache and mood disorders, specifically depression and anxiety and the potential development of more pronounced pathologies later into adulthood.

**Depression and Anxiety**

Depressive disorders are reported to be a commonly encountered psychiatric diagnosis, with 6 to 8% of children and adolescents in the general population diagnosed with a depressive disorder (Beck, Hollon, Young, Bedrosian, & Budenz, 1985). With regard to headache and its impact on depressive symptomatology, the empirical results are anything but conclusive. For example, Andrasik et al. (1988) noted differences in the level of depressive symptoms between subjects with and without recurrent headache on standardized self-report measures, although all mean scores were noted to be within the subclinical level. Kaiser (1992) noted by using clinical interviews of adolescents aged 13 to 18 years with recurrent headache met diagnostic criteria for adjustment disorder with depressed mood or dysthymia. In a study that evaluated parental perception of
psychological dysfunction in children with recurrent headaches, results indicated that parental ratings were significant for depressive symptoms (Larsson, 1998), and were more pessimistic (Cooper et al., 1987) when compared to control groups of children without recurrent headache. However, studies completed by Cunningham et al., (1987) and Kowal and Pritchard (1990) found no significant differences in the level of depressive symptoms between subjects with and without recurrent headache.

In a study completed by Mazzone and colleagues (2005), the researchers sought to examine the behavioral and emotional symptoms of children aged 6-16 referred to a tertiary headache clinic. A total of 114 subjects were included and divided between tension-type and migraine groups based on reported symptoms as well as a control group for comparison. Results from this study found that indices relating to behavioral and emotional difficulties and anxiety and depression were elevated when compared to the control group, although still falling within normal limits. In addition, they found more evidence of behavioral and emotional difficulties in the TTH group compared to the migraine group, which is in contrast to a study completed by Antilla et al., (2004) that showed higher level of total, internalized, and somatic symptoms in the migraine group.

Clearly, there are inconsistencies with the severity and/or presence of depressive symptoms within these studies. However, what can be taken from these studies is that while depressive symptoms may not meet the threshold for a formal diagnosis, there is sufficient evidence to support psychological disruption among those individuals who suffer with recurrent headaches.

Unlike the contradictory and generally inconclusive findings of increased prevalence in depression in children and adolescents with headache, stronger findings
have been shown in studies evaluating anxiety in the presence of headache. For example, in his seminal study Bille (1962) noted significantly higher levels of self-reported anxiety in children and adolescents with migraine and non-migrainous headaches. Muller et al. (1994) reported higher levels of anxiety and depressive symptoms in children with migraine compared to those experiencing episodic TTH. More importantly, they reported a positive correlation between symptoms levels and frequency of headache. In a large epidemiological study, Egger and colleagues (1998) found higher levels of anxiety and depressive disorders in adolescent girls with frequent headaches as assessed by semi-structured interviews.

In one of the first studies published involving school-aged children, Pitrou (2010) and colleagues examined the relationships between pediatric headache and emotional and behavioral difficulties in over 1,300 French children aged 6 to 11 years. Psychopathology outcomes were assessed using the parent version of the Strengths and Difficulties Questionnaire (SDQ) and the Dominic Interactive (DI). Results from this study showed that children with headaches were 2.65 times more likely to have a high level of total difficulties according to their parents when compared to non-headache children (Pitrou et al., 2010). In addition, headaches were significantly associated with emotional problems on both self- and parent-reports with symptoms associated with generalized anxiety disorder the most prevalent (Pitrou et al., 2010).

In a more recent study completed by Arruda and Bigal (2012), similar results were obtained. Specifically, the researchers evaluated the behavioral and emotional symptoms of children aged 5 to 11 years using the ICHD-II classification criteria to group the participants. Behavioral and emotional symptoms were assessed using the
Child Behavior Checklist (CBCL). Results from the study showed that relative to the control group, children with migraine were significantly more likely to have elevated scores in the CBCL domains of somatic, anxiety-depression, social, attention, internalizing, and total score (Arruda & Bigal, 2012). In addition, the participants in the TTH group showed significant elevations when compared to the control group and in the same domains as the migrainous group, though to a lesser extent.

While the empirical evidence linking recurrent headache to clinically significant anxiety and depressive symptoms has yet to be firmly established, the studies completed to date do indicate the potential for increased mood-based dysfunction and reduced adaptive functioning in those experiencing recurrent headaches. Additionally, it may be plausible to consider that increased levels of anxiety present in adolescents with recurrent headache, if left untreated could facilitate and promote increased levels of depressive symptoms leading into adulthood. In the next section, the author will provide insight on how the increased susceptibility of chronic headache sufferers to develop symptoms of anxiety and depression and how this susceptibility affects the overall quality of life for the individual.

**Quality of Life**

In addition to experiencing symptoms associated with depression and anxiety as described in the previous section, many children with headache report that their pain significantly interferes with normal functioning in everyday life activities (Ernst & Powers, 2008), and that their reported pain and negative impact on their quality of life was similar to children suffering from other chronic health conditions. Specifically, recurrent headache has been associated with impairments in academic, social, and
physical functioning – both between and during headache attacks (Holden, Levy, Deichmann, & Gladstein, 1998). In the professional literature, there is a paucity of quantitative research on the impact of headache and the quality of life (QoL) in the pediatric population. A cumulative bibliography of health-related quality of life measurement tools listed 1365 published reports, of which less than 5% were applicable to the pediatric population (Berzon, Simeon, Simpson, Donnelly, & Tilson, 1995).

Fortunately, given the high prevalence rates of headache as well as other chronic health conditions, interest in the quality of life research within the pediatric population is beginning to expand.

During the 1990’s there was an emerging scientific interest in quality of life (QoL), which is recognized as a major outcome variable associated with the impact of headache and its treatment (Frare, Axia, & Battistella, 2002). Quality of life is a concept that encompasses a broad range of physical and psychological characteristics describing an individual’s ability to function and the satisfaction derived from doing so (Walker & Rosser, 1988). Research in this area has generated considerable attention on the adverse effects of chronic pain and its impact on quality of life. For example, Hunfeld and colleagues (2001) evaluated the effect of pain on the quality of life of adolescents and their families. The study consisted of 128 adolescents aged 12 to 18 years (95 girls and 33 boys) reportedly experiencing continuous pain (n=31) or recurrent pain (i.e., pain with pain free interval [n=97]). The participants were to keep a pain-related diary accounting for frequency and intensity for a three-week period. In addition, the participants completed the Quality of Life Pain-Youth (QLP-Y) questionnaire to measure the impact of pain on daily functioning. The mother of each participant completed the Impact on
Family Scale (IFS) to measure how the participant’s pain related behavior affected family functioning. Results from this study showed an inverse relationship with pain frequency and intensity with overall quality of life as reported by the adolescents. Similarly, the mother’s perception of the impact of chronic pain showed significant restrictions in social life and problems with their interpersonal response to their child with chronic pain (Hunfeld et al., 2001). Results from this particular study show evidence of how living with chronic and recurrent pain can negatively affect not only the individual experiencing the pain, but also can affect the ecological system in which the individual resides.

In another study completed by Powers, Patton, Hommel, and Hershey (2003), the researchers evaluated the QoL of children diagnosed with migraine and chronic daily headaches. Using a sample derived from 572 consecutive patients attending a children’s headache center between the ages of 2 to 18, their results showed that the negative impact that their headache had on their QoL was similar to that of children with arthritis and cancer, with the most profound impairments in school and emotional functioning (Powers, Patton, Hommel, & Hershey, 2003). Specifically, children with headache reported moderate to significant difficulty with sustained attention in class, memory disturbances, difficulty keeping pace with schoolwork, increased absences due to headache related pain, sleep difficulties and increased levels of emotional lability (Powers, Patton, Hommel, & Hershey, 2003). Similarly, Nodari, Battistella, Naccarella, & Vidi (2002) found that those participants with frequent and intense headache attacks scored much worse on subscales of anxiety and headache impact on psychological, physical, and social functioning when compared to healthy controls.
In a more recent study completed in the Netherlands, Bruijn and colleagues (2009) measured the quality of life in children presenting with primary headache at an outpatient pediatric department. The sample consisted of a total of 70 participants between the ages of 4 – 17 diagnosed with TTH, migraine, chronic TTH, and combined migraine and TTH. QoL was measured using a Dutch version of the Child Health Questionnaire (CHQ-PF50 Dutch edition). Their results showed that the headache group scored significantly lower on 12 of the 13 subscales when compared to healthy matched controls, with particularly lower scores in the domains of mental health, parental impact time, and family cohesion (Bruijn et al., 2009). While new research is being produced addressing the impact of headache and the individuals overall quality of life, those who suffer from headache can experience its negative impacts in both psychological and behavioral domains.

**Headache Effect on Coping**

The impact of headache on the individual’s QoL may also be influenced by their ability to cope with headache pain and/or associated symptoms. Lazarus and Folkman (1984) define coping as “intentional cognitive and behavioral efforts to manage specific internal or external demands (and conflicts between them) that are appraised as stress because they are taxing or exceeding the resources of the person” (p. 141). The relatively recent interest in pediatric pain and coping skills is derived from the observation that pain is associated with disability and unease in some individuals, whereas others are able to adapt to discomfort, pain and stress associated with headache symptoms (Frare et al., 2002).
Two approaches to coping have been distinguished in the literature: *style* and *process* approaches (Lazarus, 1993). The focus of the style approach is on coping as a relatively stable individual disposition. As such, with the style approach the main objective is to identify consistent patterns in the ways an individual handles various stressors. The process approach is focused on how coping strategies change over time and situations. According to this notion, the use of coping strategies depends on how the individual appraises the stressor and the outcome of previously employed strategies. Because such judgments are dynamic, coping strategies may change from time to time and between situations within the same individual. Similarly, coping responses have varying definitions within the literature. Many theories emphasize some major functions of coping, either problem-focused versus emotion-focused coping, or behavioral versus cognitive coping (Gil et al., 1997; Lazarus, 1993). Problem-focused strategies aim at changing the problem by acting in the environment. Emotion-focused coping strategies aim at changing the individual’s attention to the stressor or the relational meaning of what is happening (Lazarus, 1993). Behavioral coping strategies are overt behaviors a person uses to deal with stressors, while cognitive coping strategies are mental strategies or cognitions to deal with stress (Gil et al., 1997). None of the above mentioned coping strategies are intrinsically adaptive or maladaptive. Their adaptiveness must be evaluated independently of assessment of the use of each coping strategy.

Although there are only a limited number of empirical studies investigating pediatric pain coping strategies, the existing literature offers some clinically relevant insight. For example, an exploratory study completed by Gilbert (1999) utilized the qualitative approach of case analysis to identify spontaneous coping behaviors of children
who suffer from pediatric migraine to describe the child and family holistically and capture the conditions, norms, patterns, and complexities of children’s coping skills in the naturalistic setting. Eight cases were selected though stratified purposeful sampling and assigned to one of two groups, “copers” and “non-copers” based on their normal versus clinical scores respectively on The Child Behavior Checklist (CBCL). Three categories of coping were constructed from the data: (a) affective coping, (b) cognitive coping, and (c) problem-focused coping. Affective coping was defined as the effort of the informants to reduce anxiety or other stressful feelings by eliciting social support, sharing feelings about the headache disorder, experiencing an empathetic response, and being reassured directly by another person. Cognitive coping was defined as the informants’ mental attempts to affect cognitions, perceptions, and beliefs in order to alter their perceptions of themselves or the headache disorder to decrease the anxiety or other stressful feelings associated with headache. Problem-focused coping was described as efforts intended to reduce or eliminate the stressor such as taking actions to obtain relief from existing headache (i.e., medication), actions taken to prevent the onset of headache (i.e., avoiding headache triggers), advance planning for headache occurrence (i.e., carrying medication when away from home), and requesting assistance from others (i.e., seeking support from another prior to or during headache episode). The author of this study reported that children who scored in the average range on the CBCL and had below average rates of school absenteeism used a greater number of coping strategies than informants within the clinical range. In contrast to the “non-copers” group, the “coping” group employed strategies from each of the three broad categories of coping. They were also noted to rely
comparatively more on prevention, anticipatory, and resignation coping approaches to pain management (Gilbert, 1999).

Frare and colleagues (2002) evaluated the relationship between headache, coping strategies, QoL, and situational variables. The participants in this study were forty-eight children aged 8 to 14 years recruited from a tertiary pediatric headache clinic in Italy. This research study reported that participants’ QoL was worst when the headache attacks were frequent and long. Interestingly, the intensity of headache was not found to have a meaningful impact on the QoL. In addition, they found that headache characteristics are not associated with child coping, suggesting that children’s ability to cope with headache is not directly influenced by their experience with the episodes. Finally, the authors found that the family adaptive routine influences in a meaningful way both the child coping and his or her QoL and that the coping strategies determined the QoL.

The conclusions based on these findings suggests that what appears to be an important factor in the development and maintenance of recurrent pediatric headache on a psychological level is the failure to resolve normally occurring childhood stressors associated with academic, social, and physical activities (Holden et al., 1998; McGrath & Hillier, 2001). Ineffective coping skills may be learned through modeling of parental coping strategies, and secondary gain for reporting pain may play a role in maintaining the headache activity (Connelly, 2003). McGrath and Hillier (2001) proposed the following theoretical model: A stressful situation occurs that does not reach resolution resulting in increased anxiety, which in turn leads to the development of a headache episode. The child is thereby removed from the situation and provided with temporary stress reduction until another stressful situation occurs; the cycle then repeats itself.
Factors that interact with this model include child factors (e.g., age, gender, cognitive level, pain experience, family learning), cognitive factors (e.g., beliefs about headache etiology, beliefs about pain control), behavioral factors (e.g., child and parent behavior during the attack and parental response to repeated attacks), and emotional factors (e.g., situation-specific stress, anxiety, fear of an undiagnosed medical condition, frustration regarding disruption of daily activities). While the etiology of recurrent pediatric headache remains to be fully understood, it is clear that a model of headache etiology needs to account for genetic, biochemical, emotional, cognitive, and behavioral contributing factors. Additionally, a comprehensive model must also postulate how these various factors interact with one another to elicit individual headache episodes potentially leading to the development of recurrent and/or chronic headache.

**Summary and Conclusions**

Children and adolescents experiencing recurrent or chronic headache have been shown to be more likely than those without headache to exhibit higher levels emotional lability, conduct problems, inattention, and peer problems and significantly more likely than those without headache to be upset or distressed by their difficulties and to have those difficulties interfere with home life, friendships, classroom learning and participation in leisure activities (Termine et al., 2011). Additionally, individuals who experience headache experience more stress, fatigue, depression, and somatic symptoms; they felt less strong, had a less cheerful mood and reported lower satisfaction with health and with life in general than those without headache (Karwautz et al., 1999). Further, these individuals have a decreased capacity to successfully navigate and negotiate normally occurring childhood stressors (Holden et al., 1998), likely contributing to a
negative interaction cycle whereby ineffective coping strategies leads to increased emotional distress causing increased headache activity further reducing the individuals coping abilities.

Given the multi-faceted impact that headache can have on the individual, treatment approaches should facilitate relief in a similar fashion. That is, a comprehensive treatment approach to headache should address not only the physiological pain, but also address the impact of the pain as it relates to the individuals overall social/emotional and psychological well-being.

**Research-Based Treatments for Headache**

Children and adolescents managing and coping with headache is an almost ubiquitous phenomenon. It has been estimated that nearly one million children and adolescents suffer from migraine headaches specifically and that several hundred thousand school days are missed each month across the globe due to pediatric migraine (Stang & Osterhaus, 1993). The empirical evidence demonstrating the negative cumulative effects of frequent or recurrent headache within this population are still in their infancy. Studies that have been completed to date show that long-term consequences of headache, if left untreated can include impairment of social functioning and deterioration in academic performance, increased absenteeism, greater amount of behavioral difficulties, and more self-reported exhaustion after school (Karwautz et al., 1999; Smith, Martin-Herz, & Womack, 1999; Hershey, Powers, & Vockell, 2001). Much like early intervention has been shown to provide very favorable results with academic difficulties; this same notion can be generalized to proactive and preventative treatment of pediatric headache.
The goal of any treatment program is the reduction of primary symptoms and associated sequelae resulting from the primary conditions. With treatment of headache, the goal is to reduce the frequency of headache attacks, relieve headaches as rapidly as possible, and decrease the impact of headache on quality of life, including school performance and relationships with peers and family, as well as to prevent progression to more long-term comorbidities such as depression and anxiety (Sanmaneechai & Ballaban-Gil, 2013). With the relatively recent influx of attention being paid to pediatric headache, studies addressing treatment strategies have begun to emerge more frequently.

In addition to medical treatment, there exist a variety of literature-derived interventions that may be classified as behavioral or cognitive-behavioral, or some combination thereof. Examples of behavioral interventions identified in the literature include relaxation training (RT), and biofeedback therapy (BFT). Examples of cognitive-behavioral therapies (CBT) identified in the literature include stress management training, cognitive restructuring, coping skills training, and problem solving. The remainder of this section is dedicated to a critical review of the current state of research-based treatments of pediatric headache. It begins with a brief review of traditional medically oriented interventions, followed by a review of behavioral and cognitive-behavioral treatment modalities that may have promise for school-based applications.

**Medical Intervention**

Pharmacologic headache treatments can be either abortive (i.e., reduction of current symptoms) or prophylactic (i.e., reduce the frequency and intensity and/or the likelihood of future attacks; El-Chammas et al., 2013), however, the data on the efficacy and safety of medications used to treat headaches in children are limited. To date, only a
handful of randomized placebo-controlled clinical trials have been completed with children and adolescents for both acute and preventative medications. Moreover, the few published studies show a high placebo response rate in children, up to 55% for prophylactic drugs, and up to 69% for symptomatic ones (Termine et al., 2011).

To date, positive outcomes have been reported for abortive and palliative drug treatment with mild analgesics (ibuprofen and acetaminophen; Lewis et al., 2002) and sumatriptan nasal spray in children and adolescents suffering from migraine (Winner et al., 2000). At the same time, there continues to be a paucity of sound methodological studies done concerning the efficacy of prophylactic drug treatments.

While traditional medicine may indeed provide relief from headache and associated sequelae, this approach requires clinicians with specialized training and is predominately only available in tertiary settings, making access and feasibility limited to a great many. Alternatively, the use of non-pharmacologic treatments (e.g., CBT, Relaxation Training) delivered by trained mental health clinicians are more widely accessible, especially in the school setting.

**Behavioral and Cognitive-Behavior Treatments**

Living with chronic pain is a major problem for many children and adolescents, causing significant suffering, disability, and emotional lability and distress (McGrath, 1999). Chronic pain is often complex with multiple sources with many cognitive, behavioral, and emotional factors effecting children’s pain, contributing to their distress and disability (McGrath & Holahan, 2003). The biopsychosocial model of pain claims that chronic pain is influenced by cognitive-emotional, behavioral and social factors, which at least partly determine the maintenance of the disorder and especially pain-
related disability and handicap (Turk, 1996). Thus, the model emphasizes the view that cognitive styles of processing pain (e.g., catastrophizing and fear of pain) contribute to the sensory and effective experience of pain, and influence the grade of disability (Kroner-Herwig, 2011). With that in mind, successful non-pharmacologic treatment of headache necessitates a combination of intervention strategies that address the cognitive and behavioral aspects of pain and how they contribute to the maintenance of recurrent pain.

Behavioral interventions often include antecedent strategies geared toward the: (a) identification and modification of behavioral headache triggers, and (b) acquisition and use of physiological self-regulation skills aimed at prevention of headache episodes as opposed to aborting an acute headache (Rains, Penzien, McCrory, & Gray, 2005). Behavioral interventions may include education on headaches and headache behaviors (sometimes referred to as psychoeducational approaches), the use of headache diaries, identification of and avoidance of triggers, and lifestyle modification (e.g., sleep hygiene, diet, regular exercise, avoidance of excessive alcohol and caffeine, and regular practice of stress management and relaxation techniques; Whitmarsh & Buse, 2011). As applied to headache specifically, cognitive-behavioral treatments modify overt behavior by altering thoughts, perceptions and interpretations of events, assumptions, and interpersonal response patterns to events or stressors. More specifically, children and adolescents are assisted in identifying the specific psychological or behavioral factors that either trigger or exacerbate their headaches, and taught to employ more effective coping strategies for headache specific events (Andrasik & Schwartz, 2006). In the following sections, specific research-based behavioral and cognitive behavioral interventions will be
reviewed. Additionally, it will be shown that successful intervention of headache requires a multi-modal approach utilizing aspects of behavioral and cognitive-behavioral approaches.

**Relaxation training.** Relaxation skills are presumed to decrease acute headache symptoms and/or abort acute onset of headache by enabling individuals to identify environmental or interpersonal triggers of headache and modifying their own headache-related physiological responses. In general, relaxation training typically involves the following components: discrimination training focusing on identification of tense and relaxed larger muscle groups; differential relaxation (some muscle groups are tensed while other muscles are relaxed); cued relaxation (pairing breathing to a relaxing word, such as *calm, peace,* or *relax*); mini relaxation focused on a limited number of muscles in the head, neck, or shoulder and applied regularly throughout the day; and application of techniques in everyday life (Andrasik & Schwartz, 2006). Following training completion, a generalized relaxation response can be immediately initiated and realized in nearly any context. The objectives for the use of relaxation are the improvement of body awareness, a reduction of the general level of arousal, training of the ability to relax specific tense muscles, which could have triggered or reinforced pain, and the prevention, as well as the alleviation of the general stress response contributing to headache (Kroner-Herwig, 2011). While the specific techniques may vary from study to study, relaxation training has been shown to be a valuable tool in the treatment of headache.

In a study completed by Engel (1992), similar results were obtained. The study evaluated the efficacy of progressive relaxation training using a multiple-baseline across participant research design with 10 subjects aged 9 to 15 years who by parent or self-
report experience recurrent, intermittent, nonmalignant headaches at least three times monthly. Baseline periods were randomly assigned and ranged from 7 to 25 days with treatment introduced in a time-staggered fashion. Data were collected through the baseline and treatment phases through a headache diary, which recorded headache activity (i.e., peak severity and duration), rest time secondary to headache, and medication intake on a daily basis. The treatment consisted individual relaxation training sessions once a week for six weeks, initially lasting one hour and tapered to a final length of 20 minutes. The first session consisted of a psychoeducational component on the nature of stress, the body’s physiological response, their impact on headaches, and the use of breathing to induce relaxation. During sessions 2, 3, and 4, the subjects received additional training on relaxation techniques (i.e., progressive muscle relaxation, hand warming) as well as guided practice and review of previous techniques. The final two sessions consisted of consolidation of the learned techniques and discussion on how to incorporate these techniques into their daily lives to prevent and/or reduce headaches. Results from this study (Engel, 1992) show 8 of the 10 participants reported increased headache free days, decreases in peak severity, duration, and rest time secondary to headache; however, no follow-up data were reported. While generally favorable results were obtained, the researcher notes that reduction in headache activity was not reduced immediately, consistently, or significantly, as a result of treatment; rather, the reduction was gradual and often inconsistent for most individuals (Engel, 1992).

Larsson and Melin (1986) compared two active treatment forms to the effects of a regular contact with a professional person and systematic self-observation of the chronic headache symptoms with 32 Swedish adolescents aged 16 to 18 years during their regular
school hours. The baseline phase consisted of 3 weeks during which the subjects kept a headache diary documenting the frequency, intensity, and duration of headaches. Following baseline, they were randomly assigned to a no-treatment (self-registration), an information-contact group and a relaxation-training group. The treatment phase encompassed 5-6 weeks, followed by a 6-month follow-up evaluation.

The relaxation training group were given a 9-session relaxation training regime which focused on teaching discrimination between tensed and relaxed state of different muscle groups throughout the body; application of the relaxation technique paired with breathing and a subvocalized cue word (i.e., relax); and encouragement of regular practice of at least 15 minutes per day at home. The information-contact group initially met with the researcher and was given a basic outline of the treatment regime and general information on headache prevalence, expression, and triggers. Following the initial meeting, the participant’s expectancies for therapeutic improvement were rated. During the subsequent 5 sessions, the researcher gave additional general information about headaches as well as discussing the individual results of the assessment with each participant. At no time during these sessions were the students given any suggestions for remediation of symptoms. The self-registration group completed only the pre- and post-self-registration, and thus received no treatment. Results from this study found statistically significant differences in headache frequency, intensity, and duration in the relaxation group compared to the information-contact and self-registration only groups, and that these differences were maintained at the six-month follow-up. Additionally, they noted significant reduction of the student’s experience with stress, again only in the relaxation group (Larsson & Melin, 1986). The outcomes found in this study suggest that
therapist-assisted treatment paradigms showed more positive and sustained outcomes following treatment, however findings from subsequent studies indicate differing results.

To further explore the efficacy of therapist assisted relaxation training within the school setting and a more home-based self-monitoring treatment approach, Larsson and colleagues (1987) evaluated the general outcomes of 46 adolescents aged 16 to 18 years experiencing recurrent headache. To participate, the students had to have reported experiencing at least one headache per week, for at least one year, and who were not receiving any psychological or medical treatment. Baseline data was collected through a headache diary recording the frequency, intensity, and duration of headache episodes, number of headache free days, and medication use. In addition, the Child Behavior Checklist (CBCL) was administered pre- and post-treatment to evaluate levels of anxiety and depression. The subjects were randomly assigned to one of three treatment conditions for the five-week program: therapist-assisted relaxation (TAR), self-help relaxation (SHR), and self-monitoring (SM). The TAR group met twice a week for 45 minutes during regular school hours receiving direct instruction and guided practice in progressive relaxation techniques (i.e., breathing, PMR, cued control) as well as written materials for each session. The SHR group was provided a written manual and five audiotapes containing the treatment exercises and was given the general parameters of the program by the resident school nurse during an initial meeting. The SM group was instructed to only record headache activity, thus receiving no active treatment. At two months post-treatment, the TAR group received a booster session with the clinician and the SHR group received a booster audiocassette. Follow-up was completed at five months. Results from this study suggest that a structured home-based treatment program
was as effective as a therapist-assisted program in the overall phenotypic expression of headache for the participants with reductions in frequency, intensity, and duration of headache activity as well as an increase in headache free days (Larsson, Daleflod, Hakansson, & Melin, 1987).

In the only study to date involving school-based personnel in the treatment of chronic headache, Larsson and Carlsson (1996) evaluated a nurse-administered relaxation training to a no-treatment control condition with 26 Swedish students aged 10 to 15 years. The participants were randomly assigned to one of the two groups and were asked to self-record their headache intensity in a diary on a 6-point scale ranging from 0 (no headache) to 5 (incapacitating headache) four times a day during a 3-week period at baseline, post-treatment, and a 6-month follow-up. The data collected was used to determine headache sum (mean headache intensity per week), headache free days (number of days per week without headache), and headache frequency (number of discrete headaches per week).

The treatment procedure included three school nurses with no prior relaxation training experience. The nurses received 2 to 3 hours of training before treatment was initiated by a physiotherapist, who also provided supervision throughout the study. Treatment sessions were completed in groups of 3 to 4 participants, two times per week for twenty minutes in the nurse’s office using a series of five audiotapes and complementary manual. No indication of homework or generalization procedures identified.

Results from the study showed that 69% of the treatment condition attained a clinically significant headache improvement as compared to 8% of the students in the no-
treatment control group. Additionally, the positive outcome of relaxation training was well maintained at a 6-month follow-up with an improvement rate of 73% compared to 27% for the no-treatment control group.

From a broader prospective, these studies show compelling evidence towards the efficacy of relaxation training on the overall reduction of headache symptoms. In addition, for many the use of these strategies also showed sustained reduction of headache symptoms over a prolonged period. However, of these limited number of studies, only one was delivered by school-based personnel. Additionally, the school-based clinician required individual training on the psychological components of the treatment package, thus not utilizing the comprehensive training associated with school psychologists.

**Biofeedback.** Biofeedback therapy (BFT) is one of the most prominent behavioral approached to pain management. Theoretical and technological advances in psychophysiology in recent decades have stimulated scientific interest in the examination of bidirectional relationships between the physiological and psychological processes, and lead to clinical applications for behavioral regulation of neural and visceral processes through operant learning and biofeedback (Rains, Penzien, McCrory, & Gray, 2005). In fact, in most studies evaluating treatment efficacy, more than two thirds of the children could be classified as treatment successes based on the generally accepted criterion of a 50% symptom reduction rate (Blanchard & Schwarz, 1988).

In BFT, the patients learn voluntary control over their bodily reactions through the feedback of physiological processes (Nestoriuc & Martin, 2007). More simply, BFT utilizes technology to monitor physiological processes that are usually considered
involuntary or that are modulated outside of conscious awareness (e.g., muscle tension, pulse, peripheral blood flow; Rains, Penzien, McCrory, & Gray, 2005). Thus, biological signals are transformed into perceptible signals, such as acoustic or visual stimuli, and fed back to the individual allowing them to hear or see their actual body state. Utilized in treatment of headache, BFT involves the learning and implementation of relaxation and visualization techniques with the goal of decreasing muscle tension and gaining some control over specific autonomic functions (Blume, Brockman, & Breuner, 2012). At present, the two most common modalities used in BFT for treatment of headache are thermal biofeedback for migraine and electromyographic (EMG) biofeedback for tension-type headache.

Research published regarding BFT in treatment of TTH is promising. For example, Allen, Elliott, and Arndorfer (2002) investigated the efficacy of thermal biofeedback and a parent-implemented pain management program. Participants were 7 children (3 boys and 4 girls) between the ages of 8 and 16, endorsing at least two headaches a month for a minimum of 6 months, of which 3 were classified as migraine, 3 with chronic tension-type, and 1 with episodic tension-type headaches. Using a multiple baseline across participants design, baseline data were collected in a time-lagged fashion using a headache diary recording frequency, intensity, and duration of headache as well as associated pain using a 10-point Likert scale. The treatment consisted of five total visits consisting of weekly thermal biofeedback training for the first three weeks, with the remaining two sessions consisting of progress review and further implementation of biofeedback skills. Parent involvement began during the second session whereby they were given the pain behavior management guidelines, which included prompts to
eliminate pain status checks, to encourage use of biofeedback skills, to encourage maintenance of normal activity during pain episodes, and to reduce response to pain behaviors. Results from this study showed six of the 7 participants experienced significant reductions on at least two headache parameters (frequency, intensity, and duration), with all six participants maintaining those reductions at the 3- and 6-month follow ups.

Blume and colleagues (2012) provided a prospective study evaluating BFT efficacy as well as associated factors with response. The authors analyzed 132 records of patients aged 8 to 18 years old who were referred to a tertiary pediatric BFT clinic for management of headache between 2004 and 2008. They extracted data regarding patient and headache characteristics, medication use, family history, and measures of depression, anxiety, and somatization. Results from this study showed that there was a significant response to BFT for those with episodic and chronic headaches with a median headache frequency dropping from 3.5 to 2 headache days/week. Additionally, the overall response rate was 58%, with 48% and 73% response rate for chronic and episodic headaches respectively. Further, multivariate analyses revealed that the ability of the patient to raise their peripheral temperature by >3 degrees at the last visit was associated with a positive response. Observation of anxiety, depression, and somatization were not significantly associated with BFT (Blume et al., 2012).

Biofeedback offers an additional modality with generally favorable results in the reduction of headache activity. However, the utilization of BFT as a stand-alone treatment yields inconclusive evidence as to its effectiveness on the reduction of symptoms with commonly associated or comorbid conditions such as anxiety and
depression. Additionally, a preponderance of the studies that employed BFT as a therapeutic technique occurred in controlled clinical environments with services provided by trained biofeedback clinicians using specialized equipment, thus rendering BFT as a viable treatment modality within a school setting implausible. However, given that relaxation training and visualization strategies are at the core of this treatment modality, these findings may have important implications similar to those associated with other behavioral and cognitive behavioral strategies described within this section.

**Cognitive-behavioral therapy.** The US Headache Consortium found very strong empirical evidence for the use of cognitive-behavioral therapy (CBT) for the prevention and treatment of migraine headache (Campbell et al. 2000). The cognitive-behavioral model suggests that emotions and the accompanying behaviors are the result of the connection between a given situation, the individual’s belief system (through which they interpret given situations), and the individual’s thoughts about the event (positive or negative; Mennuti, Christner, & Freeman, 2006). These connections should not be viewed as linear, but rather a dynamic interactional process between situational, cognitive, affective, and behavioral components (Mennuti, Christner, & Freeman, 2006). Put simply, CBT focuses on the way in which an individual interprets his or her experiences and how these thoughts ultimately influence their emotional or behavioral functioning (Friedberg & McClure, 2002).

These strategies focus on identifying and challenging maladaptive or dysfunctional thoughts, beliefs, and responses to stress (Beck, Rush, Shaw, & Emory, 1979), with particular focus on enhancing self-efficacy (Bandura, 1977), adopting an internal locus of control (i.e., a belief that the mechanism for change lies within the
individual as opposed to an external locus of control or the belief that only a health-care provider, medication, or medical procedures have the power for change), and eliminating catastrophic thoughts (i.e., a hopeless and overwhelming way of thinking; Heath, Saliba, Mahmassani, Major, & Khoury, 2008). While there is a paucity of research using CBT strategies specifically within the population of pediatric headache, there are a few noteworthy studies.

In a study published in 1986, Richter and colleagues evaluated the efficacy of relaxation training and cognitive coping, with a non-specific placebo control in the treatment of 42 children and adolescents with migraine headaches aged nine to 18 years in a tertiary headache clinic. The research design involved 4 distinct phases of continual headache monitoring: 4 weeks of baseline, 6 weeks of treatment, 4 weeks of post-treatment, and 4 weeks of follow-up from the twelfth to sixteenth week after treatment. Once randomly assigned into groups, the relaxation training group received instruction on various relaxation techniques (e.g., PMR, breathing) and were instructed to practice daily. The cognitive coping group used specific techniques emphasizing elements of cognitive restructuring, the cognitive control of pain, fantasy, simple problem solving, and stress inoculation training. The placebo treatment group was an attention-control or non-specific condition that provided psychoeducational material similar to the treatment condition; however, it was a self-driven treatment (Richter et al., 1986). Results from the study showed significant decrease in headache activity in both the relaxation and cognitive coping groups when compared to the control group. Additionally, both the relaxation and cognitive coping group not only maintained their gains at the 4-week posttest, they showed improvement at the 16-week follow up.
In a study, Griffiths and Martin (1996) evaluated the effectiveness of a cognitive-behavioral treatment program delivered in either a clinic-based, or home-based minimal-therapist-contact format in the treatment of chronic headache (mixed type) for children aged 10 to 12 years. A total of 42 participants were randomly assigned to three groups: clinic-based (N = 15), home-based (N = 15), and wait-list control (N = 12). The primary dependent variable measured was headache activity (e.g., frequency, intensity and duration) derived from daily headache diaries completed throughout the duration of the study. Secondary dependent variables included discrete measures of anxiety, depression, self-efficacy, expectancy for change, and coping responses.

The clinic-based treatment program consisted of 8 weekly sessions lasting 90 minutes that included direct instruction on relaxation techniques, identifying and modifying self-statements, autogenic relaxation, mental imagery, and cue-controlled relaxation. The home-based treatment participants were given a structured manual that mirrored the clinic-based group and were instructed to complete at their own pace with weekly phone check-ins with the treating clinician. Results from the study showed clinically significant reductions in headache activity for both the treatment groups when compared to the wait-list control group, with slightly better improvement in the clinic-based group over the home-based group, though not statistically significant. Additionally, positive trends were noted in increased self-efficacy, coping responses, and decreased symptoms of anxiety and depression. Conclusions from this study highlight the positive impact of CBT techniques in the treatment of chronic headache in children as well as demonstrating the potential cost-effectiveness of home-based or self-guided remediation of headache sequaele.
A similar study was completed by Kroener-Herwig and Denecke (2002) evaluating the efficacy in therapist-administered group training and self-help format of CBT in children aged 10 to 14 years. A total of 77 participants were randomly assigned to three groups: therapist-assisted (N = 29), self-help (N = 27), and wait-list control (N = 19). The therapist-assisted group participants were further randomly assigned into 6 treatment groups of five. The primary dependent variable measured was headache activity (e.g., frequency, intensity and duration) derived from daily headache diaries completed throughout the duration of the study. Secondary measures included a questionnaire evaluating stress experience, symptoms, and coping as well as a measure evaluating the training and its effects.

The treatment procedure was essentially identical to the study completed by Griffiths and Martin (1996), whereby the therapist-assisted groups met weekly for eight weeks following a manualized treatment protocol that included components of headache education (physiopathology), relaxation techniques, perception of stress and coping strategies, cognitions, attention to pain and imagery, self-efficacy, and problem solving. The self-help treatment group were given an identical therapy manual to complete and were provided with weekly check-ins with the clinician. Results from the study support those found in the study completed by Griffiths and Martin (1996), whereby both the therapist-assisted and self-help treatment conditions showed significant improvement in their headache activity, again with the therapist-assisted group showing slightly better improvement. Of particular interest, the participants in the therapist-assisted group ratings for treatment satisfaction were higher and showed less variance compared to the self-help group.
For those individuals experiencing and living with chronic pain, the effects can reach far beyond that of just physical pain and discomfort. It can cause long-standing disruption to the homeostasis of our natural systems (i.e., cognitive, emotional) lending to decreased abilities to effectively manage and cope with naturally occurring situations, further increasing susceptibility to recurring headache attacks. Using cognitive-behavioral principles, the treatment can be as multi-faceted as the impact of headache itself. Additionally, the inherent structure of CBT focuses on psychoeducation, skill building, between-session work (i.e., homework), agenda setting, and progress monitoring skills required to facilitate long-term change (Mennuti, Christner, & Freeman, 2006).

**Conclusions and Implications for Research**

There are numerous treatment options for children and adolescents suffering from recurrent or chronic headaches that have been shown to be effective. Ideally, the therapeutic approach would consist of the careful consideration of psychoeducation, biobehavioral (e.g., BFT), life-style modifications, pharmacotherapy, and psychotherapeutic strategies with the range of applied intervention(s), dependent on the degree of disability and impairment of the quality of life attributed to the headache as well as their availability (Bonfert et al., 2013). Given the prevalence rates of headache in the pediatric population and potentially limited access to and/or unwillingness to seek out medical or community-based mental health resources, a school-based treatment approach to headache offers a viable treatment setting with unprecedented access to children and adolescents. Only a handful of studies have evaluated treatment of headache within the school setting (e.g., Larsson and Melin, 1986; Larsson et al., 1987; Larsson & Carlsson,
Within these studies, the primary treatment modality was some form of relaxation training delivered by a trained clinician or the student him or herself with the primary outcome measure being headache activity (e.g., frequency, intensity, duration), with only two of these measuring traits of anxiety and depression, and none of the studies measuring the impact on the participants quality of life. Additionally, none of the school-based studies included coping strategies as a conjunctive treatment modality. While both relaxation and CBT or coping strategies have shown solid evidence of efficacy in the treatment of headache, prior to the current study, no study had evaluated a school-based treatment using these modalities.

**Statement of the Problem**

Pediatric headache is a common and costly pediatric condition, resulting in significant disability for numerous children. At the same time, pediatric headache may be the first medical challenge a child faces, and may provide the opportunity for the child to begin to take an active role in their health management. Schools offer unprecedented access to children experiencing recurrent or chronic headache with the opportunity to provide many students access to empirically validated treatment options by a mental health professional that might have otherwise been unavailable to them. Research has demonstrated various behavioral, cognitive-behavioral, and biofeedback techniques to be effective at the reduction of headache activity. However, much of the published literature on pediatric headache treatment was completed at tertiary or specialty clinics, which are not readily available to a large portion of the population. Access to these types of services for many youth, particularly in rural and economically disadvantaged areas is sometimes exceedingly difficult because of a shortage of mental health providers.
(America Academy of Pediatrics, 2000). In fact, in some locations, access to mental health care from providers other than primary care physicians or pediatricians is almost nonexistent (Brown, 2004).

Findings from the Great Smokey Mountains Study (Costello et al., 1996) and other population-based, epidemiological studies (Roberts, Attkisson, & Rosenblatt, 1998) indicate that from 16% to 22% of children and adolescents up to the age of 18 have a diagnosable disorder; five to nine percent of youth can be classified as seriously emotionally disturbed. In addition, approximately 4-8% of children, ages 9-17, had severe psychiatric disorders, and only about 20% of children with the most serious needs were obtaining mental health services (Forness, Kavale, & Lopez, 1993; Forness, Kavale, MacMillan, Asarnow, & Duncan, 1996; Kazdin, Holland, & Crowley, 1997).

Mental health exists on a continuum that ranges from mental wellness to serious psychiatric disorders. Within that continuum, children and adolescents learn coping skills that allow them to adapt to current and future challenges. Increased access to mental health services has been advocated and recommended at both the state and federal level. Additionally, school-based mental health service delivery models have been developed and implemented with great success. As previously stated, children and adolescents who experience chronic headache have been shown to be at greater risk for developing symptoms of anxiety and depression, academic difficulties, difficulties with relationships, and decreased ability to cope with naturally occurring stressors within their lives. Providing brief solution focused behavioral treatment for chronic headache within the school setting offers remediation of symptoms and associated behavioral difficulties that are primarily only available through tertiary settings not readily accessible to all
individuals. For such a prevalent health problem as recurrent headaches, the development of time- and cost-effective treatment approaches is an important task.

**Rationale for the Current Study**

The epidemiology of pediatric headache is described in numerous scholarly articles with the conclusion that recurrent headache is the most prevalent pain problem in children (Kroner-Herwig, 2013). The developmental and financial costs of school impairment due to chronic pain are extensive; children and adolescents disabled in school by physical and/or emotional symptoms suffer immediate educational and social difficulties, use more health-care related services, may require costly special education services, and assume a higher risk of long-term maladjustment (Shapiro & Manz, 2004). In fact, if these needs are left unaddressed, school functioning can worsen, with extreme cases potentially resulting in full time homebound instruction or school failure as well as the significantly increased potential to miss developmentally normative academic and social experiences (Loga, Simons, Stein, & Chastain, 2008).

As a profession, school psychologists possess a unique compendium of training and expertise in prevention and remediation of educational and mental health needs. The expansion of the school psychologist’s role beyond that of assessment and diagnosis has been an ongoing discussion for the better part of three decades (Nastasi, 2004). In fact, recently school psychologists have been challenged to participate as leaders in comprehensive health and mental health care and to adopt a public (mental) health perspective (Adelman & Taylor, 1998; Kubiszyn, 1999; Kolbe, Collins, & Cortese, 1997). School psychologists have the opportunity to further refine and develop professional competencies that will allow for a more comprehensive service delivery
model that will encompass the ever-growing health and mental health needs of children and adolescents. This shift to proactive and preventative service delivery models is consistent with the U.S. Surgeon General’s appeal for national reform of mental health service delivery that involves transforming the traditional medical model to one of a public health model (U.S. Department of Health and Human Services [USDHHS], 1999).

As outlined by the Surgeon General (USDHHS, 1999), a paradigm shift from medical to public health perspective involves transforming the focus from etiology, diagnosis, and treatment of mental health problems to a focus characterized by monitoring mental health needs of the general population; making services accessible to all segments of the population; addressing individual, cultural, and environmental factors in mental health; and providing and evaluating a full continuum of services that include mental health promotion and illness prevention as well as treatment. In line with this conceptual shift, there is an increasing need for school psychologists who are well-prepared and knowledgeable about children’s and adolescents unique health care needs and how they will be adapted into the school ecology (Allen et al., 1999).

Several research articles highlight the efficacy of various forms of psychological and behavioral treatment of recurrent headache. However, prior to the current study there were limited studies of treatment completed in a school setting, with virtually no studies that evaluated the impact of a school-based treatment program on social-emotional functioning and overall QoL in students as measured through self- and parent-report. The goal of the current study was to add to the current literature on the efficacy of a brief school-based cognitive-behavioral treatment program of recurrent headache.
Research Questions

Question One: Did the implementation of a school-based treatment for recurrent headache reduce the frequency, intensity, and duration of headache?

Question Two: Did the implementation of a school-based treatment for recurrent headache impact quality of life (QoL) for student participants?

Question Three: Did the implementation of a school-based treatment for recurrent headache impact social-emotional functioning in student participants?

Question Four: Were the treatment gains maintained at two weeks following conclusion of treatment?
Chapter II
Method
Overview

The purpose of this study was to expand on previous research evaluating the efficacy of school-based, therapist-assisted treatment of chronic headaches in adolescents. Prior to this study, there had been only a small number of published studies (see Larsson & Melin, 1986; Larsson et al., 1987a; Larsson et al.1987b; Larsson, Melin, & Doberl, 1990; Larsson & Carlsson, 1996) that had evaluated school-based treatment programs with adolescents experiencing chronic headache. The current study expanded on previous studies in an effort to explore the efficacy of behavioral treatment of chronic headache; however, unlike previous studies that utilized relaxation training (e.g., breathing, PMR) as the primary therapeutic agent, the current introduced coping strategies grounded in CBT in combination with relaxation techniques a psychoeducational component on the body’s physiological response to common headache triggers (i.e., stress, anxiety), to provide a more holistic treatment approach. In addition, the current study evaluated the impact of a school-based behavioral treatment package on quality of life (QoL) and social-emotional (e.g., anxiety and depression) outcomes. Participants were screened using measures of headache related functioning and behavioral functioning. Participants in this study learned to identify common triggers of headache as well as those that can protract symptoms. Participants were also taught specific relaxation and coping techniques that have been empirically validated as effective in reducing headache.
Research Questions

Question One: Did the implementation of a school-based treatment for recurrent headache reduce the frequency, intensity, and duration of headache?

Question Two: Did the implementation of a school-based treatment for recurrent headache impact quality of life (QoL) for student participants?

Question Three: Did the implementation of a school-based treatment for recurrent headache impact social-emotional functioning in student participants?

Question Four: Were the treatment gains maintained at two weeks following conclusion of treatment?

Participants

A total of six individuals participated in this study. Demographic information for each participant and parent was obtained through the headache background questionnaire (Appendix A) derived from the Stanford Hospital Headache Clinic New Patient Questionnaire, completed by the parent and the student participant prior to the intake interview. An overview of each participant’s demographic information is included in Table 4. To protect the privacy of participants, pseudonyms are used in this study for each participant.
### Table 4

**Participant Demographics**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Grade</th>
<th>Sex</th>
<th>Race/Ethnicity</th>
<th>Headache Type</th>
<th>Previous Dx, or Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>14</td>
<td>8</td>
<td>F</td>
<td>White</td>
<td>Migraine</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Charlie</td>
<td>11</td>
<td>6</td>
<td>M</td>
<td>White</td>
<td>Migraine</td>
<td>Yes, Yes</td>
</tr>
<tr>
<td>Jen</td>
<td>12</td>
<td>7</td>
<td>F</td>
<td>White</td>
<td>Mixed</td>
<td>No, No</td>
</tr>
<tr>
<td>Mac</td>
<td>12</td>
<td>6</td>
<td>M</td>
<td>Multiple</td>
<td>Tension</td>
<td>No, No</td>
</tr>
<tr>
<td>Trish</td>
<td>14</td>
<td>8</td>
<td>F</td>
<td>White</td>
<td>Mixed</td>
<td>No, No</td>
</tr>
<tr>
<td>Emily</td>
<td>12</td>
<td>7</td>
<td>F</td>
<td>White</td>
<td>Migraine</td>
<td>No, No</td>
</tr>
</tbody>
</table>

*Note.* Assignment of headache type was determined by participant reported headache characteristics as outlined by the IHS criteria; Dx = medical diagnosis; Tx = treatment for headache. Participant names are pseudonyms.

Dee was a 14-year-old white female in the 8th grade. She is the youngest of four children, with three other brothers. Dee considers herself an average student with marks generally in the B to C range. She did not indicate any school attendance concerns and does not have any history of discipline concerns. Dee reported her first recollection of headache activity around the age of 10. She reported experiencing one type of headache for which the characteristics were: throbbing/pulsating and stabbing/sharp pain located in the right forehead with a pain score of 7 out of 10, lasting about two hours occurring approximately four days per week and that they can interfere with her normal daily functioning. During headache episodes, Dee reported sensitivity to light and sound, nausea, dizziness, and difficulty reading. She reported experiencing varying levels of headache relief by using sleep, cool compress, massage, and listening to music. Dee’s parent reported that she sought medical consultation at the onset of headache activity, resulting in a diagnosis of pediatric migraine. Dee is not currently prescribed any medication, but will use over-the-counter (OTC) remedies as needed (e.g., Advil).
Charlie is an 11-year-old white male in the 6th grade. He is the fourth of five children, with three older and one younger brother. Charlie considers himself a good student with marks generally in the B range. He did not report any discipline history, however he misses approximately three to four days a quarter due to headache activity. Charlie recalls his first headache around the age of 5. He describes his headaches as unilateral in the temporal region consisting of a throbbing/pulsating quality with a pain score of 5 out of 10. These headaches range in duration from ½ hour to all day, occurring approximately four days a week. During headache episodes, Charlie reported sensitivity to light and sound, nausea, and vision problems. He reported receiving some relief from lying down in a dark space and use of a cool compress. Similar to Dee, Charlie was diagnosed with pediatric migraine around the time of initial headache onset. He is prescribed Imitrex for use at the onset of headache as needed.

Jen is 12-year-old white female in the 7th grade. She is the youngest of two children with an older brother. Jen does not consider herself to be a good student and notes earning marks generally in the C and below range. While she did not report any discipline issues in school, she did indicate difficulties with same gender peer relationships, and difficulties with her parents. Jen reports experiencing two types of headaches which began around age 11. The first headache is unilateral, primarily in the frontal-temporal regions with a throbbing/pulsating quality and a pain score of 6 out of 10. The second headache is bilateral and mobile, often moving from the back of the head to the front with a dull aching quality and a pain score of 4 out of 10. For the first headache, Jen reported experiencing sensitivity to sound, nausea, dizziness, and difficulty reading. For the second headache, she reported dizziness and loss of appetite. These
headaches occur around five days a week and can last from anywhere from two to eight hours. For both headaches, Jen reported some level of relief from lying down and listening to music. Jen does not have a current medical diagnosis and is not prescribed any medication. She reports taking OTC remedies as needed.

Mac is a 12-year-old bi-racial male in the 6th grade. He is the second oldest of four siblings with one older and two younger brothers. Mac considers himself a decent student earning marks generally in the B and C range. He did not report any discipline issues at school and indicated regular school attendance. Mac reported experiencing one type of headache that began around the age of 9. His headache is bilateral in the frontal region consisting of a squeezing quality with a pain score of 6 out of 10. Mac reported experiencing two to three headaches per week ranging from two to ten hours. During headache activity, Mac reported sensitivity to light and dizziness. He reported feeling some level of relief from lying down in a dark space. Mac does not have a current medical diagnosis and is not prescribed any medication. He reported taking OTC remedies as needed.

Trish is a 14-year-old white female in the 8th grade. She is the oldest of two children with a younger sister. Trish regards herself as an excellent student, earning consistent marks in the A range. She reported to never having a discipline concern at school and excellent attendance. Trish reported two types of headaches that began around the age of 8. The first headache is unilateral in the frontal and temporal regions with a throbbing/pulsating quality and a pain score of 8 out of 10. The second headache is bilateral and mobile generally moving from front to back with a squeezing dull aching quality and a pain score of 6 out of ten. Trish reports experiencing daily headaches with
durations ranging from one hour to all day. During the first type of headache episode, Trish reported sensitivity to light and sound, nausea, vomiting, dizziness, problems with vision, and watering of the eye. During the second type of headache episode, she reported light and sound sensitivity and fatigue. For both headache types, Trish reported experiencing some level of relief from sitting in a dark space and using a warm compress. Trish does not have a current medical diagnosis and is not prescribed any medication. She reported taking OTC remedies as needed.

Emily is a 12-year-old white female in the 7th grade. She is the oldest of three children with a younger brother and sister. Emily views herself as an okay student earning marks in the B and C range. She reported no history of discipline concerns with regular attendance. Emily reported experiencing one type of headache that began around the age of 10. Her headache is unilateral and mobile moving from the back of the neck to the forehead with a throbbing/pulsating quality and a pain score of 6 out of 10. Emily reported experiencing her headaches at least three day a week and ranged in duration from one to ten hours. During headache episodes, she reported sensitivity to sound, nausea, dizziness, and fatigue. Emily reported experiencing some level of relief from lying down and sleep. She does not have any current medical diagnosis and is not prescribed any medication. She reported taking OTC remedies as needed.

**Research-Practitioner**

The research-practitioner was an advanced doctoral student in the psychology program at Kent State University. Prior to the study, he had completed an advanced practicum and full-time doctoral internship in a hospital-based setting under the direct supervision of a board certified pediatric neuropsychologist and a board certified
pediatric psychologist with specific concentrations in neuropsychological evaluations as well as application and monitoring of evidence-based treatment modalities including but not limited to group and individual treatment of recurrent or chronic pediatric headache. The research-practitioner was employed full-time as a school psychologist in the district where the research study took place. All dependent variable measures were collected, scored (when appropriate), and recorded by the research-practitioner. In addition, the research-practitioner developed, implemented and gathered treatment fidelity data regarding the intervention package (i.e., independent variable). The study included on-site supervision with a psychologist licensed by the Ohio State Board of Psychology.

Setting

The study took place in a suburban middle school in the northeastern region of Ohio. Written permission to conduct the research was obtained from both the district (Appendix B) and middle school building (Appendix C). The district had a total student population of approximately 7,000 students housed across seven elementary schools, two middle schools, and one high school. The district student population was generally limited in its diversity; 92% of the students are White, 3% are Multiracial, 2% are Black, 2% Hispanic, and 1% are Asian or Pacific Islander (ODE, 2013). Additionally, 18% of the student population is considered economically disadvantaged (as indicated by receiving free or reduced lunch), 12% receive special education services, and less than 1% of the population demonstrates limited English proficiency. The middle school where the study took place serves approximately 900 students of which 91% are White, 3% are Black, 3% are Multiracial, 2% are Hispanic, and 1% is Asian or Pacific Islander. Additionally, 21% are considered economically disadvantaged, 14% receive special
education services, and less than 1% of the students demonstrate limited English proficiency. This information is summarized in Table 5.

Table 5

*District and Selected Middle School Demographics*

<table>
<thead>
<tr>
<th>Demographic</th>
<th>District</th>
<th>Middle School</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>92%</td>
<td>91%</td>
</tr>
<tr>
<td>Multiracial</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Black</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Economically Disadvantaged</td>
<td>18%</td>
<td>21%</td>
</tr>
<tr>
<td>Students with Disabilities</td>
<td>12%</td>
<td>14%</td>
</tr>
<tr>
<td>Limited English Proficient</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

**Treatment setting.** The individual treatment sessions were held once a week for 40 minutes each in the office of the school psychologist located within the main office of the middle school. The school psychology office was approximately 15 x 8 feet with two widows looking out over an enclosed garden. The office contained a desk, a filing cabinet, and a circular table with three chairs. The intervention took place within the normal school hours during their scheduled study hall period. All aspects of the treatment were delivered face-to-face, one-on-one at the circular table.

**Procedure**

**Participant Recruitment and Consent**

Participants for this study were recruited by reviewing the school health clinic log with the school nurse. Students who visited the clinic more than twice during a 30-day period due to headache activity were selected for initial consideration. The initial parent
contact was made by the school nurse via telephone using the initial contact script (Appendix D). If the parent indicated interest in participation, the contact information was forwarded to the research-practitioner. Following selection, the research-practitioner contacted the parent of the perspective student participant via telephone and provided them with a brief overview of the current study, including measures, treatment regimen, timeline, and participation requirements (Appendix E). When verbal consent was obtained, they were sent a recruitment pack containing a detailed written description of the study (Appendix F), a treatment outline and timeline, participant activities and responsibilities (for both student and parent participants), and informed written parent and participant consent form (Appendix G) was sent home. In addition, the packet included a copy of the Pediatric Quality of Life Inventory, Fourth Edition (PedsQL 4.0; Varni, Seid, & Kurtin, 2001; described in section below) and a headache background questionnaire (Appendix A).

Information from this packet was used to determine if the student met inclusionary criteria, which was derived from the criteria used by Allen and colleagues (2002). Only individuals who both (a) experienced at least two headaches per month, and (b) reported a headache history of at least 6 months were included in the study. Participants included students experiencing primary headaches (e.g., migraine, tension-type) as designated through the headache background questionnaire. The protocol used for the study stated that exclusionary criteria included self and/or parental report of a recent history of progressive headache symptoms or developmental disability (Allen et al., 2002), and/or symptoms associated with secondary headache activity (e.g., headache presentation in relation to recent head or neck trauma or other documented medical
condition), as obtained through the headache background questionnaire. If progressive symptoms and/or secondary headache characteristics were identified, the parent was strongly urged to seek consultation with their primary care physician immediately. However, no participants experienced these symptoms. Additionally, due the research-practitioners role as a school psychologist within the research setting, in order to reduce potential conflict of interest and undue coercion, students who were receiving special education services at the time and/or were currently involved in the evaluation process of determining special education eligibility were excluded. No participants were excluded due to this criterion. Participants who were currently taking medication for any purpose were advised to continue current regiment unless otherwise noted by their prescribing physician. For those students who meet the inclusionary criteria, a face-to-face interview was scheduled that included the participant, his or her parent, and the research-practitioner.

**Interview**

Parents whose children met the inclusionary criteria were contacted via telephone to schedule a meeting during which the research-practitioner reviewed the information contained within the general background questionnaire and conducted a formal interview with the student participant and their parent using a structured headache assessment form (Appendix I), which was derived from the Stanford Hospital Headache Clinic New Patient Questionnaire. During this meeting, the parent and the student participant were asked to complete the The Achenbach Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) and The Youth Self-Report (YSR; Achenbach & Rescorla, 2001), respectively, as well as introduced to the headache diary (Appendix J) and the
requirements for daily completion. The procedure for using self-report rating scales and semi-structured interviews had been established in past similar studies (i.e., Barry & von Baeyer, 1997; Karwautz et al., 1999; Larsson & Carlsson, 1996; Larsson & Melin, 1986; Larsson, Daleflod, Hakansson, & Melin, 1987a). Finally, written consent by both the parent and the student participant was obtained during the interview.

**Institutional Research Approval**

Permission to conduct this research study was obtained from the director of educational services for the district, the middle school principal, and the Kent State University Institutional Review Board. Participation in this study was voluntary and participants were at liberty to withdraw at any time with no repercussions. The student participant and their parent were provided with a consent form (Appendix G) that explained all the information about the nature of treatment in order to make an informed decision regarding participation in this study. This included a description of what participation entailed, including any known risks, inconveniences or discomforts that may have occurred while participating in the intervention. The consent forms (two copies) were signed by a parent and student participant, with one copy retained by the research-practitioner and one by the participants’ parents. Services were provided by the research-practitioner, with no fee for services. The study included on-site supervision with a psychologist licensed by the Ohio State Board of Psychology.

**Dependent Variables**

**Headache Activity**

The primary outcome measure for this study was obtained from the student participants’ completion of weekly headache diaries (Appendix J), which was used to
self-monitor daily headache variables such as frequency, intensity and duration of headache. In addition, the headache diary was used to monitor whether or not the headache activity interfered with typical daily functioning. The headache diary was used as a subjective measurement tool throughout this research project; that is, from baseline through follow-up phases. The headache diary used in this study was a modified version of an instrument originally developed by Russell and colleagues (1992). In addition to items pertaining to headache frequency and duration, a visual analogue scale (VAS) was used to measure headache intensity via pain parameters using a 10-point Likert scale, whereby a score of 0 = no pain, 5 = painful but manageable, and a score of 10 = excruciating pain. Studies have determined that the VAS is a reliable and valid measure of perceptions of pain in persons over the age of five, regardless of gender and health status (e.g., McGrath, 1987; McGrath & de Verber, 1986).

Quality of Life

The Pediatric Quality of Life Inventory, Fourth Edition (PedsQL 4.0; Varni, Seid, & Kurtin, 2001) was used to measure overall quality of life as rated by both the student participant and his or her parent prior to baseline, and again at follow-up. The PedsQL 4.0 is an evaluation tool intended to measure health-related quality of life (HRQOL) in healthy children as well as in those with acute and chronic medical conditions, and includes both child and parent forms. For this study, the child self-report form for ages 8-12 and children 13-18 years old was used. Similarly, the parent report for parents of children ages 8 to 12 (child) and parents of children ages 13 to 18 (adolescent). The PedsQL 4.0 consists of 23 items designed to measure the core dimensions of health as delineated by the Word Health Organization (1948), as well as school functioning. It is
comprised of four scales: Physical Functioning (8 items), Emotional Functioning (5 items), Social Functioning (5 items), and School Functioning (5 items). A 5-point Likert-type scale is utilized across child self-report for ages 8 to 18 and parent report where in 0 = never a problem, 1 = almost never a problem, 2 = sometimes a problem, 3 = often a problem, and 4 = almost always a problem. Items are reverse-scored and linearly transformed to a 0 to 100 scale (0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0), so that higher scores indicate better HRQOL. In addition to contributing to the scales identified above, the items on the PedsQL 4.0 load into a Total Scale Score and two summary scores, the Physical Health Summary Score and the Psychosocial Health Summary Score. The PedsQL 4.0 has been found to be valid and reliable for the child and adolescent reports (Cronbach’s alphas ranged from 0.68 to 0.88; Varni, Seid, & Kurtin, 2001) and is considered a “well-established” instrument (Palermo et al., 2008).

**Social-Emotional Functioning**

The Achenbach Child Behavior Checklist, intended for use with children ages 6-18, (CBCL/6-18; Achenbach & Rescorla, 2001) was used in this study as a pre- and post-intervention general outcome measure of psychological (i.e., social-emotional and behavioral) functioning as rated by the student participants’ parent. The CBCL/6-18, designed to be completed by parents or caregivers, consists of 118 items rated on a 3-point Likert scale (0 = Not True, 1 = Somewhat or Sometimes True, and 2 = Very True or Often True) addressing behavioral, emotional, and social areas of functioning during the previous six months. The 118 items yield two broadband scales (i.e., Internalizing, Externalizing,) and eight narrow-band scales (i.e., syndromes; Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social Problems, Thought Problems,
Attention Problems, Rule-Breaking Behavior, and Aggressive Behavior). In addition, a Total Problem score can be computed. Standard scores are based on the T-score, with a mean of 50 and a standard deviation of 10. According to the publisher, test-retest reliability coefficients for the eight syndrome scales and overall problems scales ranged from .78 to .97. Internal consistency is supported for the empirically based syndrome scales and overall problem scales with alphas ranging from .79 to .88. Content, criterion-related, and construct validity have all been supported through previous research and instrument updates (Achenbach & Rescorla, 2001).

The Youth Self-Report (YSR; Achenbach & Rescorla, 2001) was used in this study as a pre- and post-intervention general outcome measure of psychological (i.e., social-emotional and behavioral) functioning as rated by each student participant. The YSR is a self-report measure for children and adolescents between the ages of 11 – 18 and consists of 112 items rated on a 3-point Likert scale (0 = Not True, 1 = Somewhat or Sometimes True, and 2 = Very True or Often True). Reading the items on the YSR requires a fifth grade reading level.

The 112 items yield two broadband scales (i.e., Externalizing and Internalizing) and eight narrow-band subscales (i.e., syndromes; Rule-Breaking Behavior, Aggressive Behavior, Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social Problems, Thought Problems, and Attention Problems). Standard scores are based on the T-score, with a mean of 50 and a standard deviation of 10. According to the publisher, test-retest reliability coefficients for the eight syndrome scales and overall problem scales had alphas ranging from .71 to .95 (Achenbach & Rescorla, 2001).
Timeline for Measurement of Dependent Variables.

Table 6 links each dependent variable measure to the relevant research question and timeline for administration.

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Instrument</th>
<th>Timeline</th>
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<tr>
<td>Question One</td>
<td>Headache Diary</td>
<td>Baseline through session 5</td>
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<tr>
<td>Question Two</td>
<td>PedsQL 4.0</td>
<td>Screening (pre-treatment) and at follow-up (post-treatment)</td>
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<tr>
<td>Question Three</td>
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<td>Screening (pre-treatment) and at follow-up (post-treatment)</td>
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<tr>
<td>Question Four</td>
<td>Headache Diary</td>
<td>Follow-up</td>
</tr>
</tbody>
</table>

Research Design

This study employed a single subject multiple baseline design (MBD) across participants, originally introduced to the literature of applied behavior analysis by Baer, Wolf and Risley (1968). For this study, each headache parameter (i.e., frequency, intensity, duration) was repeatedly measured during baseline, continuing throughout treatment, and after treatment (follow-up data collection), to determine the presence of a causal inference between the independent variable (i.e., psychoeducation, relaxation training and coping strategies, as described below) and dependent variables (i.e., headache activity). Following from the literature, each phase consisted of a minimum of 3-5 data points (Alberto & Troutman, 2006). The participants were randomly arranged in dyads.
using a random number generator prior to baseline. Each dyad began baseline data collection at the same time, with the first dyad beginning treatment following three weeks of baseline, the second dyad beginning treatment after four weeks, and the final dyad beginning treatment following five weeks of baseline data. Given the impact that recurrent headache can have on the individual, this staggering of participants in groups of two allowed those participants who initiated treatment following an extended baseline period much earlier access to the treatment program than if individually staggered.

**Validity**

Internal validity is concerned with whether or not the intervention is solely responsible for the change in behavior. As cited in Horner (2005), Neuman and McCormick state, “internal validity of a single-case design is considered acceptable if an intervention is reliably associated with higher response levels while also revealing sound experimental control” (p. 166). With regard to establishing experimental control in single subject research designs, a minimum of three replications is recommended (Horner et al., 2005). This criterion was exceeded through the inclusion of six participants. In single subject research, experimental control is further enhanced when treatment is withheld until baseline data are stable (Tawney & Gast, 1984). This study took this into account through the monitoring of baseline data prior to beginning intervention across all participants.

External validity refers to the degree to which the results from a study can be generalized to other groups or settings (Gay & Airasian, 2000). In order to accomplish this, efforts were made within the study to follow those guidelines offered by Neuman and McCormick (1995) by: 1) providing a rich and detailed description of the setting and
the intervention, 2) detailing the measures, and 3) generalizing the results to a particular theoretical model. Single-case research uses controlled procedures rather than control groups (Horner et al., 2005). This study was completed following highly structured and scripted treatment components from *The Anxiety & Phobia Workbook* (Bourne, 2010) and the *Coping Cat* program (Kendall & Hedtke, 2006).

**Baseline**

Following the initial interview and prior to the first treatment session, the research-practitioner collected the pre-treatment daily headache monitoring diaries from the participants. The protocol for this study was for each participant to establish a stable baseline prior to entering into the treatment phase of the study. To determine the stability of the baseline in this study, the research-practitioner utilized the method described by Alberto and Troutman (2013) whereby 100% of the baseline data should fall between 50% of the mean. To accomplish this, the mean of the pre-treatment headache activity of each participant was recorded. The resulting mean number minus half of the mean provided the lower threshold. The mean plus half of the mean provided the upper threshold. This was calculated for each participant using Microsoft Excel data analysis functions. The protocol for this study was that once stability was reached for each participant, they entered the treatment phase.

**Overview of Treatment Package**

The treatment package utilized in this study was comprised of three distinct, but interconnected components. The first component was a psychoeducational piece that consisted of a brief, general overview of headache etiology and phenotypes as well as the body’s physiological response to stress. The second component was direct instruction of
relaxation techniques (i.e., progressive muscle relaxation and diaphragmatic breathing).

The third component was identifying maladaptive thought patterns associated with increased headache activity and the application of cognitive coping strategies.

Throughout the study, the participants engaged in activities associated with each of these components within the sessions and homework activities designed to facilitate skill mastery and generalization. The treatment package components are outlined in Table 7.
<table>
<thead>
<tr>
<th>Session</th>
<th>Component</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Treatment goal</td>
<td>Headache diary</td>
</tr>
<tr>
<td></td>
<td>Body’s response to stress</td>
<td>Breathing exercise (3x daily)</td>
</tr>
<tr>
<td></td>
<td>Diaphragmatic breathing</td>
<td>“F” step homework assignment</td>
</tr>
<tr>
<td></td>
<td>“F” step in the FEAR Plan</td>
<td></td>
</tr>
<tr>
<td>Two</td>
<td>Review of previous weeks headache diary</td>
<td>Headache diary</td>
</tr>
<tr>
<td></td>
<td>Progressive muscle relaxation (PMR)</td>
<td>PMR exercise (3x daily)</td>
</tr>
<tr>
<td></td>
<td>“E” step in the FEAR Plan</td>
<td>“E” step homework</td>
</tr>
<tr>
<td>Three and Four</td>
<td>Review of previous weeks headache diary</td>
<td>Headache diary</td>
</tr>
<tr>
<td></td>
<td>“A” and “R” steps in the FEAR plan</td>
<td>Relaxation exercise</td>
</tr>
<tr>
<td></td>
<td>Guided practice with breathing and PMR</td>
<td>(breathing or PMR; 3x daily)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“A” and “R” steps homework</td>
</tr>
<tr>
<td>Five</td>
<td>Review of previous weeks headache diary</td>
<td>Headache diary</td>
</tr>
<tr>
<td></td>
<td>Review of the FEAR Plan</td>
<td>Relaxation exercise</td>
</tr>
<tr>
<td></td>
<td>Guided practice with breathing and PMR</td>
<td>(breathing or PMR; 3x daily)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FEAR sheet (1x weekly)</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Review of final headache diary</td>
<td>Headache diary</td>
</tr>
<tr>
<td></td>
<td>Review of FEAR Plan</td>
<td>Relaxation exercise</td>
</tr>
<tr>
<td></td>
<td>Review of relaxation techniques</td>
<td>(breathing or PMR; 3x daily)</td>
</tr>
<tr>
<td></td>
<td>Completion of PedsQL 4.0, and CBCL/YSR</td>
<td>FEAR sheet (1x weekly)</td>
</tr>
</tbody>
</table>
Session One

The initial session began with reviewing the participants’ baseline data obtained from their headache diaries. Following this, the participant was asked to briefly write a statement on an end of treatment goal. Goal setting at the beginning of any treatment program is a vital component to the process. Goal setting theory as described by Locke and Latham (1984, 1991) is the purposeful action the people choose to discover what is beneficial to their welfare. By exhibiting goal directed volitional control over their behaviors, individuals must set goals and choose the means for attaining these goals. By identifying a targeted and specific goal for their treatment, student participants in this study established a personal level of efficacy following the treatment conclusion.

The participant was then guided through a brief lesson on the body’s physiological responses to stress derived from The Anxiety & Phobia Workbook, Fifth Edition (Bourne, 2010) and similar in scope and content to the psychoeducational components used in earlier studies (see Griffiths & Martin, 1996; Kroener-Herwig & Denecke, 2002). Specifically, how the central nervous system processes pain information and the roles of the sympathetic and parasympathetic nervous symptoms in achieving physiological equilibrium. Next, the research-practitioner explained and modeled diaphragmatic (or abdominal) breathing. The participant was then guided through a modified scripted breathing exercise (Appendix K) adopted from The Anxiety & Phobia Workbook, Fifth Edition (Bourne, 2010). Then, the participant was introduced to a modified version of the F.E.A.R. Plan derived originally from the Coping Cat program (Kendall & Hedtke, 2006), with particular focus on the “F” step (i.e., feeling frightened) following the specific session protocol as outlined in the Coping Cat Therapist Manual.
(Kendall & Hedtke, 2006). The participant was guided though the accompanying exercise provided in the Coping Cat workbook (Kendall & Hedtke, 2006). The concluding moments of the first session consisted of reviewing the headache diary to be completed during the next week and an instructional handout on diaphragmatic breathing (Appendix L). The participant was asked to record headache activity until the next session using the provided session one headache monitoring form (Appendix M). In addition, the student participant was asked to practice the breathing exercise at least 3 times per day regardless of headache activity. The participant was given a homework assignment to complete in the student workbook associated with the session activities to completed and turned in at the beginning of the next session.

**Session Two**

The second session began with a review of the previous week’s headache diary. Following this review, the participant was introduced to the “E” aspect of the F.E.A.R. Plan (i.e., expect bad things to happen) following the specific session protocol as outlined in the Coping Cat Therapist Manual (Kendall & Hedtke, 2006) The participant was guided though the accompanying exercise provided in the Coping Cat workbook (Kendall & Hedtke, 2006). The research-practitioner then introduced a progressive muscle relaxation (PMR) technique with an overview and rationale for its use. The participant was guided through a scripted progressive muscle relaxation protocol (Appendix N) adopted from The Anxiety & Phobia Workbook, Fifth Edition (Bourne, 2010). At the conclusion of the session, the participant was given written instructions for progressive muscle relaxation home practice (Appendix O) and a new headache diary (Appendix P) for the week that was modified to allow the participant to indicate which
relaxation technique was utilized during any episodes (e.g., diaphragmatic breathing or PMR). The participant was also given a homework assignment to complete in the student workbook associated with the session activities to completed and turned in at the beginning of the next session.

**Sessions Three and Four**

Sessions three and four began with a review of the previous week’s headache diary and use of relaxation techniques. During these sessions, the “A” (i.e., attitudes and actions) and “R” (i.e., results and rewards) parts of the F.E.A.R. Plan was introduced following the specific session protocol outlined in the Coping Cat Therapist Manual (Kendall & Hedtke, 2006), along with the corresponding activities in the Coping Cat workbook (Kendall & Hedtke, 2006). Following the end of the third individual treatment session, the parent was contacted via telephone to inquire if they had any specific questions or concerns regarding the treatment to that point as well as to give a cursory update on the respective individual progress made thus far (Appendix Q). In addition, at the conclusion of each of these sessions, the research-practitioner guided the participants through a relaxation technique previously learned (i.e., diaphragmatic breathing or PMR) as designated by student participant preference. The participants were given new weekly headache diaries identical to the one given at the end of session two and encouraged to practice the relaxation techniques at least three times daily. The participant was also given homework assignments to complete in the student workbook associated with the sessions activities to completed and turned in at the beginning of the next session.
Session Five

The final session consisted of a review of the previous week’s headache diary and use of relaxation techniques. The research-practitioner and participant reviewed the F.E.A.R. program with an activity from the Coping Cat workbook. A final guided practice of the relaxation techniques was provided as well. At the conclusion of the session, the participant was given additional headache diaries that they were asked to keep until the follow-up visit that was scheduled for two weeks from the final session. Additionally, they were given an informational sheet on avoiding headache triggers obtained from the National Headache Foundation (National Headache, 2011; Appendix R) as well as a laminated F.E.A.R. card to keep on their person. The participant was asked to record any headache activity during the two weeks as well as practicing at least one of the relaxation techniques (i.e., diaphragmatic breathing or PMR) three times per day.

Session Six: Follow-Up

The follow-up session was attended by the parent and the student participant. The session began with a review of the headache diary as well as revisiting the individual treatment goal that was established during the first session to determine if that goal was achieved. Additional review of the F.E.A.R. program and guided relaxation techniques was provided. At the conclusion of the session, the student participant and parent completed the PedsQL 4.0, and the YSR and CBCL respectively. The parent was given a copy of Tips for Parents obtained from the National Headache Foundation (National Headache, 2011a; Appendix S).
Treatment Integrity

Treatment integrity has been described as an important yet frequently overlooked component in school-based intervention research (Gresham & Gansle, 1993; Sanetti, Fallon, & Collier-Meek, 2011; Schulte et al., 2009). Authors have noted that detailed data regarding treatment integrity is important to advance scientific knowledge, to promote generalizability (Sanetti et al., 2011) and to make interventions more fully understood by the consumers (Gresham & Gansle, 1993; Perepletchikova et al., 2009). Treatment integrity has been defined as the degree to which an intervention or treatment is carried out as designed (Gresham & Gansle, 1993; McIntyre et al., 2007). This definition, as employed within the behavioral intervention literature, focuses on strict implementation of intervention procedures to help determine the degree to which the treatment influenced study results (Gresham & Gansle, 1993; Gresham et al., 1993). For this study, a custom-designed treatment integrity checklist (Appendix T) was created prior to intervention and completed following each session with each participant. The use of this evaluation tool ensured critical aspects of the treatment condition were replicated for each of the student participants.

Data Analysis

Research Question #1: Did the implementation of a school-based treatment for recurrent headache reduce the frequency, intensity, and duration of headache?

Data analysis for this question consisted of both visual analysis of graphs and non-parametric analysis using Nonoverlap of All Pairs (NAP; Parker & Vannest, 2009). Historically, single subject research designs have been subject to visual analysis procedures to assist in the interpretation of outcome data (Alberto & Troutman, 2006;
Kazdin, 2011). In an effort to complement this traditional approach coupled with the desire to enhance the reliability and generalizability of data sets, a recent trend in the literature is to include non-parametric approaches to calculating effect size in studies using single subject research designs (Parker, Hagan-Burke, & Vannest, 2007; Parker & Vannest, 2009). To date, multiple baseline design lacks a generally accepted statistical summary (Parker, Hagan-Burke, & Vannest, 2007). Parker and Vannest (2009) suggest NAP is a better solution than tests of Mean or even Median differences across phases. Therefore, data analysis for this study integrates both statistical non-parametric analysis (i.e., Nonoverlap of All Pairs) and visual analysis to provide comprehensive analyses of outcomes related to the primary dependent variables (i.e., frequency, intensity and duration of headache).

Visual inspection is commonly used as a means to analyze the data gathered within clinical research using a single subject research design (Kazdin, 2011). The continuous baseline and treatment phase data in the present study was graphed for visual analyses. The Microsoft Excel program was utilized to plot all data for all participants. Visual analysis included the consideration of the following elements as suggested by Horner and colleagues (2012): variability, level, immediacy, and trend.

It is important to examine variability in data sets because observed change in variability between phases is a potential indicator of the treatment effect, even if there are no changes in level and trend observed (Horner et al., 2012). Data variability was determined by examining any meaningful fluctuations in data. Variability was calculated as the percentage of data falling within 50% of the mean of each phase (Alberto & Troutman, 2009). To calculate the variability, the mean of each phase was found. Then
50% of the mean number was added to the mean to establish the upper level of accepted variability and 50% of the mean number was subtracted from the mean to establish the lower level of accepted variability.

The level of data change were examined through the calculation of means and medians associated with each phase followed by a comparison of these measures of central tendency across baseline and treatment phases. When comparing these descriptive statistics across settings, it is important to note whether or not there is a change in the desired direction following the implementation of the independent variable. This is important as related to visual determination of the effect of the treatment. In addition to these descriptive statistics, for each mean comparison across phases (for all participants, across all three primary dependent variables), clinical significance was considered and defined as a reduction of greater than 50% across phases (Blanchard, 1992). In order to calculate this, the mean for each participant in each of the three headache variables during the treatment phase was divided by the mean for the respective headache variable during the baseline phase. The resulting number was then multiplied by 100 to give the percentage change. These calculations were completed using a desktop calculator.

Immediacy of changes in data patterns inform research-practitioners on the effect of the treatment condition. That is, the greater the immediacy of observed effect, the more likely that the change is associated with the manipulation of the independent variable (Horner et al., 2012). In this study, the immediacy of change was reported as the treatment session in which the individual reported headache activity level below baseline level through a visual analysis of data obtained during the baseline and treatment phases the in each of the respective headache activity variables.
Examining the trend of data within and across phases is important because the greater the difference in the slope of trend lines between adjacent phases, the greater confidence one has in the differences in responding between those phases (Horner et al., 2012). More simply, the greater the degree of slope from one phase to the next, the stronger the support of the independent variable can be made. In this study, trends were calculated using the Microsoft Excel graphing functions and data analysis tools. Trend lines were plotted for each respective headache variable for baseline and treatment phases. Visual analysis and qualitative descriptions were provided.

Nonoverlap of all pairs (NAP) is a non-parametric technique for measuring nonoverlap for two phases (Parker & Vannest, 2009). NAP is defined as the percent of non-overlapping data between baseline and treatment phases. Parker and colleagues (2011) state, “NAP is interpreted as the percentage of all pairwise comparisons across Phases A and B, which show improvement across phases or, more simply, the percentage of data which improves across phases.” (p.312). For each A-B comparison, all intervention data points are compared to all baseline data points to provide an effect size that appears superior to other non-overlapping indexes. As compared to percent non-overlapping data (PND), NAP offers (a) better discriminability, (b) less human errors, (c) stronger validation by visual judgments and $R^2$, (d) greater score precision, and (e) narrower and more precise confidence intervals (CI’s; Parker & Vannest, 2009).

Petersen-Brown, Karich and Symons, (2012) reported that NAP results agreed with visual analysis over 80 percent of the time in the multiple baseline design studies that were sampled. Additionally, NAP is appropriate for nearly all data types and distributions, including dichotomous data (Parker & Vannest, 2009). NAP has good
power efficiency—about 91-94% that of linear regression for “conforming” data, and greater than 100% for highly skewed, multi-modal data. Strengths of NAP include its simplicity, its reflection of visual nonoverlap, and its statistical power (Parker & Vannest, 2009).

Nonoverlap of all pairs involves calculating a percentage of non-overlapping data by investigating the extent to which all possible pairs of data points across phases overlap. For each graphed A-B comparison in this study, each data point in the baseline phase A was compared to each data point in the intervention phase B, to determine whether overlap occurred between phases. Each pair of data points that overlapped completely were assigned a value of ‘1’, and each pair of data points that tied were assigned a value of ‘0.5.’ A value of ‘0’ was assigned to data points that do not overlap. To calculate NAP, begin by counting all overlapping pairs and then subtract from the total possible pairs to obtain the non-overlap count. The total possible pairs (total N) is the number of data points in phase A times phase B (N_A X N_B). Then divide the sum of the non-overlapping pairs from the total possible pairs to obtain the NAP. For this study, an online NAP calculator (http://www.singlecaseresearch.org/calculators/napcalculator) was used to determine NAP sizes.

In addition to individual A-B comparisons across variables and participants, group NAP means and medians were calculated for summative and comparative purposes. In Parker and Vannest’s (2009) introduction of NAP, it is stated that NAP effect sizes (ESs) of 0-0.65, 0.66-0.92, and 0.93-1.0 corresponded to small, moderate, and large effect sizes of intervention data, respectively. These guidelines for effect size were utilized in this study.
**Research Question #2:** Did the implementation of a school-based treatment for recurrent headache impact quality of life (QoL) for student participants?

Null Hypothesis (H₀): It was hypothesized that no differences reported in the quality of life by participants and parents following the treatment program.

To analyze the overall impact from the intervention on the student participants’ quality of life, this study incorporated a paired sample t-test using IBM Statistical Package for the Social Sciences (SPSS) Version 22 (IBM Corp, 2013). A paired sample t-test was used to determine whether there is a significant difference between the average values of the same measurement made under two different conditions (pre-intervention and follow-up). Both measurements were made on each unit in a sample, and the test was based on the paired differences between these two values. The t-test’s statistical significance and the t-test’s effect size were the two primary outputs of the t-test analysis. Statistical significance indicates whether the difference between sample averages is likely to represent an actual difference between populations and the effect size indicates whether that difference is large enough to be practically meaningful (Gravetter & Wallnau, 2013). For this study, a paired sample t-test was run on the Total Score, Physical Health Summary Score, and Psychosocial Health Summary Score from the PedsQL 4.0 completed at the intake meeting (pre-intervention) and again at the follow-up meeting (session 6).

**Research Question #3:** Did the implementation of a school-based treatment for recurrent headache impact social-emotional functioning in student participants?
Null Hypothesis (H₀): It was hypothesized that no differences reported in the social-emotional functioning by participants and parents following the treatment program.

To analyze the overall impact of the intervention on the student participants’ psychological functioning, the current study used a paired sample t-test to compare the Internalizing and Externalizing composite scores obtained from the CBCL and YSR originally completed at the intake meeting (pre-intervention) and again at the follow-up meeting (session 6). The same guiding principles as described above were used in determining the relevance and nature of this particular approach to data analysis.

**Research Question #4:** Were the treatment gains maintained at two weeks following conclusion of treatment?

To analyze whether treatment gains were maintained following the fifth and final treatment session, the data obtained through the weekly completion of the headache diaries during the two-week period was graphed and analyzed, and compared to the treatment phase findings using similar procedures outlined in research question one using visual analysis procedures described above. Specifically, visual analysis of changes and level and trend were analyzed as described above. Variability was not analyzed due to only two data points collected at follow-up. Immediacy of change was also excluded as follow-up was a continuation of the treatment program.

**Social Validity**

The measurement of social validity as applied to single subject research is intended to ensure that the interventions consider the perceptions and concerns of society and the consumers of interventions (Schwartz & Baer, 1991). Measures exist that
consider input from multiple consumers, including parents, teachers, and clients, including children and adolescents. According to Kazdin (2011), social validity encompasses three questions about interventions: (a) are the goals of the intervention relevant to everyday life?; (b) are the intervention procedures acceptable to consumers and to the community at large?; and (c) are the outcomes of the intervention important; that is, do the changes make a difference in the everyday lives of individuals?

A modified version of the Abbreviated Acceptability Rating Profile (AARP; Tarnowski & Simonian, 1992) was used in this research study to assess each parent and student participant’s perceptions of social validity with regard to whether or not the intervention was relevant to their everyday lives and whether or not the intervention has or will make a difference to their everyday overall functioning (Appendix U). The modifications made to the AARP for the purpose of this study included the use of first-person syntax and headache specific questions (e.g., The treatment was a good way to handle my headaches). In summary, out of 8 questions, 7 were modified for this study. These modifications were made to allow for a more direct easily understandable evaluation of the student participants’ perception of treatment validity.

The AARP consists of 8 items that are rated on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree), and yields an overall acceptability score that ranges from 8 (low) to 48 (high). Reliability for the AARP was assessed using a culturally diverse sample with limited educational background (Tarnowski & Simonian, 1992). Published split-half and Cronbach alpha coefficients for the measure are .95 and .97, respectively (Tarnowski & Simonian, 1992). The AARP takes approximately 10 minutes to complete and has a readability index of 5.0 (fifth grade reading level).
according to the Harris-Jacobson Wide Range Readability Formula. The AARP was chosen over measures such as the Treatment Evaluation Inventory (TEI; Kazdin, 1980) and the Intervention Rating Profile-20 (IRP-20) because it is shorter and easier to understand. The AARP has been successfully utilized in previous studies (e.g., Arndorfer & Allen, 2001; Elliott, Mittenberger, Rapp, Long, & McDonald, 1998; Allen, Elliott, & Arndorfer, 2002).
CHAPTER III

RESULTS

Headache Activity

The first research question was, *Did the implementation of a school-based treatment for recurrent headache reduce the frequency, intensity, and duration of headache?* Results were examined through visual and descriptive analysis of self-reported headache activity data obtained through weekly completion of participant headache diaries. Figures 1 through 3 provide a graphic display of the frequency, intensity, and duration for each participant across baseline, intervention, and follow-up phases. For each of these graphs, solid vertical lines represent treatment initiation; dotted vertical lines indicate the completion of the intervention phase. Detailed summaries of the data in terms of variability, level, immediacy, and trend are reported below. In addition to visual analyses, NAP outcomes are reported below. Microsoft Excel was used as the data editor for calculating all descriptive and effect size statistics for these analyses in accordance to the guidelines outlined by Parker and Vannest (2009).
Figure 1. Average headache frequency per week through baseline, intervention, and follow-up phases.
Figure 2. Average headache intensity from 1 (minimal) to 10 (severe) per week through baseline, intervention, and follow-up phases.
Figure 3. Average headache duration per week in hours through baseline, intervention, and follow-up phases.
Change in Variability

The mean variability within the baseline and intervention phases were calculated using Microsoft Excel to examine variability. Variability was calculated as the percentage of data falling within 50% of the mean of each phase (Alberto & Troutman, 2009). Any data that were calculated to be outside of the acceptable range, deemed the data variable. During the baseline phase, 100% of the data points fell within 50% of the mean for all participants in terms of headache frequency per week (see Table 8). This may be interpreted to mean that the baseline data were stable.

Table 8

Variability in the Baseline Phase Frequency

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline Frequency</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>Lowest Frequency</th>
<th>Highest Frequency</th>
<th>% within Bounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>0.67</td>
<td>0.33</td>
<td>1.01</td>
<td>0.58</td>
<td>0.71</td>
<td>100</td>
</tr>
<tr>
<td>Charlie</td>
<td>0.48</td>
<td>0.24</td>
<td>0.72</td>
<td>0.43</td>
<td>0.58</td>
<td>100</td>
</tr>
<tr>
<td>Jen</td>
<td>0.79</td>
<td>0.40</td>
<td>1.19</td>
<td>0.57</td>
<td>0.86</td>
<td>100</td>
</tr>
<tr>
<td>Mac</td>
<td>0.39</td>
<td>0.20</td>
<td>0.59</td>
<td>0.28</td>
<td>0.57</td>
<td>100</td>
</tr>
<tr>
<td>Trish</td>
<td>1.14</td>
<td>0.57</td>
<td>1.71</td>
<td>0.87</td>
<td>1.57</td>
<td>100</td>
</tr>
<tr>
<td>Emily</td>
<td>0.51</td>
<td>0.26</td>
<td>0.77</td>
<td>0.42</td>
<td>0.71</td>
<td>100</td>
</tr>
</tbody>
</table>

*Note: Data reported in average number of headaches per week*

Similarly, during the baseline phase, 100% of the data points fell within 50% of the mean for all participants in terms of headache intensity per week (see Table 9). This may be interpreted to mean that the intensity baseline data were stable.
Table 9

**Variability in the Baseline Phase Intensity**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline Mean Intensity</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>Lowest Intensity</th>
<th>Highest Intensity</th>
<th>% within Bounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>5.50</td>
<td>2.75</td>
<td>8.25</td>
<td>5.00</td>
<td>6.50</td>
<td>100</td>
</tr>
<tr>
<td>Charlie</td>
<td>4.95</td>
<td>2.48</td>
<td>7.43</td>
<td>4.60</td>
<td>5.25</td>
<td>100</td>
</tr>
<tr>
<td>Jen</td>
<td>5.13</td>
<td>2.57</td>
<td>7.70</td>
<td>4.60</td>
<td>5.80</td>
<td>100</td>
</tr>
<tr>
<td>Mac</td>
<td>5.63</td>
<td>2.82</td>
<td>8.45</td>
<td>5.00</td>
<td>6.50</td>
<td>100</td>
</tr>
<tr>
<td>Trish</td>
<td>5.86</td>
<td>2.93</td>
<td>8.79</td>
<td>4.70</td>
<td>7.40</td>
<td>100</td>
</tr>
<tr>
<td>Emily</td>
<td>5.53</td>
<td>2.77</td>
<td>8.30</td>
<td>4.00</td>
<td>7.00</td>
<td>100</td>
</tr>
</tbody>
</table>

*Note:* Data reported as average per week, on a scale of 1 (minimal) to 10 (severe)

Within the baseline phase for duration, 100% of the data points for five out of the six participants data fell within 50% of the mean, the exception being Emily for whom 80% (4 out of 5) of the data were within the prescribed bounds (see Table 10). For Emily, her headache duration baseline data is considered variable.

Table 10

**Variability in the Baseline Phase Duration**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline Mean Duration</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>Lowest Duration</th>
<th>Highest Duration</th>
<th>% within Bounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>3.97</td>
<td>1.95</td>
<td>5.96</td>
<td>3.00</td>
<td>4.70</td>
<td>100</td>
</tr>
<tr>
<td>Charlie</td>
<td>27.10</td>
<td>13.55</td>
<td>40.65</td>
<td>20.00</td>
<td>36.60</td>
<td>100</td>
</tr>
<tr>
<td>Jen</td>
<td>3.10</td>
<td>1.56</td>
<td>4.65</td>
<td>1.30</td>
<td>4.60</td>
<td>100</td>
</tr>
<tr>
<td>Mac</td>
<td>1.50</td>
<td>0.75</td>
<td>2.25</td>
<td>1.25</td>
<td>2.00</td>
<td>100</td>
</tr>
<tr>
<td>Trish</td>
<td>5.14</td>
<td>2.57</td>
<td>7.71</td>
<td>3.60</td>
<td>6.80</td>
<td>100</td>
</tr>
<tr>
<td>Emily</td>
<td>1.11</td>
<td>0.56</td>
<td>1.67</td>
<td>0.62</td>
<td>1.75</td>
<td>80</td>
</tr>
</tbody>
</table>

*Note:* Data reported in average hours per headache, per week

During the intervention phase, there was considerably more variability among participants across the frequency, intensity, and duration data sets (see Tables 11 through
13). Potential causal agents and implications are considered in chapter IV of this document.

Table 11

Variability in the Intervention Phase Frequency

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Mean Frequency</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>Lowest Frequency</th>
<th>Highest Frequency</th>
<th>% within Bounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>0.43</td>
<td>0.22</td>
<td>0.65</td>
<td>0.28</td>
<td>0.58</td>
<td>100</td>
</tr>
<tr>
<td>Charlie</td>
<td>0.23</td>
<td>0.12</td>
<td>0.35</td>
<td>0.0</td>
<td>0.43</td>
<td>60</td>
</tr>
<tr>
<td>Jen</td>
<td>0.45</td>
<td>0.23</td>
<td>0.68</td>
<td>0.28</td>
<td>0.85</td>
<td>80</td>
</tr>
<tr>
<td>Mac</td>
<td>0.03</td>
<td>0.02</td>
<td>0.05</td>
<td>0.0</td>
<td>0.14</td>
<td>80</td>
</tr>
<tr>
<td>Trish</td>
<td>0.62</td>
<td>0.31</td>
<td>0.93</td>
<td>0.28</td>
<td>1.00</td>
<td>60</td>
</tr>
<tr>
<td>Emily</td>
<td>0.25</td>
<td>0.13</td>
<td>0.38</td>
<td>0.14</td>
<td>0.42</td>
<td>80</td>
</tr>
</tbody>
</table>

Note: Data reported as average number of headaches per week.

Table 12

Variability in the Intervention Phase Intensity

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Mean Intensity</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>Lowest Intensity</th>
<th>Highest Intensity</th>
<th>% within Bounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>4.40</td>
<td>2.20</td>
<td>6.60</td>
<td>4.00</td>
<td>5.00</td>
<td>100</td>
</tr>
<tr>
<td>Charlie</td>
<td>3.00</td>
<td>1.50</td>
<td>4.50</td>
<td>0.00</td>
<td>5.00</td>
<td>80</td>
</tr>
<tr>
<td>Jen</td>
<td>4.07</td>
<td>2.04</td>
<td>6.11</td>
<td>2.50</td>
<td>6.10</td>
<td>100</td>
</tr>
<tr>
<td>Mac</td>
<td>1.20</td>
<td>0.60</td>
<td>1.80</td>
<td>0.00</td>
<td>6.00</td>
<td>80</td>
</tr>
<tr>
<td>Trish</td>
<td>3.80</td>
<td>1.90</td>
<td>5.70</td>
<td>3.00</td>
<td>4.50</td>
<td>100</td>
</tr>
<tr>
<td>Emily</td>
<td>4.02</td>
<td>2.01</td>
<td>6.03</td>
<td>2.00</td>
<td>5.30</td>
<td>80</td>
</tr>
</tbody>
</table>

Note: Data reported as average per week, on a scale of 1 (minimal) to 10 (severe).

Table 13

Variability in the Intervention Phase Duration

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Mean Duration</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>Lowest Duration</th>
<th>Highest Duration</th>
<th>% within Bounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>1.65</td>
<td>0.83</td>
<td>2.48</td>
<td>0.66</td>
<td>1.60</td>
<td>100</td>
</tr>
<tr>
<td>Charlie</td>
<td>16.02</td>
<td>8.01</td>
<td>24.03</td>
<td>0.00</td>
<td>24.20</td>
<td>60</td>
</tr>
<tr>
<td>Jen</td>
<td>1.02</td>
<td>0.51</td>
<td>1.53</td>
<td>0.25</td>
<td>2.75</td>
<td>60</td>
</tr>
<tr>
<td>Mac</td>
<td>0.06</td>
<td>0.03</td>
<td>0.09</td>
<td>0.00</td>
<td>0.30</td>
<td>80</td>
</tr>
<tr>
<td>Trish</td>
<td>1.63</td>
<td>0.82</td>
<td>2.45</td>
<td>0.60</td>
<td>4.70</td>
<td>60</td>
</tr>
<tr>
<td>Emily</td>
<td>0.77</td>
<td>0.39</td>
<td>1.16</td>
<td>0.50</td>
<td>1.00</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: Data reported in average hours per headache, per week.
Change in Level and Immediacy of Change

The level of change for every participant were determined by comparing the mean and median data during both the baseline and intervention phases. Tables 14 through 16 provide the mean and median data for the baseline and intervention phases for the three primary headache activity measures (i.e., frequency, intensity, and duration), respectively.

Table 14

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline Mean</th>
<th>Baseline Median</th>
<th>Intervention Mean</th>
<th>Intervention Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>0.67</td>
<td>0.71</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>Charlie</td>
<td>0.48</td>
<td>0.43</td>
<td>0.23*</td>
<td>0.28</td>
</tr>
<tr>
<td>Jen</td>
<td>0.79</td>
<td>0.86</td>
<td>0.45</td>
<td>0.42</td>
</tr>
<tr>
<td>Mac</td>
<td>0.39</td>
<td>0.35</td>
<td>0.03*</td>
<td>0.00</td>
</tr>
<tr>
<td>Trish</td>
<td>1.14</td>
<td>1.00</td>
<td>0.62</td>
<td>0.42</td>
</tr>
<tr>
<td>Emily</td>
<td>0.51</td>
<td>0.42</td>
<td>0.25*</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Note: Data reported in average number of headaches per week
*Clinically significant reduction as defined by a 50% decrease

Descriptive analysis of the mean and median frequency data revealed decreased headache frequency for all six participants. Charlie, Mac, and Emily were observed to exhibit a clinically significant decrease as defined by a reduction of greater than 50% (Blanchard, 1992). With regard to immediacy of change, upon implementation of the intervention, Dee, Charlie, Mac, and Emily reported an immediate reduction of headache frequency following the initial treatment session. Additionally, Jen and Trish reported reduced frequency following the second and third sessions, respectively (see Figure 1).
Table 15

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline Mean</th>
<th>Baseline Median</th>
<th>Intervention Mean</th>
<th>Intervention Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>5.50</td>
<td>5.00</td>
<td>4.40</td>
<td>4.50</td>
</tr>
<tr>
<td>Charlie</td>
<td>4.95</td>
<td>5.00</td>
<td>3.00</td>
<td>3.30</td>
</tr>
<tr>
<td>Jen</td>
<td>5.13</td>
<td>5.05</td>
<td>4.07</td>
<td>3.60</td>
</tr>
<tr>
<td>Mac</td>
<td>5.63</td>
<td>5.50</td>
<td>1.20*</td>
<td>0.00</td>
</tr>
<tr>
<td>Trish</td>
<td>5.86</td>
<td>5.70</td>
<td>3.80</td>
<td>3.80</td>
</tr>
<tr>
<td>Emily</td>
<td>5.53</td>
<td>5.80</td>
<td>4.02</td>
<td>4.20</td>
</tr>
</tbody>
</table>

*Clinically significant reduction as defined by a 50% decrease

Note: Data reported as average per week, on a scale of 1 (minimal) to 10 (severe)

Analysis of the mean and median intensity data revealed decreased headache intensity for all six participants when comparing baseline to intervention. However, only Mac was observed to exhibit a clinically significant decrease as defined by a reduction of greater than 50% (Blanchard, 1992). The immediacy of change was noted to be slower compared to the frequency data, with only Dee and Trish showing an immediate intensity reduction following the initial treatment session that remained relatively stable through the intervention phase (see Figure 2). Mac displayed an immediate reduction in intensity; however, that was due to the first two weeks being headache free. During the third week when he experienced a headache, the intensity was observed to be similar to those noted in the baseline (see Figure 2). Charlie, Jen, and Emily were noted to show relatively slow decreases in intensity following sessions two, three, and four, respectively (see Figure 2).
Table 16

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline Mean</th>
<th>Baseline Median</th>
<th>Intervention Mean</th>
<th>Intervention Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>3.97</td>
<td>4.20</td>
<td>1.65*</td>
<td>1.50</td>
</tr>
<tr>
<td>Charlie</td>
<td>27.01</td>
<td>20.00</td>
<td>16.02</td>
<td>18.40</td>
</tr>
<tr>
<td>Jen</td>
<td>3.10</td>
<td>3.25</td>
<td>1.02*</td>
<td>0.58</td>
</tr>
<tr>
<td>Mac</td>
<td>1.50</td>
<td>1.38</td>
<td>0.06*</td>
<td>0.00</td>
</tr>
<tr>
<td>Trish</td>
<td>5.14</td>
<td>5.10</td>
<td>1.63*</td>
<td>0.80</td>
</tr>
<tr>
<td>Emily</td>
<td>1.11</td>
<td>1.25</td>
<td>0.77</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Note: Data reported in average hours per headache, per week
*Clinically significant reduction as defined by a 50% decrease

Analysis of the mean and median headache duration data similarly showed decreased headache duration for all six participants when comparing baseline data to intervention data. Dee, Jen, Mac, and Trish were observed to exhibit a clinically significant decrease as defined by a reduction of greater than 50% (Blanchard, 1992). Mac was the only participant who reported an immediate decrease in headache duration following session one; however, as previously noted, this decrease is due to his lack of headache activity (see Figure 3). Dee, Trish, and Jen reported decreased headache duration following session two relative to baseline (see Figure 3). Charlie and Emily shared a similar pattern whereby they both reported decreased headache duration following session two; however, reporting increases in duration that were similar to baseline following sessions three and four.

**Change in Data Trends**

Trend lines during the baseline and intervention phases were plotted using Microsoft Excel’s graphing features. Figures 4 through 9 show the trend line plots for each participant in all phases.
Figure 4. Dee’s trends. The solid line represents the trend in each phase. The dotted lines represent the mean level in each phase.

Dee’s baseline data for frequency demonstrated an upward trend, with a moderate downward trend during the intervention phase. Her baseline data for intensity showed a downward trend with a very slight upward trend during the intervention. Dee’s baseline data for headache duration demonstrated a moderate downward trend, which continued during the intervention phase.
Charlie’s baseline data for frequency demonstrated an upward trend, with a pronounced downward trend during the intervention phase. His baseline data for intensity also showed an upward trend with a moderate downward trend during the intervention phase. Charlie’s baseline data for headache duration demonstrated an upward trend, with a moderate downward trend during the intervention phase.
Figure 6. Jen’s trends. The solid line represents the trend in each phase. The dotted lines represent the mean level in each phase.

Jen’s baseline data for frequency demonstrated an upward trend, with a moderate downward trend during the intervention phase. Her baseline data for intensity showed a downward trend, which continued during the intervention phase. Jen’s baseline data for headache duration demonstrated an upward trend, with a moderate downward trend during the intervention phase.
Mac’s baseline data for frequency demonstrated a very slight upward trend, with a flatline trend during the intervention phase. His baseline data for intensity also showed a very slight upward trend with a flatline trend during the intervention phase. Mac’s baseline data for headache duration demonstrated a very slight downward trend, with a flatline trend during the intervention phase. Mac’s overall trend data with his frequency, intensity, and duration during the intervention phase was due to him reporting no headache activity.

Figure 7. Mac’s trends. The solid line represents the trend in each phase. The dotted lines represent the mean level in each phase.
Figure 8. Trish’s trends. The solid line represents the trend in each phase. The dotted lines represent the mean level in each phase.

Trish’s baseline data for frequency demonstrated a flat trend, with a moderate downward trend during the intervention phase. Her baseline data for intensity showed a very slight downward trend, which continued during the intervention phase. Jen’s baseline data for headache duration also demonstrated a slight downward trend, which accellerated slightly during the intervention phase.
Emily’s baseline data for frequency demonstrated an upward trend, with a moderate downward trend during the intervention phase. Her baseline data for intensity showed a slight downward trend, which steepened during the intervention phase. Emily’s baseline data for headache duration demonstrated a downward trend, with a less steep but continued downward trend during the intervention phase.
**Overall Pattern of Change**

The analysis of the overall pattern of change included the calculation of effect size through nonoverlap of all pairs (NAP) analyses across baseline and intervention for every participant (Parker & Vannest, 2009) as well as for the group as a whole. In Parker and Vannest’s introduction and overview of NAP, it is stated that NAP effect sizes (ESs) of 0-0.65, 0.66-0.92, and 0.93-1.0 corresponded to small, moderate, and large effect sizes of intervention data, respectively. This system was used to assist in the interpretation of NAP results.

Dee’s NAP score for the comparison of baseline to intervention was 0.97 for frequency (large effect), 0.97 (large effect) for intensity, and 0.93 (large effect) for duration. Charlie’s NAP score for the comparison of baseline to intervention was 0.93 for frequency (large effect), 0.90 (medium effect) for intensity, and 0.87 (medium effect) for duration. Jen’s NAP score for the comparison of baseline to intervention was 0.87 for frequency (medium effect), 0.70 (medium effect) for intensity, and 0.95 (large effect) for duration. Mac’s NAP score for the comparison of baseline to intervention was 1.00 for frequency (large effect), 0.87 (medium effect) for intensity, and 1.00 (large effect) for duration. Trish’s NAP score for the comparison of baseline to intervention was 0.84 for frequency (medium effect), 1.00 (large effect) for intensity, and 0.92 (medium effect) for duration. Emily’s NAP score for the comparison of baseline to intervention was 0.94 for frequency (large effect), 0.80 (medium effect) for intensity, and 0.76 (medium effect) for duration.

The mean NAP score across participants for frequency was 0.93 (medium effect) and the median NAP score was 0.94 (medium effect). The mean NAP score across
participants for intensity was 0.87 (medium effect) and the median NAP score was 0.89 (medium effect). The mean NAP score across participants was 0.91 (medium effect) and the median NAP score was 0.93 (medium effect).

The overall visual analysis and NAP summary for all participants with the three primary headache parameters is provided in Table 17.
Table 17

Visual Analyses and NAP Summary

<table>
<thead>
<tr>
<th>Participant and Variable</th>
<th>Baseline Variability</th>
<th>Treatment Variability</th>
<th>Magnitude of Change</th>
<th>Immediacy of Change (Session)</th>
<th>Trend A-B</th>
<th>NAP Effect Size Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee (Frequency)</td>
<td>No</td>
<td>No</td>
<td>0.24</td>
<td>First</td>
<td>Up-Down</td>
<td>Large</td>
</tr>
<tr>
<td>Dee (Intensity)</td>
<td>No</td>
<td>No</td>
<td>1.10</td>
<td>First</td>
<td>Down-Up</td>
<td>Large</td>
</tr>
<tr>
<td>Dee (Duration)</td>
<td>No</td>
<td>No</td>
<td>2.32</td>
<td>Second</td>
<td>Down-Down</td>
<td>Large</td>
</tr>
<tr>
<td>Charlie (Frequency)</td>
<td>No</td>
<td>Yes</td>
<td>0.25</td>
<td>First</td>
<td>Up-Down</td>
<td>Large</td>
</tr>
<tr>
<td>Charlie (Intensity)</td>
<td>No</td>
<td>Yes</td>
<td>1.95</td>
<td>First</td>
<td>Up-Down</td>
<td>Medium</td>
</tr>
<tr>
<td>Charlie (Duration)</td>
<td>No</td>
<td>Yes</td>
<td>10.99</td>
<td>First</td>
<td>Up-Down</td>
<td>Medium</td>
</tr>
<tr>
<td>Jen (Frequency)</td>
<td>No</td>
<td>Yes</td>
<td>0.34</td>
<td>Second</td>
<td>Up-Down</td>
<td>Medium</td>
</tr>
<tr>
<td>Jen (Intensity)</td>
<td>No</td>
<td>No</td>
<td>1.06</td>
<td>First</td>
<td>Up-Down</td>
<td>Medium</td>
</tr>
<tr>
<td>Jen (Duration)</td>
<td>No</td>
<td>Yes</td>
<td>2.08</td>
<td>Second</td>
<td>Down-Down</td>
<td>Large</td>
</tr>
<tr>
<td>Mac (Frequency)</td>
<td>No</td>
<td>Yes</td>
<td>0.36</td>
<td>First</td>
<td>Up-Flat</td>
<td>Large</td>
</tr>
<tr>
<td>Mac (Intensity)</td>
<td>No</td>
<td>Yes</td>
<td>4.43</td>
<td>First</td>
<td>Up-Flat</td>
<td>Medium</td>
</tr>
<tr>
<td>Mac (Duration)</td>
<td>No</td>
<td>Yes</td>
<td>1.44</td>
<td>First</td>
<td>Down-Flat</td>
<td>Large</td>
</tr>
<tr>
<td>Trish (Frequency)</td>
<td>No</td>
<td>Yes</td>
<td>0.52</td>
<td>Third</td>
<td>Flat-Down</td>
<td>Medium</td>
</tr>
<tr>
<td>Trish (Intensity)</td>
<td>No</td>
<td>No</td>
<td>2.06</td>
<td>First</td>
<td>Down-Down</td>
<td>Large</td>
</tr>
<tr>
<td>Trish (Duration)</td>
<td>No</td>
<td>Yes</td>
<td>3.51</td>
<td>Second</td>
<td>Down-Down</td>
<td>Medium</td>
</tr>
<tr>
<td>Emily (Frequency)</td>
<td>No</td>
<td>Yes</td>
<td>0.26</td>
<td>First</td>
<td>Up-Down</td>
<td>Large</td>
</tr>
<tr>
<td>Emily (Intensity)</td>
<td>No</td>
<td>Yes</td>
<td>1.51</td>
<td>First</td>
<td>Down-Down</td>
<td>Medium</td>
</tr>
<tr>
<td>Emily (Duration)</td>
<td>Yes</td>
<td>No</td>
<td>0.34</td>
<td>First</td>
<td>Down-Down</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Note. For variability, Yes = variability in data calculated for phase; No = no variability in data calculated for phase; Immediacy denotes changes following particular treatment session; Trend indicates the direction in phase A then phase B.
Secondary Outcomes

Treatment Impact on Quality of Life

The second research question was, *Did the implementation of a school-based treatment for recurrent headache impact quality of life (QoL) for student participants?*

Null Hypothesis (H₀): There were no differences reported in the quality of life by participants and parents following the treatment program.

**Paired-samples t-tests**

To answer research question two, paired-sample t-tests were used to detect whether or not there were significant differences in means in the quality of life as reported by student participants and their respective parents. Since assumptions of normality and equality of variances do not apply to paired t-tests, as they do to the two-sample t-test, data were not transformed (Zar 1999). Instead, paired t-tests assume that only the differences between the two pairwise populations are normally distributed (Zar 1999).

To complete the analysis on the quality of life, both parents and student participants completed the Pediatric Quality of Life Inventory, Fourth Edition (PedsQL 4.0; Varni, Seid, & Kurtin, 2001) prior to baseline and again at follow-up. Results are listed in Table 18 and Table 19.
Table 18

**Parent Reported Quality of Life**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pretest</th>
<th>Posttest</th>
<th>t (5)</th>
<th>p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>72.92</td>
<td>16.01</td>
<td>79.69</td>
<td>14.22</td>
<td>-1.07</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.334</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-23.02, 9.49]</td>
</tr>
<tr>
<td>Psychosocial</td>
<td>60.53</td>
<td>12.32</td>
<td>68.89</td>
<td>15.55</td>
<td>-1.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.165</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-21.58, 4.87]</td>
</tr>
<tr>
<td>Total</td>
<td>64.85</td>
<td>11.48</td>
<td>72.65</td>
<td>14.75</td>
<td>-1.67</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.155</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-19.77, 4.18]</td>
</tr>
</tbody>
</table>

With regard to parent report data, there were no significant differences observed between the pre- and post-test scores for any of the three scales (i.e., Physical, Psychosocial, and Total). These results support the null hypothesis whereby the intervention did not have any significant affect on the student participants overall quality of life.

Table 19

**Student Reported Quality of Life**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pretest</th>
<th>Posttest</th>
<th>t (5)</th>
<th>p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>67.71</td>
<td>15.27</td>
<td>78.13</td>
<td>16.65</td>
<td>-1.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.161</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-26.70, 5.89]</td>
</tr>
<tr>
<td>Psychosocial</td>
<td>65.82</td>
<td>6.96</td>
<td>69.16</td>
<td>10.73</td>
<td>-1.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.339</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-11.47, 4.79]</td>
</tr>
<tr>
<td>Total</td>
<td>66.49</td>
<td>8.68</td>
<td>72.28</td>
<td>12.23</td>
<td>-1.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.224</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[-16.54, 4.95]</td>
</tr>
</tbody>
</table>

With regard to student participant data, there were no significant differences observed between the pre- and post-test scores for any of the three scales (i.e., Physical, Psychosocial, and Total). Similar to the parent results, the null hypothesis is supported here whereby the intervention had no significant affect on the student participants overall quality of life.
Treatment Impact on Social-Emotional Functioning

The third research question was, Did the implementation of a school-based treatment for recurrent headache impact social-emotional functioning in student participants?

Null Hypothesis (H₀): There were no differences reported in the social-emotional functioning by participants and parents following the treatment program.

To answer research question three, paired-sample t-tests were used to detect whether or not there were significant differences in means for social emotional functioning as reported by student participants and their respective parents.

To complete the analysis on the treatment impact on the social-emotional functioning, parents completed the Achenbach Child Behavior Checklist, (CBCL/6-18; Achenbach & Rescorla, 2001) and the student participants completed the Youth Self-Report (YSR; Achenbach & Rescorla, 2001) prior to baseline and again at follow-up. Results of the analysis are listed in Table 20 and Table 21.

Table 20

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pretest</th>
<th>Posttest</th>
<th>t (5)</th>
<th>p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internalizing</td>
<td>20.67 4.97</td>
<td>10.67 5.54</td>
<td>4.40</td>
<td>.006**</td>
<td>[4.55, 15.55]</td>
</tr>
<tr>
<td>Externalizing</td>
<td>6.83 5.11</td>
<td>3.50 3.01</td>
<td>1.89</td>
<td>.117</td>
<td>[0.99, 7.65]</td>
</tr>
<tr>
<td>Total</td>
<td>40.67 15.51</td>
<td>22.67 13.31</td>
<td>4.30</td>
<td>.007**</td>
<td>[7.74, 28.26]</td>
</tr>
</tbody>
</table>

**p < 0.01.

With regard to parent report data, there was a significant difference between the pretest internalizing scores (M = 20.67, SD = 4.97) and the posttest internalizing scores...
There were no significant differences between the pretest externalizing scores \((M = 6.83, SD = 5.11)\) and the posttest externalizing scores \((M = 3.50, SD = 3.01)\), \(t(5) = 1.89, p = .117\). There was a significant difference between the pretest total scores \((M = 40.67, SD = 15.51)\) and the posttest total scores \((M = 22.67, SD = 13.31)\), \(t(5) = 4.30, p = .007\). These results suggest that parent respondents noted statistically significant differences \((p < 0.01)\) in the Internalizing and Total scales suggesting that the intervention was effective with regard to these scales.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pretest</th>
<th>Posttest</th>
<th>(t) (5)</th>
<th>(p)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internalizing</td>
<td>18.33</td>
<td>15.50</td>
<td>1.55</td>
<td>.182</td>
<td>[-1.66, 7.32]</td>
</tr>
<tr>
<td>Externalizing</td>
<td>7.17</td>
<td>8.33</td>
<td>1.94</td>
<td>.110</td>
<td>[-2.64, 0.30]</td>
</tr>
<tr>
<td>Total</td>
<td>43.33</td>
<td>41.67</td>
<td>0.74</td>
<td>.490</td>
<td>[-3.83, 7.17]</td>
</tr>
</tbody>
</table>

With regard to student participant data, there were no significant differences observed between the pre- and post-test scores for any of the three scales (i.e., Internalizing, Externalizing, and Total). These results support the null hypothesis whereby the intervention did not have any significant affect on the student participants overall social-emotional functioning.

**Maintenance**

The final research question was, *Were the treatment gains maintained at two-weeks following the conclusion of treatment?* To answer research question four, the three
measures of headache activity (i.e., frequency, intensity and duration) were analyzed through level and trend comparisons.

**Change in Level**

The level of change for every participant were determined by comparing the mean and median data during both the intervention and follow-up phases. Tables 22 through 24 provide the mean and median data for the intervention and follow-up phases for the three primary headache activity measures (i.e., frequency, intensity, and duration), respectively.

Table 22

*Mean and Median of Intervention and Follow-Up Phases for Frequency*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Dee</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>Charlie</td>
<td>0.23</td>
<td>0.28</td>
</tr>
<tr>
<td>Jen</td>
<td>0.45</td>
<td>0.42</td>
</tr>
<tr>
<td>Mac</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>Trish</td>
<td>0.62</td>
<td>0.42</td>
</tr>
<tr>
<td>Emily</td>
<td>0.25</td>
<td>0.28</td>
</tr>
</tbody>
</table>

*Note:* Data reported in average number of headaches per week

The data collected for headache frequency suggest that five out of the six participants remained at or below intervention levels, with only Emily showing a very slight increase in frequency.

Table 23

*Mean and Median of Intervention and Follow-Up Phases for Intensity*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Dee</td>
<td>4.40</td>
<td>4.50</td>
</tr>
<tr>
<td>Charlie</td>
<td>3.00</td>
<td>3.30</td>
</tr>
<tr>
<td>Jen</td>
<td>4.07</td>
<td>3.60</td>
</tr>
<tr>
<td>Mac</td>
<td>1.20</td>
<td>0.00</td>
</tr>
<tr>
<td>Trish</td>
<td>3.80</td>
<td>3.80</td>
</tr>
<tr>
<td>Emily</td>
<td>4.02</td>
<td>4.20</td>
</tr>
</tbody>
</table>
Note: Data reported as average per week, on a scale of 1 (minimal) to 10 (severe)

The data collected for headache intensity at follow-up show that all six participants were below intervention levels with regard to headache intensity.

Table 24

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Mean</th>
<th>Intervention Median</th>
<th>Follow-Up Mean</th>
<th>Follow-Up Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dee</td>
<td>1.65</td>
<td>1.50</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Charlie</td>
<td>16.02</td>
<td>18.40</td>
<td>19.10</td>
<td>19.10</td>
</tr>
<tr>
<td>Jen</td>
<td>1.02</td>
<td>0.58</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Mac</td>
<td>0.06</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Trish</td>
<td>1.63</td>
<td>0.80</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>Emily</td>
<td>0.77</td>
<td>0.83</td>
<td>0.75</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Note: Data reported in average hours per headache, per week

The data collected during the follow-up phase for duration show that five of the six participants were below intervention levels with regard to headache duration, with only Charlie showing a moderate increase.

Change in Data Trends

Trend lines during the intervention and follow-up phases were plotted using Microsoft Excel to determine directionality. Dee (see Figure 5) exhibited a downward trend during the intervention phase with regard to frequency, which became more pronounced during follow-up. Her trend during the intervention phase for intensity showed a slight upward trend, with a sharp downward trend at follow-up. For duration, Dee exhibited a moderate downward trend during the intervention phase, and a moderate upward trend at follow-up.

Charlie (see Figure 6) showed a downward trend for frequency during the intervention phase, which continued at follow-up. He demonstrated a downward trend
for intensity during intervention, with a flatline trend during follow-up. Charlie displayed a downward trend for duration during the intervention phase, however, a moderate upward trend was observed at follow-up. Jen’s intervention phase data for frequency illustrated a downward trend with a flatline trend observed at follow-up. She also showed a downward trend for intensity during the intervention phase, which continued at follow-up. Similar to her frequency data, Jen showed a downward trend for duration during the intervention phase, and a flatline trend at follow-up.

As for Mac (see Figure 7, he demonstrated a flatline trend across all three primary measurement areas (i.e., frequency, intensity, and duration) with continued flatline at follow-up. It again bears note that Mac reported experiencing only one headache throughout the entire intervention phase, and reported being headache free at follow-up. Trish’s (see Figure 8) trend data was similar across all three measures. Specifically, data reported during the intervention phase her showed a downward trend in frequency, intensity, and duration, which continued in all three areas at follow-up. Finally, Emily (see Figure 9) demonstrated downward trends for frequency and intensity during the intervention phase, with a flatline trend observed for both at follow-up. She showed a slight downward trend during the intervention phase for duration, with a more pronounced downward trend observed at follow-up.

As previously mentioned, with only two data points obtained at follow-up, it is not feasible to conclude with any degree of certainty the long-term effectiveness of the intervention. Having said that, all six participants reported overall reduction in means across all three primary domains at follow-up.

**Social Validity**
The student participants and their parents completed a modified version of the Abbreviated Acceptability Rating Profile (AARP; Tarnowski & Simonian, 1992), in order to determine their satisfaction with the treatment program. The AARP consists of 8 items with ratings ranging from 1 (Strongly Disagree) to 6 (Strongly Agree). The AARP yeilds scores from 8 to 48, with higher scores reflecting greater treatment acceptability. A summary of scores for student participants and their parents are presented in Table 24 and 25, respectively.

**Student Participant Ratings**

All six participants anonymously completed the AARP. Overall, the participants perception of the treatment program was that it was acceptable, with individual scores ranging from 37-47 out of a possible 48, and an overall mean score of 41.5 (SD 4.51) for the group. Of note, all participants either strongly agreed (N = 3) or agreed (N = 3) that this was an acceptable treatment program for their headaches. Moreover, five out of the six participants either strongly agreed (N = 1) or agreed (N = 4) that the treatment program helped them manage their headache activity. Participant ratings for each item on the AARP are provided in Table 25.
Table 25

<table>
<thead>
<tr>
<th>Item</th>
<th>Rater 1</th>
<th>Rater 2</th>
<th>Rater 3</th>
<th>Rater 4</th>
<th>Rater 5</th>
<th>Rater 6</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This is an acceptable treatment for my behavior</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5.5</td>
</tr>
<tr>
<td>2. The treatment should be effective in changing my behavior</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5.2</td>
</tr>
<tr>
<td>3. My behavior is severe enough to justify the use of this treatment</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>5.0</td>
</tr>
<tr>
<td>4. I would be willing to use the skills I’ve learned again</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5.2</td>
</tr>
<tr>
<td>5. This treatment would not bad side effects for me</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>5.3</td>
</tr>
<tr>
<td>6. I liked this treatment</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5.2</td>
</tr>
<tr>
<td>7. The treatment was a good way to handle my headaches</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5.2</td>
</tr>
<tr>
<td>8. Overall, the treatment helped my headaches</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Note. The following scale was used on the rating scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, 6 = Strongly Agree.

Parent ratings

All six of student participants’ parents anonymously completed the AARP.

Overall, the parents’ perception of the treatment program was that it was acceptable, with individual scores ranging from 38-45 with an overall mean score of 41.5 (SD 2.59). Of note, all parents strongly agreed (N = 5) or agreed (N = 1) that the treatment program was acceptable for their respective students headache and with minimal side effects. Parent ratings for each item on the AARP are provided in Table 26.
Table 26

*Parent Ratings on the Abbreviated Acceptability Rating Profile*

<table>
<thead>
<tr>
<th>Item</th>
<th>Rater 1</th>
<th>Rater 2</th>
<th>Rater 3</th>
<th>Rater 4</th>
<th>Rater 5</th>
<th>Rater 6</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This is an acceptable treatment for my behavior</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5.8</td>
</tr>
<tr>
<td>2. The treatment should be effective in changing my behavior</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5.2</td>
</tr>
<tr>
<td>3. My behavior is severe enough to justify the use of this treatment</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5.0</td>
</tr>
<tr>
<td>4. I would be willing to use the skills I’ve learned again</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5.2</td>
</tr>
<tr>
<td>5. This treatment would not bad side effects for me</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>5.7</td>
</tr>
<tr>
<td>6. I liked this treatment</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>4.8</td>
</tr>
<tr>
<td>7. The treatment was a good way to handle my headaches</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5.0</td>
</tr>
<tr>
<td>8. Overall, the treatment helped my headaches</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4.8</td>
</tr>
</tbody>
</table>

*Note.* The following scale was used on the rating scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, 6 = Strongly Agree.
CHAPTER IV

DISCUSSION

The aim of the current study was to evaluate the effectiveness of a brief school-based cognitive-behavioral treatment program with students who experience chronic headache. Participants included four female and two male students between the ages of 11 and 14 attending middle school in a large suburban school district in northeast Ohio. The participants were identified through consultation with the school nurse as those who visited the school clinic at least one time during the previous 30-day period for headache complaints. Following initial recruitment procedures, social-emotional and quality of life data was collected from both the student participants and their parent and they were instructed on how to complete the provided headache diary. Baseline data was recorded for headache frequency, intensity, and duration for three to five weeks depending on treatment initiation date. Following baseline, the participants met individually with the research-practitioner once a week for 40 mins during a non-academic portion of their day (i.e., study hall, lunch/recess) for a period of five weeks. These sessions included activities associated with content derived from three primary approaches to intervention: (a) brief psychoeducational discourse on the body’s physiological response to stress derived from *The Anxiety & Phobia Workbook* (Bourne, 2010), (b) a modified version of the F.E.A.R. Plan adopted from the *Coping Cat* program (Kendall & Hedtke, 2006), and (c) scripted breathing and progressive muscle relaxation exercises obtained from *The Anxiety & Phobia Workbook* (Bourne, 2010). During the treatment sessions, the participant and research-practitioner: (a) reviewed the previous week’s headache diary; (b) reviewed the previous week’s F.E.A.R. Plan homework and introduced the next step
in the plan as outlined by the treatment manual; (c) introduced and/or practiced selected relaxation techniques; and (d) reviewed the homework assignment for the following week. Participants continued to record data on headache frequency, intensity and duration throughout intervention and after the final treatment session whereby, each participant continued to keep a headache diary for a period of two weeks. At the conclusion, social-emotional and quality of life data were collected from the participants and their parent as well as the final headache diary.

**Effectiveness of the Intervention**

The primary research question was: *Does the implementation of a school-based treatment for recurrent headache reduce the frequency, intensity, and duration of headache?* This section begins with a brief summary and interpretation of the outcomes with regard this question, through the consideration of visual analysis and NAP analyses. The final portion of this section addresses outcomes associated with follow-up data, in response to the question, *Are the treatment gains maintained at two-weeks following the conclusion of treatment?*

**Participant Headache Frequency**

With regard to headache frequency, all six participants reported overall reductions during treatment, with an average baseline mean of 0.66 headaches per week and an average treatment mean of 0.33 headaches per week. Charlie, Mac, and Emily reported a clinically significant decrease in headache frequency as defined by a reduction of greater than 50% (Blanchard, 1992). Visual analysis across all six participants revealed several points of consideration. First, four out of the six participants reported experiencing an immediate reduction of headache following the first treatment session.
Only Jen and Trish reported delayed relief following the second and third sessions, respectively. Second, while all six participants exhibited stable baseline data, there was variability in headache frequency during the treatment phase for all participants, except Dee. Both Charlie and Trish exhibited the greatest variability through the intervention phase, with Jen, Mac, and Emily reporting slight variability. All six participants reported an overall reduction in mean headache frequency, compared to baseline as indicated by the downward trend for each (with the exception of Mac who exhibited a flat trend line due reporting only one headache throughout treatment), with NAP analysis revealing large treatment effects for Dee, Charlie, Mac, and Emily, and moderate treatment effects for Jen and Trish. The mean NAP score across participants was 0.93 (medium effect) and the median NAP score was 0.94 (large effect).

It is noteworthy that both Charlie and Trish were the only two participants who received treatment in the past for their headache due to long standing difficulties with them. Trish exhibited the slowest response, experiencing relief after the third treatment session, which is consistent with previous literature indicating that persistent daily headache are more resistant to treatment (Silberstein, 1995). Additionally, variability during the treatment phase has been noted in previous studies (Engel, 1992), suggesting that the acquisition of the strategies taught may require additional time to practice in order to achieve the long-term desired effect. Further, the overall reduction in frequency for the treatment participants as a whole in this study is consistent with results found in similar studies (e.g., Larsson & Melin, 1986; Larsson et al., 1987; Engel, 1992; Larsson & Carlsson, 1996).
Participant Headache Intensity

The school-based treatment program also resulted in an overall reduction in headache intensity for all six participants, with an average baseline mean of 5.43 and an average treatment mean of 3.42. Mac was the only participant who displayed a clinically significant decrease in headache intensity as defined by a reduction of greater than 50% (Blanchard, 1992). Visual analysis of headache intensity data revealed more stability with the intensity of headaches, with only Charlie, Mac, and Emily exhibiting slight variability. Additionally, all six participants reported experiencing immediate reduction of headache intensity following the first treatment session. Four out of the six participants showed a downward trend through the treatment, with Charlie again showing a flat trend due to reporting only one headache through the treatment, and Dee showing a slightly upward trend, though still below her baseline levels. NAP analysis revealed large treatment effects for Dee, Mac, and Trish and medium effects for Charlie, Jen, and Emily. The mean NAP score across participants was 0.87 (medium effect) and the median NAP score was 0.89 (medium effect).

As it relates to frequency, the stability of reported intensity is not an uncommon finding as frequency is an objective, binary response, whereas intensity resides on a more subjective continuum (Engel, 1992). In relation to Dee and her upward trend, at the initiation of treatment sessions, she reported that there were major changes occurring in her immediate family and that they were causing her a certain level of distress. As such, it is difficult to accurately discern if the reported intensity levels were an accurate depiction of the true intensity, or a combination of headache pain and her reported increased levels of emotional distress.
The resulting decrease in overall intensity found in this study are consistent with similar studies findings (e.g., Larsson & Melin, 1986; Larsson et al., 1987; Engel, 1992; Larsson & Carlsson, 1996).

**Participant Headache Duration**

Similar to frequency and intensity, all six participants reported mean overall reductions in headache duration, with an average baseline mean of 6.97 and an average treatment mean of 3.63. Additionally, Dee, Jen, Mac, and Trish exhibited a clinically significant decrease in headache duration as defined by a reduction of greater than 50% (Blanchard, 1992). However, there was considerably more variability within these data sets. Specifically, upon visual analysis, Charlie, Jen, and Trish reported greater variability in relation to Dee, Mac, and Emily during the treatment phase. Additionally, not only do Dee, Jen, and Trish show a decrease in duration following the second session, but also their reported decrease is rather large in comparison to their remaining data points. Further, following the second session, all three report more stable levels of headache duration. Charlie is the only one of the participants for whom visual analysis demonstrates variability throughout the treatment program. Given Charlie’s long-standing difficulty with headache and numerous previous attempts at remediation, it is plausible that his individual headache phenotype is resistant to treatment, thus causing inconsistencies in treatment success.

This variability observed in the treatment phase is consistent with previous studies (Engel, 1992; Allen et al., 2002) whereby fluctuations are observed during the treatment phase and are suggested to be associated with the respective individuals experience with headache as well as the rate of acquisition of learned techniques (Engel, 1992).
A trend analysis reveals five out of the six participants showing a downward trend with large effect sizes observed for Dee, Jen, and Mac, and medium effect sizes for Charlie, Trish, and Emily. The mean NAP score across participants was 0.91 (medium effect) and the median NAP score was 0.93 (medium effect). Again, these results are consistent with similar previous studies (e.g., Larsson & Melin, 1986; Larsson et al., 1987; Engel, 1992; Larsson & Carlsson, 1996).

**Maintenance**

At the conclusion of the treatment phase, all six participants were asked to continue using their headache diaries for two more weeks. At the conclusion of this period, all six participants reported mean headache frequency, intensity, and duration that were below initial baseline levels. It is acknowledged that the follow-up period only allowed for the collection of two data points, which limits its ability to show maintenance of observed effects. However, these results suggest that the treatment program maintained reductions in frequency, intensity and duration after the treatments conclusion. This limitation and future research considerations are addressed later in the chapter.

When analyzing the frequency, intensity and duration data in a summative manner across participants, medium effect sizes were observed across all three headache parameters. Additionally, while the collection of only two data points were obtained at follow-up limits quantitative analysis, visual analysis across participants showed reduced levels across all three headache parameters for all participants compared to baseline. Generally speaking, when compared to studies that investigated the impact of various interventions either in isolation or in non-school settings, the outcomes of this study were
generally consistent with previous findings. Implications for research and practice are
discussed toward the end of this chapter.

**Secondary Outcomes**

With treatment of headache, the goal is to reduce the frequency of headache
attacks, relieve headaches as rapidly as possible, and decrease the impact of headache on
quality of life, including school performance and relationships with peers and family, as
well as to prevent progression to more long-term comorbidities such as depression and
anxiety (Sanmaneechai & Ballaban-Gil, 2013). This study was designed in part to
expand upon previous studies that have evaluated headache treatment and its relative
impact on the quality of life (QoL) and social-emotional functioning of the participants.
Specifically, this study addressed the following research questions: *Does the
implementation of a school-based treatment for recurrent headache impact quality of life
(QoL) for student participants?* and *Does the implementation of a school-based treatment
for recurrent headache impact social-emotional functioning in student participants?*

This section begins with an interpretation of outcomes associated with a measure of QoL.
Furthermore, this study included a pre- and post-treatment measure of the treatment
impact on the participants’ overall social emotional functioning. The results from a
measure of social-emotional functioning are interpreted below.

**Quality of Life**

This study evaluated the treatment program’s impact on the quality of life as
measured using the Pediatric Quality of Life Inventory, Fourth Edition (PedsQL 4.0;
Varni, Seid, & Kurtin, 2001) as reported by participants and parents or guardians at the
pre- and post-treatment intervals. The data collected showed that there were no
significant impact on quality of life as rated by both participants and their respective parent. While the mean scores obtained from the pre- and post-treatment assessment were not clinically significant, both participants and their parents or guardians reported a mean increase in all four quality of life domains measured (i.e., Physical, Emotional, Social, and School).

Although the literature base is relatively small, previous research studies have evaluated the impact of headache on the quality of life. For example, Powers and colleagues (2004) evaluated the quality of life of children and adolescents aged 2 to 18 ($n = 686$) with migraine in a clinic-based setting using the PedsQL 4.0 during the initial patient visit. Their findings reported that headache frequency was associated with an overall quality of life with children and adolescents when compared to healthy controls, with teens reporting lower scores (more difficulty) on the School Functioning subscale. Similarly, Langeveld, Koot, and Passchier (1997) evaluated the quality of life as it related to headache activity in high school students ($n = 64$) by asking the participants to complete headache diaries and the Quality of Life Headache – Youth (QLH-Y) weekly over a four week period. Results from this study showed that the frequency of headache activity had an inverse correlation with overall quality of life in a school-based setting.

While these studies provide support on the negative impact that headache can have on overall well-being, the data collected for this particular construct was static, measured at a single point in time. The current study is the first to our knowledge that measured quality of life outcomes both before and following a headache treatment protocol. The results of this study alone neither support nor refute the existing literature surrounding the impact of headache on the quality of life in individuals before and after treatment. This is
in part due to the absence of a headache-free control group, the study’s design did allow for the long-term attainment of treatment impact on the individual participants’ quality of life following treatment due to time constraints. More research is needed to better understand how cognitive-behavioral interventions implemented in the school setting impact students’ overall quality of life. Specifically, does the application of a brief, school-based intervention for headache provide the individual with enough exposure and practice learned strategies to produce long-standing outcomes that would have a positive effect on the overall quality of life?

**Social-Emotional Functioning**

Prior to beginning baseline data collection and again at the follow-up post-treatment session, participants and their respective parents completed the YSR (Achenbach & Rescorla, 2001) and CBCL (Achenbach & Rescorla, 2001), respectively. The participants’ self-ratings yielded no clinically significant changes in internalizing, externalizing, and overall behavioral functioning resulting from the treatment program. In contrast, the parents’ pre- and post-treatment rating of social-emotional functioning yielded clinically significant results. Specifically, they reported a significant decrease ($p < 0.01$) in overall internalizing behaviors and a significant improvement ($p < 0.01$) in total overall social-emotional functioning. While the participant ratings did not yield any significant differences at the conclusion of the study, they did provide some clinically relevant information. Specifically, though the mean differences reported pre- and post-treatment were not significant, there was an observable mean difference within the internalizing, externalizing, and total scales, for the group.

These findings are generally consistent with findings from previous studies.
For example, in a multi-site study completed by Griffiths and Martin (1996), the researchers reported that although there were no statistically significant difference in the pre- and post-treatment outcome measures for anxiety and depression, they observed a decrease in anxiety and depressive symptoms. Similarly, Larsson and colleagues (1987) found no statistically significant difference between anxiety and depression scores for participants in either therapist-assisted or self-help relaxation treatment. What is unique about the current study, however, is the assessment of the parents’ perception of social-emotional functioning following treatment. It appears that there are not any studies to date that have incorporated such a measure. As such, the current findings of statistically significant improvements in the participants’ internalizing and overall social-emotional functioning as reported by family members appears to warrant further investigation in terms of consistency in outcomes and possible interpretations of observed patterns (or lack thereof).

**Social Validity**

From the student participants’ perspective, the treatment program was rated as acceptable. All six student participants agreed or strongly agreed that the treatment program was an appropriate form of treatment to manage their headaches. Five out of six agreed or strongly agreed that the treatment should be effective in changing their headaches. Five out of six agreed or strongly agreed that they would be willing to use the skills they have learned again in the future. Similarly, five out of six agreed or strongly agreed that they liked the intervention and that it was a good way to handle their headaches, and overall feel like it had a positive impact on their ability to mitigate the impact of headache in their daily functioning.
From a parent perspective, all six respondents reported that they either agreed or strongly agreed that the intervention was an acceptable form of treatment for their respective child’s headache. Four out of six indicated that they agreed or strongly agreed that the treatment should be effective in changing their child’s headache activity in the future. Five out of six agreed or strongly agreed that the treatment was a good way to handle their children’s headaches and treatment had an overall positive effect on their child’s headache.

The acceptability of the current study by the participants and their parents is similar to numerous studies (e.g., Larsson et al. 1987; Engel, 1992; Griffiths & Martin, 1996; Allen, Elliott, & Arndorfer, 2002) whereby the application of a brief, non-pharmacologic intervention was considered acceptable and effective by the participants. This is promising in light of the fact that the participants ratings were relatively high, even when additional components were added to the intervention package. This may support the notion that for more serious concerns (e.g., pain), more comprehensive interventions are deemed acceptable and appropriate (Eckert & Hintze, 2000).

The literature suggests that parents are key stakeholders who represent a fundamental component of student growth and success. Parental understanding and participation in intervention strategies has been reported to enhance outcomes and sustainability of intervention gains (Spence, Donovan, & Brechman-Toussaint, 2000). For example, in a study designed to compare the treatment outcomes for children with social phobia using a cognitive behavioral intervention with and without parental involvement, the treatment group that included the parent as part of the treatment program produced stronger results when compared to the non-involved parent group.
Hill and Tyson (2009) completed a meta-analytic study of previous research that evaluated parental involvement in middle school academic success. What they found was that parental involvement was positively associated with academic success. Although this study did not include parents as active treatment agents, they were involved in the process of securing student participants and providing input regarding key outcomes.

The importance of parental buy-in to intervention, whether it be behavioral or academic, cannot be over-stated. By incorporating parents into the treatment plan, they have the unique ability to monitor and support within the home and community settings, where school-based personnel have limited to no reach. Additionally, their participation allows for the opportunity for enhanced communication between the school and outside providers (i.e., physicians), fostering a more collaborative and holistic treatment approach. Further, parental involvement in the treatment program could strengthen the long-term effects by continuous use of learned strategies after the intervention is completed.

**Treatment Integrity**

Throughout this study, a very high level of treatment integrity was maintained. Specifically, the treatment integrity as reported by the practitioner (i.e., the research-practitioner) was 98%. Inter-observer agreements were not solicited during this study because numerous studies have shown in varying degrees that chronic headache sufferers tend to have increased levels of anxiety and/or depression, whether chronic or acute in presentation. Given the potential to self-discover and/or reveal personal and non-educationally relevant information by the participants, the research-practitioner
determined having a third party unknown individual in the room during treatment sessions create an environment whereby the student would not feel safe to divulge potential concerns that could inherently be contributory factors to headache maintenance. Given this obstacle, the treatment integrity checklist was developed and maintained by the research-practitioner during each treatment session. Although the treatment integrity data may be interpreted as potentially inflated due to self-report, the research-practitioner believed that benefit of not including a third-party observer outweighed the costs associated with a potential over-reporting treatment integrity levels in this case.

The treatment program provided to the participants in this study was an amalgam of previously created and thoroughly researched components that have been successfully used in isolation of each other to treat other conditions (i.e. pediatric anxiety, chronic pain). The research-practitioner assembled these components into a modified treatment plan that allowed it to be completed in a timely and unobtrusive manner. Thus, the research-practitioner had a prescribed and scripted path through each session, lending to perhaps enhanced integrity due to the prescribed nature of the intervention. In fact, the only steps missed in this study were reviewing the homework and activities to be completed before the next session, and allowing time at the end of the session for comments or questions. These occurred because of an unexpected fire drill that occurred during the last few minutes of a participant’s session.

**Significance of Findings**

The findings from the current study serve to address several critical gaps within the current literature involving school-based treatment of common, but recurrent medical conditions (i.e., headache), in addition to enhancing research supporting non-
pharmacologically based treatment alternatives present for these conditions. First, while there is a considerable body of research demonstrating the effectiveness of relaxation techniques in those experiencing chronic pain conditions such as headache, the preponderance of these studies were completed in clinical or tertiary settings (Larsson & Melin, 1986; Larsson et al., 1987; Engel, 1992). While results from previous studies demonstrate the effectiveness of these strategies, they do not address the principle obstacle in service provision to children and adolescents – availability and accessibility in their respective communities. Similarly, there is a substantial research base showing the efficacy of cognitive-behavioral therapy techniques on ameliorating depressive and anxiety symptoms among children and adolescents as well as developing positive coping strategies (Richter et al., 1986; Griffiths & Martin, 1996; Kroener-Herwig & Denecke, 2002). With these aspects identified, the current study sought to provide a school-based intervention that included the key components of education about headache, specific time sensitive application of the F.E.A.R. plan, a fundamental element of the Coping Cat program (Kendall & Hedtke, 2006), and direct instruction of specific relaxation techniques, all of which have are empirically validated techniques.

The results of the current study provide support of the use of multi-component treatment program in the reduction of headache activity that was delivered within the school setting. This appears to be the first study that incorporates a school psychologist as the designer, implementer, and program evaluator of a school-based intervention intended to treat a pervasive condition in the pediatric population that was once available only in non-school settings. Through the use of school as the service delivery context,
the student participants received treatment that yielded positive reductions in their overall headache activity that was either never sought out, or was unavailable to them previously.

The results of the current study not only support the findings of previous studies indicating the efficacy of non-pharmacological remediation techniques for headache sufferers, but it also provides empirical support for the expansion of mental health supports and services delivered within the school setting. This is discussed below as an implication for practice. Finally, the current study highlights the vital role that the school psychologist can play in the development, implementation, and evaluation of mental health services within the school setting, as recommended with the NASP Model for Comprehensive and Integrated School Psychological services (NASP, 2010).

**Implications for Practice**

The present study demonstrated several implications for school psychologists and their role in the educational process that relate to: (a) utilizing mental health techniques to enhance student learning, (b) expanding treatment options to a largely underserved population, and (c) using evidenced-based intervention to promote better mental health in students.

**Headache and Learning**

This study demonstrated that the use of a brief multi-component treatment package was effective at reducing the frequency, intensity, and duration of headache in adolescents. The impact of recurrent or chronic headache can have far and reaching negative implications for those individuals. In fact, headaches can make even the simplest of tasks almost impossible to perform. Students who suffer from headaches are often forced to miss school, and if they attend school, report that their productivity is
reduced (Lipton et al. 2007). Previous studies have highlighted the detrimental effects of experiencing chronic pain conditions and that relative to non-headache individuals, children and adolescents with headache are more likely to have somatic, anxiety and depressive symptoms (Antilla et al., 2004), diminished attention span and increased hyperactivity-impulsivity (Arruda, Guidetti, Galli, Albuquerque, & Bigal, 2010) as well as adverse effects on environmental (e.g., academic performance, recreation) and social and familial relationships (Bruijn, Locher, Passchier, Dijkstra, & Arts, 2010). Whereas only the parent or guardian reported clinically significant changes in aspects of social-emotional functioning, all participants and their respective caregivers reported some level of improvement on the social-emotional and quality of life measures. By providing a treatment option that is readily available, easily accessible, and delivered by a school-based mental health professional, students have the ability to increase academic performance by reducing or eliminating common everyday impairments in the context in which they are likely to occur. Additionally, less academic time is lost due to school absences and school clinic visits. While the preponderance of early intervention research in education has focused primarily on remediating academic skill deficits, up until recently, very little attention has been paid to the emotional health of children and its impact on student achievement. This study provides some evidence in support of a cost-effective and easily accessible mental health treatment that could positively impact student learning (Stephan et al., 2012).

**School-Based Mental Health**

As indicated earlier, this study demonstrated the effectiveness of a cognitive-behavioral approach to headache treatment and supports similar findings from previous
studies. However, what is unique to this study is its application within a school setting
delivered by a school-based mental health professional. This study’s unique qualities
highlight the need for expanded school mental health services.

As previously noted, findings from the Great Smokey Mountains Study (Costello
et al., 1996) and other population-based, epidemiological studies (Roberts, Attkisson, &
Rosenblatt, 1998) indicate that from 16% to 22% of children and adolescents up to the
age of 18 have a diagnosable disorder, and only about 20% of children with the most
serious needs were obtaining mental health services (Forness, Kavale, & Lopez, 1993;
Forness, Kavale, MacMillan, Asarnow, & Duncan, 1996; Kazdin, Holland, & Crowley,
1997). This recognition of the vastly unmet mental health needs of children and
adolescents has led to numerous calls for reforms in the provision of mental health
service provisions across the continuum of stakeholders. Historically, No Child Left
Behind (2002) provided opportunities through grant-based funding for the establishment
or expansion of existing programs that are geared towards the enhancement of social and
emotional development to ensure “student access to quality mental health care by
developing innovative programs to link the local school system with the local mental
health system” (U.S. Department of Education Office of Elementary and Secondary
opportunities for the development or enhancement of programs or services using
evidence-based interventions to meet the academic and behavioral needs of students.
This acknowledgement of the interrelatedness of children’s health and their school
achievement has led to the development of several models supporting school-linked
services to meet both the physical and mental health needs of children (Allen, Mathews, & Shriver, 1999).

Within the existing literature, both population-based (see Doll & Cummings, 2008) and ecological-developmental (see Nastasi, 2004) researchers have proposed a sound theoretical framework for the expansion and provision of mental health services within the educational context. While the focus of each model range from the community at large (population-based) to the developmental needs and the individual’s interaction with the immediate environment (ecologically based), there are several shared tenants between them. These include shared engagement among all stakeholders (i.e., teacher, parents, administrators, and students), effective collaboration linking service delivery and supports within the school and the community, and the delivery of comprehensive, evidence-based services that meet both the needs of the individual as well as the greater community. Within this context, the results of the current study provide preliminary data on the successful implementation of a school-based mental health intervention that is supportive to the unique needs of the population as well as providing a service that could be made accessible to all students.

**Evidenced-Based Interventions**

The present study offers evidence of a multi-component treatment package in which the individual components have been empirically validated across a variety of settings. However, to our knowledge, this is the first time these components have been packaged and delivered by a school-based mental health professional in the school setting.
Within the current educational research, the foundational supports for effective student learning lies is the use of empirically validated core curriculum, delivered by highly qualified teachers, in addition to the application of evidenced-based remedial techniques for those students who demonstrate academic or behavioral delays (Gresham, VanDerHayden, & Witt, 2005). There are a countless number of studies that demonstrate the efficacy of various academic and behavioral support strategies; however, there are considerably fewer studies evaluating the application and effectiveness of mental health interventions within the school context.

Despite the potential of school-based mental health programs, there remain significant questions about the ability of school mental health clinicians to deliver empirically supported interventions that result in the same level of child and family outcomes that may be achievable in more controlled settings (i.e., tertiary clinics; Stephan et al., 2012). Additionally, while many schools are delivering various types of these services, the evidence base and overall quality of these services remains largely unknown (Rones & Hoagwood, 2000). The current study contributed to the existing literature of providing components of evidenced-based interventions packaged to meet the specific individual needs of the student population. Because this study incorporated a standardized approach to the treatment, the study can be easily replicated for future research.

Limitations

Although positive findings were reported from this study, there are several limitations that need to be addressed. First, the current study included only those students that visited the school clinic due to headache complaints. As previously mentioned, a
large percentage of children and adolescents do not report their headache activity, and as such, the treatment package presented within this study was not made available to them. This resulted in a relatively small sample size. Future research should include a larger recruitment pool in order to ascertain treatment effects to a larger number of participants. Although six participants represents an acceptable number of participants for one single-subject research study, replications are warranted to allow for overall efficacy to be determined. The Council for Exceptional Children (2014) suggests that in order for a particular intervention to demonstrate a high level of efficacy, there needs to be “...five methodologically sound single-subject studies with positive effects and at least 20 total participants across studies” (p. 9).

Another limitation is related to the fact that the timeframe that the current study utilized was relatively brief, most notably the latency between the final treatment session and the follow-up meeting. Because of this, the data collected may not represent the long-term effectiveness of the intervention as desired. In order to address this, future research studies could utilize a longer wait period between the final session and follow-up.

In addition, because the current study used an amalgam of individual components from multiple interventions, it is impossible to determine the relative effectiveness of these components in isolation, or if the combination proved to have a greater effect than its individual parts. Future research might consider providing the individual components in isolation to determine their individual impact on headache activity in children and adolescents. Upon consideration of both this limitation and the first one mentioned above, it appears that more research is needed to investigate both (a) outcomes associated
with replications of this particular package, and (b) outcomes associated with various components as applied by a school psychologist as the designer, implementer, and program evaluator of the cognitive-behavioral intervention to address headache in schools.

Another limitation has to do with the idea that the instrumentation used to evaluate the social-emotional impact of the treatment program may not have been sensitive enough to detect subtle discriminant changes over a relatively short period. To address this, future research should consider assessments tools that are more readily equipped and validated to detect changes throughout the intervention process. According to Roach and Elliott (2005), one approach to measuring socially valid outcomes that has gained momentum in the fields of education and psychology is Goal Attainment Scaling (GAS; Kiresuk and Sherman, 1968). Through the use of a five-point Likert rating scale that can be used at regular intervals (e.g., weekly), this instrument allows consumers to rate outcomes according to at least two ranges: either from (a) best possible outcome (a score of +2), to no change (a score of 0), to worst possible outcome (a score of -2); or (b) much more than expected (+2), to expected level of outcome (0), to much less than expected (-2) (Elliott & Roach). When using either set of these primary anchors, future researchers could list individualized goals and objectives that are socially-relevant for that student or group of students.

Finally, because the intervention was implemented by the research-practitioner, it was impossible to objectively assess the feasibility of and interventionist’s level of satisfaction with the intervention within the context of social validity considerations.
Future research may consider gaining this invaluable information from school psychologists who serve as treatment agents.

**Additional Recommendations for Future Research**

The current study contributed to the literature on non-pharmacological treatment options for children and adolescents with recurrent or chronic headache. Additionally, this study appears to be the first to utilize a multi-component treatment program that is delivered within a school setting by a school-based mental health professional. However, future research is needed to continue to discover more about various applications and the overall efficacy of mental health interventions delivered in the school setting delivered by properly trained school mental health professionals.

Given that this particular study provided treatment in a one-on-one setting, future research should evaluate the effectiveness of this treatment option in a group format. By determining the treatments efficacy in-group settings, the potential impact could lend itself to reaching a larger portion of the student population in addition to reducing the time constraints placed on the provider in an individual setting. Additionally, future research is needed to explore the impact of this treatment on overall academic performance of the participants. That is, future research might explore the extent to which the successful reduction of headache activity may have any significant impact on performance in the classroom as measured by marks earned and other performance indicators across academic settings.

**Conclusions**

Children and adolescents who experience recurrent or chronic headache have been shown to have increased levels of anxiety and/or depression, difficulties with
familial and personal relationships, emotional lability, and increased difficulties with sustained attention and concentration, lending to greater academic difficulties and a decrease in overall quality of life when compared to their non-headache peers. Overall, the present study provides support to the existing literature base of effective cognitive-behavioral treatment of headache in children and adolescents. The present study also provided support to the growing consensus of expansion of school-based mental health programs and treatments, and more specifically, the school psychologist’s role in the design, provision, and evaluation of evidence-based treatment options. With the growing number of recent initiatives that have highlighted the mental health needs of children and adolescents, combined with insufficient, inaccessible, and/or unavailable mental health service options, schools have now been identified as a critical context for service provision.

The findings from the present study illustrate the effectiveness of a brief, low cost treatment alternative that is successful at reducing the overall headache activity in children and adolescents when it is delivered in the school setting by a school-based mental health professional. Like most research, in addition to answering some questions, this study highlights additional questions to be addressed through future replication and expansion.
APPENDIX A
HEADACHE BACKGROUND FORM
Appendix A

Headache Background Form

Parent and child/adolescent should complete the following form together.

Child’s Name: __________________________ Date: _________ Date of Birth:________

Gender: M / F (circle)   Ethnicity: ____________________

Name(s) of Person(s) Completing Questionnaire: _________________________________

Please List Everyone in the Family:

<table>
<thead>
<tr>
<th>Name</th>
<th>Relationship to Child</th>
<th>Living with the Child?</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Y  /  N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y  /  N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y  /  N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y  /  N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y  /  N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y  /  N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y  /  N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y  /  N</td>
<td></td>
</tr>
</tbody>
</table>

Social/Educational History:
Name of child’s school:

Grade in school: __________ (Regular classroom setting?   Y  /  N  )
Does child receive specialized tutoring or accommodations in school: Y  /  N
Typical school grades: __________________________
Number of extracurricular activities:_______

Please list activities:__________________________________________________________

Average after school hours spent on school work:___________per day/week
Average after school hours spent on extracurricular activities_________per day/week

Any social difficulties (e.g., trouble making/keeping friends, isolation)?

________________________________________________________
Medical History:
Any unusual complications (problems) at birth?
______________________________________________________________

Any developmental problems or delays?
______________________________________________________________

Any history of head trauma, meningitis, encephalitis, or other brain injury or neurological condition?
______________________________________________________________

Any other medical conditions?
______________________________________________________________

Vision difficulty? Y / N Hearing difficulty? Y / N

If yes, please explain: ____________________________________________

Any family members with a history of headache or migraine?
☐ YES ☐ NO

If Yes, please list relationship(s):
______________________________________________________________

What time does child usually fall asleep?
School day: _____________
Summer/weekend: _____________

What time does child usually wake up in the morning?
School day: _____________
Summer/weekend: _____________

Does the child nap? If so, how long?

Below are a list of sleep difficulties that some people with headaches may experience. Please answer yes or no if you experience these sleep difficulties.

Lack of sleep?
☐ YES ☐ NO

Trouble falling asleep?
☐ YES ☐ NO

Walking or talking in your sleep?
☐ YES ☐ NO

Waking at night and trouble falling back asleep?
☐ YES ☐ NO

Frequent waking at night?
☐ YES ☐ NO

Feeling not rested or daytime sleepiness?
☐ YES ☐ NO

Total Sleep Time

School day: _____________ hrs
Summer/weekend: _____________ hrs
What medications has your child taken now or in the past for headache?

<table>
<thead>
<tr>
<th>Name/dose</th>
<th>Frequency</th>
<th>Dates taken</th>
<th>Still using?</th>
<th>Relieves headache?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Y / N</td>
<td>Y / N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Y / N</td>
<td>Y / N</td>
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<td>Y / N</td>
<td>Y / N</td>
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<td>Y / N</td>
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<td>Y / N</td>
<td>Y / N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Y / N</td>
<td>Y / N</td>
</tr>
</tbody>
</table>

*If you use Over-The-Counter medicines (e.g., Advil, Tylenol, Aleve) more than 3x a week...*

Does headache seem to get worse when you stop taking the medication?  Y / N
Appendix B

Medina City School District Research Consent

Recognizing Potential – Maximizing Achievement

April 2, 2015

To Whom It May Concern,

Chris LaVogue has the permission of the Medina City School District to conduct his doctoral research in our district and access school nursing logs during the 2015 calendar year with Medina City School District students. Mr. LaVogue will secure permission of the parents for this study and will maintain confidentiality of the students and our district in his research.

If you have any questions, please feel free to contact me at 330-636-3092.

Sincerely,

Kristine Gallich, Ph.D.
Director of Educational Services
APPENDIX C

CLAGGETT MIDDLE SCHOOL RESEARCH CONSENT
Appendix C

Clagget Middle School Research Consent

Recognizing Potential-Maximizing Achievement

Medina
City Schools

Clagett Middle School

Principal
Paul Worsencroft

Associate Principal
Matthew Mattie

July 21, 2015

To Whom It May Concern,

Chris Lavogue has the permission of the Medina City School District and my permission as building principal, to conduct his doctoral research in our district and access school nursing logs during the 2015-2016 school year with Medina City School District students. Mr. LaVogue will secure permission from the parents for his study and will maintain confidentiality of the students and our district in his research.

If you have any questions, please feel free to contact me at 330-636-3500.

Sincerely,

Paul Worsencroft

Principal
Clagett Middle School
Medina City Schools

420 E. Union Street Medina, Ohio 44255  P 330-636-3300  F 330-725-9349
APPENDIX D

SCHOOL NURSE/HEALTH AIDE RECRUITMENT SCRIPT
Appendix D

School Nurse/Health Aide Recruitment Script

Hello – My name is _________ and I’m the school nurse/health aide at Claggett Middle School. I’m calling you today because I’ve noticed that your son/daughter has been down to the school health clinic (number of times) over the past month with reported complaints of headache. In addition to answering any questions that you might have concerning your child’s headache, I wanted to let you know of a research study that is being completed by our school psychologist utilizing a non-medication treatment approach of recurrent headache. If you are interested in learning more about the study, with your verbal permission, I will forward your name and contact information to the school psychologist and he will contact you directly with more information. If you are not interested, I would be happy to send you some literature about headache. Thank you for your time and consideration.
APPENDIX E

VERBAL RECRUITMENT SCRIPT
Appendix E

Verbal Recruitment Script

Hello – My name is Chris LaVogue and I am the school psychologist at Claggett Middle School and a doctoral candidate at Kent State University in the School Psychology Program. I’m calling to talk to you about [Student Name] participating in my dissertation research study. The study is attempting to evaluate the efficacy of a school-based brief cognitive-behavioral treatment package for adolescents who experience headache. [Student Name] has been identified as a potential participant in the study due to complaints of headache during the school day resulting in a visit to the school clinic.

If you and [Student Name] are willing to participate, the study will require you both to complete brief rating scales on headache related symptoms and difficulties as well as a face-to-face interview prior to initiation of treatment and again at the conclusion. [Student Name] will participate in 5 weekly meetings with me and will learn various techniques using a highly structured treatment program that will include weekly homework and headache monitoring. The sessions will be completed during the school day or immediately following school depending on the scheduling availability. No personally identifying information will be used as part of this study. All personal information will be kept strictly confidential and will be housed in a locked file cabinet located within a locked office.

This study is completely voluntary and participation can be stopped at any time without consequence. If you'd like [Student Name] to participate, I will mail you a study package that will provide a detailed written description of the study and some preliminary forms for you and your child to complete. Once received and completed, we can go ahead and schedule a time for me to meet with you and [Student Name] to review this information and give you an opportunity to ask any further questions you may have. If you need more time to decide if you would like [Student Name] to participate, you may also call or email me with your decision.

Do you have any questions for me at this time?

If you have any more questions about this process or if you need to contact me about participation, I may be reached at (330) 636-4156 or lavoguec@medinabees.org.

Thank you so much for your consideration.
APPENDIX F

PROJECT OVERVIEW PARENT LETTER
Appendix F

Project Overview Parent Letter

Date

Dear Parent(s)

Thank you for your consideration for [Student Name] to participate in our research project on the evaluation of a brief cognitive-behavioral treatment package with adolescents who experience headache. This project will be conducted at the Claggett Middle School in the school psychologists’ office over the next three months. We are interested in determining if the application of a school-based treatment approach with individuals who experience frequent to chronic primary headache (e.g., migraine and/or tension type) will effectively reduce the frequency, intensity, and duration of headache activity. In addition, we will be examining the effects of the applied intervention program with regards to social and emotional functioning, general impact of headache activity, and the quality of life.

The project in which [Student Name] has been invited to participate is expected to be an enjoyable experience and will require approximately 13 hours of [his/her] time and approximately 3 hours of yours. To help you in this discussion, a brief description of the project is provided.

Initially, both you and [Student Name] will be asked to complete some preliminary rating scales that will include the PedsQL 4.0, and the CBCL/YSR as well as a general background questionnaire. These rating scales will be used to determine if there are any appreciable differences in headache impact, quality of life, and social emotional functioning by comparing responses prior to the intervention and at its completion. [Student Name] will be asked to monitor their headache activity for at least 3 weeks on the provided headache monitoring sheet prior to the beginning of the intervention. The intervention will consist of 5 weekly individual meetings with the researcher (approximately 40 mins) in which they will participate in a structured treatment curriculum that will teach them specific strategies on stress management and relaxation techniques. At the end of each individual meeting, [Student Name] will be assigned a brief homework activity that will coincide with the skills learned in that session and also be asked to record their headache activity for the following week. At the fifth individual session, [Student Name] will be asked to record their headache activity over a period of two weeks and encouraged to continue daily practice of the skills previously learned. Finally, a follow-up face-to-face meeting will be scheduled with you and [Student Name] to review the data collected through the course of the intervention as well as you and [Student Name] will be asked to again complete the rating scales that were completed prior to the initiation of the intervention.
You and [Student Name] performances and information are considered confidential and the individual results will not be shared with school staff. All documents that have any personal identifiers will be securely stored in a locked file cabinet located in the school psychology office at Claggett Middle School. During the individual meetings, all appropriate measures will be taken to ensure the privacy of [Student Name] and at no time will the teacher and/or staff member know the reason for their visit.

Only those students who have been provided with informed written consent by both the parent and the student themselves will be involved in the study. This consent to participate may be withdrawn at any time during the study without penalty by indicating this decision to the researcher. There are no known or anticipated risks to participation in this study.

We would like to assure you that this study has been reviewed and approved by the Institutional Review Board (IRB) at Kent State University. In addition, we have been provided with research consent by both the Claggett Middle School administration and the Medina City Schools.

If you have any questions about the study, or if you would like additional information to assist you in reaching a decision, please feel free to contact Chris LaVogue at lavoguec@medinabees.org or (330) 636-4156 or my faculty supervisor, Dr. Richard Cowan at rcowan1@ksu.edu or (330) 672-4450. Thank you in advance for your interest and support of this project.

Sincerely,
APPENDIX G

INFORMED CONSENT TO PARTICIPATE IN A RESEARCH STUDY
Appendix G

Informed Consent to Participate in a Research Study

STUDY TITLE: School-Based Treatment of Headache in Adolescents: An Evaluation of a Brief Cognitive-Behavioral Package

PRINCIPLE INVESTIGATOR: Richard J. Cowan, Ph.D., NCSP. Associate Professor, School Psychology

CO-INVESTIGATOR: Chris LaVogue, M.S., NCSP. Doctoral Candidate, Kent State University

RESEARCHERS’ STATEMENT: You are being asked to participate in a research study conducted by Chris LaVogue, a doctoral student in the school psychology program at Kent State University. This research is being conducted as a dissertation study, in partial fulfillment of those requirements associated with Chris’s doctoral program in school psychology. Further questions about this project may be directed to Chris LaVogue (clavogue@kent.edu) or to Dr. Richard Cowan, Chair of Chris LaVogue’s dissertation committee (rcowan1@kent.edu). This project has been approved by the Kent State University Institutional Review Board. If you have any questions about your rights as a research participant or complaints about the research, you may call the KSU IRB at (330) 672-2704.

PURPOSE OF THE STUDY: The purpose of this study is to examine any effects the application of a brief school-based cognitive-behavioral treatment package might have with adolescents who experience recurrent or chronic headaches with regard to headache activity (i.e., frequency, intensity, and duration), and to determine if any noticeable changes are identified with regard to headache impact, social and emotional functioning, and overall quality of life.

STUDY PROCEDURES: If you agree to take part in this study, you and your child will complete some rating scales and questionnaires. Following this initial step, you and your child will participate in a face-to-face interview (approximately one hour) with the researcher where the preliminary headache background form and brief parent- and self-report assessments related to headache impact and social and emotional functioning will be collected. Additionally, you and the student participant will be interviewed using a structured interview in order to more clearly define the student participants’ individual headache symptoms. At the conclusion of this interview, the student participant will be provided a headache activity monitoring form in which they will be asked to record their headache activity for at least three weeks as a baseline measure (this will take approximately 10 minutes daily). This form will record headache frequency, intensity, and duration of headache activity.
Following the baseline period, the student participant will meet once a week (approximately 40 mins) in a 1:1 setting with the researcher in the school psychologist’s office over the course of five consecutive weeks. These meetings will be scheduled only during non-academic portions of the student participant’s day.

In the first session, the student will work with the researcher to develop individual goals for the treatment that will be reviewed weekly. During this session, the student will be instructed on the basics of headache activity including thoughts and behaviors that contribute to headache. Additionally, they will be guided through a breathing exercise with opportunity to practice under the direction of the researcher. Finally, they will begin the first component of the F.E.A.R plan. This plan is a component of the Coping Cat (Kendall & Hedtke, 2006) program originally designed to treat anxiety in children and adolescents. The F.E.A.R plan is a 4-step coping plan that teaches students to recognize their bodies response to anxiety provoking situations, identify what their thoughts are during these moments, identify alternative more adaptive thoughts, and evaluate the outcomes when these new thoughts are utilized. At the conclusion of the session, the student participant will be given a new headache activity log for the week and a homework assignment to be completed prior to the next individual session (approximately 10 minutes daily).

In each of the following sessions, the student will review with the researcher the previous week’s headache diary and homework. Additionally, they will be introduced to a new component of the F.E.A.R plan and participate in guided relaxation exercises. The student will be asked to complete weekly assignments related to the F.E.A.R plan as well as individually practice the relaxation techniques at least three times per day with his/her parent initialing the monitoring form.

At the conclusion of the third individual session, you the parent will be contacted via telephone (approximately 10 minutes) to provide a general update on the intervention progress and to allow for any questions you might have up to that point.

At the conclusion of the fifth and final 1:1 meeting with the student participant, they will be given additional information regarding headache causes and prevention as well as additional headache activity logs to complete daily for a period of at least two weeks.

A follow-up meeting (approximately one hour) will be scheduled with you and the student participant at approximately two weeks following the fifth and final individual meeting. At the follow-up meeting, the data collected through the course of the intervention will be reviewed as well as you and the student participant will be asked to again complete the rating scales that were completed prior to the initiation of the intervention.

POTENTIAL BENEFITS OF THE STUDY: By participating in this intervention, the participant will learn to recognize various factors associated with headache activity and learn to use specific strategies and techniques.
RISK, STRESS, OR DISCOMFORT: There are no anticipated risks beyond those encountered in everyday life. The intervention is designed to stimulate personal reflection on the thoughts and feelings and the bodily response to stress in order to apply more effective coping skills.

PRIVACY AND CONFIDENTIALITY: Although this research will result in publication and possibly in professional presentations, no identifying information will be made available to the public. Research participant data will be reported using pseudonyms. Randomly-generated student identification numbers will be included on the pre- and post- intervention behavior rating scales and questionnaires. Furthermore, the weekly headache logs, homework, and parent- and self-report measures will be kept confidential within the limits of the law. According to the law, confidentiality will not be maintained if there is an indication that the student may harm himself or herself or others. All materials resulting from this research study, including those that contain identifying information will be kept in a secure location and only the researchers will have access to the data. Consent forms and all pre- and post- behavior rating scales and questionnaires will be kept in a locked cabinet at the school. To ensure the privacy of the participant, the scheduled meetings will occur only during mutually agreed non-academic periods within the day. The participant will be given a non-specific hall pass to the main office and instructed to proceed directly to the school psychologist’s office. At no time during this study will any of the student’s teachers or any school staff members be aware of the purpose of the passes or of the individual meetings.

OTHER INFORMATION: There is no cost to you for participating in this study. Participation is voluntary. The student and/or the parent is/are free to withdrawal from this study at any time without penalty. A copy of this information will be provided to you for future reference.

STATEMENT OF CONSENT: I have read previous information and understand how to ask for and receive any additional information I might need. If you would like to participate in this research, please check, “I agree to participate.”

I agree to participate ☐

I do not want to participate ☐

__________________________  ___________________________
Child Participant’s Signature  Parent Signature
APPENDIX H

HEADACHE ASSESSMENT FORM
Appendix H

Headache Assessment Form

TYPE ONE HEADACHE

Please tell me where your FIRST type of headache occurs. (L=Left and R=Right)

- L forehead
- R forehead
- L temple
- R temple
- L Side (above ears)
- L back of head
- R back of head
- Above eyes
- Below eyes
- Top of head
- Back of neck
- L shoulder
- R shoulder
- Top of head
- Back of neck
- L shoulder
- R shoulder
- All over

What words best describe your FIRST type of headache?

- Pounding
- Throbbing / pulsating
- Stabbing / sharp
- Dull ache
- Pressing / band-like / squeezing

- Other:

Overall, how severe is your FIRST type of headache from 0-10? __________

0 = no pain, 2 = little pain, 5 = medium pain, 7 = large pain, 10 = worst pain possible

How old were you when your FIRST type of headache began? __________ years old

Overall, how long does your FIRST type of headache last? __________ minutes/hours

What is the longest time your FIRST headache has lasted? __________ minutes/hours

How often do you get your FIRST type of headache? __________ per day/week/mo.

When are you most likely to have your FIRST type of headache? __________

What are you usually doing at this time? __________

Do you experience these signs/sensations BEFORE your first type of headache?

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blurred Vision</td>
<td></td>
<td></td>
<td>Dizziness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seeing spots</td>
<td></td>
<td></td>
<td>Loss of consciousness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flashing lights</td>
<td></td>
<td></td>
<td>Ringing in ears</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of vision</td>
<td></td>
<td></td>
<td>Hearing difficulty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double vision</td>
<td></td>
<td></td>
<td>Speech difficulty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tingling/numbness</td>
<td></td>
<td></td>
<td>Fatigue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle weakness</td>
<td></td>
<td></td>
<td>Excessive thirst</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of balance</td>
<td></td>
<td></td>
<td>Excessive hunger</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Do you experience these symptoms AT THE SAME TIME AS your first type of headache?

<table>
<thead>
<tr>
<th>Symptom</th>
<th>YES</th>
<th>NO</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bothered by light</td>
<td></td>
<td></td>
<td>Problems with vision</td>
<td></td>
</tr>
<tr>
<td>Bothered by sound</td>
<td></td>
<td></td>
<td>Feeling tired/worn out</td>
<td></td>
</tr>
<tr>
<td>Bothered by smell</td>
<td></td>
<td></td>
<td>Loss of appetite</td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td></td>
<td></td>
<td>Difficulty reading</td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td></td>
<td></td>
<td>Watering of the eye</td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td></td>
<td></td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Dizziness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Now think about factors that may TRIGGER headaches. **Do these usually SET OFF your first type of headache?**

<table>
<thead>
<tr>
<th>Factor</th>
<th>YES</th>
<th>NO</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td></td>
<td></td>
<td>Exercise (physical exertion)</td>
<td></td>
</tr>
<tr>
<td>Movement</td>
<td></td>
<td></td>
<td>Mental exertion (studying)</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td></td>
<td></td>
<td>Change in sleep pattern</td>
<td></td>
</tr>
<tr>
<td>Odors (perfume, gasoline)</td>
<td></td>
<td></td>
<td>Weather</td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
<td></td>
<td>Holidays or weekends</td>
<td></td>
</tr>
<tr>
<td>Avoiding meals</td>
<td></td>
<td></td>
<td>Coughing or sneezing</td>
<td></td>
</tr>
<tr>
<td>Caffeine</td>
<td></td>
<td></td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

Does headache occur more frequently with any aspect of menstrual cycle?  
☐ YES ☐ NO ☐ NOT APPLICABLE  
If yes what part of the menstrual cycle? __________________

Now think about factors that may WORSEN headaches. **Do these usually WORSEN your first type of headache?**

<table>
<thead>
<tr>
<th>Factor</th>
<th>YES</th>
<th>NO</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td></td>
<td></td>
<td>Exercise (physical exertion)</td>
<td></td>
</tr>
<tr>
<td>Movement</td>
<td></td>
<td></td>
<td>Mental exertion (schoolwork)</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td></td>
<td></td>
<td>Change in sleep pattern</td>
<td></td>
</tr>
<tr>
<td>Odors (perfume, gasoline)</td>
<td></td>
<td></td>
<td>Weather</td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
<td></td>
<td>Holidays or weekends</td>
<td></td>
</tr>
<tr>
<td>Avoiding meals</td>
<td></td>
<td></td>
<td>Coughing or sneezing</td>
<td></td>
</tr>
<tr>
<td>Caffeine</td>
<td></td>
<td></td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

Now think about factors that some people find to provide RELIEF from headaches. **Do these usually provide RELIEF from your first type of headache?**

<table>
<thead>
<tr>
<th>Relief</th>
<th>YES</th>
<th>NO</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep</td>
<td></td>
<td></td>
<td>Keeping active at work/play</td>
<td></td>
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<tr>
<td>Lying down</td>
<td></td>
<td></td>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>Dark places</td>
<td></td>
<td></td>
<td>TV</td>
<td></td>
</tr>
<tr>
<td>Cool compress</td>
<td></td>
<td></td>
<td>Talking to others</td>
<td></td>
</tr>
<tr>
<td>Massage</td>
<td></td>
<td></td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>
TYPE TWO HEADACHE  (Do NOT complete if you only have one primary type of headache)

Please tell me where your second type of headache occurs.

☐ L forehead  ☐ R forehead  ☐ L temple  ☐ R temple  ☐ L Side (above ears)
☐ L back of head  ☐ R back of head  ☐ Above eyes  ☐ Below eyes  ☐ Behind eyes
☐ L shoulder  ☐ R shoulder  ☐ Top of head  ☐ Back of neck  ☐ All over

What words best describe your second type of headache?

☐ Pounding  ☐ Throbbing / pulsating  ☐ Stabbing / sharp  ☐ Dull ache  ☐ Pressing / band-like / squeezing
☐ Other:

Overall, how severe is your second type of headache from 0-10? __________
0 = no pain, 2= little pain, 5= medium pain, 7= large pain, 10= worst pain possible

How old were you when your second type of headache began? __________ years old

Overall, how long does your second type of headache last? __________ minutes/hours

What is the longest time your second headache has lasted? __________ minutes/hours

How often do you get your second type of headache? __________ per day/week/mo.

When are you most likely to have your second type of headache? __________

What are you usually doing at this time? ______________________________

Do you experience these signs/sensations BEFORE your second type of headache?

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blurred Vision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seeing spots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flashing lights</td>
<td></td>
<td></td>
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<tr>
<td>Loss of vision</td>
<td></td>
<td></td>
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<tr>
<td>Double vision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tingling/numbness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle weakness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of balance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dizziness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of consciousness</td>
<td></td>
<td></td>
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<tr>
<td>Ringing in ears</td>
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<tr>
<td>Hearing difficulty</td>
<td></td>
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<tr>
<td>Speech difficulty</td>
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<td>Fatigue</td>
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<tr>
<td>Excessive thirst</td>
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<tr>
<td>Excessive hunger</td>
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</tbody>
</table>
**Do you experience these symptoms AT THE SAME TIME AS your second type of headache?**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bothered by light</td>
<td></td>
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<td>Problems with vision</td>
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<tr>
<td>Bothered by sound</td>
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<td></td>
<td>Feeling tired/worn out</td>
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<tr>
<td>Bothered by smell</td>
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<td>Loss of appetite</td>
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<td>Nausea</td>
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<td>Difficulty reading</td>
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<tr>
<td>Vomiting</td>
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<td>Watering of the eye</td>
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<tr>
<td>Fever</td>
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<td></td>
<td>Other:</td>
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<tr>
<td>Dizziness</td>
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</tbody>
</table>

Now think about factors that may **TRIGGER** headaches. **Do these usually SET OFF your second type of headache?**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
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</thead>
<tbody>
<tr>
<td>Light</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Movement</td>
<td></td>
<td></td>
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<tr>
<td>Noise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odors (perfume, gasoline)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoiding meals</td>
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<td></td>
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<tr>
<td>Caffeine</td>
<td></td>
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</tbody>
</table>

Now think about factors that may **WORSEN** headaches. **Do these usually WORSEN your second type of headache?**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td></td>
<td></td>
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<tr>
<td>Movement</td>
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<tr>
<td>Noise</td>
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<tr>
<td>Odors (perfume, gasoline)</td>
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<tr>
<td>Food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoiding meals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caffeine</td>
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</tbody>
</table>

Now I am going to list factors that some people find to provide **RELIEF** from headaches. **Do these usually provide RELIEF from your second type of headache?**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep</td>
<td></td>
<td></td>
<td>Keeping active at work/play</td>
<td></td>
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<tr>
<td>Lying down</td>
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<td></td>
<td>Music</td>
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<tr>
<td>Dark places</td>
<td></td>
<td></td>
<td>TV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cool compress</td>
<td></td>
<td></td>
<td>Talking to others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massage</td>
<td></td>
<td></td>
<td>Other:</td>
<td></td>
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</tbody>
</table>
FOR ANY/ALL HEADACHES
Are there things you cannot do or avoid doing when you have a headache (e.g., go to school, watch TV)?

What can you do, even though you have a headache?

In the last THREE months (i.e., 90 days)...

A) How many full school days of school were missed due to headaches?

B) How many partial days of school were missed due to headaches (do not include full days counted in the first question)?

C) How many days did you function at less than half your ability in school because of a headache (do not include days counted in the first two questions)?

D) How many days were you not able to do things at home (i.e., chores, homework, etc.) due to a headache?

E) How many days did you not participate in other activities due to headaches (i.e., play, go out, sports, etc.)?

F) How many days did you participate in these activities, but functioned at less than half your ability (do not include days counted in the 5th question)?

Stress is mental or physical tension that occurs with demands of everyday life. Stress affects everyone and can be present in negative events (e.g., divorce), positive events (e.g., many extracurricular activities), or demands for high performance (such as striving for excellence in school or sports)? Please list all possible sources of stress in the following areas of your life.

School: _______________________________________________________________

Overall, how stressful is school (circle one)?  0  1  2  3  4  5  6  7  8  9  10

Not at all  Stressful
Extremely  Stressful

Friends: _______________________________________________________________

Overall, how stressful are friends (circle one)?  0  1  2  3  4  5  6  7  8  9  10

Not at all  Stressful
Extremely  Stressful

Home: _______________________________________________________________

Overall, how stressful is home (circle one)?  0  1  2  3  4  5  6  7  8  9  10

Not at all  Stressful
Extremely  Stressful

Other: _______________________________________________________________

Overall, how stressful is this (circle one)?  0  1  2  3  4  5  6  7  8  9  10

Not at all  Stressful
Extremely  Stressful
APPENDIX I

HEADACHE DIARY
## Appendix I

### Headache Diary

<table>
<thead>
<tr>
<th>Date</th>
<th>8-hours of sleep last night?</th>
<th>Feeling stressed at all?</th>
<th>HEADACHE FREE DAY!! (You can skip the other columns today!)</th>
<th>The number of headaches I had today…</th>
<th>The average length of time of headache today…</th>
<th>The average intensity of headache today…</th>
<th>Did headache interfere with any activities today…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y / N</td>
<td>Y / N</td>
<td>Y / N</td>
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<td>Y / N</td>
</tr>
</tbody>
</table>

![Pain Scale](image)

0 = no pain  
10 = worst pain
APPENDIX J

BREATHING SCRIPT
Appendix J

Breathing Script

Focusing on your breath helps you to concentrate on slow deep breathing which aids in separating you from distracting thoughts. Begin by finding a quiet, comfortable place to sit or lie down. Begin by taking a normal breath. Now let’s try a deep breath:

Breathe in slowly through your nose, allowing your chest and lower belly to rise as you fill your lungs. Let your belly expand fully.

Now breathe out slowly through your mouth (or your nose, if that feels more natural). Breathe in… and Exhale out….. Breathe in….. and Exhale out….. Breathe in….. and Exhale out…..

Keep breathing slowly like this, emptying your lungs completely with each breath. Your deep breathing calms and relaxes you…allowing your body to relax, getting just the right amount of oxygen, and helping you feel calm….. Breathe in….. and Exhale out….. Breathe in….. and Exhale out…..

Continue breathing in slowly through your nose, allowing your chest and belly to rise. You may want to place your hand on your belly as you breathe in and feel the hand rise each time you inhale and fall back each time you exhale. Remember to relax your belly so that each inhalation expands fully. Breathe in….. and Exhale out….. Breathe in….. and Exhale out…..

Keep breathing smoothly and calmly. You can breathe like this any time, drawing in relaxation, releasing any tension that accumulates through the day. Breathe in….. and Exhale out….. Breathe in….. and Exhale out….. Breathe in….. and Exhale out…..

Let’s focus now on the word “Relax” mentally saying “Relax each time you breathe in and each time you exhale. Breathe in….Relax, and Exhale out…. Relax,.. Breathe in…. Relax,.. and Exhale out… Relax,.. Relax,.. Breathe in… Relax,.. and Exhale out… Relax,..

Every day, your breathing can relax you, making you strong and resilient, able to cope with the stressors that come your way. Breathe in….Relax, and Exhale out…. Relax,.. Breathe in…. Relax,.. and Exhale out… Relax,.. Relax,.. Breathe in… Relax,.. and Exhale out… Relax,.. Relax,..

And now knowing that you can recall and practice this deep breathing exercise whenever you wish… begin to bring your awareness back reorienting yourself to your surroundings. Breathe normally.

APPENDIX K

BREATHEING HOMEWORK
Breathing Homework

Abdominal Breathing Exercise

First, access your effortless breathing skill:
1. Find a comfortable position (initially, reclining or lying on your back may work best).
2. Breathe as you normally do.
3. Place one hand on your stomach and one on your chest.
4. Notice as you breathe your stomach rise when inhaling (breathing in) and fall when exhaling (breathing out).
5. Do not focus on breathing deeply, just allow the air to move into your stomach area and notice this feeling.

Now that you are doing effortless breathing, try to breathe slow, low, quiet, and in a regular pattern.
1. Begin by slowly breathing in through your nose or mouth to the count of 4-5.
2. Hold the breath for a count of 1 (if you choose).
3. Slowly exhale through your mouth for a count of 5-6.
4. Do this for 10 breaths, then continue breathing effortlessly for up to 5 minutes.
5. By practicing this daily, you will soon engage in effortless breathing more naturally during the day.

Tip for family
- It is not necessary for breathing to be exactly 4 seconds in and 5 seconds out. This counting method helps establish a rhythm to the breathing cycle. The key component of effortless breathing is maintaining a breathing pattern that is:
  - Slow (slower than typical breath pace)
  - Low (using the diaphragm)
  - Quiet, and
  - Regular (or in a steady rhythm).
- In the beginning it may be helpful for you to observe your child’s breathing exercise and praise them for what they are doing to achieve effortless breathing. You may also want to practice with them to increase their enthusiasm and motivation for these exercises and to help you give feedback to them.

To strengthen the relaxation response during effortless breathing, focus your attention on:
- air moving through your body
- your heart beat speeding up and slowing down
- a positive feeling or memory
- a positive thought or image
- warm relaxed feelings in different areas of your body
Appendix L

Headache Diary: Week 1

<table>
<thead>
<tr>
<th>Date</th>
<th>HEADACHE FREE DAY!! (You can skip the other columns today!)</th>
<th>The number of headaches I had today...</th>
<th>The average length of time of headache today...</th>
<th>The average intensity of headache today... 0 -10 0 = no pain 10 = worst pain</th>
<th>Did headache(s) interfere with any activities today...</th>
</tr>
</thead>
<tbody>
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<td>Y / N</td>
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</table>

Current Relaxation and Coping Skills:

1) Belly Breathing

<table>
<thead>
<tr>
<th>Date</th>
<th>Type</th>
<th>Time</th>
<th>Before score 0 -10</th>
<th>After score 0 -10</th>
<th>Type</th>
<th>Time</th>
<th>Before score 0 -10</th>
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</table>

Practice at least 3 times each day. Be sure to evaluate how relaxed you feel before AND after the exercise (0-10)

APPENDIX M

PROGRESSIVE MUSCLE RELAXATION SCRIPT
Appendix M

Progressive muscle relaxation script

Find yourself a quiet place to relax. Turn off your phone and dim the lights. This is your time...a time for complete and utter relaxation.

For this relaxation, you can either sit or lie down. Just make sure that you are warm enough, and that you are comfortable. Let your hands rest loosely in your lap, or by your side. Now close your eyes.

Become aware of your breathing, and notice how your abdomen rises and falls with each breath...

Now take a long slow deep breath in through your nose, all the way down into your stomach. Hold the breath for just a moment, and then exhale through your mouth. Allow your breath to carry away all stress and tension as the air floods out of your lungs.

Take another slow breath in through your nose. Fill your lungs completely. Hold it for a moment...and release the breath through your mouth. Empty your lungs completely.

Take a third deep breath in. Hold it for a moment, and then let it go.

Feel that your body has already undergone a change. The tension in your body has begun to loosen and subside.

Now let your breathing rhythm return to normal...and relax....

During this relaxation I will ask you to tense various muscles throughout your body. Please do this without straining. You do not need to exert yourself, just contract each muscle firmly but gently as you breathe in. If you feel uncomfortable at any time, you can simply relax and breathe normally.

Bring your awareness to your feet and toes. Breathe in deeply through your nose, and as you do, gradually curl your toes down and tense the muscles in the soles of your feet. Hold your breath for just a few seconds and then release the muscles in your feet as you breathe out. Feel the tension in your feet wash away as you exhale. Notice how different your feet feel when tensed and when they are relaxed.

Take another deep breath in again, tense the muscles in the soles of your feet and hold this position for a few seconds.

Now release. Feel yourself relaxing more and more deeply with each breath. Your whole body is becoming heavier, softer and more relaxed as each moment passes.
Now bring your awareness to your lower legs...to your calf muscles. As you draw in a nice deep breath, point your toes up towards your knees and tighten these muscles. Hold for just a moment, and then let those muscles go limp as you exhale. Once again, draw in a deep breath...and tighten your calf muscles. Hold for a few seconds, and then let it all go. Feel your muscles relax, and feel the tension washing away with your out-breath.

In a moment you will tense the muscles in the front of your thighs. If you are lying down, you can do this by trying to straighten your legs. You’ll feel the muscles pulling your kneecap upwards. If you are seated, you can tense these muscles by pushing your heels down onto the floor.

Take a deep breath in, and tense the muscles in your thighs. Hold for just a moment, and then release everything. As you do this, the blood flow to your muscles increases, and you may notice a warm tingling sensation. Enjoy this feeling of soothing relaxation in your thighs.

Again, breathe in deeply and tighten your thigh muscles. Hold for a moment. Now release. Focus on letting your muscles go limp and loose.

Draw in a nice deep breath and gradually tighten the muscles in your buttocks. Hold this contraction for a few seconds, and then release your breath. Feel the tension leaving your muscles. Feel them relaxing completely.

Once more, breathe in deeply and tighten the muscles in your buttocks. Hold for a moment. Now release them. You are becoming more and more deeply relaxed.

Take another breath, and this time, gradually tighten all the muscles in your legs, from your feet to your buttocks. Do this in whatever way feels natural and comfortable to you. Hold it...and now release all these large strong muscles. Enjoy the sensation of release as you become even more deeply relaxed.

Now bring your awareness to your stomach. Draw in a nice deep breath and then tighten these muscles. Imagine you are trying to touch your belly button to your spine. Now release your breath and let your muscles relax. Notice the sensation of relief that comes from letting go.

Once again, draw in a deep breath and then tighten your stomach muscles. Hold for a few seconds... and then let them relax as you exhale and release all tension.

Bring your awareness to the muscles in your back. As you slowly breathe in, arch your back slightly and tighten these muscles....Now release your breath and let your muscles relax.
Again, draw in a deep breath and then tighten your back muscles. Hold for a few seconds...and then let them relax and release.

Now give your attention to your shoulder muscles and the muscles in your neck. As you slowly draw in a nice deep breath, pull your shoulders up towards your ears and squeeze these muscles firmly. Now breathe out completely, and allow your contracted muscles to go loose and limp.

Again, pull your shoulders up towards your ears and squeeze these muscles firmly. Now feel the tension subside as you relax and breathe out.

Feel the heaviness in your body now. Enjoy the feeling. Feel yourself becoming heavier and heavier. Feel yourself becoming more and more deeply relaxed.

You are calm, secure, at peace.

Now it’s time to let go of all the tension in your arms and hands. Let’s start with your upper arms.

As you breathe in, raise your wrists towards your shoulders and tighten the muscles in your upper arms. Hold that breath and that contraction for just a moment...and then gently lower your arms and breathe all the way out. You may feel a warm, burning sensation in your muscles when you tighten them. Feel how relaxing it is to release that tightness and to breathe away all tension.

As you curl your upper arms again, tighten the muscles as you breathe in. Breathe in deeply. Now relax your arms and breathe out.

Now bring your awareness to your forearms. As you breathe in, curl your hands inwards as though you are trying to touch the inside of your elbows with your fingertips. Now feel the tension subside as you relax and breathe out.

Again, take a deep breath in, and tighten the muscles in your forearms. Hold it for a moment, and then release them. Feel the tension washing away.

Now, take another breath in and tightly clench your fists. When you have finished breathing in, hold for just a few seconds, and then release. Notice any feelings of buzzing or throbbing. Your hands are becoming very soft and relaxed.

Take another deep breath in and clench your fists again. Hold for just a few seconds, and then release. Let your fingers go limp.

Your arms and hands are feeling heavy and relaxed.
Take a couple of nice long slow breaths now, and just relax. Feel yourself slipping even deeper into a state of complete rest.

Now tighten the muscles in your face by squeezing your eyes shut and clenching your lips together. As you do, breathe in fully. Hold it...now breathe out and relax all your facial muscles.

Feel your face softening.

Once more, breathe in deeply while you scrunch the muscles in your eyes and lips....and release.
Now bring your awareness to the muscles in your jaw. Take a deep breath in, and then open your mouth as wide as you can. Feel your jaw muscles stretching and tightening.
Now exhale and allow your mouth to gently close.
Again, fill your lungs with air and then open your mouth wide. Now let your mouth relax and let your breath flood all the way out.

You are now completely relaxed from the tips of your toes to the top of your head.

Please take a few more minutes to rest. Relax. Listen to the sound of your breathing and enjoy the lovely, warm sensation of physical relaxation. If you have the time, feel free to fall asleep. You will wake feeling completely rejuvenated and relaxed.

APPENDIX N

PROGRESSIVE MUSCLE RELAXATION HOMEWORK
Progressive Muscle Relaxation Homework

Let Go and Get Loose!

Progressive Muscle Relaxation!

Progressive Muscle Relaxation, or PMR, is a fun way to get to know your body, learn to relax all of your muscles, and get rid of some of the stress you feel. You let go and get loose by tightening different muscle groups and then letting go or releasing the tension until your entire body feels loose and relaxed.

When to Use it: Use PMR whenever stress or pain makes your muscles feel tight.

Why it Can Help: The muscles in your neck, shoulders, head, and face can all become tight when you are stressed or in pain. When you tighten up a muscle and then let it go, it actually relaxes more than it was before so you feel better.

What you Need: You need a comfortable place to sit or lie down and a positive attitude.

HOW TO DO IT:

We're going to relax our muscles by tightening them for 3 seconds and then letting the tension go. After you tighten one group of muscles, move on to the next. Start with your toes and move up to your head.

1. Tense the muscles in your feet. Hold to a count of three and let go.
2. Tighten your leg muscles from your toes to your hips. Hold to a count of three and let go.
3. Tighten your stomach and your chest. Note how hard it is to breathe. Hold to three and let go.
4. Pull your shoulders up to your ears. Hold to three and let go.
5. Tighten your arm muscles. Make fists with your hands. Hold to three and let go.
6. Clench your teeth and tighten your nose, cheeks, and eyes. Hold to three and let go.
7. Raise your eyebrows and tighten your forehead. Hold to three and let go.
8. Tighten your feet, legs, abdomen, chest, shoulders, arms, neck, and face. Hold and let go.

Let every muscle in your body be completely loose and relaxed.

APPENDIX O

HEADACHE DIARY WEEK TWO
Appendix O

Headache Diary: Week Two

<table>
<thead>
<tr>
<th>Date</th>
<th>Headache FREE DAY!! (You can skip the other columns today!)</th>
<th>The number of headaches I had today...</th>
<th>The average length of time of headache today...</th>
<th>The average intensity of headache today... 0-10 0 = no pain 10 = worst pain</th>
<th>Did headache(s) interfere with any activities today...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Y / N</td>
</tr>
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<td>Y / N</td>
</tr>
</tbody>
</table>

Practice at least 3 times each day. Be sure to evaluate how relaxed you feel before AND after the exercise (0-10)
APPENDIX P

MIDWAY PARENT PHONE DISCUSSION POINTS
Appendix P

Midway Parent Phone Discussion Points

• Provide purpose of the call is to give the parent a general update on the individual students progress with the intervention to date

• Indicate whether weekly headache logs are completed accurately and turned in at the beginning of each meeting

• Indicate whether the weekly homework assignments associated with the F.E.A.R. plan are completed and turned in at the beginning of each meeting

• Provide perceived level of engagement within the individual 1:1 sessions with regard to the structured intervention activities (i.e., is the student participant independently participating, needs some encouragement to participate, or requires many prompts to participate)

• Inquire with the parent or if they have observed any appreciable change in the participants headache activity and/or behavioral functioning

• Inquire with the parent if they have any additional questions or concerns with the intervention up to this point.
APPENDIX Q

KIDS GUIDE TO HANDLING HEADACHES
Appendix Q

Kids Guide to Handling Headaches

FROM THE NATIONAL HEADACHE FOUNDATION
www.headaches.org

KIDS GUIDE TO HANDLING HEADACHES

Introduction
By the time they are teens, at least half of all kids have had headaches. Since 15% of children and teenagers have tension-type headaches, and 5% have migraines, this means that even if your school only has 100 students, there are 20 (20%) of you who have chronic headaches. You may not have met each other yet. And when you do, you'll discover that each person's headache is different.

Hopefully these tips will help you take more control of your headaches and head pain. Once you identify the causes of your headache, you will be able to avoid many triggers and learn to manage stress better. At the very least, you will have more information and a greater understanding of headaches. The trick is living with your headaches so you can lead an active, happy and rewarding life. Many kids like you have said that, because they had to learn to deal with headaches, they developed new skills that made them stronger or more understanding in other areas of their lives.

Recognize your headache symptoms and their frequency
Think about what your headaches feel like, how often your headaches occur, and how long this has been going on. You can create your own headache diary to look for clues about your headaches and what may cause them. This will help you when you go to see your doctor about your headaches. You can use the headache diary provided here to help you record this information.

Answer these questions for your headache diary:
• What does the headache feel like?
• Where is the pain located? How much does it hurt?
• Does your headache appear without warning, or are there signs of it coming such as weakness, nausea, sensitivity to light or noise, dizziness?
• Do you see bright lights, blind spots or changes in vision called "aura"?
• Do headaches occur after eating certain foods or drinking certain beverages (soft drinks with caffeine, pizza or chocolate)?
• Do certain situations, events or physical activity produce a headache?
• When do the headaches occur…time of day, time of week? How long does the headache last?
• How often do they occur…once a week, twice a week, once a month?
• Does anyone else in your family have headaches?

These are just a few of the questions you should ask yourself to prepare to work with your doctor. With answers to these questions, your doctor will be better able to correctly diagnose your
headache problem and start an appropriate treatment process to help ease the pain of your headaches.

If medication or other approaches are not effectively treating your headaches, then ask to see a doctor who specializes in headaches. Talk to teachers, school health professionals, parents, friends, and others about your headaches, and explain the pain you are in and how it affects you. Communication is very important...for you, as a headache sufferer, and for the people you know. There is help for your pain, and it starts by you taking control of the situation.

**Stress**
Figure out what's most important and do it first. What must be done (homework or cleaning up your room?) and what you want to do (after-school activities or getting together with family). Learn to plan ahead, pace yourself, and find the balance that suits your personality, your needs and your nature. If a particular situation is bothering you, talk to a trusted friend, family member, counselor or someone who can help you with your problems.

**Exercise and relaxation**
Whether you choose exercise such as walking, running, or biking, or other individual activities, you can reduce your stress and feel better. Review the many relaxation options, and choose one that works for you such as a nap, listening to music, a break from the computer, a quiet period away from others, or reading.

**Self-esteem and accepting yourself**
Do what feels right for you. Try to do your best in school, at home, or in activities you like, but you do not have to meet others' expectations. You are "you." Accept the fact that every person is unique, and every kid does some things better than other things. This means that you and your best friend, or you and your sister or brother, or you and your mom and dad, might do better at different things. So, learn to accept yourself. You'll find what's right for you.

**Food and drink**
If pizza, chocolate, some cheeses, caffeine drinks (soft drinks) or other foods have proven themselves headache triggers for you, then don't eat or drink them. You might like the taste, and you might want to be like other kids, eating all of the fun foods. But the fun ends when these foods cause or make your migraine worse. If you want to join the other kids for pizza, just say, "I'll order something else because I can't eat pizza." Your friends will understand this, because so many kids have to avoid particular foods, either because they have allergies or because certain foods upset their stomachs. And, because everyone has different tastes, one of your friends might not eat something simply because he or she doesn't like it.

**Communication**
If a headache comes on while you're with friends, or when you're in a class, take care of the headache. Then explain. "I get [migraine or tension-type] headaches. Sometimes I know when it's coming, and sometimes it happens suddenly. If I'm at school, I may have to go to the nurse's office until it passes. But, otherwise, my life is like everyone else's." You do not have to feel ashamed if your headache causes you to vomit in class or if you have to leave class to go to the nurse's office. Once you have gone to school for a while, you will notice that other kids have either thrown up in class or have had to leave because they didn't feel well.
Take control
As a child or young adult, it may seem difficult to take control of your headache problem. After all, the adults in your life appear to have all the control, and you just take orders. But, whether you're shy or very outgoing, you can take more control of the things affecting you and your headache. Taking control will make you feel better, both physically and emotionally.

Resources
The National Headache Foundation web site at www.headaches.org provides a large body of information about all types of headaches and treatments. The site also offers an educational resource section specifically addressing children's headaches, from the perspective of a parent or teacher and of a child/teen entitled CHILDREN’S HEADACHES: An informative guide for young sufferers, their parents and school health professionals. The NHF web site also offers a bookstore with many resources for you and your parents.
APPENDIX R

THINGS TO KNOW IF YOUR CHILD HAS HEADACHES
Appendix R
Things to Know if Your Child Has Headaches

FROM THE NATIONAL HEADACHE FOUNDATION
www.headaches.org

THINGS TO KNOW IF YOUR CHILD HAS HEADACHES

Introduction
By the time they reach high school, most young people have experienced some type of headache. Fortunately, less than 5% of headaches are the result of serious disease or organic problems, such as a tumor, abscess or head trauma.

The more parents and teachers know about children and headaches - their triggers, symptoms, prevention, and treatments - the easier it will be to identify them and help kids live with them for a full and rewarding life. Here are some tips and advice for dealing with your child's headache.

Legitimate Biological Disease
While a kid suffering from migraines has most likely inherited a predisposition to them, these headaches can result from stress, food or environmental triggers. A child's or adolescent's tension-type headaches are real responses (not excuses) to personal, family or school-related stress or challenges. Whether it's a pop math quiz, an anticipated grammar test, or the school play, each child responds differently. It is important for parents to recognize their child's headaches as a legitimate biological disease which is treatable, and to seek diagnosis and a treatment plan to make your child's head pain and associated symptoms better.

Finding headache care
Some children, once diagnosed, will find immediate relief from prescribed treatment. With other kids, doctors might have to try a few approaches before achieving success. And, there are a few young people who will find some relief but not a totally successful treatment. Generally, however, if the symptoms persist despite the best efforts of your family physician or pediatrician, then it's time to ask your doctor for a referral to a pediatric neurologist or headache specialist.

Stress
Tension-type headaches are almost always caused by emotional stress, and migraines can be aggravated by stress. So, it is critical to understand what causes your child's stress, as well as your own, and how you both can manage it. Counseling can be very helpful in identifying stress and in teaching a child how to more effectively deal with headaches in daily life.

If counseling is possible, you may wish to try it. If your healthcare plan or HMO does not cover it, a note from your child's pediatrician may overcome this obstacle. Your kids cannot avoid stress, because it's everywhere. But if parents help their children deal with both good and bad stress, they will be helping them learn necessary life-management skills.

It is important to help a child identify the sources of school stress such as problems learning math, science or another language, or an upcoming test. Recognition of this stress by a parent or teacher, coupled with understanding and encouragement, can help a young person better deal with his headaches.
Headache at home
When your child develops a headache or feels one coming on, suggest a dimly lit room, offer medication, and an ice pack if it helps. Be responsive and sensitive to the headache without pampering, and treat this child the same as you treat your other children.

School and communication
It is important for parents of younger children, and for adolescents themselves, to discuss the headaches with school health professionals and teachers. Your child's doctor can write a letter explaining the importance of treatment when the headache starts. Give the school nurse the medications and instructions for use. Explain to each teacher, every semester, that the moment a child feels the warning signs of a headache, he should be allowed to leave class, go to the nurse's office for medication, and rest there until the symptoms have decreased.

Headache at school
Young children experiencing or recovering from a migraine might not want to play with other kids and may find the activity of school recess periods difficult. Offer an alternative, such as lying down in the nurse's room or, if the child feels like it, reading a book. Or, if a migraine diminishes a young person's appetite, then instead of lunchtime in the cafeteria, ask if he would prefer to rest and relax instead of eating. It is important to acknowledge and appropriately respond to the challenges that a child may experience during his headache, but it is also important for the child not to be separated or feel isolated from other students.

Allow immediate treatment
Children with migraines eventually learn the warning signs. These sometimes include dizziness, nausea and sensitivity to light and sound. The actual headache may be accompanied by vomiting. If a child feels that he has to take his medication, then encourage his teacher to allow a visit to the nurse's office to do this because taking medication as soon as the first signs of a headache appear is important. Waiting until class is over could put a young person in a more vulnerable situation, and force him to miss more of school than necessary.

Missing school days
There will be times when a headache will cause a child to be late to school, to leave school early, or to miss a day of school, but your kid should not miss more than five days per semester as a result of headaches. If a child misses more than five days, then further evaluation may be necessary. Discourage "school refusal," and home schooling should not be considered a solution for headaches.

Healthy, moderate lifestyle
Successful control and management of headaches includes balanced, nutritious meals (especially breakfast), regular sleep patterns and a full night's sleep, physical exercise, activities, and avoiding food or environmental triggers. During the course of a headache, however, kids should minimize physical activity because it may aggravate the headache.
Activities
While a child with headaches should remain active, refrain from over-commitment or too many activities. If a particular activity triggers a headache, do not allow it if possible, and, if it cannot be avoided, discuss how it might become more manageable. Your pediatrician, psychologist, teachers or other kids might have suggestions for alternate activities.

Resources
The National Headache Foundation web site at www.headaches.org provides a large body of information about all types of headaches and treatments. The web site also offers an educational resource section specifically addressing children's headaches, from the perspective of a parent or teacher and of a child entitled CHILDREN’S HEADACHES: An informative guide for young sufferers, their parents and school health professionals. The site also offers a bookstore with many resources for you and your child.

A membership with the National Headache Foundation will keep you abreast of the latest in headache care. To join, visit the web site at www.headaches.org or call 888-NHF-5552.
APPENDIX S

TREATMENT INTEGRITY CHECKLIST
### Appendix S

**Treatment Integrity Checklist**

**Headache Treatment**

<table>
<thead>
<tr>
<th>Student: __________________________</th>
<th>Date: ____________</th>
<th>Session: ______</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Intervention Components</strong></th>
<th><strong>Completed</strong></th>
<th><strong>Not Completed</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reviewed previous weeks headache diary and allowed time for brief discussion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Introduced and/or reviewed relaxation techniques (breathing and/or PMR)</td>
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<td></td>
</tr>
<tr>
<td>3. Provided guided practice with relaxation technique following script</td>
<td></td>
<td></td>
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<tr>
<td>4. Introduced and discussed the applicable concept in the FEAR Plan following the therapist manual</td>
<td></td>
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<tr>
<td>5. Reviewed the homework and activities to be completed prior to the next session</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Allowed at least 5 minutes at the end of the session for any comments and/or questions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX T

ABBREVIATED ACCEPTABILITY RATING PROFILE
## Appendix T

### Abbreviated Acceptability Rating Profile

<table>
<thead>
<tr>
<th>Abbreviated Acceptability Rating Profile</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This is an acceptable treatment for my behavior</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. The treatment should be effective in changing my behavior</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. My behavior is severe enough to justify the use of this treatment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. I would be willing to use the skills I’ve learned again</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. This treatment would not have bad side effects for me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. I liked this treatment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. The treatment was a good way to handle my headaches</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. Overall, the treatment helped my headaches</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

REFERENCES


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