A Comparison of Group Versus Individually Administered Behavioral Treatment for Adolescent Migraine

by

Karen E. Davies

A Thesis

Submitted to the Faculty of Graduate Studies

in Partial Fulfillment of the Requirement for the Degree

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ABSTRACT

Comparisons were made between individually and group administered behavioral treatments, and a nonspecific attention placebo condition, in a sample of 45 female adolescent migraine sufferers. The behavioral program consisted of a series of relaxation and cognitive coping exercises designed to reduce Headache Frequency, Duration, and Intensity. Following an initial Baseline period of 4 weeks, during which daily headache activity was monitored, each participant attended 12 one hour treatment sessions. Members in one treatment condition were seen individually for each of these sessions, while those in the group and attention placebo conditions were seen in small groups of 4 or 5. Daily headache information was gathered for 4 weeks immediately Post-Treatment, and again at a Follow-Up period 3 months after the end of treatment. The results of this study demonstrate that individually administered relaxation and cognitive coping treatment is generally effective in reducing overall headache activity among female adolescent migraine sufferers. Those subjects who received group administered treatment experienced greater, but not statistically significant, reductions in overall headache activity than did those in an attention placebo condition. There was an overall decrease in Headache Frequency and increase in Headache-Free Days/Week, from Baseline to Follow-Up, regardless of treatment group membership. Post hoc analyses suggest that group administered treatment is likely to be effective in reducing Headache Duration only among girls who initially present with low severity headaches, but not so for girls with high severity headaches. Limitations of the present study are discussed, and recommendations for further research are offered.

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INTRODUCTION

One of the most common ailments known to mankind, in one form or another, is headache. Adams, Feuerstein and Fowler (1980) have reported that approximately 42 million Americans suffer from headache, making it almost as prevalent as the common cold. By the age of 7 years, according to Prensky (1976), 40% of children report having experienced some kind of headache. More than 30 million pounds of aspirin are ingested annually in the United States, the majority of which are taken to relieve headache pain, and it is estimated that more than 40% of the North American population has experienced severe headache at some point in their lives (Ziegler, Hassanein & Couch, 1977). Furthermore, approximately 5-10% of the general population present with headache as the major symptom in seeking medical attention, clearly representing a significant demand on limited medical resources.

The incidence of headache rises sharply from childhood to adolescence, and yet to date, little effort has been made to study and treat this developmental group as a specific subsample of the general headache population. The current project was designed to study a treatment program specifically developed for female adolescent migraine sufferers. This headache group comprises a major portion of the referrals of childhood migraine to an existing migraine treatment clinic in a large Eastern Ontario hospital.

The existence of migraine headache, although not labelled as such, was recorded as long ago as 3000 B.C. in Babylonia. During his life, Hippocrates (460-377 B.C.) described a syndrome of periodic headache with visual disturbances and vomiting that very closely resembled what we now define as classical migraine. Further descriptions of a similar headache disorder have appeared in the writings of scholars and physicians throughout the centuries that followed. Galen (130-200 A.D.) called this syndrome 'hemicrania' (making reference to the unilaterality of the pain) and proposed the primary cause to be black bile irritating the brain. Many centuries later, in 1783, Tissot attempted to formulate a precise description and definition of migraine as a specific disease entity, distinctly separate from the common headache. He described it as a form of supraorbital neuralgia provoked by reflexes from the stomach, gall bladder or uterus (Bille, 1962).

Most of the early references to a migraine syndrome were made following observations of adults. However, in the 18th and 19th centuries, Tissot, Calmeil and Liveing did document the existence of migraine with childhood onset (Bille, 1962). At that time, of course, adolescents would not have been thought of or investigated as a separate developmental group from adulthood.

With respect to etiological explanations of migraine headache, various vascular theories have been offered since the late 1700's, as discussed in Bille's monograph (for example--Parry, 1789; Hall, 1851; DuBois-Reymond, 1860; Mollendorf, 1867), and further refinements of such theories continue to receive research and clinical interest and attention today (to be discussed below). Riley (1932) provides a very complete medico-historical review of the evolution of our present-day thinking about migraine.

Definition and Classification

Although our general knowledge about migraine has increased dramatically over the past 2 centuries, there continue to be problems in establishing a clear, universally endorsed definition and classification system for this disorder. While some definitions have been based on descriptive data including particular observable or subjectively experienced criteria, other definitions are based on proposed underlying physiological mechanisms of the migraine attack. Until a single, indisputable definition is accepted by all who work in the area, many researchers continue to make use of the suggestions offered by the Ad Hoc Committee on the Classification of Headache (1962) as a basis for forming their definitions of migraine. These definitions are used primarily for establishing inclusion and exclusion criteria in research studies.

The Ad Hoc Committee, formed by the United States National Institute of Neurological Diseases and Blindness in 1962, described 15 types of headaches, the most frequently occurring being migraine and muscle contraction headaches. Those related to disease at some level of the central nervous system occur least frequently.

Migraine is defined by the Ad Hoc Committee as "recurrent attacks of headache, widely varied in intensity, frequency and duration, separated by symptom-free intervals". The head pain is commonly described as throbbing, is usually unilateral in onset, and the headache may be accompanied by various systemic symptoms such as anorexia, nausea, vomiting, and sensory or motor disturbances. There may be a prodromal phase characterized by contralateral visual, sensory or motor neurological symptoms, such as scotoma, diplopia, paresthesia, strange odors, ataxia or vertigo. A family history of migraine is common, and relief is often achieved following a period of sleep.

There are several categories of migraine. The most frequently occurring is common migraine, which includes approximately 85% of all migraine patients, followed by classical migraine which includes another 8-10%. Classical migraine begins with a definite sensory (often visual) and/or motor prodrome, which is followed by a distinctly unilateral, pulsatile or throbbing head pain. Frequently there is a generalized decrease in the sensory threshold (thus the individual suffering from a migraine attack often seeks out a quiet, darkened room), and nausea and/or vomiting often occur. The average duration in adults is 6-8 hours, although the headache may last longer. Childhood migraine usually lasts 1-6 hours, with longer duration attacks occurring almost exclusively among girls (Bille, 1962).

Common migraine also features paroxysmal headaches with throbbing or pulsatile pain. However, there usually isn't a sharply defined prodromal phase, the pain is often bilateral, and frequently the headache is longer lasting. Occasionally, focal neurologic disturbances occur during the headache. Among children and adolescents, common migraine is even more prevalent, relative to classical migraine, than it is among adults. As discussed later in the paper, the distinction between common migraine and muscle contraction headache is difficult to make, as the similarities between the two are numerous.

There has been some suggestion made that classical and common migraine are in fact physiologically distinct disorders (Oleson, Lauritzen, Tfelt-Hansen, Henriksen & Larson, 1982), but the evidence for this is weak (Raskin & Appenzeller, 1980).

Cluster migraine, occurring in approximately 4% of migraine sufferers, is a shorter duration, extremely intense, unilateral headache which usually lasts less than an hour, but may recur 2-3 times per day. As the name implies, the headaches usually occur in clusters, on average extending over an 8-12 week period, and then disappearing entirely for 1-2 years. A chronic variant does exist as well. Also known as Horton syndrome, histamine cephalagia, or migrainous neuralgia, this headache is extremely rapid in onset and is frequently associated with nasal stuffiness and teariness, and unilateral face flushing. Although age of onset is usually in the middle age period, cases have been reported in children (Curless, 1982).

Complicated migraine, including hemiplegic, opthalmoplegic and basilar artery migraine, occur in approximately 1-3% of those who suffer from migraine. Each of these types shares some similar features with classical or common migraine, but generally have one or two distinquishing characteristics, usually in the form of some sensory or motor defect that persists during and after the headache. Only very rarely are such forms of migraine seen in children or adolescents.

Given the relatively rare occurrence of cluster and complicated migraine in children and adolescents, these migraine types will not receive any further attention in this dissertation. None of the adolescents referred to our program were diagnosed as having either of these forms of migraine.

A wide variety of precipitating factors are believed to play a role in triggering individual migraine attacks, but, experimentally, the false negative response rate to specific triggers is too high for them to be useful diagnostically. Rarely is the trigger alone sufficient to elicit a headache.

Selby and Lance (1960) note that common precipitating factors include stress and worry, endocrine changes (as occurring during menstruation or in relation to oral contraceptive use), glare, physical exertion or fatigue, head trauma, hunger, some foods and beverages, and weather or temperature changes. Less common triggers are high humidity, excessive sleep, high altitude exposure, excessive vitamin A, certain drugs, cold foods, refractive errors, pungent odors, fluorescent lighting, and allergic reactions.

The fact that specific triggers do not consistently elicit a migraine attack would argue for an etiological model that is not strictly biological in nature. Different etiological explanations of the migraine disorder will be reviewed below.

While the general definition of migraine provided by the Ad Hoc Committee has been widely accepted, a review of the literature on child and adolescent migraine reveals that somewhat discrepant classification criteria have been used in different studies. These discrepancies reduce the comparability of results from different studies and pose definitional problems for further research, specifically with respect to inclusion and exclusion criteria.

Vahlquist and Hackzell (1949) made a diagnosis of migraine if the headaches were paroxysmal, separated by symptom-free intervals and if at least 2 of the following 4 conditions existed: unilateral pain; nausea and/or vomiting; focal neurologic symptoms preceding the attacks; positive family history. While Vahlquist (1955) and Bille (1962) used the same criteria in their research, Prensky (1976) used the following: recurrent headaches separated by symptom-free intervals and at least 3 of the following 6: unilateral pain; nausea and/or vomiting; visual, sensory or motor aura; complete relief after a period of sleep; throbbing pulsatile pain; positive family history.

In his study, using the Vahlquist and Hackzell (1949) criteria for diagnosing migraine, Bille (1962) reported the following rates of occurrence of the 4 major migraine symptoms among the 347 migraine sufferers that he observed: family heredity, 78.1%; nausea/vomiting, 79.5%; unilateral pain, 62.5%; and visual aura, 50.1%. Of course, by definition, all children experienced paroxysmal headache. These figures would clearly indicate that many children and adolescents do not experience the classical form of migraine, and more recent data gathered by McGrath, Humphreys, Goodman and Firestone (1982) suggest that the incidence of unilateral pain and visual aura is even lower in their sample of 9-17 year olds in the Eastern Ontario region.

Obtaining accurate and reliable reports of the various criteria described above can make the task of correct diagnosis that much more difficult. Prensky (1976) has pointed out the difficulties in obtaining consistent histories from young children who are inclined to offer responses that are most likely to please the interviewer, i.e. agreement with suggestions. Young children may also lack the necessary language skills to accurately describe their pain and accompanying symptoms.

The task should be somewhat easier for adolescents, although even with this older group, there can be a general difficulty in recognizing and reporting visual aura or other focal neurological signs, simply because many people have neither the experience of attending closely to what is happening in their bodies (Fisher, 1970), nor the vocabulary to explain it. At times, the throbbing pain characteristic of migraine is mixed with a dull, steady pain, depending on the individual's postural position or level, and the type of activity in which he/she is engaged. This, of course, makes it difficult for that person to describe the pain specifically as throbbing, or steady and dull in nature.

Abdominal pain in children or adolescents may be the result of any number of factors, including: overeating, eating foods that do not digest easily; anxiety; to achieve some sort of secondary gain; and as a symptom of migraine. Depending on the frequency of abdominal pain in these other contexts, it may be difficult to determine just when it is specifically an indicator of migraine.

Finally, although responsiveness to ergotamine tartrate is sometimes used to confirm a diagnosis of migraine, this type of circular reasoning is subject to the same logical errors inherent in diagnosing hyperactivity by responsiveness to Ritalin, or manic-depression by reponsiveness to Lithium. No conclusive information is provided regarding the etiology of the disorder when a diagnosis is made based on drug response. Furthermore, one cannot conclude with certainty that the drug is indeed treating the disorder for which it is being administered without more complete knowledge of the etiological factors involved.

Further complicating the diagnostic picture, some studies have reported difficulty in confirming the co-existence of the 3 primary symptoms believed to define classical migraine — distinct prodrome, nausea and/or vomiting, unilateral pain of a throbbing nature that occurs intermittently with symptom-free intervals — in migraine sufferers (Critchley, 1978). That is, little correlation has been found between prodrome, unilaterality of pain and nausea/vomiting. Factor-analytic studies of the co-existence of these specific migraine symptoms have also failed to confirm the traditional symptom picture of this disorder (Bakal, 1980).

Within his psychobiological conceptual framework of the migraine disorder, Bakal (1982) argues strongly against the traditional diagnostic and classification criteria described above. These criteria fail to address the important psychological aspects of the disorder. Furthermore, the repeated failures of several recent studies to clearly confirm the co-existence of the primary migraine symptoms among large groups of migraine sufferers cast further doubt on the utility of such diagnostic and classification criteria for this disorder.

Bakal suggests that similar psychobiological processes underly the headache activity of all headache sufferers, with the processes becoming more involved as the disorder increases in severity. This is discussed further in the following section.

Muscle Contraction Versus Migraine Headache

While the focus of the current paper is on migraine headache, specifically among adolescent girls, a brief description of muscle contraction headache is offered, in that it frequently occurs intermittently with migraine attacks. A differential diagnosis between these 2 relatively common forms of headache is not as easy to make accurately as was once believed.

Muscle contraction headaches are usually experienced as sensations of tightness, pressure or constriction, which vary widely in intensity, frequency and duration, and are believed to be a function of cephalic and neck muscular reactivity to stress, either internally or externally generated. Physiologically, the muscle contraction headache is manifested in the sustained contraction of skeletal muscles in the cephalic and neck areas, in the absence of permanent structural change. The pain is usually bilateral, occipital, frontal, facial, or in a `hat band' position, and tends to be dull and nonpulsatile, lasting for hours or even days (Adams, Feuerstein & Fowler, 1980).

Traditionally, treatment for these headaches has been pharmacological in nature, although within the past 15 years, a greater emphasis has been placed on the value of several psychological approaches (Blanchard, Andrasik, Ahles, Teders & O'Keefe, 1980), including traditional psychotherapy, relaxation training (Cox, Freundlich & Meyer, 1975), biofeedback training (Andrasik & Holroyd, 1980; Epstein & Abel, 1977; Holroyd, Andrasik & Noble, 1980), and cognitive restructuring (Holroyd, Andrasik & Westbrook, 1977; Holroyd & Andrasik, 1982). The effectiveness of these various approaches is amply documented in the studies cited above.

Historically, migraine and muscle contraction headaches have been thought of as 2 distinct and separate disorders, with different etiologies and symptom patterns. However, there has been some recent speculation (Raskin & Appenzeller, 1980) that the contraction of skeletal muscles implicated in the development of muscle contraction headache, and the cerebral vasodilation which is thought to play a major role in the migraine attack, are in fact epiphenomena of a central headache-generating mechanism which is specifically biological in nature.

In their empirical approach to differentiating between muscle contraction and migraine headache, Ziegler, Hassanein, and Hassanein (1972) reported little agreement between the symptoms reported by their patients and the symptoms that define migraine. They also suggested that the two headache types might in fact be manifestations of the same underlying headache-generating mechanism.

In reviewing the literature on the psychophysiological similarities and differences between these 2 types of headache, Cohen (1978) noted that significant contraction of the neck muscles in particular occurred during the actual headache for both groups of sufferers. Between headaches, migraine patients experienced more intense head and neck muscle spasms than muscle contraction patients, with both groups surpassing the muscle spasm activity of the non-headache controls. Thus it would appear that muscle contraction does play some role in the migraine attack, although it is uncertain whether it is a contributory or simply a consequential one.

There is also some evidence to suggest that both migraine and muscle contraction sufferers experience temporal artery vasoconstriction to novel stimuli, while in non-headache controls, the response is one of vasodilation (Bakal & Kaganov, 1977; Pozniak-Patewicz, 1976). According to Sokolov's (1963) theory of orienting and defensive behavior, one would expect to see cephalic vasodilation in response to orienting (or novel) stimuli, and vasoconstriction in response to noxious (or dangerous) stimuli. Cohen (1978) has suggested the possibility that both migraine and muscle contraction headache patients might be hypersensitive to a variety of stimuli, and interpret (or, in fact, misinterpret) rather innocuous stimuli as somehow dangerous or threatening. From that point, though, it is unclear how or why this vasoconstriction to stimulation results in a rebound vasodilation in migraine (further discussed below), and a sustained vasoconstriction in muscle contraction headache.

Evidently, the distinction between these 2 headache disorders is not as clear as was once believed, but some general differentiating factors have been discussed (Adams, Feuerstein & Fowler, 1980). These include: a greater likelihood of a family history in migraine; migraine headaches occur less frequently, but are of longer duration; prodroma, either visual, sensory or motor, occur more frequently with migraine; the pain of a migraine tends to be more throbbing and unilateral in location; vomiting and/or nausea occur more often with migraine.

As discussed above, several of these `migraine specific' symptoms tend to be more strongly associated with classical migraine, which comprises only a relatively small proportion of all migraine sufferers. Common migraine, clearly the largest of the migraine classes, is characterized by fewer of these migraine specific symptoms and thus becomes more difficult to differentiate from muscle tension headache.

Bakal (1982) has presented some research evidence indicating that the symptoms of muscle contraction and migraine headaches do not in fact occur in the form of two distinct clusters. As noted above, he suggests that similar psychobiological processes underly the headache activity of all headache sufferers, with the processes becoming more involved as the disorder increases in severity. Bakal proposes viewing headache symptoms along a continuum of severity. Muscle contraction symptoms occur along with vascular and autonomic symptoms in clinical patients, and as the severity of the headache disorder increases, so does the involvement of both types of symptoms. Bakal points out a quantitative rather than qualitative change in the headache symptoms reported by headache patients, and in so doing, questions the usefulness of differentially diagnosing patients as muscle contraction or migraine sufferers.

In their 1983 study, Joffe, Bakal, and Kaganov, reported that their child headache sufferers experienced a wide variety of symptoms from both traditional symptom lists of migraine and muscle contraction headache. Furthermore, both categories of symptoms increased in frequency as the headache intensity and duration increased.

Given that the age of onset for muscle contraction headaches is generally thought to occur after the second decade of life (Adams et al., 1980), one might anticipate that differentiating between the two types of headaches would not be an issue in a treatment study with adolescents. However, in one of the very few large-scale studies of headache in children, Bille (1962) noted that of 8993 children ages 7-15 years, in Uppsala, Sweden, 4316 children had experienced occasional nonparoxysmal headache at some time in their lives, and 473 children suffered from frequent recurrent nonmigrainous headache. Although these children were not specifically diagnosed as having muscle contraction headache (or any other specific type of headache), these numbers do lead one to question the possibility of the existence of muscle contraction headache among some of these 7-15 year olds.

Vahlquist (1955) reported that, among the 1236 10-year old Swedish children that he studied, 13.3% experienced recurrent nonmigrainous headache. Again, while these pre-adolescents were not specifically diagnosed as having muscle contraction headache, the question can certainly be raised regarding the possibility of such a headache type occurring in this sample.

Barlow (1978) suggests that psychogenic headaches (of which muscle contraction headaches are considered to be a subset) may well occur during adolescence and points out that prior to puberty, children are more likely to complain of abdominal pain or vomiting rather than headache as a consequence of psychological distress. Some authors refer to recurrent abdominal distress or cyclic vomiting in children, in the absence of headache, as 'migraine equivalents' (Tomasi, 1979; Bille, 1962).

Prevalence of Migraine Headache

Prevalence studies of adult migraine yield a confusing array of results. While Adams, Feuerstein and Fowler (1980) report that 12 million individuals in the United States suffer from some form of migraine, representing approximately 6% of the entire population, Raskin and Appenzeller (1980) suggest that the best estimates of the annual prevalence of migraine is in the 20-25% range.

Waters (1974, 1978) and Waters and O'Connor (1971, 1975) have studied selected samples of the population in the British Isles and report prevalence rates of 23-29% for women, and 15-20% for men. Tomasi (1979) similarly cites differing rates for women (30%) and men (20%). In his survey of 20-29 year old Swedish medical students and nurses, Vahlquist (1955) reported a more moderate overall frequency rate of 5.9%, while Prensky (1976) has cited figures in the 10% range for American adults.

As discussed above, inconsistencies in the definitions of migraine across studies undoubtedly contribute to the variability of the results, and of course, affect the comparability of the figures reported. Furthermore, different studies have used different definitions of 'prevalence', i.e. asking whether a person has ever had a migraine attack; whether they have had an attack during the past year; or whether they have had an attack during the past month.

Depending on the time period chosen for establishing prevalence rates, one would expect the outcomes to vary considerably. Notwithstanding such variability, the general figures are sufficiently high to strongly encourage continuing efforts to find effective treatment programs, pharmacological and/or psychological in nature.

There is little quantitative epidemiologic data for children under 7 years of age, but Barlow (1978) notes that the occurrence of migraine in some 2 and 3 years olds has been documented. The most comprehensive survey of children 7 years and older was completed by Bille (1962), who sent headache questionnaires to the parents of 9059 school children (7-15 years) in Uppsala, Sweden. Approximately 99% of these questionnaires were completed, from which Bille calculated an overall frequency rate of 5.4% with recurrent paroxysmal headache. Just under 4% were defined specifically as migraine according to his classification criteria (reviewed earlier).

Some interesting sex and age differences were noted as well — for example, at age 7, a similar prevalence rate of 1.4% was found in both boys and girls. In the 7-9 year old group, this rose to 2.5%, but again there were no apparent sex differences. Among the 10-12 year olds, girls were more likely to have migraine (5.4%) than boys (3.9%), and by adolescence (13-15 years), significantly more girls were reported to have this disorder (6.4%) than boys (4.0). Also, only among the girls was there a significant increase in frequency of migraine from the 7-9 year old group, to the young adolescents (13-15 years). Bille (1962) reported no significant relationship between social class or intellectual ability and migraine prevalence.

In his study of 4235 7 year old Finnish children beginning school in the autumn of 1974, Sillanpaa (1976) reported a migraine frequency rate of 3.2% (more than twice the rate reported by Bille for the 7 year old children in his sample) using the same diagnostic criteria as Bille (1962) had earlier. Recurrent headache was observed in 6.3% of the children. He suggested that the large difference between his and Bille's figures might be attributable to increasing stress on the general population, in that Finland was going through a period of rapid urbanization at the time of the study. Such a hypothesis presupposes that psychological stress plays a major contributory role in the development and/or expression of migraine symptomatology.

In his study of 1236 10-12 year old Swedish schoolchildren, Vahlquist (1955) found 13.3% with frequent nonmigrainous headache, and 4.5% who met their criteria for migraine. The latter figure is virtually identical to that reported later by Bille (1962) for the same age group.

More recently, Sillanpaa (1983) surveyed 3784 children in 2 Finnish cities, a group comprising 94.5% of all grade school pupils 13 years of age in those cities in 1980. Using Vahlquist's (1955) criteria for migraine, Sillanpaa (1983) reported an overall migraine rate (classical and common) of 11.3% in this sample, and noted a considerable difference between the girls (14.5%) and boys (8.1%). Clearly these rates are markedly higher than those reported by Vahlquist (1955) and Bille (1962), and Sillanpaa suggests that they reflect a true increase in the incidence of migraine. However, it must be noted that Sillanpaa collected his data through self-administered, brief (10 minute) questionnaires given to the children to complete during class time, and the accuracy of their recall over such a short time period might be questioned. Nevertheless, the significance of Sillanpaa's findings and the implications for treatment requirements cannot be overlooked.

Vahlquist's 1955 survey of 1373 late adolescents (16-19 years) reported a migraine frequency of 7.4%, considerably higher than Bille's (1962) 5.2% rate for young adolescents (13-15 years). Although sex differences were not described in these last 2 studies, there does appear to be a general tendency for migraine frequency to increase with age, at least into early adulthood, with the increase occurring more rapidly for females than males beginning around age 10-12 years. Although Oster's (1972) criteria for the diagnosis of migraine are not clear, he has also observed a similar pattern of sex differences.

Child, Adolescent and Adult Migraine

Not only are the prevalence rates different across these three age groups, but the manifestation of the migraine disorder itself also differs somewhat depending on the age of the individual. Bille (1962) has summarized the major differentiating factors between adult and child migraine as the following:

(1) the prodromal phase tends to be shorter, or even nonexistent in children,

(2) children's attacks occur more frequently but are shorter in duration,

(3) in general, the headache itself appears to be less severe among children,

(4) children's head pain is less frequently unilateral,

(5) various gastro-intestinal symptoms predominate in children, including abdominal pain, nausea, vomiting, cyclical vomiting,

(6) high fever occurs more often in children,

(7) vertigo, motion sickness and lightheadedness, both during and between headaches, are more commonly seen in children,

(8) sleep disturbances, such as night terrors, head banging and uneasy sleep, are more frequently seen in children.

To date, adolescents have received little attention as a separate developmental group, and have usually been included either in children's or adult samples for treatment or information-gathering studies. As a result, we do not know whether there is a particular migraine symptom pattern for this group. Important developmental changes, both physiological and emotional in nature, occur during the adolescent period, and these may well make the experience and expression of migraine qualitatively different from that of childhood or adulthood.

The need to adjust to rapid physical and emotional changes causes adolescents to focus greater concern on physical aspects of the self (Clifford, 1971; Minahan, 1971; Douvan & Kaye, 1957; Frazier & Lisonbee, 1950). This may well include focusing more attention on any bodily experiences, including unpleasant ones such as migraine. Thus, the migraine attack, or the anticipation thereof in adolescent migraine sufferers, may become a more salient aspect of their existence than would be the case during earlier or later years.

The changing and increasing demands and responsibilities of adolescence, combined with the natural lessening of dependence on the parents, may well provide sufficient additional stress to precipitate migraine in individuals who are biologically predisposed to this disorder but who have not previously suffered from it.

As noted above, Bille (1962) has reported a higher incidence of migraine in adolescence than during childhood, and furthermore that adolescent girls apparently suffer from this disorder more frequently than boys of the same age. Specific reasons for such a sex difference are not known at this time, but possible explanations include:

(1) that particular hormonal differences between the sexes increase the likelihood of the migraine attack process occurring in females,

(2) that adolescent girls tend to be more concerned about their physical development and appearance than boys (Douvan & Adelson, 1966; Dwyer & Mayer, 1967). Douvan & Kaye (1957) report that outward appearance and inner self image are more closely bound together for girls, and thus girls may be more sensitive to bodily experiences in general,

(3) that, by the time adolescence arrives, girls may have learned through cultural sanctions and expectations that it is acceptable to openly express feelings of discomfort or pain, and thus may be more inclined to acknowledge and report headache pain, than boys.

Whatever the particular reasons are for the above noted sex difference, the fact remains that a higher percentage of adolescent girls (compared to boys) suffer from migraine attacks and require some form of treatment for them. Pharmacological treatment has not been completely effective for this group. We also know that considerable success has been reported with various psychologically-based approaches in the treatment of children and adults with migraine (to be reviewed below). Perhaps, then, a treatment program of a psychological nature, specifically designed to address those issues that are pertinent to adolescent girls, might also be successful in reducing headache activity in this group.

Etiological Theories of Migraine

A number of biological and psychological theories of migraine have been advanced over the past 30-35 years, including a fairly recent theory that recognizes a mutual contribution of both biological and psychological factors. While a complete and technical review of the biological theories is well beyond the scope of the present paper, a brief summary of the major biological positions is presented.

Biological Theories

A. Vascular Instability

Certainly the most widely discussed and researched explanatory model of migraine is that of a proposed instability in the central vasomotor control mechanism in migraine prone individuals (Tunis & Wolff, 1953, 1954; Dalessio, 1980). Basically a 2-stage process is described, the first stage being an intracranial vasoconstriction that occurs in response to an unspecified trigger. This is known as the pre-headache phase, during which headache pain is not usually experienced. In classical migraine, this phase is characterized by prodromal symptoms, usually visual or sensory, but sometimes motor in nature.

Following the first phase, a rebound arterial dilation occurs, believed to involve both intra- and extra-cranial arteries, but primarily the latter. More specifically, this dilation is thought to primarily involve the branches of the external (and less so, internal) carotid arteries, and is accompanied by a general loss of tone and marked distension of one or more of these arteries. An increased permeability follows in the arterioles, venules and capillaries in the same region, and Chapman, Ramos, Godell, Silberman and Wolff (1960) have suggested that a specific substance -- perhaps neurokinin -- may diffuse out into the surrounding tissues, reducing the pain threshold there and making distension of the large arteries painful.

Wolff has described a third 'late headache' phase which is characterized by a dull, continuous ache that may last several days. Wolff suggested that this ache might be due to a sustained contraction of the muscles of the scalp, neck and upper dorsal zone that began during the second phase. Alternatively, the ischemia of the vasoconstrictive phase might contribute to this lasting ache.

B. General Autonomic Nervous System Instability

Selby and Lance (1960) have discussed the theory that a general instability of the entire autonomic nervous system of migraine sufferers predisposes them to overreact, physiologically and emotionally, to externally and internally generated stress. Specifically, a considerable amount of evidence has been accumulated to demonstrate that migraine sufferers as a group experience heightened resting levels of autonomic arousal and/or overreactive general autonomic responses to stress.

Recently, however, in a couple of well controlled but unfortunately rather small sample size studies, these earlier findings have been seriously challenged. Cohen, Rickles and McArthur (1978) did not find any differences between their headache and control groups on multiple measures of autonomically-mediated peripheral responses to psychological stress. Similarly, in their study of 3 headache groups (migraine, mixed migraine-muscle contraction, muscle contraction) and 1 non-headache control group, Feuerstein, Bush and Corbisiero (1980) found no significant group differences at all with respect to tonic (or resting) levels of autonomic arousal, or patterns of physiological and cognitive response to aversive (or stressful) stimulation. In fact, all 4 groups displayed a similar, general autonomic-skeletal muscle arousal to the 3 stressful conditions presented.

C. <u>Focal Cerebral Hypoxia</u>

Amery (1982) has recently presented a new hypothesis that a brief episode of focal cerebral hypoxia plays a critical role in the genesis of a migraine attack. He has reviewed the potential roles of decreased oxygen supply and increased oxygen needs as mechanisms that might provoke an hypoxic episode, and furthermore, has suggested that excessive sympathetic drive might be a potential key mechanism in many patients.

Apparently, there is some evidence to indicate that experimentally increased levels of adrenalin (and possibly other catecholamines-Edvinsson & MacKenzie, 1977) in animals increases cerebral oxygen consumption (Siesjo, Berntman & Rehncrona, 1979). If there is not a concomitant increase in oxygen supply, perhaps due to some sort of vascular instability as discussed earlier, a brief episode of focal hypoxia may result. Whether or not this leads to a migraine attack depends largely on "the quality of the whirlpool of biochemical, vascular, and hematological changes that follow the hypoxic episode" (Amery, 1982, p. 83). Excess sympathetic drive is only one of many factors that Amery reviews as having a potential contributory role to changes in oxygen levels, either through decreasing the supply or increasing the consumption. And as discussed above, the evidence regarding heightened sympathetic drive levels in migraine sufferers is contradictory.

While the actual hypoxic episode is believed to result in the prodromal phenomena of classical migraine, the pain of the migraine heaache is thought to occur as the result of various humoral mediators being released in response to the hypoxic episode. However, no explanation is offered as to why such prodromal phenomena are not experienced by all migraineurs (including those with common migraine) if, in fact, brain hypoxia is the critical element in the genesis of migraine. Again, this raises the question as to whether classical and common migraine might be 2 distinct disorders with different pathophysiologies.

D. Biochemical Theories

Several biochemical theories have been advanced over the past 20 years, implicating a variety of humoral substances in the pathogenesis of migraine. The most widely studied has been serotonin, a potent vasoconstrictor amine in the cerebral circulation. There appears to be a decrease in serotonin levels at the onset of the migraine attack, which persists for most of the duration of the attack. This depletion of serotonin decreases normal tonus of the arteries, resulting in a passive distension of the arterial walls, and general extracranial vasodilation (Sicuteri, Testi & Anselmi, 1961).

Increased release rates of catecholamines during a migraine attack have been reported (Kangasniemi, Sonninen & Rinne, 1972; Curran, Hinterberger & Lance, 1965). Similarly, there is some evidence that histamine plays a role during a migraine attack (Anthony & Lance, 1971) — when histamine releasers are injected into the carotid arteries, vasodilation, edema, pain and nervous disorders are produced, all of which are similar to the clinical features of migraine (Sicuteri, 1963).

Bradykinin and neurokinin have been proposed as important mediators in the headache phase of the migraine attack (Chapman, Ramos, Godell, Silberman & Wolff, 1960). They are known to be very potent vasodilators, and as mentioned earlier, serve to increase the permeability of the endothelium in the microcirculation. Finally, prostaglandins and other arachidonic acid derivatives continue to receive interest as research topics in the search for the solution to the migraine genesis question (Williams & Piper, 1980; Peatfield, Steiner, Gawel & Clifford, 1980). Amery (1982) has suggested that a focal cerebral hypoxic episode may trigger the release of varying quantities of the biochemicals reviewed above, each of which then contributes in some manner to the development and subjective experience of the migraine attack.

E. Spreading Cortical Depression

The focal brain hypoxia theory of migraine, which has previously been discussed as a possible explanatory model for the development of the neurological phenomena that frequently accompany migraine, has been compared to Leao's (1944) 'spreading cortical depression' (Milner, 1958). Amery (1982) has speculated that "focal hypoxia or ischemia can initiate spreading cortical depression by inducing focal increases in extracellular K+ levels in the brain" (p. 92).

In spreading depression, there is an initial short-lived neuronal activation followed by an inhibitory wave — in experimental hypoxia, an excessive excitability of the neurons is observed first, which subsequently turns into non-excitability when the hypoxia becomes more marked. Spreading depression can be triggered chemically, and Amery suggests that localized cerebral hypoxia may trigger a similar process in migraine.

F. Hereditary Factors

A review of the various biological theories of migraine would not be complete without some consideration of the role of hereditary factors. In fact, most patients with migraine headache do report that at least one of their relatives suffers from the same disorder. Friedman and Merritt (1959) observed that a near relative of 65% of their migraine patients was similarly afflicted. Selby and Lance (1960) found that 55% of their 464 patients had relatives with migraine, while Dalsgaard-Neilsen (1965) reported a very high 90% familial incidence rate.

Obtaining reliable and valid reports of the incidence of migraine in immediate and distant family members is very difficult, and in part accounts for the wide variation in `heritability' estimates. The use of retrospective data, and/or clinical interviews with only the presenting patient, is clearly an inadequate procedure for gathering such information, but frequently is all that is available. Through directly interviewing first degree relatives of patients with migraine, and taking care not to ask leading or suggestive questions, Waters (1971) found only a 10% incidence rate of migraine in these relatives.

Based on his long term follow-up study of childhood migraine in Sweden, Bille (1981) suggested that the maternal link appears to be stronger than the paternal, and it has been further suggested that the transmission from parent to child may be via autosomal dominant heredity with incomplete penetrance. Further research is needed, including well controlled twin studies and prospective studies, before the nature and degree of genetic contribution to migraine is fully understood.

Psychological Theories

Three general approaches have been taken with respect to providing psychological explanations for the occurrence of migraine headache. Perhaps the most longstanding and widely supported historically has been the attempt to define the specific characteristics of the `migraine personality', that is, the personality factors that predispose migraineurs to suffer from this disorder.

A. Personality and Migraine

In Wolff's original studies of the childhood personality of adult migraineurs, as reviewed by Anderson (1980), Wolff concluded that, as children, these individuals were delicate, shy, withdrawn, and usually very obedient to their parents. They tended to be gracious, polite, accomodating children, but with a definite streak of stubbornness and inflexibility. Blumenthal and Fuchs (1959) described their childhood migraine patients as intense, ambitious and perfectionistic in nature. Comby (1921) and Vahlquist and Hackzell (1949) similarly found their young migrainous patients to be nervous, indecisive, exceptionally careful, conscientious and ambitious.

Wolff (1937) described his adult migraine sufferers as tense, driving, obsessional perfectionists with inflexible personalities, who maintained stores of bottled up resentments which couldn't be expressed or resolved. The psychoanalytic perspective of migraine, as presented by Fine (1969), Fromm-Reichmann (1959) and Sperling (1964), postulated the presence of unconscious hostility in migraine sufferers toward persons who were consciously much loved. Given that the expression of this unconscious hostility could not be permitted, this hostility was directed toward the individual him/herself in the form of the periodic migraine attack.

Since Wolff's early descriptions of the migraine personality, many authors have reported similar personality characteristics among their patients (Selby & Lance, 1960; Klee, 1968; Dalsgaard-Neilsen, 1965;

Alvarez, 1947; Friedman, Von Storch & Merritt, 1954). However, it should be noted that these reports have been almost exclusively derived from clinical observation or anecdotal information, rather than through formal psychometric assessment. Furthermore, most of the samples of migraineurs studied were composed of individuals who had sought specialist medical help and thus could not be considered to be representative of the general migraine population.

A controlled study, with a large sample size, of adult personality in migraine (Henryk-Gutt & Rees, 1973) and a general review of the literature on this topic (Harrison, 1975) have failed to discover confirming evidence of excessive obsessional drives or ambitions in the migraine groups. While Henryk-Gutt and Rees' (1973) migraine group was significantly more likely to report that they tended to bottle up anger and resentment and had difficulty expressing feelings appropriately, than did their control group, Harrison (1975) concluded from his overall review that the results on this point are at best equivocal.

The only consistent findings that Harrison did observe were heightened scores on the hysteria and hypochondriasis scales of the Minnesota Multiphasic Personality Inventory (MMPI), a self-administered, true-false formatted personality inventory. High scores on these 2 scales are thought to reflect a greater likelihood of using physical symptoms as a means of solving difficult conflicts or avoiding mature responsibilities, and an excessive or abnormal concern for bodily functions, respectively (Dahlstrom, Welsh & Dahlstrom, 1972). Of course, these scores are also elevated as a result of physical illness, and may represent a response to the headaches rather than a cause of them.

An interesting observation made by Henryk-Gutt and Rees was that their migraine group, including both men and women, reported significantly more experiences of suppressive parental discipline during childhood than did either the nonmigrainous headache or no headache groups. While these data were retrospective in nature, and thus coloured to some extent by the patients' current perceptions of important relationships, it does encourage some speculation as to whether such early suppressive discipline might contribute to a tendency later in life to bottle up feelings of anger and resentment.

Most of the early work on migraine and personality was done with adults, and furthermore, speculations about the relationship between childhood personality and migraine was done by means of gathering retrospective data from adults. A couple of studies were completed in the 1950's with child migraine sufferers, themselves, and both of these studies reported specific personality characteristics among the migraine children.

Krupp and Friedman (1953) reported superior intelligence, sensitivity, thoroughness, high need for approval, seriousness, orderliness, reliability, feelings of inadequacy, excessive guilt, strong superego and psychogenic symptoms. Vahlquist (1955) described the migrainous children in his study as being "characterized by neuro-vegetative instabiity, overdue ambition and perfectionism" (p. 155). In their 1969 study, Koch and Melchoir reported that 39 of their pediatric migraine patients exhibited some degree of mental symptoms related to stress. Control groups were not included in any of these studies, thus precluding any comparison with children without headaches, nor were standardized assessment procedures utilized. As a result, the meaning of the conclusions stated by these authors is not clear.

In a recent epidemiological study, Passchier and Orlebeke (1985) reported that stress, fear of failure and school difficulties such as worrying and problems with concentration showed small but significant correlations with headache (type not specified) complaints in their sample of approximately 2100 10-17 year old school children. These authors did not include a control group, and while they suggest that these several variabiles described above contribute to headache, there is no evidence to support this particular direction of causality in their correlational data.

In 1962, Bille completed one of the few controlled studies of children's personality and migraine. In comparing 73 children with pronounced migraine to 73 nonmigrainous children, Bille reported that the migraine group admitted significantly more symptoms indicative of manifest anxiety, tension and nervousness, both in general, and with situational reference to achievement and tests at school. Furthermore, parents of the migraine children rated them as significantly more anxious, apprehensive and sensitive, less physically enduring, more tidy and more vulnerable to frustration. It is interesting to note that most of the more obvious significant differences were observed among the girls. Although no differences were reported with respect to school achievement or degree of ambition, there was a stronger tendency towards deliberateness, cautiousness and restraint in the migraine group, which was also more marked among the girls.

In a recent study of childhood migraine and personality variables, Andrasik, Kabela, Quinn, Blanchard and Rosenblum (1985) compared 32 migrainous children with 32 no-headache controls, matched on age, sex and some demographic variables. Standardized scales of psychological functioning were administered. Results of the study indicated that headache sufferers were significantly more depressed, expressed a greater number of somatic complaints and experienced more internalizing behavior problems than the no-headache control children. At the same time, however, while statistically significant between-group differences were reported, the authors noted that all group means fell within the normal range, confirming that the headache children were not clinically maladjusted.

As McGrath (1984) has pointed out, the relationship between certain personality characteristics and migraine may be simply correlational in nature and not causative, and in fact, some underlying factor may account for both the personality features and the headaches. Alternatively, a longstanding pain disorder, such as migraine, may contribute to the development of certain behavioral and personality characteristics in individuals who suffer from regular or chronic pain (Naliboff, Cohen & Yellen, 1982; Barr & Feuerstein, 1983).

As Andrasik et al. (1985) explain, they did not include a no-headache group composed of individuals suffering from some other form of longstanding pain disorder. Thus, it is not clear from their study whether the differences in personality variables they reported contribute specifically to the migraine disorder, or whether these variables occur as a consequence of living with a longstanding pain disorder.

In an attempt to address this question, Cunningham, McGrath, Ferguson, Humphreys, D'Astous, Latter, Goodman and Firestone (1987) compared 20 pediatric migraine patients with 20 no-pain control children and 20 no-headache children suffering from chronic musculo-skeletal pain (including juvenile rheumatoid arthritis and patella-femoral knee pain). Both control groups were matched for age and sex. Standardized psychological assessment measures were used to assess state and trait anxiety, depression, social competence, school performance and behavioral problems. Pain diaries were also collected from all children in the 2 pain groups.

When the amount of pain experienced by the children was statistically controlled, the only discriminating variable between the headache and no-headache children was that of somatic complaints which included vomiting, nausea, and perceptual disturbances, all phenomena related directly to the migraine disorder. These authors concluded that several of the personality and behavioral characteristics evident in pediatric migraine patients may result from the recurrent pain disorder itself, rather than in some way actually causing the disorder.

A controlled study of adolescent migraine and personality has not been made to this point in time. While not the primary aim of the current study, measures of personality, anxiety and depression were administered to the participants for exploratory purposes only (further discussed below).

B. Emotional Specificity and Migraine

Bearing some resemblance to the migraine personality idea, the traditional psychiatric view of psychosomatic disorders holds that specific emotional patterns elicit specific types of physiologic response patterns. Thus, as a consequence of continual emotional stimulation, an overreactive and eventually disruptive organ system develops. This particular theory applied to migraine suggests that repetitive experiences of witholding or suppressing anger and resentment lead to an overreactive cephalic vasomotor system that eventually becomes dysfunctional. The current psychiatric view is more biomedical in its outlook, and in its description and explanation of psychosomatic disorders.

C. Stress and Migraine

Stress, worry and anxiety have long been considered to be important and frequent precipitants of migraine attacks (Raskin & Appenzeller, 1980; Selby & Lance, 1960), although controlled research data confirming this are relatively limited. In their study of 1895 British civil service members, divided into 3 matched groups of migraine headache patients, non-migraine headache, and no-headache controls, Henryk-Gutt and Rees (1973) found that psychological factors, namely stresses of various kinds, were reported to act as important precipitants of 54% of the attacks reported by the migraine group over a period of 2 months. While the actual number of specific life stresses did not differ much among the groups, the authors noted that the migraine group appeared to experience significantly more subjective symptoms of emotional distress in response to these stresses.

Among their childhood patients, Vahlquist (1955) found that 87% of his 55 10-13 year olds reported mental stress as a significant precipitant of migraine, while Bille (1962) observed that 57% of the 61 severe migraine children who could identify any trigger factors, mentioned the importance of school-related and other mental stress.

Dalsgaard-Nielson (1965) reported that 68% of their group of chronic headache patients indicated that psychological stress related to school demands and conflict at home accounted for more than half of their childhood migraines. A more recent study (Leviton, Slack, Masek, Bana, & Graham, 1984) noted that the most commonly reported trigger for headache in children up to age 16 was "an especially hard day", with "worrying a lot" and "unexpected excitement or pressure" as other significant contributors.

While there has been plenty of speculation that children and adults who suffer from chronic headache are subjected to more stress in their day-to-day lives, preliminary data from a recent study (Andrasik, Kabela, Quinn, Blanchard, & Rosenblum, 1985) indicate that childhood headache sufferers are exposed to equivalent levels of stress as are children who are headache-free. Similar results have been reported in comparing recently experienced life stresses among adult headache sufferers and their controls (Andrasik, Blanchard, Arena, Teders, Teevan, & Rodichok, 1982).

In the current study, information has been collected from a group of female adolescents regarding their specific migraine headache triggers, including various emotional stresses.

D. Depression and Migraine

While headaches and depression have often been associated among those who suffer from chronic tension headache (Martin, 1978; Diamond, 1983), heightened levels of depression, along with overactivity, compulsive features, and anxiety, have been reported in Prensky and Sommer's (1979) retrospective review of migrainous children.

As a result of this depression-headache association, antidepressant medication has been tried as a prophylaxis for headache, and marked clinical improvement has been reported among small samples (Ling, Oftedal & Weinberg, 1970) of child headache sufferers. At the same time however, decreases in depression have been reported along with successful treatment for headache symptoms (Cox & Thomas, 1981; Gerber, Miltner, Birbaumer, & Lutzenberger, 1983), leading one to question whether depression precedes headache activity, or occurs in response to the experiencing of a chronic painful condition.

Among their carefully matched sample of 32 child migraineurs and 32 non-headache controls, Andrasik et al. (1985) found higher scores on all scales measuring depresion and somatic complaints among the migraine sufferers. They also noted that the older children in the sample showed higher levels of depression than did the younger ones, evidence which they interpreted as supporting the notion that depression may be a consequence of rather than a precursor to migraine.

Integration Theories

Following his original studies of migraine patients, Wolff proposed the first integration theory of migraine, suggesting that susceptability to migraine is determined by genetic factors and that this genetic predisposition manifests itself in headache when the individual is under stress. Such an explanatory model acknowledges the importance of underlying biological factors as well as superimposed psychological stresses. Specifically, Wolff suggested that when the cephalic vasomotor system is vulnerable due to the genetic constitution, it will become dysfunctional when a sufficient degree of stress is experienced, leading to migraine headache.

Bakal (1980) believes that migraine can best be understood as a disorder which results from complex interactions between environmental, psychological, genetic and biochemical variables. Bakal (1982) supports a psychobiological model of migraine and suggests that while headaches may originally begin (in genetically predisposed individuals) in response to psychological stress, with repeated attacks the underlying psychobiological mechanisms may not only become more involved but may also begin to operate in a relatively autonomous fashion, perhaps via a classical conditioning paradigm. For example, early apparent symptoms of a headache, or anticipation of the pain, may come to act independently from psychosocial stressors, as triggers for a migraine attack.

The specific biological or constitutional factors implicated in an integration model may include any or all of those discussed earlier in the paper. While the most common psychological factor is reported to be stress, either internally or externally generated, basic behavioral theory would suggest that other factors may play a contributory, but not exclusive, role as well. For example, there may be some secondary gain — i.e. additional attention, sympathy or support — provided to the person who is experiencing the migraine, or the migraine may represent a dramatic (and perhaps unconscious) form of avoidance behavior, providing the individual with a socially-sanctioned reason for avoiding necessary but unpleasant tasks.

Similarly, in exploring the individual's relationships within a particular system (i.e. family), attention should be paid to the potential modelling of sick-role behaviors, or of selective reinforcement of such behaviors, by another member in the system. While these factors have not been investigated with migraine patients to date and are beyond the scope of the present study, they are worthy of further attention in the search for the complete explanatory picture.

Prognosis of Childhood Migraine

Historically, childhood migraine has been thought of as a benign, self-limiting disorder, although Amery's (1982) recent brain hypoxia theory has raised the possibility that repeated severe migraine attacks may in fact have some lasting impact on brain functioning. Prensky and Sommer (1979) found that, irrespective of the form of treatment given, about half of their patients showed more than a 50% reduction in Headache frequency over the 6 months following their initial visit to a neurologist.

At his 6 year follow-up, Bille (1962) reported that 57 of the 67 migraine children, and 62 of the 73 pronounced migraine children were either free of migraine completely, or significantly improved relative to the levels of their headache activity at the start of the study. Furthermore, Bille reported no significant sex or age differences with respect to the rates of improvement, but did find that improvement was greatest for those patients with the lowest initial frequencies of attacks. Also, a higher age of onset of migraine appeared to be associated with an increased likelihood of becoming symptom-free.

Bille (1981) followed most of these children into adulthood and found that at 30 years of age or older, approximately 60% of the migraine children were still having migraine attacks, even though one third of those had had migraine-free periods for an average of 5.6 years. The remaining 40% who were completely migraine-free included 52% of the boys and only 30% of the girls, from which Bille concluded that the prognosis for boys is considerably more favorable than for girls.

It is interesting to note that the follow-up into adulthood yielded generally poorer improvement rates compared to the shorter 6 year follow-up, suggesting that although there may be significant migraine-free periods over the years, this tends to be a recurring lifelong disorder for the majority of childhood onset migraineurs. Fortunately, as reported by Bille (1981), the adulthood attacks are less severe and less frequent in the majority (52%) of cases.

A more recent study by Sillanpaa (1983), reporting on the 7-year follow-up of 2,921 child headache sufferers, described similar results to those of Bille (1962). At the time of the follow-up, 78% of the children continued to experience headache; 41% reported that their headaches were either unchanged or had worsened; 37% believed their headaches were milder; and 22% reported that they no longer experienced headaches. Again, males appeared to have a more favourable prognosis than females.

Given the relative enduring nature of this disorder over time, a sensible treatment approach would seem to be one in which children are taught specific strategies for coping with and reducing their subjective experience of their headache pain.

Treatment of Migraine

Prior to the late 1960's and early 1970's, when research into the effectiveness of behavioral treatments for adult headache sufferers began, chronic headache patients had relatively few treatment options open to them. Medical reassurance, non-prescription drug preparations, recommendations to watch one's diet and obtain sufficient sleep, and prescribed medication were really the only forms of treatment available.

An investigation of the effects of an oligoantigenic diet treatment on pediatric migraine headache activity was conducted by Egger, Carter, Wilson, Turner and Soothill in 1983. While they claimed an extremely high rate (93%) of "recovery" among the 88 migrainous children in their study, this study seems to have raised more questions than it has answered. Leviton (1984) has summarized many of the issues that were raised by numerous authors following the initial publication of the Egger et al. (1983) study, and concluded that the results of the study should be interpreted with considerable caution.

The connection between food sensitivity or allergy, and migraine, has long been a controversial one. Until dietary studies like the one conducted by Egger et al. (1983) can be reliably replicated with numerous samples of migrainous children, dietary treatments are not likely to be chosen by physicians or parents as the treatment of choice for their young migraine patients.

During the past 5-6 years, encouraging results from the investigations of pharmacological and behavioral interventions with adult headache patients has resulted in a growing interest in applying such treatment methods to the pediatric headache population.

A. Pharmacological Treatment

Among children and adolescents, 3 different types of medication can be used, including prophylactic, abortive, and palliative preparations. Most of the medications that have been used with headache sufferers have also been tried with children. Andrasik, Blake and McCarran (1986) have summarized the citations for numerous uncontrolled claims for the efficacy of several different medications for pediatric headache.

Prophylactic medication is taken on a daily basis for a given period of time, and is used to prevent the occurrence of a migraine attack. Several different medications, including antiepileptic medications and anti-depressants (Prensky, 1976) have been recommended for children but controlled clinical trials documenting their effectiveness have not yet been done.

Propranolol and clonidine, 2 prophylactic preparations, have been the subjects of controlled research efforts. Ludvigsson (1974) studied propranolol in a double-blind, single crossover design with 32 children, ages 7-16 years, and although 4 children were lost from the study due to noncompliance and surgery, 71% of the remaining 28 showed excellent response -- no headache or only minor symptoms -- when on the propranolol trial. Eleven per cent experienced good effects (frequency of attacks reduced to less than one-third), and another 11% had moderate effects (frequency of attacks reduced to less than two-thirds). Propranolol was not effective for the last 2 patients. On placebo, 3 children became headache free, but 21 showed no response whatsoever. The specific action of propranolol in preventing migraine is not completely understood, but several different hypotheses have been proposed, largely based on different etiological models of migraine.

In direct contrast to the positive findings of the Ludvigsson (1974) study, Forsythe, Gillies and Sills (1984) reported no significant positive effect of propanolol on pediatric migraine activity (frequency, severity or duration) in their double blind crossover study of 39 children with established migraine. In fact, their results showed some evidence that propanolol actually increased the average length of the headaches. Adding that the mode of action of propanolol in migraine prophylaxis has not been fully explained, these authors concluded that they can find no evidence to support its use as a prophylactic agent for childhood migraine.

Sillanpaa (1977) studied clonidine in a double blind experiment with 57 children, and found that it was no more effective than placebo for the entire group. Fifty-seven per cent of those children receiving the clonidine were "greatly improved" at the end of 2 months of treatment, while 42% of the placebo control children showed similar improvement at that time.

In a double-blind placebo-controlled study of papaverine, with 37 migraine sufferers, 6-15 years of age, Sillanpaa and Koponen (1978) reported strong drug and placebo effects. Among those children who received the papaverine, 74% showed improvement of at least 50% after 2 months of treatment. Among the placebo control children, 50% showed this same degree of improvement.

Concerns are expressed both by physicians and parents about the potential long term risks associated with the administration of daily prophylactic medication to developing children and adolescents. As a result, many parents and physicians choose not to make use of such medications except in extreme circumstances, for fear that they might create more problems in the long run than they cure. Conflicting findings as described above with respect to the effectiveness of propanolol serve to increase general concern about the use of medication for treatment of headaches in children and adolescents.

Abortive medications, such as ergot preparations, are infrequently used with children and adolescents, but to date, no controlled trials have been done. There are also several unpleasant side effects that are frequently associated with these drugs, and as a result, they are not often the treatment of choice. Furthermore, the successful use of abortive medication requires that it be taken in a timely manner for optimal effect. Children do not often experience warning symptoms of an impending migraine headache, and it is not always feasible for children to carry their medication around with them for immediate use.

Palliative treatment, such as sedatives, antiemetics and analgesics, are the most frequently prescribed medications for child and adolescent migraine. Although there are no published results from controlled studies with these preparations, the early use of these medications has long been considered clinically effective in reducing the duration and severity, but not the frequency of migraine attacks. Again, as with the prophylactic medications, there are concerns about potential long term effects of regular analgesic use during childhood and adolescence. There is the additional concern that reliance on pain suppressant medication during the young years might place such children at greater risk for abuse of these drugs in adulthood.

For the several reasons discussed above, alternatives to drug treatment for the management of pediatric migraine deserve further exploration.

B. Psychological Treatment

The earliest psychological treatment offered to migraineurs was traditional individual psychotherapy of a relatively long term nature, largely based on the belief that certain specific personality characteristics predisposed these individuals to suffer from this disorder. Thus, treatment was directed toward changing some of these characteristics. Psychological treatment of this kind was provided almost exclusively to adults, whereas for children and adolescents, treatment tended to be confined to:

(1) providing reassurance that there was nothing severely wrong,

(2) recommending bed rest at the earliest sign of a headache, and

(3) encouraging changes in the child's environment in an effort to alleviate stresses, and ensure regular sleeping and eating routines.

Within the past 10-15 years, several behavioral treatments have been introduced, biofeedback and relaxation training being the 2 major types. Although initially these were used primarily with adults, the application of such treatments has been extended to children and adolescents within the past few years.

Adams, Feuerstein and Fowler (1980) have reviewed the major methodological shortcomings of many of the treatment outcome studies.

They point out that most of the literature consists of case studies or uncontrolled group studies, and that sample sizes are frequently quite small. Accurate definitions of the headache type or the target problem have frequently been omitted, and subject samples have largely included only 20-45 year old women. Adams et al. (1980) also reported a lack of standardization in the measurement of headache activity, and have noted that follow-up periods range from only a couple of weeks to several years, making it difficult to compare outcomes.

Given that several recent reviews of outcome studies of the psychological treatment of migraine have been done (Adams et al., 1980; Blanchard, Ahles & Shaw, 1979; Turk, Meichenbaum & Berman, 1979; Blanchard, Andrasik, Ahles, Teders & O'Keefe, 1980), an exhaustive review will not be provided here. However, several better examples of the outcome research will be discussed.

1. Biofeedback Training

With respect to the development of biofeedback training for the treatment of migraine in adults, the first reports of the use of finger-forehead temperature differential came out of the Menninger Clinic in a series of uncontrolled, largely anecdotal reports (Sargent, Green & Walters, 1973). These results suggested that raising finger temperature was effective in reducing the number and severity of migraine attacks, supposedly by way of an alteration in the cerebral vascular flow system.

Since that time, a proliferation of biofeedback training studies has been published, and in virtually all cases, as reviewed in a meta-analysis of outcome studies of migraine and muscle contraction headache treated by behavioral methods, biofeedback has been shown to be superior to placebo in reducing headache activity (Blanchard et al., 1980). Some authors have claimed a specific biofeedback effect (Sturgis, Tollison & Adams, 1978; Turin & Johnson, 1976; Bild & Adams, 1980) while others have questioned whether the improvement in headache might be due to other factors, such as expectations, or a general reduction in autonomic nervous system arousal (Cohen, McArthur & Rickles, 1980; Blanchard et al., 1980; Mullinix, Norton, Hack & Fishman, 1978).

Although biofeedback procedures initially included only the hand warming technique, investigators have since used electromyographic (EMG) and cephalic vasomotor response (CVR) biofeedback (Feuerstein, Adams & Beimen, 1976). EMG feedback has been used based on the relatively recent finding that muscular tension appears to play a contributory role in migraine (Cohen, 1978). Feuerstein et al. (1976) suggested that CVR feedback may lead to the modification of the hypotonic state of the smooth muscles surrounding the temporal artery. This might increase the tonicity of the artery and thus reduce the lability or reactivity of the vessels to environmental stimuli.

Cohen, McArthur and Rickles (1980) compared the effectiveness of the 3 forms of biofeedback described above, along with a fourth type—alpha brain wave enhancement. Their study was somewhat limited in sample size, and their drop-out rate over the course of the treatment program was quite high — 50 subjects began, 42 completed the 8 weeks each of baseline and treatment, 34 remained involved for the 8 month follow-up. These authors reported only a modest reduction of about 20% in the average number of headaches experienced each week from pre- to post-treatment, in all 4 groups and there was no apparent treatment effect on the average length of headache, average intensity or average disability.

There was no evidence to support the notion that one type of biofeedback was more effective than the others, and that being the case, there was no supportive evidence for one particular pathophysiological model of migraine in this study. Furthermore, no new light was shed on the question of how the biofeedback process is mediated physiologically to have any influence on headache activity.

Cohen et al. (1980) offered 4 potential explanations for their results. First, they presented the possibility that there may have been a moderate placebo effect across groups, but argued that their baselines and follow-up were quite lengthy, and that there was no apparent drop-off of effectiveness over the 8 month follow-up. Second, they suggested a `regression to the mean' phenomena, with patients seeking help when their headaches were worse and then naturally getting better. Again they argued that their long term baselines and follow-up made this an unlikely explanation.

Third, they noted that 3 of their 4 types of biofeedback were designed to lower general arousal, and thus suggested that the acquisition of a general relaxation effect may have accounted for some of the reduction in headache activity. Finally, Cohen et al. proposed that acquiring perceived control over certain of one's own physiological processes might increase one's sense of mastery over a migraine attack, and perhaps even some aspects of one's larger environment, thus leading to decreased headache activity.

The three authors clearly considered these latter 2 possibilities to be the most feasible explanations for the 20% reduction in headache across groups that they reported. In recognizing the importance of both a relaxation effect and a cognitive sense of mastery or control, the current study has included both of these components in the treatment program for female adolescents.

2. Relaxation Training

This has been the second major form of behavioral treatment offered to migraine sufferers and has usually involved a series of progressive relaxation instructions with accompanying homework assignments. Many studies have been done comparing the effectiveness of biofeedback training with relaxation training, and these have been well reviewed in Blanchard et al.'s (1980) meta-analysis of outcome studies of behavioral treatments for migraine and muscle contraction headache.

Basically these authors found that relaxation training, temperature biofeedback and EMG feedback were equally effective in the treatment of migraine, and all were superior to placebo. Blanchard et al. (1980) proposed that a basic relaxation response might be the final common pathway by which differing migraine treatments have their effect.

Given the results of this meta-analysis, there are several very good reasons why relaxation, rather than biofeedback, training might be the preferred form of treatment. For example, costs would be considerably lower; the many problems of equipment breakdown can be avoided; relaxation training can be more easily practiced at home; and it can more easily be taught in groups. Thus, in an effort to teach female adolescents the basic relaxation response, the current study included relaxation training, rather than biofeedback training as part of the overall treatment program.

3. Cognitive Training

Bakal, Demjen and Kaganov (1981) have argued that the therapeutic changes seen following biofeedback or relaxation training are not necessarily the result of direct effects inherent to these procedures, but rather are the results of indirect changes due to alterations in the sensations, feelings, and cognitions which previously preceded and accompanied the headache attacks. The cognitive-behavioral view of pain contends that the conditions controlling chronic pain (or the experience thereof) are multifaceted, and include cognitive and affective events as well as sensory and physiological ones. It follows therefore that negative cognitions and feelings associated with headache may in fact act to maintain the disorder, and may be capable of generating more severe attacks in the future.

With regard to treatment, Bakal et al. (1981) recommend shifting emphasis away from dealing with antecedent events, and focusing more on teaching procedures which help to modify the sensations, feelings and cognitions that accompany the headache attacks.

With a sample of 45 chronic headache patients, applying the rationale outlined in Meichenbaum's cognitive theory of self control, these authors reported significant pre- to post-treatment effects for daily headache hours, daily Headache Index and daily medication. Large individual differences in treatment effectiveness were found, and it appeared that those who experienced continuous or near-continuous pain during waking hours showed the least benefit from treatment.

Holroyd, Andrasik and Westbrook (1977) and Holroyd and Andrasik (1982) have also evaluated the effectiveness of cognitive stress management treatments with tension headache patients (in the 1977 study) and with migraineurs (in the 1982 study) and have reported positive results, again emphasizing the important roles of achieving a sense of personal mastery, and altering self statements regarding expectancies and appraisals.

The current study included a cognitive training component as part of the treatment program for female adolescent migraine sufferers.

4. Multimodal Treatment

Mitchell and Mitchell (1971) voice strong support for migraine treatment programs that include not only anxiety reduction or relaxation training techniques, but also "educative, environmental, manipulative, chemotherapeutic, socioeconomic and any other types of procedures necessary to bring about a change in the patient's disturbing life patterns".

In their comparisons of applied relaxation training alone, with a combined desensitization program — which included relaxation, desensitization and assertion training, the latter of which tended to be cognitive in nature -- these authors reported significant reductions, in 2 different studies, in both the number and duration of migraine episodes only for the groups receiving the combined program. It must be pointed out however, that sample sizes were small, with cell sizes of only 5-6.

Mitchell and Mitchell (1971) clearly support Gelder and Marks' (1966) contention that single model procedures are only partially effective when applied to relatively complex behavioral problems. They believe that while relaxation training and systematic desensitization emphasize a change in feelings, anxieties and moods, these procedures do little to modify the perceptual and interpersonal behavioral patterns, and other environmental factors that are thought to play a role in precipitating and maintaining the migraine response. Thus, a cognitive component, and perhaps an interpersonal one as well are recommended.

In a later study, Mitchell and White (1977) set out to train 12 longstanding migraineurs to "stabilize and control their cognitions and emotional reactions to everyday events and situations perceived as stressful, increase their capacity to express and cope with social situations, and to modify stressful features in their social, work and home environment". Subjects were seen in a group context, and new skills were progressively added to the treatment program and then evaluated for their additional contribution to the effectiveness of the program. As a new component was added, 1 or 2 subjects were dropped so that comparisons could be made between subjects who received different parts of the overall package.

As the range of skills that were learned increased, migraine frequency decreased. However, this result is seriously confounded by increase in length of treatment, in that the 2 individuals who received the entire treatment package had been involved from the very first phase, and thus had received treatment longer than anyone else.

The current study recognizes the value of multimodal treatment and thus has incorporated a limited number of well defined treatment components into the overall treatment package. As mentioned above, both relaxation and cognitive training components have been included, as well as an educational component. These are further discussed in the 'Procedure' section of the paper.

5. Behavioral Treatment of Children and Adolescents With Migraine

Virtually all of the migraine treatment studies published to date have been done with adults, with only a very few exceptions. Prior to 1984, research into the effectiveness of behavioral treatment of pediatric headache was confined to the case study approach.

In an uncontrolled series of case studies, Diamond and Franklin (1975) treated 32 children, ages 9-18 years, with finger-temperature biofeedback, and reported general decreases in Headache frequency and severity in 26 of the children. Their criteria for "good response" are not well defined, nor have they provided any follow-up data to indicate whether their treatment effects were maintained over time.

Several other case studies that have since been completed (Feuerstein & Adams, 1977; Sallade, 1980; Lake, 1981; Olness & MacDonald, 1981; Andrasik, Blanchard, Edlund & Rosenblum, 1982; Houts, 1982; Labbe & Williamson, 1983; Marrazo, Hickling & Sison, 1983; Ramsden, Friedman & Williamson, 1983) have similarly reported very promising results, with continued improvement in headache activity described at periods from 1 month to 2 years following the end of treatment.

In these case studies, several treatment procedures were provided, with the majority including some form of biofeedback, autogenic training, and/or relaxation training. Although different criteria for success have been used, and methods of measuring and recording headache activity have varied somewhat, the overall set of results from these case studies has been sufficiently positive to encourage the undertaking of larger-scale controlled group outcome studies.

Only with the use of well-controlled outcome studies in which subjects are randomly assigned to treatment or control groups, can researchers tease out the actual effective components of a given treatment program. The passage of time, as well as the many possible placebo effects (i.e. attention, involvement in a program, expectations for improvement, someone actually taking an interest and listening, etc.), can only be controlled for in a comparative group outcome study.

Andrasik, Attanasio, Blanchard, Burke, Kabela, McCarran, Blake and Rosenblum (1984) report very positive findings from their controlled group outcome study of 48 8-16 year old migrainous children. Among those 14 who received thermal biofeedback and autogenic training, 8 (89%) of the 9 children thus far seen at their 6 month follow-up appointment were described as "improved".

As their criterion for "improved", these authors used a standard that is frequently used in the headache literature, both with adults and children. "Improved" refers to a reduction of at least 50% in headache activity as measured by the Headache Index. The Headache Index is a composite measure which reflects headache frequency, duration and intensity. The Headache Index is usually calculated on a weekly basis. Then an average Headache Index is determined for the length of time (usually, but not always, 4 weeks) during which the headache data were gathered for a particular assessment period (i.e.

baseline, follow-up). Further detailed information about the specific manner in which headache data are typically gathered (i.e. the headache diary) is provided in the Procedures section of this paper.

Among the 16 children who received relaxation training, 6 (67%) of the 9 children seen by 6 months were rated "improved", while only 4 (22%) of the 18 waiting-list control children were "improved" at this same time. Follow-up results on the remainder of the biofeedback and relaxation training groups are not yet available. While these intitial results are indeed promising, this study still leaves several important questions unanswered. There has been no attempt to control for the various potential placebo effects that may be operating as described above. Furthermore, there have been no statistical comparisons made between groups.

Labbe and Williamson (1984) similarly compared the effectiveness of a combined thermal biofeedback and autogenic training program, with a waiting-list control group, among a group of 28 7-16 year old migraine sufferers. At their 6 month follow-up, 5 (63%) of the 8 children thus far seen in the active treatment group were described as "improved", while only 2 (14%) of the 14 waiting-list controls were similarly described. The criterion for improved was the same as that used in the Andrasik et al. (1984) study described immediately above. Again, as in the Andrasik et al. (1984) study, no attempt was made to control for nonspecific placebo effects, nor were any statistical comparisons made between groups.

In their multiple baseline across groups study, Mehegan, Masek, Harrison, Russo, and Leviton (1984) reported an average reduction in headache activity of 91% among their 20 child migraine subjects at a 1 year follow-up. Again headache activity was measured by the Headache Index. However, instead of using the 50% reduction in overall headache activity as the criterion for "improved", these authors calculated the actual percent reduction in headache activity for each child (from baseline to follow-up), and then calculated an average of those individual values across the whole group. Thus, their reported average reduction in headache activity of 91% in a group of 20 children represents a very high overall rate of improvement. Treatment consisted of a combined program of EMG biofeedback, meditative relaxation training, and individualized behavior therapy (primarily contingency management and therapy for school and family problems). No attempt was made to evaluate the discrete contributions of the individual treatment components, nor was a placebo control condition included.

An uncontrolled single group outcome study was completed by Werder and Sargent (1984) in which an extensive treatment program was offered to 19 children, ages 7-17 years, suffering from recurrent migraine headache. Treatment included thermal and EMG biofeedback, autogenic training, relaxation training, self-awareness and guided imagery training. At the 2-3 year follow-up of the 13 children thus far seen, 12 (92%) were described as being able to "successfully regulate their headaches". Without adequate controls for the passage of time or nonspecific placebo effects, the meaning of these results is rather unclear. Also, the criteria used for defining successful regulation of headaches are not adequately described.

Another controlled group outcome study was published in 1986 by Richter, McGrath, Humphreys, Goodman, Firestone and Keene. In this particular study of 42 migrainous children, ages 9-18 years, relaxation training was compared to cognitive training, and an attention placebo control group was included. Again, the Headache Index was used as the major dependent variable, and the criterion for "improved" was a 50% reduction in headache activity as measured by the Headache Index. From baseline, to the 4 month follow-up, 11 (73.3%) of the 15 children who received cognitive training reached the criterion for `improved'; 10 (66.7%) of the 15 who received relaxation treatment were `improved', and 6 (50%) of the 12 in the attention placebo group similarly reached the criterion for `improved'.

Clearly, the improvement in headache activity reported for the nonspecific placebo control group is considerably higher than the figures cited in the studies described above for waiting-list controls. This emphasizes the necessity for including such an attention placebo control group in order to adequately account for nonspecific treatment effects.

In the Richter et al. (1986) study, significant between-group differences after treatment were found. Specifically, the relaxation and cognitive training groups reported less overall headache activity and lower headache frequency after treatment and at 4 months follow-up, than did the placebo group. Although significant overall group effects were reported, the presence of a significant interaction between group membership and level of headache severity suggests that an interpretation of general effectiveness of these treatments is somewhat inaccurate. That is, in the presence of a significant treatment by severity interaction, an independent analysis of significant main treatment effects can result in misleading general conclusions about those treatment group differences.

Further investigation of this interaction revealed that the relaxation and cognitive training programs were only effective in reducing the headache activity and Headache frequency of those patients who reported high severity headache at baseline. This study did not demonstrate the effectiveness of these programs for reducing headache activity among children aged 9-17 years with low severity headache. No significant differences were reported between the two active treatments.

To date, this is the only study in which cognitive treatment has been offered to childhood migraine sufferers as a means for reducing and controlling headache pain. As this particular avenue of treatment and research gains broader acceptance and attention with adult headache patients, it is only a matter of time before the downward extension to children and adolescents is bound to occur on a larger scale. This particular study has used several specific cognitive training components, including; cognitive restructuring, stress-innoculation training, rational emotive therapy, and cognitive control of pain. Children in the age range of 9-18 years have been able to learn and utilize these various cognitive strategies quite effectively to reduce their headache pain, and thus this appears to be a very viable form of treatment to offer.

In a recent study by Fentress, Masek, Mehegan and Benson (1986), 18 children between 8 and 12 years of age, all diagnosed as migraine sufferers, were offered one of three forms of treatment for their recurrent headaches. The first active treatment group (n = 6) received frontal EMG biofeedback, meditative relaxation training and pain behavior management, while the second group (n = 6) received instruction in meditative relaxation, progressive muscle relaxation, and pain management. The third group (n = 6) was a waiting-list control group.

Because of the heterogeneity of their data, Fentress et al. (1986) analyzed their results with nonparametric statistics. The authors don't describe, nor do they provide full statistics to explain, the full nature of the heterogeneity of the data. Baseline levels of headache duration and headache activity (as measured by the Headache Index) do vary considerably between the 3 groups, and it is also possible (although not reported) that variances within groups were quite different. Heterogeneity of variances, both within- and between-groups has frequently been reported in the headache literature.

At the end of a 15 week treatment period, the two active treatment groups showed significant reduction in overall headache activity, as compared to the control group, which showed no improvement over the same period of time. Furthermore, there were no significant differences between the two treatment groups, leading these researchers to question "whether the expense of biofeedback equipment and technical support is justifiable when a simpler, less costly alternative is available" (p.143).

The average reduction in headache activity at the end of treatment was reported to be 70% for the biofeedback and relaxation group, 84% for the relaxation only group, and -58% for the waiting-list control group (as a group, they became worse). As in the Mehegan et al. (1984) study described above, Fentress et al. (1986) did not use the 50% reduction in headache activity as the criterion for improved, which is commonly used in the headache literature. Rather, they calculated the individual rates of percent reduction from baseline to end of treatment for each child, and then calculated an average of those individual values across each group. However, they do not report average per cent reduction figures from baseline to follow-up, and thus it is difficult to determine the long term effectiveness of their treatment methods.

These authors do note however, that no significant increases in headache frequency, duration and overall headache activity were found from the end of treatment to the 1 year follow-up, as tested by Wilcoxon matched pairs signed-ranks tests. While there may not have been any significant <u>increases</u> in headache frequency, duration or overall headache activity, from the end of treatment to the 1 year follow-up, such a finding does not provide any information about possible spontaneous improvement (or decreases in headache activity) in the control group. If this had occurred, it would certainly reduce the appearance of the clear superiority of the active treatments over time. Furthermore, as Fentress et al. (1986) themselves point out in their discussion, their study did not include an attention placebo group to control for various nonspecific factors that might have been operating in their study.

Larsson and Melin (1986) have recently completed the only controlled group outcome study in which adolescents, suffering primarily from recurring tension headache, have been offered behavioral treatment in small groups. Thirty females and one male, all 16-18 years of age, participated in the study. Eleven students were given a 9 session relaxation training program in small groups of 3-4. The program was administered over a period of 5 weeks and took place in the students' school.

A placebo control group, described as an "information contact group", was formed in which 12 students met regularly for 9 sessions. During these sessions, information about chronic headache was provided by 2 psychologists (for 4 sessions) and a child psychiatrist (for 5 sessions). Information about prevalence and sex differences in chronic headache was given, and students were required to perform "a behavioral analysis in which factors like stress and types of situations in which headache was likely to occur, were particularly noted" (p. 329). With the psychiatrist, common psychological and physiological causes of migraine and tension headaches were discussed.

The last group was called a "self-registration" group, which was the equivalent to a waiting-list control. The seven students in this treatment condition did not meet with any other headache sufferers, nor did they have any ongoing contact with a psychologist or psychiatrist.

Headache data were collected during a 3-4 week baseline period and recorded in a weekly headache diary (to be further discussed in the next section). Following baseline, treatment was offered in 9 sessions over a period of 5-6 weeks. Headache diaries were again completed for a 3-4 week period immediately after treatment, and again at a point 6 months after treatment.

Credibility evaluations were conducted prior to the beginning of the treatment program, and at that time, equally high ratings of students' expectancies for improvement in the relaxation (M = 30.33) and information-contact (M = 29.77) groups were reported. The credibility evaluations used in this study are not described by the authors, and thus it is impossible to know what these reported mean values actually represent. Furthermore, there is no indication that such credibility ratings were gathered at the end of treatment or at the 6 month follow-up, nor is it reported whether these credibility ratings were completed anonymously or signed by the individual participants.

Although this study was in fact a repeated measures design, the data were not analyzed as such. Instead, separate one-way analyses of variance were performed on both (1) the post-treatment minus baseline differences, and (2) the follow-up minus baseline differences, on several headache measures derived from the headache diaries. These measures included overall headache activity, headache frequency and duration, headache-free days, and peak headache intensity (the highest intensity rating given to any headache during a 1 week period, based on a 6 point rating scale of headache intensity). This form of analysis in fact increases the possibility of Type II error to as high as .10 for testing each of the headache variables, and thus, interpretations of reported significance must be made with some caution.

Larsson and Melin report significantly lower overall headache activity ratings, and higher number of headache-free days among the relaxation training group as compared to the information contact and waiting-list control groups. However, these significant differences were only found immediately at post-treatment, and not at the 6 month follow-up. Headache frequency was significantly reduced among the relaxation training students at both time periods, as compared to the other 2 treatment conditions.

In reviewing the per cent improvement figures over time, again it is evident that while marked differences existed between the groups at post-treatment, most of these differences had disappeared by the follow-up at 6 months. For example, at post-treatment, 9/11 relaxation subjects showed improvement of 50% or greater, while only 1/13 information-contact students and 0/7 waiting-list control students displayed such improvement. At the follow-up, however, 6/11 relaxation, 5/13 information contact, and 2/7 waiting-list control students showed improvement of 50% or greater.

Given that this is the first and only study to date that has administered and evaluated the effectiveness of offering behavioral treatment to adolescent headache sufferers in groups, these initial results are encouraging. However, as mentioned above, these results must be viewed with some caution. The group sizes were very different (n's of 11, 12 and 7) for which the authors offer no explanation, and it would appear that participants were not in fact randomly assigned to the 3 treatment conditions, although the authors state that this was a randomized trial. Careful review of the Procedures section of the paper reveals that participants were recruited from 2 different schools. Although students were assigned to one of the three treatment conditions in the first school, students from the second school were only assigned to relaxation training or information-contact groups due to insufficient numbers in the second school to fill a waiting-list control group.

Furthermore, students in the placebo control group met in a single large group of 12, as compared to the much smaller groups of 3-4 in the treatment condition. One must question how well the authors have in fact controlled for attention and contact when it is clear that individual attention and "air-time" will be significantly greater in groups of only 3-4 students.

The method of analysis chosen for this study does not match the research design well, and as such, increases the Type II error (or the risk of falsely rejecting the null hypothesis and accepting significant differences when they do not really exist). Finally, the treatment effects described immediately after the completion of the treatment program do not appear to have been well maintained over time.

Individual Versus Group Treatment of Headache

In all but 2 of the outcome studies (Mitchell & White, 1977; Larsson & Melin, 1986) described above, treatment has been offered on an individual basis only. Holroyd and Andrasik (1978) conducted a study with 39 adult tension headache sufferers, wherein they compared the effectiveness of 2 self-control treatment conditions to a headache discussion condition and a symptom-monitoring control condition. In all treatment conditions, subjects were seen in small groups of 4 or 5.

Participants in the first self-control treatment condition were taught several cognitive strategies for altering maladaptive cognitive responses that were believed to mediate tension headache occurrence. Participants in the second treatment condition were taught these same cognitive strategies, and in addition received relaxation training. The headache discussion group was, in a sense, an attention placebo condition, wherein subjects met with a therapist in small groups for five 1 3/4 hour sessions (as in the active treatment conditions), but were not taught any specific relaxation or cognitive skills. Instead, they discussed historical roots of their headache symptoms and were encouraged to reduce the stress they felt in their lives through discussion and exploration of their emotional responses to stressful life events. The final condition was a waiting-list control group, wherein subjects monitored their headaches for a 15 week period, corresponding to the 2 week pre-treatment, the 5 week treatment, the 2 week post-treatment and the 2 week follow-up phases (at 6 weeks after the end of treatment) that the other treatment conditions went through.

Although this clearly was a repeated measures design, the authors conducted two separate analyses of covariance on each of their headache variables (Headache Index, frequency, duration and intensity), one at post-treatment and one at follow-up, using pre-treatment scores as the covariate in each case. The authors do not describe why this particular statistical approach was taken, but as in the Larson and Melin (1986) study described above, this form of analysis increases the possibility of Type II error to as high as .10 for testing each of the headache variables. Thus, interpretations of reported significance must be made with caution.

Significant treatment effects were reported for the Headache Index scores at post-treatment and follow-up, and the subsequent application of a fairly liberal means comparison test (Duncan's new multiple-range) revealed that the 2 active treatment groups and the headache discussion group differed significantly from the symptom-monitoring control group, but not from one another. Similar findings were reported for headache frequency, duration and intensity.

The authors concluded that group administration of cognitive and relaxation training, among adult tension headache patients, was an effective procedure for reducing headache activity, but that, given the apparently equal success of the headache discussion group, it was difficult to determine what the actual effective procedural ingredients were in this study. They suggested that the provision of a causal explanation for the headache symptoms (which was done in the 3 effective treatment conditions) might have increased participants' belief in their own ability to cope with such symptoms. This, in turn, could have lead to greater initiation and persistence of general coping behavior, and thus reduced the experienced stress that is believed to contribute to headache onset and/or exacerbation.

These findings are certainly encouraging for the application of behavioral procedures to headache sufferers in small groups. However, the manner of analysis chosen, as well as the choice of a liberal means comparison test for following up significant overall effects, and the relatively short term follow-up period (only 6 weeks) do require that some caution be exercised in making conclusive statements about these results.

Figueroa (1982) conducted one of two other headache treatment studies, wherein treatment was offered in a small group format (group size of 5). He compared 3 treatment conditions among a group of 15 adult tension headache sufferers. The treatment conditions included: (1) application of a 3 stage behavioral program over seven 90 minute sessions, consisting of Problem Solving, Relaxation Training and Stress Innoculation Training phases; (2) seven 90 minute sessions of group psychotherapy in each of which participants engaged in a headache discussion and conflict resolution process; and (3) a self-monitoring control group. Headache data (frequency, duration and intensity) were collected in a written headache diary format for 2 weeks before treatment, 2 weeks immediately after treatment, and again for 2 weeks, one month after treatment was completed.

Although Figueroa reports significant improvement in headache symptom reduction only among the behavioral program treatment condition, it is difficult to determine if this is in fact the case, given the statistical results reported in the study. The author reports significant time by treatment condition interactions in the repeated measures analyses of the headache variables, but fails to further investigate the meaning of such significant interactions through the testing of meaningful a posteriori complex contrasts. Instead, Figueroa applies a fairly liberal means comparison test (Duncan new multiple-range) to further describe significant main effects, and also uses this means comparison test inappropriately to evaluate within-group differences along with between-group differences. Such analyses render it impossible for the reader to draw any meaningful conclusions from this study.

Williamson, Monguillot, Jarrell, Cohen, Pratt and Blouin (1984) evaluated the effectiveness of two group relaxation programs for the treatment of headache among a group of 48 adult headache patients diagnosed by their physician as having either migraine, muscle contraction, or mixed headache. Arguing that the effectiveness of individualized relaxation training for adults has been clearly demonstrated (Williamson, 1981; Blanchard, Ahles, & Shaw, 1979; Blanchard, Andrasik, Ahles, Teders, & O'Keefe, 1980), these authors sought to explore the feasability of offering less intensive and more cost-efficient treatment methods for chronic headache sufferers.

Thus, Williamson et al. (1984) compared a traditional therapist-assisted relaxation program administered to 3 groups of 6 adults each, with a self-help relaxation condition where therapist contact was kept to a minimum and subjects drew primarily from The Relaxation Book (Rosen, 1977) for their relaxation training. Subjects in the traditional relaxation training program met for a total of 12 hours with a pair of therapists over a period of 4 weeks, while those in the self-help condition had only 4 hours of therapist contact over that time. Subjects in an attention-control placebo group met with a pair of therapists for 4 1-hour sessions over a 4 week period, during which time they discussed the physiological and psychological bases of headache.

From their repeated measures analysis of variance of their headache data (Headache Index, duration and frequency), these authors report significant treatment group main effects for Headache Index and duration, but not frequency. No information is provided about any interaction effects, even though the only real test of any meaning in these data is whether an interaction exists between treatment condition and time — that is, do the three different treatment conditions show different rates of change in headache activity (or duration or frequency) over time?

After finding the significant main effects as described above, Williamson et al. proceded to perform very liberal post hoc means comparison tests (least significant differences) of differences between groups at the end of treatment and at 1 month follow-up. From these analyses, they concluded that for Headache Index, each treatment group was superior to the waiting-list control group at the end of treatment. For headache duration, only the therapist-assisted relaxation condition differed from the waiting-list controls at the end of treatment. At one month follow-up, on Headache Index (but not duration), each treatment group was superior to the waiting-list control group. No information was provided about maintenance of treatment effectiveness beyond the 1 month follow-up.

The meaning of these reported findings is unclear. Testing simple main effects of an interaction without providing information about the overall ANOVA test of the interaction is a questionable procedure. Furthermore, the use of very liberal post hoc means comparison tests suggests that the between-group differences were not large at all.

In reporting per cent improvement, which provides some indication of within-group changes over time, Williamson et al. (1984) have presented what appear to be conflicting results. In the Results section of their paper, they report (in table form and within the written text) that at one month follow-up, 5/14 (or 35.7%) of the self-help relaxation group experienced 50% or greater reduction in headache activity, while 4/13 (or 31.8%) of the therapist-assisted group relaxation subjects experienced a similar reduction. In the Discussion section of their paper, they report that 31.7% of those in the self-help program achieved this 50% reduction at one month follow-up, and that 50.6% of those in the therapist-assisted program experienced such a degree of improvement.

Given this disparity in reported per cent improvement rates, it is difficult to draw any clear conclusions about the effectiveness of either of their group administered programs. If in fact, % improvement rates (of those who achieve at least a 50% reduction in their headache activity level) are no greater than the 30-35% reported in the Results section, these results are not far different from those previously reported for placebo treatment conditions (Blanchard et al., 1980; Richter et al., 1984).

At this time, the question of the efficacy of offering behavioral treatments in group format (at least to adult headache patients) has yet to be clearly demonstrated.

To date, there exist no published studies comparing individual and group treatments of migraine for any age group. Yalom (1975) has discussed a variety of "curative factors" that he believes are important aspects of the therapeutic change process in any form of group treatment. These include; instillation of hope, universality, imparting of information, altruism, the corrective recapitulation of the primary family group, development of socializing techniques, imitative behavior, interpersonal learning, group cohesiveness, catharsis and existential factors.

Many of these factors, or slight variations thereof, have been reported by others, both from the therapists' and the group members' points of view, to be important aspects of the treatment process (Corsini & Rosenberg, 1955; Berzon, Pious & Parson, 1963; Lieberman, Yalom & Miles, 1972; Yalom, Tinklenberg & Gilula, as summarized in Yalom, 1975). While not all of these factors may be considered directly applicable to a group behavioral treatment of migraine for female adolescents, many do appear to be very relevant (to be discussed below).

In support of the belief that treatment in a group context could be at least as effective as individually administered treatment for this particular group - and certainly less costly to provide - it should be noted that the developmental period of adolescence, at least in many Western cultures, is characterized by a strong drive to separate emotionally from parents and family, in an effort to more clearly establish a separate and individual identity. As this separation process occurs, the adolescent's attention shifts away from the family, and in a more general sense, away from established authority figures, toward the peer group — compatriots, in a sense, who are suffering similar emotional conflict and who are also searching for their own separate identities. In adolescence, the peer group is frequently the source of considerable information and support. Given the potential strength of the force of such a peer group, the question is raised as to whether this force can be utilized in some form to assist adolescent girls suffering from recurrent migraine headaches.

The curative factor that Yalom refers to as universality can be exercised simply by bringing together a group of adolescent migraine sufferers, thus providing them with peers who can understand and sympathize with one another's, at times, very painful condition. The incidence of adolescent migraine is certainly high enough to warrant continued research and clinical effort to alleviate the pain associated with it. However, it is still low enough to prevent the likelihood of any individual migraine sufferer coming across any others similarly afflicted during the normal course of their teenage lives. The knowledge that one is not alone with one's suffering can be very reassuring.

Frequency, severity and duration of migraine attacks, as well as level of ability to cope with the pain of the attacks, are likely to vary considerably in a fairly heterogeneous group of female adolescent migraine patients referred through different physicians at different times. Those who generally suffer less can provide a certain level of hope to those who are more seriously affected. Also, the simple fact that many are gathered and committed to work together to treat their migraines provides additional hope for success, an important aspect of any treatment program. At the same time, there can be a sharing of information among peers, information that particular individuals have found useful in dealing with their own attacks. For adolescents, such information often has more impact coming from peers than from persons in authority positions.

Just as adolescents like to seek support and advice from their friends, they similarly like to be able to give it, and thus, the treatment group provides them with a context within which they may practice such altruism, another of Yalom's curative factors.

Given the adolescent's general desire to be part of a peer group, treatment in a group context can serve to fulfill this need, at least in part. The importance of group cohesiveness in the therapeutic process has been well documented (Yalom, Tinklenberg & Gilula, in Yalom, 1975; Yalom, Houts, Zimmerberg & Rand, 1967). As it is anticipated that most adolescents will be very peer-oriented, it stands to reason that encouraging and utilizing such potential cohesiveness within a group context can well serve to augment the effectiveness of a migraine treatment program for this developmental group.

Statement of the Problem and Hypotheses

Over the past 10-15 years, relaxation training, and more recently cognitive training, have proven effective in reducing the headache activity of adult migraine patients. During the past 2-3 years, results of controlled group outcome studies with children and adolescents have similarly yielded encouraging results. However, concerns pertaining to (1) the use of adequate control groups, (2) unclear evidence that gains are maintained at follow-up, and (3) use of appropriate design and subsequent statistical analyses, prevent one from clearly concluding, from the available data, that behavioral programs (i.e. relaxation and cognitive training) are indeed effective with this population.

Furthermore, there have been no published studies to date that compare individually versus group administered treatment for childhood or adolescent migraine sufferers. Individual treatment is costly, and limited budgets in those settings that might offer such treatment (i.e. hospitals, schools) may prevent, or at least seriously delay, some children or adolescents from receiving it. There may also be specific benefits from a group approach (as described earlier) that simply would not be available in an individual program.

The purpose of the current study was to evaluate the effectiveness of a behavioral program, combining relaxation training and cognitive-coping techniques, to reduce the headache activity of female adolescent migraine headache sufferers. Furthermore, a comparison was made of the effectiveness of administering this program to girls individually, versus administering it to small groups of 4 or 5.

Prevalence rates of migraine headache for the population of female adolescents have been reported in the range of 6-10% (of large samples of children from 7-15 years). Although certain types of medication (as described earlier) can be used as the major form of treatment, many parents and physicians prefer these young girls to pursue other avenues of treatment before resorting to a regular regime of medication.

Extensive descriptive data pertaining directly to the headaches have also been collected from the female adolescent participants. Such data have not been previously available for this particular subject population.

Finally, given the existence of certain etiological models of migraine that propose particular emotional or personality patterns among migraine sufferers, measures of anxiety, depression, and several personality characteristics were administered.

The following a priori hypotheses were made:

Hypothesis 1: Subjects receiving individually administered relaxation and cognitive training will experience greater reduction in headache activity from baseline to the 3 month follow-up than will subjects in the group administered attention placebo condition.

Hypothesis 2: Subjects receiving group administered relaxation and cognitive training will experience greater reduction in headache activity from baseline to the 3 month follow-up, than will subjects in the group administered attention placebo condition.

Hypothesis 3: Subjects receiving individually administered relaxation and cognitive training will show a different degree of reduction in headache activity from baseline to the 3 month follow-up from those receiving the same program administered in groups. The specific directions of these differences were not hypothesized.

No specific a priori hypotheses were made regarding the depression, anxiety or personality measures that were administered. While relationships between such measures and headache activity have been postulated for many years, the actual research data available do not clearly support either a definitive theory of a "headache personality type", or a specific theory of depression or anxiety as causal agents of headache activity.

Information obtained from the anxiety, depression and personality measures have been used to explore variables that might be relevant to treatment responsiveness. Finally, relationships between reduction in headache activity and measures of anxiety and depression have been investigated, although no specific a priori hypotheses were specified regarding these relationships.

METHOD

Subjects

The subjects in this study included 48 female adolescent (12-17 years) migraine sufferers. These girls were referred to the Children's Hospital of Eastern Ontario (CHEO) by family physicians and pediatricians in the Ottawa/Hull area for consultation regarding migraine headaches.

These same physicians had been asked to refer their child and adolescent migraine patients to this hospital for a previous migraine study, and were asked for their continued assistance in referring patients at the beginning of the current study (see Appendix A for a copy of the letter sent to the physicians at the beginning of this study). Approximately one year after the study began, a second letter was sent to inform the physicians that we were still accepting referrals of teenage girls with migraine headaches (see Appendix B for a copy of this second letter).

For admission into the treatment program, potential participants had to meet a set of inclusion criteria as described below, and also had to be seen by a staff neurologist at the Children's Hospital (1) for confirmation of a diagnosis of migraine and (2) to rule out any other cause for the recurring headaches.

The following inclusion criteria were required for participation in this study:

A. girls had to be 12-17 years of age at the time of referral,

B. they had to have a history of recurrent headaches for a period of at least three months,

C. girls had not begun any new medication within the previous 2 months,

D. headaches were not generally linked to dietary factors, allergies, or the menstrual cycle, as reported by the participants and their parents. That is, participants and their parents indicated that they had not been able to detect any such links,

E. headaches occurred, on average, at least once a week, over a four week period,

F. there was no evidence of behavioral, neurological or major medical problems that might require intervention during the course of the project, as reported by the participants, their parents, the referring physician or the neurologist.

Confirmation of a diagnosis of migraine was made by a staff neurologist at the Children's Hospital, using the following diagnostic criteria:

A. intermittent paroxysmal headache separated by symptom-free intervals, and

B. any 2 of the following:

throbbing pain,

scotomata or related neurologic phenomena,

vomiting and/or nausea,

positive family history.

Although there is currently some dispute about the reliability and validity of the diagnosis of migraine (discussed in the Introduction), it was necessary to use some set of generally agreed upon guidelines to ensure uniformity of diagnosis. Thus, with minor modification as described below, the diagnostic criteria for migraine headache as set forth by the Ad Hoc Committee on Classification of Headache (1962) were used. 'Throbbing pain' was substituted for 'unilateral pain', as it is generally acknowledged that unilaterality is relatively infrequent in children (Bille, 1962, 1981; Tomasi, 1979). These are the same diagnostic criteria that were used by Vahlquist and Hackzell in 1949, and have since been widely used in migraine research.

Over a 1 1/2 year period, a total of 66 referrals were received to the adolescent migraine treatment program. Of these 66 referrals, 48 girls entered the program. Of the remaining 18 girls who did not become participants, most did not meet the full set of inclusion criteria as described above; several others were not interested in participating; and 2 girls lived too far away to be able to attend weekly treatment sessions.

Of the 48 girls who began treatment, 45 attended all assessment, treatment and follow-up appointments. This represents a treatment drop-out rate of only 6%, a figure considerably below that which is frequently reported in the clinical literature (15-25%). In part, this relatively low treatment drop-out rate may be attributable to the procedure by which potential participants were first introduced to the program. During the first two assessment sessions, all potential participants were fully informed of the considerable time and effort that would be required if they chose to enter the treatment program. All girls were specifically encouraged to think carefully about whether they were willing and able to make such a commitment, and any questions they had about any aspect of this committment were answered honestly and completely by the therapist. Once a girl indicated that she did wish to participate, she was told she would be expected to fulfill all requirements of the program from baseline through to follow-up.

Furthermore, given that all of the girls who began the treatment program had histories of a chronic painful condition (i.e. migraine), they began with relatively high levels of motivation to discover methods by which they might alleviate some of their pain. Throughout the program, all of the girls were offered regular encouragement to continue actively participating in the program. At the earliest sign of any diminishing motivation to fulfill program requirements, this was discussed with the participant, and the need to fulfill such requirements in order to best benefit from the program was emphasized.

A sample size of 16 subjects in each of 3 treatment conditions was chosen at the outset of the study. This number was arrived at based on the results of an analysis of the number of subjects required to have an 80% chance of finding a moderate treatment effect as described in Kirk (1968).

Sample Description

Forty-eight adolescent girls, aged 12-17 years, participated in this study. The girls were randomly assigned to 3 treatment conditions. The average age of those girls in individual treatment was 13.6 years; in group treatment, 13.9 years; and in the control condition, 13.5 years. There were no significant differences in mean age across treatment conditions.

Over the course of treatment, there were 3 drop-outs, 2 from the group treatment condition, and 1 from the individual treatment program.

One of the girls who dropped out of the group treatment program had general difficulties with compliance (at home and at school), and similarly had difficulty complying with the requests of this program. After 4 weeks, she decided not to continue. The second girl found it very difficult to attend regular treatment sessions due to a very busy academic and personal life. The one girl who dropped out of the individual treatment program lived a considerable distance from the hospital, and reported major difficulties with transportation.

Although all 45 remaining girls completed the entire treatment program, 2 girls from the individual treatment program did not complete their 3 month follow-up diaries. Thus, their headache data were excluded from all analyses that investigated baseline to follow-up differences in all headache variables. Also, 1 girl from the attention placebo group completed neither her post-treatment nor her follow-up headache diaries. None of her headache data were included in any of the analyses of headache variables. Refer to Table 1 for a summary of subjects who completed the treatment program, and all required headache data gathering.

Insert Table 1 about here

In order to ensure that there was no systematic bias in assignment to treatment condition related to either father or mother's level of education, or age of participant, chi-square analyses of these three variables were performed. None of these 3 analyses revealed significant differences in group composition between treatment conditions.

Table 1

Summary of Subjects Who Completed Treatment and Headache Data Collection

	Column A	Column B	Headache Data Complete	
	Began Treatment	Completed Treatment	% of Col.A	% of Col.B
Individual Treatment	16	15 (94%)	13 (81%)	13 (87%)
Group Treatment	17	15 (88%)	15 (88%)	15 (100%)
Attention Placebo	15	15 (100%)	14 (93%)	14 (93%)
Total	48	45 (94%)	42 (88%)	42 (93%)

Parental education was used as a rough estimate of socioeconomic level. While this is not generally considered to be the best measure of socioeconomic level, it is the most frequently used in this particular geographical location (Ottawa, Ontario, Canada). Relative to the entire population of this region, there is a disproportionately high level of employment in the civil service. If we were to use the typical occupational rating scales, along with education level, to determine socioeconomic status, this would result in a considerable overestimation of actual socioeconomic level. Income in the civil service is higher than in comparable non-civil service positions and thus, is also believed to provide an overestimate of actual socioeconomic level. Thus, researchers in this geographical area have found that parental education (both parents) alone provides a better estimate of socioeconomic status, than using any other combination of education, occupation and income.

Procedure

Prior to providing the procedural details of the study, it should be noted at this time that the writer was the researcher responsible for proposing and designing the study, and was also the primary contact person for all participants. The writer arranged and conducted the various scheduled appointments, and also served as the therapist for all individual, group treatment, and placebo control sessions. At the time, I was a senior graduate student in the final stages of my doctoral training in clinical psychology and had had both academic training and clinical experience in the administration of the treatment methods used in the study.

Given that I acted in both the roles of researcher and of therapist, it was not possible for any of the treatment conditions to be provided without the therapist's full awareness of the hypotheses of the study. While such blind administration of treatment conditions is the ideal in the experimental evaluation of a treatment program, it was, from a purely practical perspective, impossible to obtain.

Even if several therapists, apart from the primary researcher, had been employed to administer the treatment programs, it is very likely that they would have had some awareness of the major hypotheses of the study. Therapists do not necessarily work in total ignorance of the research literature, and it is often very easy to distinguish the more active from the less active treatment components in a comparative treatment outcome study. Furthermore, with frequent and regular contact between the principal investigator and several therapists, it becomes virtually impossible to keep all research hypotheses secret from therapists.

It might be argued that the personal investment that a Ph.D. student had in the results of her research could lead her to perform in such a way as to inadvently bias the outcome of the treatment programs in the direction of proving the main hypotheses of the study.

As a means of checking on this to some degree, pre- and post-treatment credibility measures were administered to all participants and to one parent of each participant. These were completed anonymously, and sent back to the researcher through the general hospital mail system so that participants might feel freer to provide honest responses.

There were no significant differences between the individual and group treatment and attention placebo conditions on the pre- or post-treatment credibility questions, or between ratings of any of the post-treatment therapist variables (including therapist skill, understanding, warmth and friendliness). If systematic biases had occurred in the way in which services were provided to subjects within the the different treatment conditions (apart from the different treatment procedures that were being subject to investigation), one would expect that some differences would have appeared on these credibility measures. The results of these credibility measures will be discussed at greater length in the Results section of this paper.

The basic procedure of this study can best be described as a series of five phases. These phases included;

1. Subject Referral / Subject Selection / Initial Contact,
2. Pre-Treatment Assessment and Baseline Headache Data Gathering,
3. Treatment (individual, group, attention placebo),
4. Post-Treatment Assessment and Post-Treatment Headache Data Gathering,
5. Follow-Up Assessment and Follow-Up Headache Data Gathering.

Subject Referral / Subject Selection / Initial Contact

Upon receipt of the referral, potential subjects and one of their parents were contacted by phone. The general procedures of the study were described (See Appendix C for an outline of the intial phone contact), and if an interest was expressed in pursuing the referral, an inital appointment was made.

If the referral had initially come from the Neurology Department within the Children's Hospital, diagnostic and inclusion criteria as described above would have already been met. If the referral had come from any other source, a referral was immediately made to Neurology for confirmation of the diagnosis of migraine.

Any uncertainties as to whether a girl met the specific inclusion criteria were clarified during the intial appointment at the hospital. Girls who did not meet the diagnostic and inclusion criteria were offered treatment in the appropriate regular service programs of the hospital.

Pre-Treatment Assessment

During the initial appointment at the hospital, the basic procedures of the program were described in greater detail. The nature, purpose and conditions of the program were explained, and any questions raised by either the parent or the daughter were answered. Girls who still indicated an interest in participating were required to make a committment to attend all assessment and treatment sessions, phone in headache data when requested, and complete any homework assignments that would be given. An Informed Consent form (see Appendix D) was signed both by the adolescent and her parent.

During this first appointment, a detailed pediatric and headache history was taken (see Appendix E), and girls were taught by means of instruction, modelling and rehearsal, how to phone in their daily headache information to a telephone answering machine. Each girl was given a 5" x 8" index card (see Appendix F) to take home and keep in a prominent place to act as a reminder for her to call and also to remind her of the information required from each daily phone call. (This phone-in headache diary will be discussed at greater length in the Measurement Instruments section below).

All girls were requested to provide daily headache information for the following 4 weeks (Baseline data gathering), at the end of which a second preassessment appointment was scheduled. Girls were informed that the headache data would be taken off the answering machine every morning, and that any girls who had not phoned in their headache information would be contacted later that day.

Just prior to her attendance at the second preassessment session, each girl was randomly assigned to one of the three treatment conditions described below. If a girl had not had an average of 1 headache per week during the preceding 4 weeks of Baseline, she was excluded from the study and offered treatment in the regular service program at the Children's Hospital. The only constraints to the randomization procedure were (1) that equal numbers of girls were assigned to each treatment condition, and (2) that girls who were assigned to a group treatment condition not have to wait more than 3-4 weeks after the Baseline headache monitoring before beginning treatment.

During the second preassessment appointment, detailed descriptive information about the headaches of the previous 4 weeks was gathered in a structured interview format (see Appendix G). Also, during the second appointment, parents and adolescents were informed of the treatment condition to which the girl had been assigned, and a standardized rationale for psychologically-based migraine treatment was given to all participants (see Appendix H). This rationale included a description of the general causes of migraine and an explanation of the relationships between stress, bodily reactions, and the migraine process.

More specifically, it was explained that some individuals are genetically predisposed to having migraine headaches. For these individuals, some of the normal stresses and emotional upsets of everyday life can lead to increased muscle tension and biochemical changes that alter cranial circulation, setting up the process that results in a migraine headache. This model represents a combination of Wolff's (1963) integration model of migraine, Schachter's (1964) theory of emotion, and Lazarus' (1981) stress and coping paradigm.

Then, depending on the treatment condition to which a girl had been assigned, a specific rationale for that particular treatment condition was given. For those girls assigned to either the individually or group administered relaxation and cognitive training treatment conditions, the rationale as outlined in Appendix I was provided. Basically, this rationale included explanations as to how relaxation and `Thinking Straight' techniques could be useful in reducing the tension and emotional stress that might serve either to initiate a headache or exacerbate the pain of an existing headache.

For those girls assigned to the attention placebo condition, the rationale as outlined in Appendix J was given. The primary emphasis of this rationale was that the awareness and expression of one's feelings played an important role in reducing the stress and tension that could contribute either to the development of a headache or to the exacerbation of an already existing headache.

Also during the second preassessment appointment, girls were requested to complete the Spielberger State-Trait Anxiety Inventory, the Birleson Self-Report (Depression) Inventory, and the Beitchman Self-Report Questionnaire (a self-report personality questionnaire). A Pre-Treatment credibilty measure was also completed both by the participant herself and her parent at the end of this appointment. These measures will be described in detail in the 'Measurement Instruments' section below.

Treatment

Prior to their second preassessment appointment, girls had been randomly assigned to one of 3 treatment conditions. These included:

(1) an individually administered relaxation and cognitive training program,

(2) a group administered relaxation and cognitive training program,

(3) a group administered attention placebo program,

The treatment phase of the program involved attendance at 12 weekly sessions, each lasting approximately 1 hour. Those girls in the individual treatment condition were seen individually for these sessions, while those girls in the group treatment and attention placebo conditions were seen in small groups of 4 or 5.

In order to ensure as much standardization in administrative procedure as possible, detailed treatment manuals were used. The same manual was used for each of the active treatment conditions — this manual is provided in Appendix K. The treatment manual for the attention placebo condition can be found in Appendix L.

In each condition, treatment began with a restatement of the treatment rationale that was provided during the second preassessment appointment. These treatment rationales had been previously tested in a pilot project with 125 normal analogue subjects (Richter, Bartoli, Cunningham, Firestone, Goodman and McGrath, 1982), and no significant differences in credibility between the specific and nonspecific treatment groups were found.

Girls were reminded of the importance of keeping track of their headaches on a regular basis, so that they could learn about their own individual, unique patterns of headache triggers. Reviewing headaches and their triggers from the previous week was a standard procedure carried out at the beginning of each treatment session in all three conditions.

Drawing on the general treatment paradigm for pain recommended by Meichenbaum (1974) and Turk and Genest (1979), each component of each treatment condition included an educational phase, a skills-training phase, and an application-training phase.

Relaxation and Cognitive Training

The same 12 session treatment package was offered to subjects in both active treatment conditions, the only difference being that those in the group administered condition had an opportunity to discuss with other migraine sufferers, their headaches and headache triggers, and the general effectiveness of the specific treatment techniques.

The first session included a review of the explanation of the general causes of migraine, a restatement of the treatment rationale for this particular program, and a general discussion of each girl's specific headache history. Girls were requested to continue to phone in their daily headache information.

During their second visit, subjects were given a training session in progressive relaxation which closely followed the procedure developed for children by Cautela and Groden (1978). This is a simplification of Jacobson's (1938) method, which involves the sequential tensing and relaxing of large muscle groups, and the use of deep breathing to achieve a state of total body relaxation. This training session was taped on a portable cassette tape recorder, and subjects were requested to practice this full body relaxation once a day for the next week. Details regarding the best time and place for practicing were discussed in an effort to increase the likelihood that each girl would practice as requested.

Full body relaxation without the prior tensing of muscles was taught during the third session. Again, this exercise was taped, and girls were requested to practice on a daily basis at home.

At the fourth session, the girls were introduced to the 'Thinking Straight' or cognitive coping section of the program. Richter et al. (1986) had developed this program for children, based on Holroyd and Andrasik's (1978) cognitive-coping programs for adults with tension headaches, and Bakal's (1982) cognitive-behavioral treatment for chronic headaches. The rationale for cognitive coping techniques was explained. Girls were told that through monitoring and changing their negative self-talk to positive self-talk, they would be able to reduce the stress and tension that they felt. This, in turn would reduce both the number of headaches they would get, and would also reduce the amount of pain that they would experience during a headache.

During this fourth session, girls were taught how to monitor their own self-talk, and to identify negative self-statements through the use of a Thinking Straight Diary (in Appendix K - the Treatment Manual for the Individual and Group Treatment Conditions). They were also instructed to review each day's experiences every evening to try to link self-talk, emotions and outcome. Girls were encouraged to continue practicing their full body relaxation exercises, either with or without initial muscle tensing, at least 4 times per week.

At the beginning of each new session, the homework assigned during the previous session was reviewed and discussed. In the fifth session, the role of self-talk in creating or exacerbating stress was reviewed, and the use of positive self-statements was presented as a means of controlling one's reaction to stress in general or more specifically, controlling one's reaction to the onset of a migraine headache.

The concept of irrational or crooked thoughts was also introduced during this session to all girls in the individual and group treatment programs. The therapist identified several common irrational thoughts (based on those presented by Ellis, 1962) and explained how these thoughts frequently served as the basis for negative self-statements. Through presenting specific examples of self statements that might represent these common irrational thoughts (see Appendix K for details), each participant was asked to consider which of these irrational thoughts or beliefs she was likely to use, often without really being aware that she was thinking these thoughts. Each girl was then instructed to monitor her own self-talk during the coming week to attend to their presence. Various alternative coping statements were proposed and discussed. Those particular coping statements that a girl thought might be particularly helpful for her were written out on small cards. She was then requested to carry them around with her during the day, either in a purse, a pocket, a pencil case, etc. and to refer to them whenever she noticed that she was using negative self-statements that were making her feel worse about a situation in general, or a headache in particular.

During the sixth and seventh sessions, subjects were taught partial or differential relaxation (sixth session), and "mini" relaxation (seventh session) through deep breathing and self-cueing. Girls were instructed to choose certain activities or times during each day for practicing these two skills and were also encouraged to continue the full body relaxation exercises at least 3 times per week.

During the eighth session, girls were taught to use attention deployment as another means of coping with the pain of a headache. They were instructed to try a different form of attention deployment each day over the coming week, and to choose those 1 or 2 methods that worked best for them. The use of fantasy and imagery as yet another technique for coping with pain and to induce positive feelings was taught during the ninth session. As always, girls were instructed to practice the technique on a daily basis during the following week.

The tenth session was used to review the several relaxation exercises that had been taught and to discuss specific stressful situations in each girl's life where she might apply some of these newly learned skills. A similar review of the cognitive coping exercises was done in the eleventh session.

During the twelfth and final session, all relaxation and cognitive coping techniques were briefly reviewed. Girls were asked to informally evaluate which particular techniques seemed to be most useful for them, and to describe situations in which they might use their newly acquired skills. They were encouraged to continue using aspects of both the physical relaxation program and the more cognitive or mental program to reduce their responsiveness to stress in general, and to migraine headaches in particular.

Placebo Treatment

This was an attention control or nonspecific treatment condition. Girls met in small groups of 4 or 5 for 12 weekly sessions, of approximately 1 hour in length. Girls were required to phone in their headache information each day, and sessions began by reviewing the headaches of the past week, and discussing potential triggers for them.

The first session was an introductory one, in which the group members met one another and shared information about their headache histories. The rationale for this treatment condition (as previously described) was provided again during this first session. Basically, the girls were told that if important feelings were not identified, understood and expressed appropriately, these feelings could lead to a greater sense of stress and tension. Such increased stress and tension could then trigger the biochemical and vascular changes that would ultimately result in a migraine heaedache. The purpose of the group meetings was to provide each participant with a place to explore and express some of these feelings.

As in the other treatment conditions, girls were encouraged to learn about their own unique set of headache triggers. Girls in this treatment condition were not taught any specific coping strategies for reducing the perceived pain of their headaches, or for coping with other stresses in general. However, they were allowed to discuss among themselves some of their own individual solutions for dealing with painful headaches, or with other generally stressful situations.

Post-Treatment Assessment

Four weeks following the end of the treatment phase, the subjects were seen for a Post-Treatment assessment. Headache data were gathered over that 4 week period, and reviewed during the appointment. Detailed descriptive information about the headaches was collected (as in Appendix G), and the girls were encouraged to describe what techniques they had been using to help reduce the frequency and intensity of their headaches.

The anxiety and depression measures, along with the personality inventory, were completed again. Also, during this appointment, both the participant and her parent filled out a Post-Treatment credibility rating form.

Follow-Up Assessment

Three months following completion of the treatment program, subjects were seen again for one last appointment. Headache data were gathered for 4 weeks prior to the appointment, and reviewed at that time. The detailed descriptive information about the headaches was collected once again, and the same anxiety, depression, and personality measures were administered for the last time.

Measurement Instruments

Headache Diary

In order to investigate the effectiveness of any form of clinical intervention designed to reduce headache activity within a particular population, it is essential that valid and reliable measures of such headache activity be obtained from all participants. Given the truly subjective nature of the experience of headache pain (or pain of any kind), researchers in this field must rely on headache data provided directly by each subject.

The written 'headache diary' has become the "gold standard" for assessing headache pain in adults, and more recently, has been used quite successfully with children ages 9-17 years (Richter et al., 1986). This self-report measure was first introduced by Budzynski, Stoyva, Adler and Mullaney (1973) and required regular periodic ratings of pain intensity according to a numerical scale with verbal anchors. The 6 point rating scale used in the present study was adapted from the work of Epstein and Abel (1977), where Ø is used to indicate no headache, and 5 represents 'very severe headache' that the subject describes as incapacitating.

The traditional written headache diary has required subjects to assess their headache activity four times per day (breakfast, lunch, supper and bedtime), using a 6 point rating scale to indicate the intensity of the headache. Subjects are also requested to provide information about the type and quantity of any medication they take, any accompanying symptoms that they notice, and possible causes of the headache.

Reasonable reliability has been demonstrated for this format of headache data collection. Thompson and Collins (1979) administered a self-report headache questionnaire, composed of a series of questions pertaining to frequency, severity, heredity and accompanying symptomatology, to a group of 101 college students.

These students included 21 problem headache (who reported that they experienced severe or recurring headaches), and 80 non-problem headache students. The questionnaire was adminstered at two time periods, 3 months apart. Two-thirds of the students recorded headache activity by means of the standard headache diary for the intervening 3 months, while the other third only completed the questionnaires before and after the 3 month period. Thompson and Collins reported statistically significant (alpha levels of .05 to .001) test-retest correlations (ranging from .41 to .69) for all of the headache symptomatology questions, and reported no differences between those who recorded headache activity and those who did not. Similarly, they reported significant (alpha levels of .05 to .001) test-retest correlations (ranging from .37 to .51) for the verbal indicators of headache severity. Again no differences were reported between those who self-monitored headache activity by means of the headache diary, and those who did not.

Several studies have presented evidence of acceptable levels of construct validity for the self-report diary method of collecting headache data (Thompson & Figueroa, 1980; Blanchard, Andrasik, Neff, Jurish & O'Keefe, 1981; Andrasik, Blanchard, Ahles, Pallmeyer & Barron, 1981), primarily through social validation studies and investigations of concordance rates between self-report headache data (by means of the headache diary), and behavioral observations of subjects' headache symptomatology by other individuals. Richardson, McGrath, Cunningham and Humphreys (1983) completed a validation study of the 6 point pain intensity ratings with 16 children 9-17 years, who suffered from migraine headaches. Using a weighted kappa measure of concordance to determine the degree of agreement between each subject's and parent's rating of pain intensity, these authors reported a high degree of concordance between the children's ratings of headache intensity and the parents' independent intensity ratings of the same event based on their direct observations of the child's behavior. Weighted kappa values ranged from .18 to 1.00, with 9 of the 16 values above .50, and all but one were statistically significant at the .05 level. Weighted percentage agreement ranged from 85% to 100% for the 16 subject/parent pairs.

In the current study, there were two changes made to this basic format of gathering headache data. Although reasonable reliability of this format has been shown, Collins and Thompson (1979) have demonstrated that noncompliance, or false compliance, frequently occurs. With a written diary, there is simply no way to ensure that headache ratings are indeed done on a daily basis, at the appointed times throughout the day.

In this study, participants were required to phone their daily headache data into a telephone answering machine. Instead of making 4 daily ratings, girls were asked to indicate the actual time the headache (or headaches) began, and to estimate its (their) duration. Girls were asked to rate the intensity of each headache on the aforementioned 6 point scale (see Appendix F for the verbal anchors for each of the 6 points). They were also requested to provide information about any medication they took, whether they noticed any other symptoms, and what, if any, possible causes might have existed for the headaches.

Headache information was removed from the answering machine each morning, and girls who had not phoned their information in were contacted later that day. In collecting specific information about the time and duration of headaches, it was believed that a more truly accurate picture of headache activity would be obtained, as compared to the 4 times per day rating system, which only estimated headache duration by viewing the number of subsequent headache ratings during a day. For example, with the 4 times per day rating system, a headache rating made only at lunchtime would be assigned a duration value of 1, whether that headache lasted for 15 minutes or 3 hours. It seems likely that the impact of a 15 minute headache compared to a 3 hour headache would be considerably different for the migraine sufferer.

One important advantage of the 4 times per day rating system is that the degree of variability in headache duration is reduced markedly, both within and between subjects. This, of course, can have a significant impact on the statistical analyses performed on these data. Reducing within- and between-subject variability can serve to reduce the size of the error terms used in the significance tests, and thus increase the chance of finding statistically significant results. Reducing variability in this way, however, also necessitates that some potentially very important data are forfeited. In the current study, headache duration did in fact vary greatly, from 10-15 minutes in length, to as long as 12 hours. When girls reported that a headache lasted the entire day, it was recorded as a 12 hour headache in an effort to provide some uniformity across subjects for the term "all day".

Girls expressed no difficulty whatsoever in providing an estimate of their headache duration. When they were questioned about the manner in which they kept track of headache duration, participants frequently explained that they used specific time periods within their day (i.e. from breakfast until they got on the school bus, for the duration of math class, immediately after school until supper, etc.) to provide a time frame of reference.

From the information provided regarding the intensity and duration of each headache that a subject reported over each one week period, a composite score, referred to as the "Headache Index", was calculated for each week during Baseline, Post-Treatment and Follow-Up. This score was a summary score of the product of the intensity rating and the duration for each headache, summed over the total number of headaches reported during the week.

$$HI = \sum_{i=1}^{f} \text{dur}(f) \times \text{intensity}\ (f)$$

where f = the total number of headaches in one week

This is considered to be the single most sensitive headache measure (Andrasik, Blanchard, Arena, Saunders & Barron, 1982), precisely because it does reflect frequency, duration and intensity. An average Headache Index score for a specific period of assessment (Baseline, Post-Treatment of Follow-Up) was calculated by summing the four weekly scores during that period and dividing by 4.

While compliance to the phone-in system of reporting headache data was initially excellent (greater than 90% in all three treatment conditions during the 4 week Baseline period), there was a significant drop in compliance across groups approximately 2 weeks into the treatment program. At that point, girls began reporting difficulties remembering to phone in, and no amount of encouragement was sufficient to significantly raise compliance to the task at that time.

Not wanting to lose further headache data altogether, the girls were offered the option of using written headache diaries (see Appendix M) for the duration of the treatment program, and also for the Post-Treatment and Follow-Up periods. By midway through the treatment program, there was a general consensus that written diaries would be more convenient (and thus result in greater compliance). By the beginning of the Post-Treatment period, all girls were required to keep only written diaries to ensure uniformity in headache data collection for the Post-Treatment and Follow-Up periods across all treatment conditions.

It should be noted here that the <u>only</u> headache data actually used in the statistical analyses were those gathered during the Baseline, Post-Treatment, and Follow-Up periods. Headache data recorded during the treatment program was used only for the purpose of having girls review the headaches (and the possible triggers for those headaches) that occurred during the week prior to the treatment session. However, these headache data were not used in any statistical analyses.

If the subsequent analyses of the headache data obtained using these 2 different formats of data reporting were only within-group analyses, it would have been impossible to separate out the effects of the treatment, and the effects of the change in the data reporting format. However, all analyses in this study were conducted as between-groups analyses. Thus, any systematic differences in reported headache activity that could be solely attributable to the change in data recording, should be equivalent across groups. Any subsequent significant group differences could then be attributed to the effect of the specific treatment conditions.

State-Trait Anxiety Inventory (STAI)

Anxiety has frequently been postulated as an important contributor to the experience of pain in general (Turk, 1977; Turner and Chapman, 1982; Khatami and Rush, 1982), and to the experience of headache pain in particular (Raskin and Appenzeller, 1980; Selby and Lance, 1960; Henryk-Gutt and Rees, 1973). The STAI (see Appendix N) was chosen as a measure of anxiety because of its statistical and structural properties (Spielberger, Gorsuch, and Lushene, 1970; Speilberger, 1973). This test includes both a measure of State Anxiety, which is sensitive to transient or situational factors, and also a measure of Trait Anxiety, which is believed to reflect a more enduring personality characteristic that is fairly stable across situations.

The State Anxiety Scale was administered by having each participant imagine the most stressful situation that she frequently experienced, and then respond to the items of the scale as if she were in that situation. This variation is among the uses suggested by Spielberger for this scale. The Trait Anxiety Scale was administered next, and participants were asked to respond according to how they felt generally, on a day-to-day basis.

Both the State and Trait Scales consist of 20 items presented in a forced-choice format with higher scores reflecting greater anxiety. Both scales have a range of 0-80 points, and raw scores were converted to standardized T-scores (using appropriate age and sex norms) before being subjected to statistical analyses.

The STAI has been shown to have good internal reliabilty (r = .78 to .92), and acceptable test-retest reliability for the Trait Scale. As expected, the test-retest reliability for the State Scale is considerably lower (r = .16 to .47) given that this scale is designed to be susceptible to situational factors (Endler, 1978; Dreger, 1978). Extensive evidence of content, criterion and construct validity is provided in the test manuals (Speilberger, 1973; Spielberger, Gorush & Lushene, 1970).

Birleson Self-Report (Depression) Inventory

Depression and headache have frequently been linked in the headache literature, although clear evidence of direction of causation has not yet been presented.

The Birleson Self-Report Inventory (see Appendix O) is a self-report measure of the extent of depressive symptomatology that the respondent has experienced during the week prior to completing the Inventory. The test consists of 18 items, each being scored 0, 1,or 2, with an overall range of 0 - 36, with higher scores indicating a greater degree of depression.

In an effort to develop an easily administered self-report depression scale for children and young adolescents (ages 7-13 years), Birleson (1981) compiled an inventory of 37 items that were identified as being associated with, or occurring as part of, the symptomatology of depressive disorder in childhood. This inventory was then administered to 4 groups of children, including: 1) 17 children diagnosed as depressed, on the basis of an operational definition, at a hospital-based department of child psychiatry, 2) 17 control children seen from the same clinic, representing a wide diagnostic range (excluding depression), 3) 20 children from a residential school for maladjusted pupils, and 4) 19 children with no history of psychiatric disturbance, from a normal school.

Of the 37 items initially used, 18 items separated the clinically diagnosed depressed group from the other three groups in a statistically significant way (using analyses of variance on the group scores for each item). Thus, the 18 items presented in Appendix O were used in the composition of the final scale. Birleson (1981) reports test-retest reliability of .80, and internal consistency, as estimated by the split-half reliability coefficient, of .86, for the final 18 item scale.

The Birleson Self-Report Inventory has since been administered to children and adolescents (10 to 16 years) in the Cunningham et al. (1987) study as a self-report measure of depression. The Children's Depression Rating Scale (CDRS) was also administered in that study--this is a 15 item observer-scored scale, based on DSM-III criteria, which is completed after a structured interview. Poznanski, Cook and Carroll (1979) report good inter-rater reliability of .92 for the CDRS, and have demonstrated that scores on this scale discriminate clinically diagnosed depressed from non-depressed children very well.

A significant positive correlation ($r = .356$, $n = 60$, $p < .01$) was found between the Birleson Self Report Inventory and the CDRS in the Cunningham et al. study, providing some external criterion validity for the Birleson Scale in a slightly older population than Birleson's original sample.

Given the limitations of this measure, with respect to complete reliability and validity data for an adolescent population, results obtained with it in this study must be interpreted with caution. However, given that these depression data were not central to the major hypotheses of the study, the scale was included as a source of potentially useful descriptive information.

Beitchman Self-Report Scale

It was difficult to find a self-report personality measure that could be administered to this sample of 12-17 year old girls. While the Minnesota Multiphasic Personality Inventory (MMPI) had initially been the measure of choice (especially as it has been widely used in the past in the headache literature), it was judged to be too difficult and too time-consuming for several of the younger girls in the program (especially those who were not proficient readers). Given that the majority of the girls in the study were in the younger age range (mean ages in the 3 treatment conditions were 13.6, 13.9 and 13.5 years), the decision was made to use a measure that was more suitable for a younger population. Thus, we chose to use the Beitchman Self Report Scale. It appeared that, regardless of which measure we chose, data at one or the other end of the age range were going to be difficult to interpret.

The Beitchman Self-Report Scale is a self-report measure, containing 55 yes-no items, which has recently been developed as a measurement of childhood deviance. The Scale (see Appendix P) provides profiles of factor scores corresponding to eight clinically relevant dimensions, including: Conduct Problems, Lie-Immaturity, Positive Self-Peer Relations, Worry, Negative Peer Relations, Anitsocial-Permissive, Sensitive-Emotional, and Positive Family Relations.

Extensive norming and standardization procedures have recently been completed with this scale (Beitchman, Kruidenier, Clegg & Corradina, 1986) on a large population of children 6-13 years of age. In the 10-13 year age group, test-retest reliability coefficients for normalized scores on each of the 8 factory listed above ranged from .51 to .76 at the 10 day retest, with a mean of .70 across the 8 factors. At the 28 day retest, the reliability coefficients ranged from .52 to .72, with an overall mean of .61, in this same age group.

The summary score on the Children's Self-Report Scale is used to classify children as belonging to clinical or normal groups. It was derived from a discriminant function analysis which compared scores on the 8 self-report factors from a <u>clinical</u> group of children (in- or out-patients at a psychiatric hospital, or classified by a psychiatrist as requiring help), to scores from a <u>normal</u> group (unselected children in regular school programs). Test-retest reliability for the probability of attaining a designation of 'clinical' within the 10-13 year age range yielded a Pearson r of .77, both at the 10 and the 28 day retest.

Unfortunately, there is no test-retest reliability data available beyond the 28 day retest period, and thus, the longer term stability of this measure is unknown at this time. Extensive work has been done on the validation of the scale, and the results of this work have been summarized by Beitchman, Raman, Carlson, Clegg and Kruidenier (1985), and Beitchman et al. (1986).

The raw data from the completed Beitchman Self-Report Scales were computer-scored using a system that estimated factor scores for each factor based on the original 55 item, 8-factor analysis (which was initially conducted to determine the factor structure of the scale). According to this method, a factor score was calculated by assigning a weight to each of the 55 items proportional to its factor loading, multiplying each weight by the item response, and summing the products over the 55 items. While all items thus contributed to the score of each of the 8 factors, those with high factor loadings contributed more than those with low loadings.

Data from the large normative sample of 2751 children were used to transform the raw Self-Report scores on the 8 factors to normalized T scores (skewness and kurtosis = 0, mean = 50, standard deviation = 10) within each sex/age group. Thus, the only scores that are provided following the computer scoring are already normalized T scores, based on the normative sample of boys and girls, ages 6-13.

Although the girls in the current study ranged in age from 12-17 years, the average age in each treatment condition was between 13 and 14 years. More than 70% of the girls were between 12 and 14 years of age at the beginning of the treatment program. For those girls who were older than 13, normalized T scores on each of the 8 factors were computer-generated based on the normalization population of 13 year old girls, and thus, their results must be interpreted with caution.

The information generated from this personality scale was not central to the main hypotheses of the study. However, it was felt that, notwithstanding the limitations described above, it could potentially yield some interesting information that would justify its inclusion.

Credibility Ratings

In evaluating the effectiveness of different treatment interventions, it is important to assess the perceived credibility of the different interventions offered. If there is significant differential credibility across treatment conditions, serious confounding may occur, obscuring the results of the investigation (Holroyd, Andrasik and Noble, 1980). This is particularly important when a placebo treatment condition has been included in the design.

In the current study, measures of credibility were administered just prior to the commencement of the treatment program after the rationale for the specific treatment condition had been provided (see Appendix Q), and again at the 1 month Post-Treatment appointment (see Appendix R). These measures were completed anonymously by the participant and one of her parents, and sent back to the investigator through the general hospital mail system.

The Pre-Treatment credibility rating form consisted of 4 questions aimed at evaluating how logical the proposed treatment seemed, how effective it might be, and how likely it was that the participant would experience improvement from her participation in the program. There were 5 anchor points for each question, ranging from "not at all" scored as 0, and "very (much so)" scored as 4. A total score was obtained by summing the assigned values for the 4 questions. Responses to the 4 individual questions, as well as the total score across the 4 questions were analysed for between-group differences.

The Post-Treatment credibility rating form included 3 questions relating to the rationale and the effectiveness of the program, as well as 3 questions pertaining to the levels of skill, understanding and warmth of the therapist (these latter 3 questions were completed only by the participant). An overall rating of the participant's perceived personal benefit was also obtained. The same 5 anchor points as described above were used, and separate total scores were calculated for the program credibility and the therapist ratings. As above, responses to the individual questions, as well as the total scores were analysed for between-group differences.

RESULTS

Pre- and Post-Treatment Credibility Ratings

A series of one-way analyses of variance was performed on the parents' and adolescents' Pre-Treatment credibility ratings, with treatment condition being the only between-groups factor (with 3 levels). There were no significant differences found between groups on any of the parents' or adolescents' ratings of treatment credibility at the Pre-Treatment period.

A similar series of analyses was performed on the parents' and adolescents' Post-Treatment credibility ratings. The only significant difference on the parents' ratings was in response to the question "How beneficial was the treatment in improving your (daughter's) migraine headaches?", $F\ (2, 40) = 6.16$, $p < .01$ (see Table 2).

Insert Table 2 about here

Tukey tests of the between-group differences further demonstrated that parents of girls in the individual treatment condition rated the treatment program significantly more beneficial ($M = 3.00$) than did parents of girls in the control condition ($M = 1.79$). Similarly, parents of girls in the group treatment condition rated the program significantly more beneficial ($M = 2.80$), than did parents of girls in the control condition ($M = 1.79$), $q\ (40) = .91$, $p < .05$ (see Table 3 for the group means and standard deviations). There were no significant differences between the individual and group treatment conditions.

Table 2

Oneway Analyses of Variance

Parents' Post-Treatment Credibility Ratings

How Beneficial Was the Treatment in Improving Your Daughter's Migraine Headaches?

Source	*df*	*SS*	*MS*	*F*-ratio	*p*
Between (treatment condition)	2	11.94	5.97	6.16	.005
Within	40	38.76	.97		
Total	42	50.70			

Children's Post-Treatment Credibility Ratings

Do You Think That the Children's Hospital Should Make This Treatment Available to Other Adolescents Suffering from Migraine Headaches?

Source	*df*	*SS*	*MS*	*F*-ratio	*p*
Between (treatment condition)	2	1.63	.82	3.18	.052
Within	41	10.55	.26		
Total	43	12.18			

Insert Table 3 about here

There was one significant between-group difference on the Post-Treatment credibility ratings provided by the girls who participated in the study, in response to the question, "Do you think that the Children's Hospital should make this treatment available to other adolescents suffering from migraine headaches?", $\underline{F}$ (2, 41) = 3.18, $\underline{p} < .05$ (see Table 2).

Tukey tests of the differences between the group means (provided in Table 3) revealed that girls in the group treatment condition ($\underline{M}$ = 3.80) would recommend this program more strongly than would girls in the control condition ($\underline{M}$ = 3.36), $\underline{q}$ (41) = .45, $\underline{p} < .05$. The difference between the individual treatment program and the control condition was not statistically significant.

Thus, of the 24 significance tests run on the Pre-Treatment and Post-Treatment credibility ratings, only two proved to be significant. Although the results of these two significance tests are presented above, it should be noted that with 24 significance tests conducted at the alpha level of .05, the likelihood of finding at least 2 significant results by chance alone is very high. Thus, before any final conclusions can be drawn about treatment condition differences in Post-Treatment ratings of benefit (as perceived by parents or participants) from a behavioral treatment program for migraine, some replication of these results in future research is required.

Table 3

Means and Standard Deviations

Parents' Post-Treatment Credibility Ratings

How Beneficial Was the Treatment in Improving Your Daugther's Migraine Headaches?

	M	SD	n
Individual Treatment	3.00	.55	14
Group Treatment	2.80	1.08	15
Attention Placebo	1.79	1.19	14

Children's Post-Treatment Credibility Ratings

Do You Think That the Children's Hospital Should Make This Treatment Available to Other Adolescents Suffering From Migraine Headaches?

	M	SD	n
Individual Treatment	3.73	.46	15
Group Treatment	3.80	.41	15
Attention Placebo	3.36	.63	14

Efficacy of Training in Reducing Migraine Headache Activity

Three a priori hypotheses were specified for this study, and have been described in detail in the Introduction. In order to statistically investigate these hypotheses, a set of 3 a priori complex contrasts were established and tested by means of the Dunn A Priori Multiple Comparison Procedure. This is the only multiple comparison procedure that can legitimately be used to test a set of nonorthogonal a priori complex contrasts. This particular multiple comparison procedure provides protection at a specified alpha level for each set of complex contrasts on a particular variable. For example, in evaluating the effect of treatment on the Headache Index, 3 specific complex contrasts were tested, with an overall protected error rate of .05 — that is, the level of significance, alpha, is divided evenly among these 3 contrasts or comparisons.

All complex contrasts that were established to test the headache activity dependent variables involved tests of interactions between treatment group membership and time. The only truly meaningful questions that can be asked about these data are whether there exist differential patterns of change in headache activity over time, as a function of treatment condition. Furthermore, a decision was made to investigate these differences from Baseline to the 3 month Follow-Up period, rather than looking at differences from Baseline to Post-Treatment. The rationale was that if significant differences did not exist between conditions at 3 months following treatment, then the true effectiveness of the treatment in reducing headache activity would be questionable.

The 4 specific headache variables examined, all of which provide some information about headache activity, were:

(1) Average weekly Headache Index over a four week period, at Baseline, Post-Treatment, and Follow-Up (hereafter referred to as Headache Index),

(2) Average weekly Headache Duration over a four week period, at Baseline, Post-Treatment, and Follow-Up (hereafter referred to as Headache Duration),

(3) Average weekly Headache Frequency over a four week period, at Baseline, Post-Treatment, and Follow-Up (hereafter referred to as Headache Frequency),

(4) Average weekly Number of Headache-Free Days over a four week period, at Baseline, Post-Treatment, and Follow-Up (hereafter referred to as Headache-Free Days).

In order to test the 3 A Priori Hypotheses described in the Introduction, three questions were asked and tested by complex contrasts for each of these 4 dependent variables. These were:

(1) From Baseline to Follow-Up, did subjects in the individual treatment condition show a significantly different degree of change in headache activity, as compared to subjects in the control condition? This is a test of a 2-way interaction. The test of this complex contrast was evaluated as a one-tailed test, in that the first a priori hypothesis was unidirectional, i.e. that the individual treatment program would be more effective in reducing headache activity than the control condition.

(2) From Baseline to Follow-Up, did subjects in the group treatment condition show a significantly different degree of change in

headache activity, as compared to subjects in the control condition? This is a test of a 2-way interaction. The test of this complex contrast was also evaluated as a one-tailed test, again because the second a priori hypothesis was also unidirectional, i.e. that the group treatment program would be more effective in reducing headache activity than the control condition.

(3) From Baseline to Follow-Up, did subjects in the individual treatment condition show a significantly different degree of change in headache activity, as compared to subjects in the group treatment condition? This is a test of a 2-way interaction. The test of this complex contrast was evaluated as a two-tailed test, in that the direction of the difference between the individual and group treatment conditions in the third a priori hypothesis was not specified.

On any headache dependent variable where the a priori tests of the 2-way interaction between treatment condition and time proved to be nonsignificant, an a posteriori repeated measures analysis of variance was done. This one factor (3 levels of treatment condition) repeated measures analysis of variance (with time as the repeated measure) was conducted to determine if there was an overall main effect of time (regardless of treatment group membership) on that dependent variable. Such a test of a time main effect can only be meaningfully interpreted <u>in the absence of</u> a significant 2-way interaction. If a significant time main effect was found, this was followed by Tukey tests of the differences between the means (at Baseline, Post-Treatment and Follow-Up), with an alpha of .05.

The results of the statistical analyses of these 3 a priori complex contrasts and any necessary a posteriori repeated measures analyses of variance are presented below, under the sub-headings of each of the 4 headache dependent variables.

It should be noted that the F-distribution (used for all non-repeated measures F-tests of significance) is "relatively unaffected by lack of normality and heterogeneity of variance" (Kirk, 1968, p. 63) when sample sizes within groups are equal or very near equal. Just the same, tests for homogeneity of variance (Cochran's C and Bartlett-Box F tests) were conducted on each of the Baseline headache variables (Headache Index, Duration, Frequency, and Headache-Free Days/Week). In all cases, the p values for these significance tests were greater than .Ø5, indicating that Baseline variances on headache variables were not significantly different.

In those cases where a posteriori repeated measures analyses of variance were conducted, an important assumption that had to be met was that of symmetry in the variance-covariance matrix. Lack of such symmetry in the matrix can result in a positive bias in the F-test. As recommended by Kirk (1968), p. 142, all repeated measures analyses of variance significance tests were subjected to the Geisser-Greenhouse Conservative F-test to guard against such possible bias. In all cases, all reported significant effects remained significant when tested by this conservative test.

Headache Index

Using Dunn's a priori multiple comparison procedure for testing the 3 a priori complex contrasts described above for the Headache Index, only Contrast 1 proved to be significant, $|\underline{Y}| = 42.43$, $\underline{t}'D\ (3,78) = 37.Ø4$, $\underline{p} < .Ø5$, one-tailed test. That is, those girls who received individual treatment showed significantly greater reduction in the Headache Index from Baseline to the 3 month Follow-Up, than did those girls in the attention placebo control group (see Table 4 for the results of the tests of these 3 a priori contrasts).

Insert Table 4 about here

Girls receiving the group treatment did not experience significant reduction on the Headache Index from Baseline to Follow-Up, compared to the control group. Nor were there significant differences between the individual and group treatment conditions over time, on this variable. Examination of the graph in Figure 1 and the group means in Table 5 reveal that the group treatment condition certainly did lead to some decrease in headache activity as measured by the Headache Index.

Insert Table 5 and Figure 1 about here

However, the use of the conservative Dunn's multiple comparison procedure, combined with the presence of a relatively large within-group variability, resulted in nonsignificant findings when group treatment was compared to the control condition, and also when individual treatment was compared to group treatment.

Given the existence of this significant 2-way interaction between time and treatment condition, a repeated measures analysis of variance to investigate a time main effect would not have yielded meaningful results. Thus, such an analysis was not done for Headache Index.

Table 4

Tests of 3 A Priori Contrasts
Headache Index

Contrast	$\lvert\underline{Y}\rvert$	Error $\underline{MS}$	Critical Difference	* signif.
1 (Individual Treatment vs. Attention Placebo, over Time)	42.43	982.22	37.Ø4	yes
2 (Group Treatment vs. Attention Placebo, over Time)	17.89	982.22	35.74	no
3 (Individual Treatment vs. Group Treatment, over Time)	24.54	982.22	41.15	no

* using Dunn's protected (across all 3 contrasts) error rate of .Ø5

Table 5

Means and Standard Deviations
Headache Index

	Baseline	Post-Treatment	Follow-Up
Individual Treatment (n = 13)	*M* = 58.88 *SD* = 63.65	*M* = 20.26 *SD* = 23.55	*M* = 21.31 *SD* = 22.42
Group Treatment (n = 15)	*M* = 55.70 *SD* = 31.97	*M* = 47.25 *SD* = 49.87	*M* = 42.67 *SD* = 47.02
Attention Placebo (n = 14)	*M* = 58.49 *SD* = 42.60	*M* = 60.66 *SD* = 54.41	*M* = 63.35 *SD* = 56.28

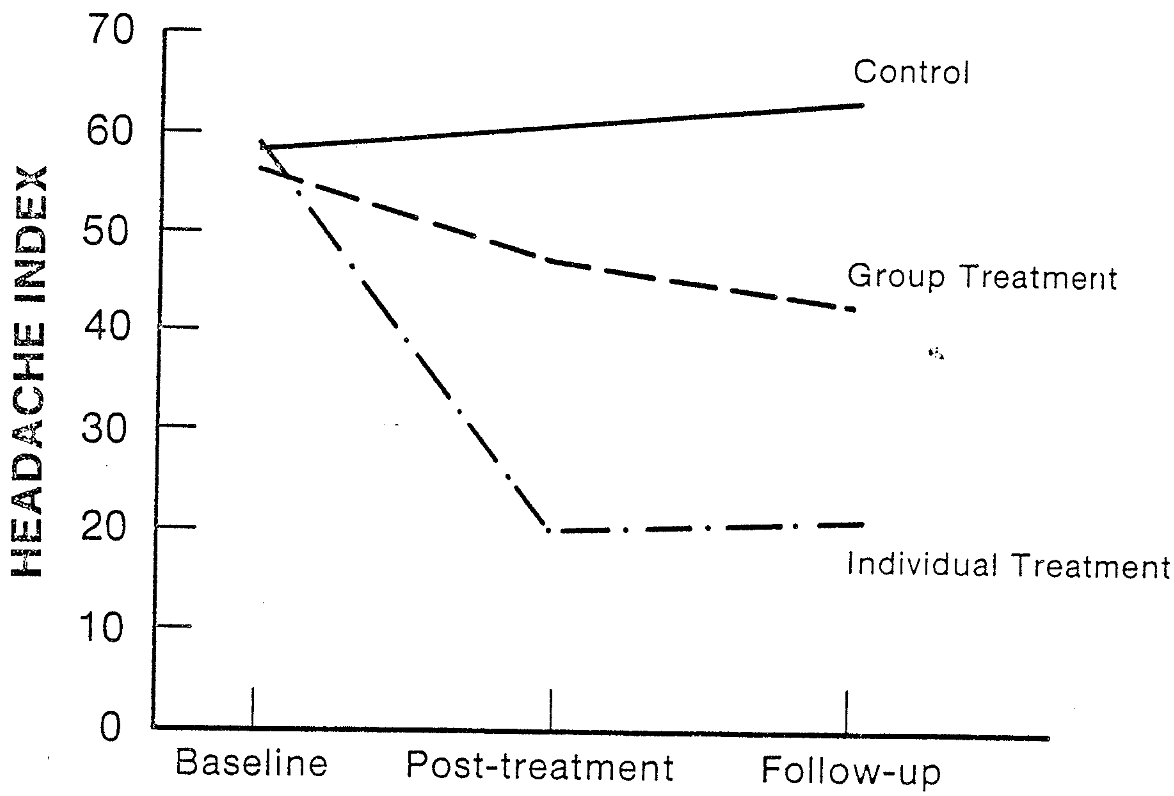

Figure 1

Mean Headache Index at Baseline, Post-Treatment, and Follow-Up for the Three Treatment Conditions

Headache Duration

Tests of the 3 a priori complex contrasts for Headache Duration, using Dunn's multiple comparison procedure revealed no statistically significant differences 1) between individual treatment and the control condition over time, 2) between group treatment and the control condition over time, or 3) between the individual treatment and the group treatment conditions over time (see Table 6 for the results of the tests of these contrasts).

Insert Table 6 about here

Given these nonsignificant tests of the 2-way interaction between time and treatment condition on Headache Duration, an a posteriori 1 factor (treatment condition) repeated measures analysis of variance (with time as the repeated measure) was done.

The results of this analysis (see Table 7) reveal that there was a significant change over time in Headache Duration (regardless of treatment condition), F (2, 78) = 3.40, p = .038. However, Tukey tests of the differences between the 3 individual means (at Baseline, Post-Treatment and Follow-Up) reveal no significant differences at an alpha level of .05 (see Table 8 for means and standard deviations).

Insert Tables 7 and 8 about here

Thus, unless a much more liberal means comparison test is performed (such as the least significant differences test, which is not a

Table 6

Tests of 3 A Priori Complex Contrasts
Headache Duration

Contrast	$\|Y\|$	Error MS	Critical Difference	* signif.
1 (Individual Treatment vs. Attention Placebo, over Time)	9.68	77.76	10.42	no
2 (Group Treatment vs. Attention Placebo, over Time)	6.33	77.76	10.06	no
3 (Individual Treatment vs. Group Treatment, over Time)	3.35	77.76	11.58	no

* using Dunn's protected (across all 3 contrasts) error rate of .05

Table 7

Repeated Measures Analysis of Variance
Headache Duration

Source	*df*	*SS*	*MS*	*F*-ratio	*p*
Treatment Condition	2	3166.39	1583.19	2.42	.102
Residual	39	25496.22	653.75		
Time (Repeated Measure)	2	529.02	264.51	3.40	.038
Time x Treatment Interaction	4	411.37	102.84	1.32	.269
Residual	78	6065.34	77.76		

Table 8

Means and Standard Deviations
Headache Duration

	Baseline	Post-Treatment	Follow-Up
Individual Treatment (n = 13)	*M* = 15.91 *SD* = 16.19	*M* = 7.15 *SD* = 7.64	*M* = 7.38 *SD* = 7.80
Group Treatment (n = 15)	*M* = 19.11 *SD* = 9.83	*M* = 16.23 *SD* = 16.98	*M* = 13.97 *SD* = 13.68
Attention Placebo (n = 14)	*M* = 22.91 *SD* = 19.39	*M* = 20.99 *SD* = 21.95	*M* = 24.07 *SD* = 24.54

recommended statistical procedure), no conclusions can be drawn about significant overall changes in Headache Duration over time.

The results of some post hoc analyses (provided in Appendix S), wherein initial level of headache severity was used as a blocking factor in a further repeated measures analysis of variance, do provide a possible explanation for this failure to clearly delineate significant overall differences in Headache Duration over time. This will be further discussed below.

Headache Frequency

Tests of the 3 a priori complex contrasts described above revealed no significant interactions between treatment group membership and time on average Headache Frequency/week. That is: (1) subjects in the individual treatment program did not experience a greater reduction in Headache Frequency over time as compared to the control condition, (2) subjects in the group treatment program did not experience a greater reduction in Headache Frequency over time than did subjects in the control condition and (3) subjects in the individual treatment program did not experience a significantly different reduction in Headache Frequency over time compared to those in the group treatment program (see Table 9 for the results of these significance tests).

Insert Table 9 about here

Results of the a posteriori repeated measures analysis of variance show a significant main effect for time, F (2, 78) = 19.12, $p < .001$ (see Table 10). Tukey tests of the differences between the means over

Table 9

Tests of 3 A Priori Complex Contrasts
Headache Frequency

Contrast	|Y|	Error MS	Critical Difference	* signif.
1 (Individual Treatment vs. Attention Placebo, over Time)	.37	2.83	1.99	no
2 (Group Treatment vs. Attention Placebo, over Time)	.43	2.83	1.92	no
3 (Individual Treatment vs. Group Treatment, over Time)	.Ø6	2.83	2.21	no

* using Dunn's protected (over all 3 contrasts) error rate of .Ø5

time indicated that, over all groups, subjects experienced significantly fewer headaches at Post-Treatment (M = 3.15) than at Baseline (M = 4.91), and also, significantly fewer headaches at Follow-Up (M = 2.78) than at Baseline (M = 4.91), q (78) = .88, p < .05. Means and standard deviations are provided in Table 11.

Insert Tables 10 and 11 about here

These results suggest the possibility that all girls in the program were able to learn about their own headache triggers, and developed some degree of control over these triggers. Alternatively, this overall decrease in Headache Frequency may reflect a generalized placebo effect of being "seen" in treatment, regardless of specific treatment condition. It may also be due simply to the passage of time, or some other unknown condition.

Number of Headache-Free Days During a Week

As with Headache Frequency, none of the 3 a priori complex contrasts of interactions between treatment condition and time proved to be significant. That is, with respect to number of Headache-Free Days during a week, there were no statistically significant differences (1) between individual treatment and the control condition over time, (2) between group treatment and the control condition over time, and, (3) between the individual treatment and the group treatment over time (see Table 12 for results of the tests of these contrasts).

Table 1Ø

Repeated Measures Analysis of Variance
Headache Frequency

Source	df	SS	MS	F-ratio	p
Treatment Condition	2	77.44	38.72	2.54	.Ø92
Residual	39	595.28	15.26		
Time (repeated measure)	2	1Ø8.11	54.Ø5	19.12	<.ØØ1
Time x Treatment Interaction	4	4.Ø4	1.Ø1	.36	.838
Residual	78	22Ø.48	2.83		

Table 11

Means and Standard Deviations
Headache Frequency

	Baseline	Post-Treatment	Follow-Up
Individual Treatment (n = 13)	*M* = 3.68 *SD* = 2.55	*M* = 2.29 *SD* = 1.96	*M* = 1.67 *SD* = 1.54
Group Treatment (n = 15)	*M* = 4.87 *SD* = 3.05	*M* = 3.36 *SD* = 2.68	*M* = 2.89 *SD* = 2.36
Attention Placebo (n = 14)	*M* = 6.09 *SD* = 4.05	*M* = 3.71 *SD* = 2.13	*M* = 3.69 *SD* = 2.52

Insert Table 12 about here

Results of the a posteriori repeated measures analysis of variance indicated a significant time main effect on Headache-Free Days, F (2, 78) = 17.68, $p < .001$ (see Table 13). Tukey tests of the differences between means over time indicated that, over all groups, subjects reported significantly more Headache-Free Days/Week at Post-Treatment (M = 4.23) than at Baseline (M = 3.18), and also significantly more Headache-Free Days/Week at Follow-Up (M = 4.50) that at Baseline (M = 3.18), q (78) = .56, $p < .05$. Means and standard deviations of Headache-Free Days during a week are provided in Table 14.

Insert Tables 13 and 14 about here

As with Headache Frequency, it is impossible to determine exactly what factor or factors might have led to these observed differences over time.

50% Reduction in Headache Index

A frequently used method of analysing the effects of intervention in headache treatment studies has been to report the number of subjects in each treatment condition who have achieved a certain criterion level of improvement in headache activity over a given period of time. Numerous researchers have concluded that a 50% reduction in headache activity (as measured by Headache Index) would in fact represent a clinically significant degree of change from Baseline to Post-Treatment

Table 12

Number of Headache-Free Days During the Week

Contrast	$\lvert \underline{Y} \rvert$	Error $\underline{MS}$	Critical Difference	* signif.
1 (Individual Treatment vs. Attention Placebo, over Time)	.44	1.16	1.27	no
2 (Group Treatment vs. Attention Placebo, over Time)	.16	1.16	1.23	no
3 (Individual Treatment vs. Group Treatment, over Time)	.28	1.16	1.51	no

* using Dunn's protected (over all 3 contrasts) error rate of .Ø5

Table 13

Repeated Measures Analysis of Variance
Number of Headache-Free Days During the Week

Source	*df*	*SS*	*MS*	*F*-ratio	*p*
Treatment Condition	2	47.86	23.93	3.19	.059
Residual	39	292.31	7.50		
Time (repeated measure)	2	40.90	20.45	17.68	<.001
Time x Treatment Interaction	4	.89	.22	.19	.942
Residual	78	90.22	1.16		

Table 14

Means and Standard Deviations
Number of Headache-Free Days During the Week

	Baseline	Post-Treatment	Follow-Up
Individual Treatment (n = 13)	M = 3.93 SD = 1.55	M = 4.98 SD = 1.63	M = 5.49 SD = 1.30
Group Treatment (n = 15)	M = 3.12 SD = 1.53	M = 4.17 SD = 2.04	M = 4.41 SD = 2.05
Attention Placebo (n = 14)	M = 2.54 SD = 1.57	M = 3.59 SD = 1.95	M = 3.66 SD = 2.32

or Follow-Up. A particular advantage to this form of analysis is that within-group variability is markedly reduced — that is, each subject is assigned either a value of 1 for success (reduction of at least 50%), or a value of 0 for failure (reduction less than 50%). Of course, whenever data are transformed in this fashion, some information is lost, in this case, information about within-group variability. Thus, for the purposes of full analysis of headache data, I would recommend, as a general rule, that per cent reduction in Headache Index not be used as the sole form of data analysis.

For purposes of comparison with other studies in the migraine literature, this secondary analysis, a chi square analysis of % reduction in headache activity from Baseline to 3 month Follow-Up was performed. Using a 50% reduction in headache activity as the criterion for success, a chi square analysis was performed to determine if the proportions of subjects who achieved this criterion of success was significantly different between treatment conditions, and significant differences were found, chi-square (2 df) = 7.09, $p < .05$. See Table 15 for the breakdown of the rates of reduction in Headache Index between groups.

Insert Table 15 about here

Although the chi-square analysis was specifically performed for success from Baseline to Follow-Up, improvement rates from Baseline to Post-Treatment are also provided in Table 15.

Given that the statistical test used to analyse the per cent reduction in Headache Index between groups over time was a chi-square

Table 15

Reduction in Headache Activity of at Least 50%
From Baseline

	Post-Treatment	3 Month Follow-Up
Individual Treatment	66.7% (10/15)	76.9% (10/13)
Group Treatment	40.0% (6/15)	60.0% (9/15)
Attention Placebo	35.7% (5/14)	21.4% (3/14)

test, and that this test involved analysis of more than 2 cells, it is not possible to state with certainty where the significant differences lay. Unfortunately, no post hoc analysis is currently available to determine this. Therefore, conclusive statements about the specific differences between groups cannot be made based on this analysis, although inspection of the data in Table 15 does give the reader some indication of the general nature of the differences.

To rule out the possibility that success or failure to meet this criterion of 50% reduction in headache activity (as measured by the Headache Index) was attributable to the age of the participant, or her family's socioeconomic status (as estimated by both parents' levels of education), 3 chi-square analyses were performed. These chi-square analyses tested the equality of proportions of subjects in 3 matrices: (1) age of participant by participant's success or failure to reach the criterion of 50% reduction in headache activity, (2) mother's level of education by participant's success or failure to reach this same criterion in headache activity reduction, and (3) father's level of education by participant's success or failure to meet this criterion of 50% reduction in headache activity. All 3 of these chi-square analyses yielded nonsignificant results (with an alpha of .05).

Analyses of variance were not used to investigate the relationships between participant's age or socioeconomic status, and change in headache activity over time because of the extremely unequal n's in what would be used as the independent variables in such analyses. For example, participants' ages ranged from 12 to 17 years, but the number of subjects in each age category (12, 13, 14, 15, 16, or 17) ranged from 2 (17 year olds) to 13 (12 year olds). Similarly, the range of n's for categories of father's education was 5 (up to grade 8) to 16 (highschool), and for mother's education, the range was 1 (postgraduate training) to 24 (highschool). Any results obtained from analyses of variance with such unequal n's between groups would not be meaningful. Thus, chi-square analyses were performed on success or failure to reach criterion.

Medication

The subjects were requested to report all medication that they took for their headaches over the course of the study, so that the potential effect of the medication could be separated out from the effect of the treatment interventions. Examination of the medication data revealed that the actual frequency of medication intake was very small in this sample of girls. Given that very few girls reported taking any medication at all, and that the frequency count of medication taken by those girls was also very small, medication was not used as a covariate in any of the headache analyses. Richter et al. (1986) similarly reported very low rates of medication intake in their sample of children 9-17 years of age.

State and Trait Anxiety Scores

Repeated measures analyses of variance were performed on the state and trait anxiety T-scores. These scores had been converted from the raw scores to standard scores with a mean of 50, and standard deviation of 10 (see Tables 16 and 17 for the group means and standard deviations). There was one grouping factor in the repeated measures analysis

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Insert Tables 16 & 17 about here

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of variance — treatment group membership with 3 levels. The repeated factor was time, with 3 levels, Baseline, Post-Treatment and Follow-Up.

Analysis of the State Anxiety scores resulted in no significant differences between groups over time, nor a significant overall reduction in state anxiety from Baseline to Follow-Up across all groups.

While there were no significant differences between groups over time on the Trait Anxiety scores, there was a significant overall reduction in Trait Anxiety from Baseline to Follow-Up, $\underline{F}$ (2, 82) = 10.52, $\underline{p}$ < .001 (see Table 18).

Insert Table 18 about here

The Tukey multiple comparison procedure was used to further investigate the differences between the group means. Trait anxiety scores were significantly lower at Post-Treatment ($\underline{M}$ = 50.23) than they were at Baseline ($\underline{M}$ = 53.00), and were also significantly lower at Follow-Up ($\underline{M}$ = 48.16) than they were at Baseline ($\underline{M}$ = 53.00), $\underline{q}$ (82) = 2.55, $\underline{p}$ < .05.

No significant correlations were discovered between Headache Index scores (at Baseline, Post-Treatment, and Follow-Up) and state or trait anxiety scores. Nor were there any significant correlations between reduction in Headache Index (from Baseline to Post-Treatment or Baseline to Follow-Up) and state or trait anxiety scores.

Table 16

Means and Standard Deviations
Standard State Anxiety Scores

	Baseline	Post-Treatment	Follow-Up
Individual Treatment (n = 15)	M = 63.27 SD = 5.64	M = 63.80 SD = 5.87	M = 64.67 SD = 4.76
Group Treatment (n = 15)	M = 68.53 SD = 2.92	M = 66.67 SD = 8.55	M = 65.93 SD = 11.05
Attention Placebo (n = 14)	M = 66.43 SD = 3.88	M = 66.07 SD = 2.64	M = 64.29 SD = 4.87

Table 17

Means and Standard Deviations
Standard Trait Anxiety Scores

	Baseline	Post-Treatment	Follow-Up
Individual Treatment (n = 15)	*M* = 51.07 *SD* = 4.65	*M* = 49.40 *SD* = 5.79	*M* = 48.60 *SD* = 6.54
Group Treatment (n = 15)	*M* = 53.47 *SD* = 8.34	*M* = 50.60 *SD* = 10.23	*M* = 47.47 *SD* = 10.39
Attention Placebo (n = 14)	*M* = 54.57 *SD* = 8.35	*M* = 50.71 *SD* = 9.40	*M* = 48.43 *SD* = 10.38

Table 18

Repeated Measures Analysis of Variance
Standard Trait Anxiety Scores

Source	df	SS	MS	F-ratio	p
Treatment Condition	2	52.30	26.15	.16	.853
Residual	41	6734.51	164.26		
Time (repeated measure)	2	525.02	262.51	10.52	<.001
Time x Treatment Interaction	4	68.40	17.10	.69	.604
Residual	82	2046.41	24.96		

Depression Scores

A repeated measures analysis of variance was performed on the raw scores derived from the Birleson Depression Scale. The grouping factor was treatment condition with 3 levels; the repeated measure was time, with 3 levels. A significant main effect of time was found F (2, 82) = 19.80, $p < .01$ (see Table 19). Means and standard deviations are provided in Table 20.

Insert Tables 19 & 20 about here

Tukey tests of the differences between means revealed that, over all treatment conditions, depression scores at Post-Treatment (M = 8.86) were significantly lower than depression scores at Baseline (M = 11.43). Similarly, depression scores at Follow-Up (M = 8.11) were significantly lower than depression scores at Baseline (M = 11.43), q (82) = 1.33, $p < .05$.

Correlational analyses of depression scores and Headache Index scores resulted in two significant findings. Depression scores at Baseline were significantly positively correlated with Headache Index scores at Baseline, $r = .32$, $p < .05$, $n = 44$, and also with Headache Index scores at Follow-Up, $r = .25$, $p < .05$, $n = 41$. While these are statistically significant results, such low r values indicate that only 10% (depression score with Baseline Headache Index) and 6% (depression score with Follow-Up Headache Index) of the variance in the data is accounted for by these relationships.

Table 19

Repeated Measures Analysis of Variance
Birleson Depression Scores

Source	df	SS	MS	F-ratio	p
Treatment Condition	2	138.36	69.18	1.47	.241
Residual	41	1925.19	46.96		
Time (repeated measure)	2	269.49	134.74	19.80	<.001
Time x Treatment Interaction	4	10.77	2.69	.40	.811
Residual	82	558.10	6.81		

Table 20

Means and Standard Deviations
Birleson Depression Scores

	Baseline	Post-Treatment	Follow-Up
Individual Treatment (n = 15)	*M* = 11.07 *SD* = 3.31	*M* = 9.00 *SD* = 3.42	*M* = 8.13 *SD* = 4.03
Group Treatment Treatment (n = 15)	*M* = 10.00 *SD* = 4.23	*M* = 7.80 *SD* = 3.42	*M* = 7.07 *SD* = 4.03
Attention Placebo (n = 14)	*M* = 13.36 *SD* = 6.36	*M* = 9.86 *SD* = 5.04	*M* = 9.21 *SD* = 5.66

Beitchman Self-Report (Personality) Scale

As above, normalized scores on the 8 subscales of this self-report measure were subjected to one factor (treatment condition) repeated measures analyses of variance, the repeated measure being time.

There were no significant differences between groups over time on any of the 8 subcales, nor were there any significant overall changes on any of the Subscale scores from Baseline to Follow-Up.

Current Headache Description

Descriptive data about the participants' headaches were collected at Baseline, Post-Treatment, and Follow-Up. These included information about possible triggers for their headaches, activities with which their headaches interfered, descriptions of what the headaches felt like, any accompanying symptoms they noticed, and information about the average duration and location of the headaches.

For the full details of the information provided by the girls, refer to Appendix T. Of particular interest is the degree to which the girls in this study did experience symptoms that were initially used to diagnose the existence of migraine headache. Throbbing headache was reported by 86% of the total sample of girls at Baseline, by 71% at the Post-Treatment assessment, and by 78% at Follow-Up. Nausea was reported by 68% of the girls at Baseline, by 50% of the girls at Post-Treatment, and by only 47% at Follow-Up. Vomiting was reported only by 21%, 14%, and 16% of the girls at Baseline, Post-Treatment, and Follow-Up respectively.

Some form of aura (visual or aural) was only reported by a very small number of girls — 20% at Baseline, 9% at Post-Treatment, and 13%

at Follow-Up. Only 2% of the girls reported one-sided pain at Baseline and Post-Treatment, while 11% reported one-sided pain at Follow-Up. One-sided headache had not been used as a diagnostic criteria in our study, because previous research has noted that few children and adolescents experience their headache pain as one-sided only. Our results here simply confirm previous evidence.

Those specific headache triggers reported by 40% of more of the girls at Follow-Up included: feeling depressed or unhappy; feeling upset, afraid or angry; not getting enough sleep; loud noises; sun and bright lights.

Post Hoc Analyses of Headache Dependent Variables

Very high within-groups variability was discovered in the Headache Index information that was gathered during the 4 week Baseline period. As a result of this high within groups variability, a decision was made to conduct a series of post hoc analyses on the 4 headache dependent variables in this study -- Headache Index, Headache Duration, Headache Frequency and Headache-Free Days/Week. Specifically, a post hoc decision was made to block subjects on a severity factor, by splitting them at the median Headache Index at Baseline, into high severity and low severity groups. Thus a new set of analyses was run on the headache dependent variables using 3 (treatment condition) x 2 (severity) repeated measures analyses of variance, with time as the repeated factor.

Full results of these post hoc analyses are reported in Appendix S. The main significance test of interest in each of the 4 repeated measures analyses of variance of the headache dependent variables was that of the 3-way interaction between treatment condition, severity, and time. On 3 of the variables -- Headache Index, Headache Frequency, and Headache-Free Days — this 3-way interaction was not significant. That is, subjects in the different treatment conditions did not experience different rates of change in their headache activity (as measured by Headache Index, Headache Frequency and Headache-Free Days) over time, as a function of their initial level of headache severity.

However, a significant 3-way interaction on the Headache Duration variable was found, $\underline{F}$ (4, 72) = 3.22, $\underline{p}$ < .017 (see Appendix S for details), and further investigation of this significant interaction was carried out by means of Scheffe a posteriori complex contrasts. Tests of 3 complex contrasts suggested the possibility that subjects in the group treatment condition with low severity headache experienced a considerable reduction in Headache Duration (relative to the control group), while those in the group treatment condition with high severity headache did not. However, the test of this contrast was significant only at the $\underline{p}$ < .10 level, and thus, can only be interpreted as a trend towards significance.

The existence of this 3-way interaction on the Headache Duration variable may provide some explanation of the failure to find significant means differences (using Tukey tests) of the significant time main effect that was reported earlier from the 1 factor repeated measures analysis of variance of Headache Duration. That is, the proportion of variance accounted for by the significant 3-way interaction between time, severity and treatment condition may have been great enough to reduce that accounted for by the time factor itself, to such an extent that a posteriori testing of the significant main time effect with the conservative Tukey tests revealed no significant differences.

DISCUSSION

The purpose of the current study was to evaluate the effectiveness of individually and group administered relaxation and cognitive training treatment programs in a sample of female adolescent migraine sufferers, and also to compare the relative effectiveness of these treatments to each other. It was hypothesized that girls in the individually administered treatment program would show a greater reduction in headache activity from Baseline to 3 month Follow-Up, than would girls in an attention placebo group (Hypothesis 1). It was also hypothesized that girls in a group administered treatment program would experience a greater reduction in headache activity over time, than would girls in the attention placebo condition (Hypothesis 2). Finally, it was hypothesized that there would be some differences in the rate of improvement between the individually and group administered conditions (Hypothesis 3). The presence of very high within-group variability on the Headache Index data gathered during Baseline led to the inclusion of an additional set of post hoc analyses designed to investigate the potential impact of initial headache severity on the effectiveness of the treatment programs.

A secondary objective of the study was to examine the relationships that existed between levels of headache activity, and depression, anxiety, and several personality characteristics.

Efficacy of Training in Reducing Migraine Headache Activity

Tests of the Three Major Hypotheses of the Study Using Headache Index as a Measure of Overall Headache Activity

The results clearly support the first major hypothesis of the study. That is, individually administered treatment was more effective in reducing overall migraine headache activity (as measured by the Headache Index) than was attending the attention placebo control group.

These results are generally consistent with those reported in the adult migraine literature on relaxation training (Blanchard et al., 1980) and cognitive training (Knapp and Florin, 1981). They are also consistent with recently reported results from studies that have applied relaxation training techniques (Andrasik et al., 1984; Labbe and Williamson, 1984; Menegan et al., 1984; Fentress et al., 1986) and cognitive coping techniques (Richter et al., 1986) to childhood and adolescent migraine patients, on an individual basis. With the exception of the Richter et al. (1986) study, attention placebo groups have not been included in the research designs, and thus several potentially important nonspecific factors have not been controlled for adequately in these other studies. Included among these nonspecific factors are regular contact with a therapist, active involvement in any kind of treatment program, and general expectations for improvement.

The second hypothesis of the study was not directly confirmed--that is, the differences in headache activity over time between the group administered treatment condition and the attention placebo condition, as measured by the Headache Index, did not reach statistical significance, although they were in the predicted direction.

The third hypothesis of the study also was not confirmed in these data -- that is, there were no significant differences in headache activity over time, between the individually and group administered treatment programs, as measured by the Headache Index.

While the tests of the complex contrasts that were used to evaluate Hypotheses 2 and 3 as described above yielded nonsignificant results, the analysis of per cent reduction in Headache Index (a composite measure of Headache Duration, Frequency and Intensity) from Baseline to Post-Treatment and Follow-Up suggests that differences did exist, (1) between individually administered treatment and attention placebo conditions, (2) between group administered treatment and attention placebo conditions, and (3) between the individual and group treatment conditions. However, the nature of the statistical test (chi-square) used to analyze these differences in per cent reduction in Headache Index precludes making any definitive statements about where the actual statistical differences lay. Of those subjects who received individual treatment, 66.7% (10/15) reached the criterion of at least 50% reduction in headache activity (success) from Baseline to 3 month Post-Treatment and 76.9% (10/13) reached this criterion from Baseline to Follow-Up. Among those who received group administered treatment, 40% (6/15) reached the criterion for success from Baseline to Post-Treatment, while 60% (9/15) reached this criterion from Baseline to Follow-Up. Among those in the attention placebo condition, 35.7% (5/14) reached the criterion for success from Baseline to Post-Treatment, while only 21.4% (3/14) reached this criterion from Baseline to Follow-Up.

The rates reported above for the active treatment conditions are in the same range as those reported in previous studies (Andrasik et al., 1984; Labbe and Williamson, 1984; Richter et al., 1986). The rate for the attention placebo group is considerably below that reported by Richter et al. (1986), who found that 50% of their attention placebo group (very similar to the attention placebo used in the current study) showed at least a 50% reduction in Headache Index from Baseline to Follow-Up. The treatment program in the present study was twice as long as that in the Richter et al. study (12 weeks as compared to 6 weeks). It is conceivable that the relatively high placebo improvement rates in their study in part reflected reponse to certain nonspecific factors (eg. expectations for improvement) that might have levelled out over a longer period of time.

This analysis of per cent reduction in headache activity is a frequently used analysis of change because it takes into account individual case by case information while at the same time, removing within-group variability. Very high within-group variability was found in these data during collection of the Baseline headache information. It is believed that such high within-group variability did affect the significance testing of the complex contrasts of the 3 major hypotheses in this study. In an effort to reduce this high within-group variability and further explore why the group treatment did not differ significantly from the attention placebo and individual treatment conditions, a series of post hoc analyses was conducted by splitting subjects at the median on Baseline Headache Index and creating a new between-groups factor, Severity, with 2 levels. Discussion of the results from these analyses will be included in the following section.

General Findings — Headache Index, Duration, Frequency and Intensity

The results of the analyses of the 4 different headache activity dependent variables (Headache Index, Duration, Frequency, Number of Headache-Free Days/Week) suggest that the active components of the treatment programs offered individually and in small groups, differentially affected different aspects of headache activity.

As presented in the Results section of the paper, there was an overall decrease in Headache Frequency across all groups, confirming that even those girls in the attention placebo condition experienced fewer headaches at Follow-Up than during the Baseline period. Although there were no specific treatment components taught to the girls in the attention placebo condition, these girls were taught to monitor their headaches on a daily basis, and to learn to identify their own specific headache triggers. This was also part of the treatment program offered to the other two treatment conditions.

One possible hypothesis for this finding is that all girls not only learned to better identify their own headache triggers, but also gained some increased control over these triggers. That is, perhaps they learned to avoid some of those situations and conditions that they learned were likely to elicit migraine headaches. An alternative explanation for this general decrease in Headache Frequency across groups is that of a generalized placebo effect of being 'in treatment', regardless of specific treatment condition. It should be noted however, that the entire program took 7-8 months for each participant, and this is a long period of time for a placebo effect to remain operationally effective. Furthermore, if such a generalized placebo effect was operating, one might question why it only affected Headache

Frequency and Headache-Free Days, but not Headache Duration and Headache Index (a composite measure of Headache Frequency, Duration and Intensity).

Simple passage of time might also account for the general decrease in Headache Frequency. If that were the case, though, and we were simply seeing the natural course of headache activity changing over time (with girls entering the program at a peak headache activity period, and then leaving at a low headache period), one might again question why Headache Frequency might naturally decrease over time, but not Headache Duration or Headache Index.

Further research in which a waiting-list control group is included, wherein subjects do not have regular contact with a therapist, and no emphasis is placed on learning to be aware of (and subsequently attempt to control) headache triggers, might help to clarify the reasons for the general decrease in Headache Frequency that was observed in the current study.

Previous research has suggested that migraine Frequency (as compared to Duration or Intensity) may be the most reponsive to intervention (Mitchell and White, 1977; Holroyd et al., 1977; Knapp and Florin, 1981). However, studies that have reported significant reductions in Headache Frequency have reported such significant findings only for their active treatment groups. In most cases, the control group has been a no-regular-contact waiting-list control, and thus there has been no way of determining whether the effect on headache activity was due to the active treatment components per se, or to a generalized educational component, including (1) teaching patients about the migraine process itself, and (2) teaching patients about their individual headache triggers and how to control or avoid some of these triggers. All of the studies mentioned above have used the written headache diary as the means of gathering headache data from all participants, including those in the waiting-list control groups, and it is certainly possible that through such daily recording, participants may have acquired some new information about their headache triggers, particularly if any emphasis was placed on recognizing and learning about headache triggers.

It is virtually impossible to completely separate out the effects of `newly acquired education about headaches' on headache activity, from the effects of self-monitoring itself, because in any self-monitoring process (which is essential in order to collect headache data), a certain amount of learning about one's headaches and headache triggers could occur.

Results from the current study suggest that the active component responsible for reducing Headache Frequency may in fact be an educational one, rather than the acquiring of any specific relaxation or cognitive coping skills, although potential placebo effects or passage of time cannot be completely ruled out either.

Holroyd and Andrasik (1978) similarly suggested that "provision of a causal explanation for distressing symptoms may have served to increase clients' belief in their ability to cope with their symptoms" (p. 1043) as a possible explanation for their findings of no significant differences between their active self-control treatment (relaxation and/or cognitive training) groups of adult tension headache patients, and their headache discussion groups. The latter group condition was quite similar to the attention placebo condition used in the current study — that is, subjects in the Holroyd and Andrasik (1978) headache discussion group were taught that headaches often occurred as a result of psychological stress, and that such feelings of distress would improve if clients understood the underlying source of their problems. Group members were encouraged to examine the thoughts and feelings that accompanied their headaches in an effort to better understand the underlying sources of these headaches, and were also encouraged to openly discuss and explore emotional responses to stressful life events as a means of reducing the experienced stress associated with such events.

The results from the current study are contradictory to those reported by Richter et al. (1986) who found that, at least for their high severity participants, significant reductions in Headache Frequency occurred only in their two active treatment groups, and not in their attention placebo group where participants were specifically taught to monitor headache triggers.

Richter et al. (1986) compared an individually administered 6 week relaxation training program and an individually administered 6 week cognitive skills training program to an individually administered 6 week attention placebo condition. The active training skills taught in the 12 week individually and group administered treatment program in the current study were very similar to those used by Richter et al. in their treatment program. The attention placebo condition was also very similar in content, but twice as long and provided to small groups of 4-5 in the current study.

It is possible that the observed differences in changes in Headache Frequency between these two studies are related either to the length of the treatment program or to the nature of the administration of the program. In the current study, girls in the attention placebo condition were seen in small groups for 12 weeks. Thus, they had a significantly longer time period in which to learn about, and try to control their headache triggers, and at the same time, had the support and encouragement of other group members in their efforts to reduce their headaches.

As Frequency of headaches decreased over time, the number of Headache-Free Days during the week also increased significantly across all groups from Baseline to Follow-Up.

Given that Headache Frequency decreased and number of Headache-Free Days/Week increased significantly over time across all groups, it would be useful and important to know how significant the participants themselves considered these changes to be. Furthermore, it would be important to determine whether the added benefit of the active treatment components in reducing Headache Duration and/or Intensity for patients in an individual program, justifies the considerable effort and expense required to provide these programs. Although those subjects in the group administered treatment program did not experience statistically significant greater reductions in overall headache activity as compared to the attention placebo condition, they clearly did experience some change in the predicted direction. Given that group treatment is less expensive to provide, it would certainly be worthwhile in future research to determine if group treatment is superior to a waiting-list control condition, as this has not yet been clearly demonstrated in the literature.

Given this general decrease in Headache Frequency across all groups, it is possible that a feasible explanation for the absence of between-group differences in Post-Treatment credibility ratings is that all groups did in fact experience fewer headaches after treatment. Certainly if headaches have interfered to any extent with academic and social activities, reducing the Frequency by one or two headaches over a period of one week could well be experienced as a significant improvement, even if the Intensity and/or Duration of those headaches has remained the same or even increased.

As presented in the Results section, there was a differential effect of treatment group membership on the Headache Index over time. The Headache Index is generally considered the best overall indicator of headache activity because it is a composite measure reflecting Headache Frequency, Duration and Intensity. Thus, it is sensitive to changes in any of these three aspects of headache activity. Furthermore, it has been shown to have reasonable validity (Blanchard et al., 1981).

Those girls who received individual treatment experienced a significant reduction in headache activity (as measured by the Headache Index) from Baseline to the 3 month Follow-Up, compared to those girls in the attention placebo condition. These results provide evidence for the generalized effectiveness of a combined relaxation and cognitive training program in the treatment of adolescent migraine, regardless of initial level of headache severity.

In the Richter et al. study, the relaxation and cognitive programs proved effective only for those children with high severity headache. In that study, participants in the active treatment conditions were given either a relaxation training or a cognitive skills training program, whereas in the current study, the active treatment programs included both relaxation and cognitive skills training. It is possible that subjects with high severity headache in the Richter et al. study were more highly motivated to make the best use they could of whatever form of treatment was offered (either relaxation or cognitive training) simply because they were in more pain and were more desperate to find some means to alleviate it. Low severity headache patients, on the other hand, may have been less highly motivated to make use of a specific form of treatment, particularly if it didn't seem to provide immediate benefit. However, it is possible that when the low severity patients in the current study were offered a more comprehensive treatment package, they may have been more inclined to pick and choose those components from the larger package that seemed to work best for them. It is possible, then, that some of the low severity patients in the Richter et al. study simply did not find the specific treatment program offered to them as compelling or as useful as did the high severity patients. This might explain why, in the Richter et al. study, the low severity patients (as a group) did not show significant improvement on Headache Index and Frequency, while the high severity subjects did.

The relationships between headache severity and treatment outcome have yet to be spelled out clearly in the existing research. Previous research with adult migraine patients has yielded conflicting results regarding the effectiveness of relaxation training with high versus low severity headache patients. While Bakal et al. (1981) reported that patients with almost continual pain were the most refractory to treatment, Gauthier and Marshall (1978) suggested that relaxation techniques may be effective only in the case of severe migraine. Further research is needed, with severity as an a priori grouping factor, and different forms of treatment, both individually and group administered, before the complex relationships between headache severity, treatment administration and treatment outcome can be more clearly delineated, in samples of children, adolescents and adults.

In that changes in Headache Frequency occurred in the absence of any specific treatment intervention (as reported above) in the current study, it might be hypothesized that the active components of the treatment program had their greatest influence on Headache Duration and/or Intensity (the other two aspects of headache activity that are used to form the composite Headache Index score).

There were no significant differences in Headache Duration between girls who received individual treatment and girls in the attention placebo group, but as the reader may recall from the Results section, this test just failed to reach significance at the .05 level. Thus, some reduction in Headache Duration possible did occur for this group. Further research is needed to confirm this suggested finding, perhaps with a larger sample, and/or through using a methodology that reduces within-group variability.

One might hypothesize that avoidance of particular headache triggers is beneficial in reducing the likelihood that a headache will begin (Headache Frequency), if in fact such avoidance of headache triggers was responsible for the decrease in Headache Frequency in the current study. However, it may be that implementation of a specific relaxation or cognitive technique is required in order to either shorten the Duration of the headache, or reduce the subjective experience of the pain of the headache (Headache Intensity). Further research as described above (including a waiting-list control group with no emphasis on headache triggers) is required to clarify the results of the Headache Frequency data in this study.

Those girls who received the group administered treatment program did not experience a significant reduction in Headache Index scores as compared to girls in the attention placebo condition. To further investigate this failure to find significant differences between the group treatment and attention placebo conditions, the post hoc analyses described earlier were conducted. That is, subjects were split at the median of the Baseline Headache Index into high and low severity groups. When this was done, a significant interaction was found between treatment condition, time and severity on the Headache Duration variable. Further investigation of this significant 3-way interaction led to the suggestion that girls with low severity headache who received group treatment did reduce their Headache Duration over time, as compared to those in the attention placebo condition. However, girls with high severity headache who received group treatment did not. The test of this specific complex contrast was significant only at the .10 alpha level, and thus, only suggests the possibility that such differences between the low and high severity groups do exist. Further research is required to clarify this possibility.

In order to suggest a possible explanation of the differential effects of the relaxation and cognitive training programs on various aspects of headache activity found in this study, the following should be considered:

(1) the Headache Index is algebraically a multiplicative product of Headache Frequency, Duration and Intensity,

(2) there was a significant reduction in Headache Frequency across all groups,

(3) those girls in the individual treatment condition experienced a significant reduction in the Headache Index scores over time as compared to the control group,

(4) those girls in the individual treatment condition experienced a nearly significant reduction in Headache Duration over time as compared to the control group,

(5) those girls in the group treatment condition (with initial low severity headache) experienced a nearly significant reduction in Headache Duration over time as compared to the control group.

One possible explanation suggested by these findings is that while Headache Frequency can be reduced primarily through an educational component, providing active treatment in small groups can in addition serve to decrease Headache Duration, at least with low severity headache patients. Providing treatment on an individual basis may in fact be required to affect perceived Intensity of headache pain. As mentioned above, the experience of pain is a very private and subjective phenomena, and as such may be less amenable to forms of treatment that are less individually focused. It is also possible that the differential impact of treatment condition on the several headache variables simply reflects different levels of sensitivity to treatment among these variables. Another possibility is that these measures of headache activity are in fact inadequate to accurately and reliably reflect real headache activity.

The results of the analyses (a priori and post hoc) of Headache Index and Headache Duration do suggest that those girls with high severity headache are more likely to benefit from an individually administered treatment program, while those with low severity headache can benefit from either individually or group administered treatment. Again, further research, with severity included as an a priori blocking variable, inclusion of a waiting-list control group, and with a larger sample size, is needed to clarify the relationships between headache severity, form of treatment administration, and treatment outcome.

The implications of such a potential interaction between initial headache severity and form of treatment administration are very important for treatment planning. If headache patients can be reliably pre-selected for individual or group treatment based on initial level of headache severity, limited resources can be optimally allocated to effect the greatest change for the largest number of patients. In any clinical setting, optimal allocation of limited resources is very important.

No significant differences were found between the individually and group administered treatment programs. The post hoc analyses that were conducted, in which a severity factor was created as a blocking variable, indicated that on the measures of Headache Index and Headache Duration, this failure to find differences occurred primarily because some of those in the group administered programs (the low severity girls) did in fact show reductions in headache activity, while others (the high severity girls) did not. Thus, the overall differences between the individually and group administered treatment conditions were not statistically significant. On none of the Headache variables did girls in the group administered treatment programs show greater reductions in headache activity than did girls in the individually administered programs. Again, further research with severity as an a priori grouping factor, including a waiting-list control group, might help to clarity potential differences between group and individually administered treatment.

Finally, it is possible that the therapist's greater experience in conducting individual as compared to group therapy may have had some differential impact on the 2 treatment conditions. While the treatment programs per se (both group and individual) involved the teaching of specific skills rather than the exploring of deeper psychological issues, it is conceivable that different levels of experience with individual versus group therapy could have affected the outcome of these programs. This issue could be addressed in future research through the inclusion of therapists with similar levels of experience in providing both group and individual treatment of a psychological nature.

Relationships Between Headache Activity and Anxiety, Depression, and Personality Variables

There was very little evidence of significant relationships between headache activity and measures of anxiety, depression and personality variables.

There were no changes observed in State Anxiety from Baseline to Follow-Up. This may primarily reflect the method of test administration used, in which each subject was asked to imagine a particularly stressful situation for her, personally, and then respond to questions about how she would immediately feel if she were in that situation. The interventions taught in the treatment program were taught more as coping strategies, or means of dealing with feelings that arose during stressful situations or headaches, rather than as methods for altering one's very immediate response to such stressful situations. Thus, it is not surprising that significant changes in participants' immediate reactions to imagined stressful situations were not observed.

The significant overall reduction in Trait Anxiety from Baseline to Follow-Up, across all groups, suggests that all 3 interventions were equally effective in reducing general levels of anxiety. Alternatively, such a finding could mean that no treatment condition was specifically effective, and that some external variable, such as passage of time, was responsible for the change. Given that there was a significant decrease in Headache Frequency across groups over time, it is possible that this was accompanied by a true decrease in general anxiety as girls felt some degree of relief from their headaches. Statements made by many of the girls in each of the 3 treatment conditions, at the end of treatment, indicated that many of them felt that they were more in control of their headaches. Along with such a sense of increased control, there may well have been a decrease in general anxiety.

Of course, the coexistence of decreased Headache Frequency and decreased Trait Anxiety scores does not provide any information about the direction of causality, or even whether the two variables are directly related. The possibility exists that the changes in both variables are in fact a function of their relationships to some third unknown variable. In the current study, in the active treatment conditions, subjects were specifically taught various relaxation and cognitive coping skills to help them reduce stress and tension arising from headaches in particular, and also from day-to-day life experiences in general. Those girls in the attention placebo condition were taught the importance of recognizing, accepting and expressing a wide range of feelings as a means for reducing stress in their lives. Thus, while the primary focus of all treatment conditions was to reduce headache activity, this was done within the overall context of a 'stress reduction' model. Thus, this existence of a general decrease in Trait Anxiety over time is really not totally unexpected.

In order to truly determine a direction of causality between Headache Frequency and Trait Anxiety, one would have to design a study wherein the influence of external variables could be held constant and either Headache Frequency or Trait Anxiety could be experimentally manipulated, in turn to observe the impact of the manipulation of one on the other. To date, there is no research evidence available to clearly confirm direction of causality between anxiety and headache activity, or the effect of another variable(s) on both.

There were small but statistically significant positive correlations between depression scores at Baseline, and Headache Index scores at Baseline and Follow-Up. Higher headache activity levels at Baseline and Follow-Up were associated with higher initial levels of depression, suggesting the possibility either that increased headache activity results in increased depression, or that increased depression results in greater headache activity. However, these results were strictly correlational in nature, and thus do not offer any causal explanations. Furthermore, given that these correlations only accounted for 6 - 10%

of the observed variance, one must be cautious in making definitive statements about such findings. Furthermore, there was no evidence of a significant relationship between headache activity at Follow-Up and depressions scores at Follow-Up, indicating that the existence of a relationship between depression and headache activity is not clearly and consistently confirmed in the current study.

In the Richter et al. (1986) study, small negative correlations were reported between Baseline levels of headache activity and Baseline depression scores, and also between Follow-Up levels of headache activity and Follow-Up depression scores, findings that appear to contradict those observed in the current study. Richter et al. used a different measure of depression than was used in the current study, and this may account for the different findings. Richter et al. used the Children's Depression Rating Scale, developed by Poznanski (Poznanski et al., 1979), an observer-scored scale which is completed after a structured interview, while this study used a self-report measure of depression symptomatology.

Richter et al. also reported significant correlations between headache activity change scores (from Baseline to Post-Treatment, and from Baseline to Follow-Up), and depression scores, indicating that children with more depression at Baseline showed more decrease in headache activity over time, than did children with lower depression scores. In the current study, there were no significant correlations between change in headache activity over time, and depression scores at any period. The contradictory results found in these two studies suggest that caution must be exercised in interpreting any potential relationships between headache activity and depression until such time as the reasons for these findings are discovered or explained. To date, the general headache literature has yielded similar confusing and contradictory results. Perhaps it is time to attempt to develop a really adequate methodology and measurement system to experimentally investigate the relationships among these variables.

A significant overall decrease in depression scores (regardless of treatment group membership) was observed from Baseline to Follow-Up, as was the case with the Trait Anxiety scores. Richter et al. similarly reported a general decrease in depression over time, across all groups. Again, given the general decrease in Headache Frequency over time, this finding on the depression scale may simply reflect the fact that reduced Headache Frequency results in less depression. Of course, the nature of these data does not clearly permit a causal statement in one direction or the other, and it is possible that the co-existence of decreased Headache Frequency and decreased depression scores indicates that less depression results in fewer headaches, or that the decreases are a function of the operation of some unknown variable(s).

There were no significant differences between groups over time, on any of the subscales of the personality measure. Nor were there any particularly elevated scales to confirm the existence of a certain personality characteristic in this sample of female adolescent migraine sufferers. Again, these findings tend to support current beliefs that a migraine 'personality' per se does not exist (Henry-Gutt & Rees, 1973; Harrison, 1975; McGrath, 1983), and that this is not an adequate explanatory model for migraine headache.

Theoretical Explanations for the Efficacy of the Treatment Programs

Given that a combined program of relaxation training and cognitive training was effective in reducing overall headache activity among those female adolescent migraine sufferers who received individually administered treatment, compared to an attention placebo condition, a theoretical explanation for the efficacy of this program must be discussed.

Given the results of the Pre-Treatment and Post-Treatment credibility ratings described above, it is unlikely that differences in expectations for improvement can account for the observed differences in headache activity between treatment conditions. Several other nonspecific factors, such as therapist contact, and a subjective sense of ongoing active involvement in a treatment program, were also controlled for in the use of the attention placebo condition in this study.

Early explanations for the changes in migraine headache activity observed following biofeedback interventions suggested that alterations in blood flow were primarily responsible for the success of these treatments. That is, through hand warming techniques, it was believed that subjects learned how to alter blood flow in such a way as to affect cerebral circulation and thus reduce the vasodilation that contributed to the pain of the migraine. However, this explanation has been seriously challenged recently by repeated demonstrations that the acquisition of the targetted response is not essential for clinical improvement.

More recent theories have postulated the existence of certain behavioral and cognitive mechanisms that account for the changes in migraine activity seen following various behavioral and cognitive interventions.

Cohen et al. (1980) and Blanchard et al. (1980) have strongly supported a theory suggesting that a basic relaxation response and a concomitant decrease in autonomic arousal, is the final common pathway by which differing migraine treatments have their effect. In the current study, such a relaxation response could have been achieved either through the musculoskeletal relaxation exercises that were taught, or through several of the cognitive coping exercises, such as learning to use attention diversion or fantasy and imagery to control the perception of pain.

In the current study, there was no attempt made to specifically evaluate to what degree participants actually learned and subsequently made use of the various treatment techniques that were taught. Future research should investigate this more closely. In our study, the girls were given weekly homework assignments, and these were reviewed at the beginning of every session. Although every effort was made to encourage girls to practice the techniques they were taught by discussing specific times and locations for such practice, in truth, no records of these activities were kept. Follow-up studies should do this, as this may clarify some of the ambiguities both in the current study and in those described in the literature.

For any treatment intervention to be successful, the program content and the therapist must be able to elicit sufficient motivation from the participant to ensure adequate compliance with the demands of the program. At times, good clinical judgement is required to detect the early signs of diminishing motivation, and then, good clinical skills may be necessary to identify and hopefully alter the situation.

In the current study, clinical judgement and skills were often used to maintain motivation and compliance in the participants. This may account, in part, for the very low treatment drop-out rates reported earlier, as well as the generally very high compliance with the basic demands of the programs, although, again, variables such as actual practice time, were not directly monitored or recorded at the time. However, it is believed that participants did in fact comply with the majority of homework assignments and general practice requests.

Recent research that has attempted to correlate physiological measures of relaxation with successful use of these techniques in reducing headache activity has produced contradictory findings. Also, there does not appear to be a specific methodology available for evaluating the acquisition of cognitive coping skills, beyond checking homework assignments and reviewing subjects' understanding and use of the skills on a regular basis throughout the program. Again, measurement and/or methodological improvements in future research would help to remedy this.

A second theoretical explanation for reduction in headache activity following certain behavioral interventions is that subjects acquire one or more specific coping skills that may be applied to general stressors, or to headaches in particular. In the current study, a repertoire of coping skills was taught. Participants were encouraged to practice each one for a certain length of time, and after that were advised to choose those that worked best for them individually and attempt to integrate these into their daily living routines. Again, as noted above, there was no formal evaluation of the degree to which girls learned and subsequently practiced these skills.

It is suspected that each girl ended up putting together her own particular 'package' of most useful skills (from the entire repertoire that was taught) for dealing with her headache pain. Again, comments made by many of the girls at various points in the treatment program, suggested that this was the case. These statements themselves may constitute important clinical evidence for the effectiveness of multi-component treatment programs, although of course, evaluating the effectiveness of any individual component is very difficult to do under such circumstances. This again raises questions that can only be answered by appropriate systematic research to discover and/or tease these components out.

A third theoretical explanation for reduction in headache activity is that participants experienced cognitive or attitudinal changes in their appraisal of the self and environmental demands, similar to Bandura's (1982) concept of an emerging perception of self-efficacy. Although not formally evaluated in this study, many of the participants spontaneously made comments, both during and after the end of the treatment program, that reflected an increased sense of control over their headaches in particular, and over certain stresses in general. Given that all participants in an active treatment condition received training both in relaxation and cognitive coping skills, it is not, at this time, possible to pinpoint which particular skills led to this increased sense of control, if in fact participants did achieve some increased sense of control over their headaches. In future research, inclusion of a formal measure for assessing perceived control over headaches in particular, and over stresses in general, both at Pre- and Post-Treatment periods, could provide some very useful information about the role that such perceived control may play in affecting treatment outcome.

In the current study, it would appear that these potential explanations of the mechanism for change in headache activity did not occur singly. Rather, based on the comments that many participants made at the end of the program, both spontaneously, and in response to a short questionnaire (Appendix R) about the effectiveness of the program, it would appear that (1) achieving a general relaxation response, (2) acquiring one or more specific coping skills, and (3) making cognitive or attitudinal changes in the appraisal of the self and environmental demands, may have all occurred to some extent. In some combination, they may have resulted in the overall improvement in headache activity for the girls in the individually administered treatment program in this study.

Until we are able to accurately determine, in advance of beginning treatment, the best treatment approach for a particular individual patient with a particular pattern of presenting symptoms, offering several active treatment components (known to be effective for certain populations) may be the most efficacious way to reduce overall headache activity (Headache Frequency, Duration and Intensity combined) for migraine patients. This has been the clear choice of procedure for Mitchell and Mitchell (1971) and Mitchell and White (1977). In the pediatric migraine literature, there are several examples of multi-component treatment programs (Andrasik et al., 1984; Labbe and

Williamson, 1984; Menegan et al., 1984; and Richter et al., 1986), and while the authors don't always specifically state their reasons for including several active treatment components, one might suspect that, at this time, they also believe that a multi-component approach is likely to be the most effective approach in treating their migraine patients.

Although this study does not provide any further information regarding the important clinical question of most appropriate intervention for which particular subject, some light has been shed on the question of individual versus group treatment for adolescent migraine. There is a strong indication that female adolescents with low severity headache can be treated successfully in individual or group administered treatment, while those with high severity headache are more likely to require individual treatment. This has important implications for the planning of treatment interventions, and allows a therapist to assign patients to one form of treatment or another based on the pattern of headache data obtained during some Baseline or other preliminary examination period. When financial resources are scarce, this finding can in fact help make the best use of limited funds in treating a population of adolescent migraine patients. Further research is needed to determine if the same holds true for childhood or adult migraine patients.

Conclusions and Implications for Future Research

The results of this study generally confirm that a combined treatment program of relaxation and cognitive training administered individually is effective in reducing overall headache activity among female adolescent migraine sufferers. Only tentative evidence is offered that such a combined treatment program can be administered effectively to small groups. While individually administered treatment was generally effective for both high and low severity headache patients, the data suggested that group administered treatment was more likely to be effective for those patients with low severity headache, but not so for those with high severity headache. Further research is required to more clearly describe this relationship between headache severity, mode of treatment administration and treatment effectiveness.

Several limitations of the current study have been presented above, and will be summarized again here for further consideration. First, it is impossible to determine exactly what the effects may have been in having the roles of primary researcher and treatment therapist both filled by one individual who had a personal investment in the outcome of the research. Certainly an optimal alternative would be to explore the same questions addressed in this study under conditions of less potential confounding between the roles of primary researcher and therapist(s). Ideally, multiple therapists should be used to administer the treatment programs in order to control for any specific therapeutic or personality characteristics that may exist within a single therapist, and that may account for some common percentage of the variance of change across all groups.

As described above in the 'Method' section, there was a change in the method of collecting headache data from the Baseline period to the Post-Treatment and Follow-Up periods. While such a change should not have adversely affected the between-groups analyses that were subsequently conducted on these data, it would be preferable to maintain continuity in format of data collection throughout the entire study.

It is this author's recommendation that further efforts be made to use the 'phone-in' data reporting system that was used during the Baseline period in this study. Compliance was initially excellent (for approximately 5-6 weeks) and one is assured of obtaining headache data that are reliably provided on a daily basis. If participants are required to report headache data in this manner for no more than 4 weeks at a time, this author suspects that high rates of compliance could be achieved at all phases of a treatment program, i.e. Baseline, Post-Treatment, and Follow-Up. However, further research needs to be conducted with such a data reporting format to verify its reliability and subject compliance rates. At this point, it does appear to be a promising tool for collecting headache data.

Compliance to correct completion of the written daily headache diary is still unknown, and it is virtually impossible to measure accurately. An interesting study for future research on assessment of headache activity would be a comparison of these two methods of headache data gathering — the written headache diary (usually completed for a week or longer at a time), and the daily phone-in system of reporting headache activity. Perhaps a parent could be involved in making direct observations of headache symptomatology as an external check on accuracy of reporting.

Andrasik, Burke, Attanasio and Rosenblum (1985) have recently completed a study of parental observation of pain behaviors in children. They reported that children and parents alike overreported the existence of headache symptomatology in investigative interview situations, as compared to the information these same patients provided in a month of systematic diary recordings. Parents' and children's ratings of peak headache intensity, both prior to and following behavioral treatment, were highly similar, while ratings of headache frequency were quite dissimilar before treatment, but not after treatment.

Andrasik et al. (1985) concluded that these results provide some limited but useful evidence of the reliability and validity of the written headache diary for obtaining information about children's headaches. Similar research is needed with the daily phone-in system of headache reporting in order to compare the respective reliabilities of the two reporting formats. It would be interesting to explore whether the specific type of headache data collection resulted in the reporting of more or fewer headaches.

Inclusion of a waiting-list control group is also recommended for further research investigating group versus individual administration of a behavioral treatment program for migraine. While the effectiveness of individually administered behavioral treatment for migraine, as compared to a waiting-list control group, has been amply documented, such is not the case in evaluating the effectiveness of group administered programs. Furthermore, the inclusion of such a waiting-list control group would be helpful in attempting to clarify the complex relationships between headache severity, mode of treatment administration and treatment outcome. The relative effectiveness of different sized groups (eg. of 6-8 members) should also be investigated as there is some literature that suggests that this may be an important variable.

Further research is also needed to clarify the differential impact of treatment intervention on different aspects of headache activity, i.e. Headache Duration, Frequency, Intensity, and Headache Index (which is a composite measure of these three). In fact, the appropriate way of arithmetically combining these components also requires further investigation. In an effort to determine which measure of headache activity is in fact the most clinically significant, it might be useful to gather data directly from migraine patients themselves in a questionnaire or semi-structured interview format. Comparability of results between studies would be greatly facilitated if all researchers in the field were using the same dependent headache variables.

In an effort to better understand the mechanisms responsible for change in headache activity following a particular treatment intervention, it would be most useful to have access to some kind of reliable measure of particpants' own perceptions of what was most beneficial to them in the program. In particular, a reliable and valid measure of children's and adolescents' perceptions of self-efficacy, or ability to have some control over stressful events (headaches, or other events) could provide some useful answers regarding the actual effect of this perceived increased sense of control. The importance of acquiring an increased sense of control over headaches and headache pain has been reported anecdotally both in this study and in the Richter et al. study.

Although continuing evaluation of the effectiveness of individual treatment components to reduce headache activity may well provide some valuable information in this field, this author would prefer to see more research focused in the direction of determining the most appropriate treatment intervention for particular headache patients. If subjects could be pre-selected for specific forms of intervention (relaxation or cognitive training), based on some preliminary assessment of suitability for a particular type of treatment, valuable and frequently limited resources could provide effective service to a greater number of headache patients.

The issue of accurate and reliable diagnostic and classifcation criteria for migraine headache continues to be a controversial one. While the recommendations made in 1962 by the Ad Hoc Committee on the Classification of Headache have been used quite extensively in migraine research, Bakal and his associates (1982) have seriously questioned the the reliability of these criteria, and suggest that they cannot necessarily be used to accurately distinquish between migraine and muscle contraction headache. In fact, Bakal (1982) has proposed a severity model of headache, suggesting that both muscle contraction and vascular symptoms occur in clinical patients, and as the severity of the headache disorder increases, so does the involvement of both types of symptoms. Bakal (1982) also points out that the traditional classification criteria for migraine fail to acknowledge and address the psychological aspects of this disorder.

In the current study, many girls did report both muscle contraction and vascular symptoms with their headaches, although all had formally received a diagnosis of migraine (classical, common or mixed) by a staff neurologist at the Children's Hospital of Eastern Ontario, where the study took place. Given the lack of a clearly defined symptom picture among the migrainous adolescents in this study, one must seriously question the adequacy of the traditional classification criteria, both for purposes of diagnosis, and for defining inclusion/exclusion criteria in future research studies. It is important that research continue on this issue of classification and diagnosis of headache disorders. Until there is general and widespread agreement among researchers in the field, regarding the issue of headache diagnosis, the comparability of results across studies will always be limited.

Finally, as this is the first study to compare the effects of individually versus group administered treatment with migraine patients, the results reported above must be interpreted with some caution. Further research with groups, as suggested above, is needed to provide definitive answers regarding the benefit of individual versus group treatment for this population. Specific recommendations for future research include: remove any potential effects of the confounding of primary investigator/therapist roles by hiring different individuals (from the primary investigator) to provide the treatment programs; employ multiple therapists to administer the treatment programs to control for any specific individual personality or therapeutic characteristics within a single therapist that may have a generalized effect across all groups; include therapists with fairly equal training and experience in conducting individual and group therapy; include a waiting-list control group to separate out the impact of regular therapist contact; use one format of headache data collection throughout all phases of the program; conduct further research into the reliability of the daily phone-in headache data gathering format as compared to the weekly written diary; include some formal measure with adequate reliability and validity of participants' perceived sense of control over their headaches in particular, and over their environment in general; explore some means of assessing migraine patients' own perceptions as to what would constitute a meaningful change in headache activity for them — including which specific headache variables (Frequency, Duration, Intensity) they would most like to see change over time, as a function of treatment; include severity as an a priori blocking factor, in order to more fully investigate the complex relationships between headache severity, mode of treatment administration, and treatment outcome; vary the size of groups to investigate if this alters the group process and consequently the effects on the different headache indices; and, repeat the study in a geographical area that might be more representative of the general population, rather than an area with a disproportionate number of civil service employees.

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APPENDIX A

Initial Letter to Family Physicians and Pediatricians

Initial Letter to Family Physicians and Pediatricians

Dear Dr.

We are requesting your continued assistance in recruiting subjects for our ongoing studies to determine the efficacy of psychological treatments in the treatment of migraine in participantren.

Our initial results are promising and we will be sending you a report in the next few months.

At this time, the criteria for patients to be included in the research are:

(1) Females aged 12 to 17 years.

(2) Recurrent migraine headaches for the past three months or longer.

(3) Headaches occurring a minimum of once a week.

(4) Not having started new medication within the previous two months.

(5) Headaches not linked to specific foods or the menstrual cycle.

The study has been approved by the Research Committee of the Children's Hospital of Eastern Ontario, and will be conducted at the Children's Hospital under the auspices of the Department of Psychology and the Division of Neurology by Drs. McGrath, Humphreys, Keene, Goodman and Firestone. Each adolescent included in the project will be examined by a neurologist.

You may refer children to this treatment study by calling the DEPARTMENT OF PSYCHOLOGY at 737-2492 or by referring to the NEUROLOGY SERVICE.

Further information can be obtained by contacting Dr. McGrath at the above number.

Yours sincerely,

Patrick McGrath, Ph.D.
Department of Psychology

Peter Humphreys, M.D.C.M., FRCP(C)
Head, Neurology Service

APPENDIX B

Second Letter to Family Physicians and Pediatricians

Second Letter to Family Physicians and Pediatricians

Dear Dr.

We are sending this brief note to let you know that we are still accepting referrals of teenage children with migraine headaches to the migraine treatment program currently offered through the Psychology Department in collaboration with the Division of Neurology.

Basically, the program involves the teaching of various stress reduction techniques to reduce the frequency and severity of headaches. These techniques have previously been used quite successfully with adult migraine sufferers. The several criteria for participation in the program include:

(1) 12-17 years of age at the time of the referral.

(2) Headaches have been occurring for 3 months or longer and currently average 1 or more per week.

(3) No new medication has been adMinistered within the past two months.

(4) Headaches are not specifically linked to diet, allergies or the menstrual cycle.

If you currently have any patients that you feel might benefit from such a treatment program, please refer them to me here in the Psychology Department. If you have any questions about the program, I can be reached at 737-2492.

Thank you.

Yours sincerely,

Patrick McGrath, Ph.D.
Psychologist

APPENDIX C

Initial Phone Contact

Initial Phone Contact

Hello Mrs./Mr. _______. This is Karen Davies phoning from the Children's Hospital. Your doctor, Dr. _______ , has contacted us and indicated that you might be interested in having your daughter, _______, take part in a study under the direction of Dr. McGrath here at the Children's Hospital to investigate methods of treatment of headaches in teenage children.

What this will involve is a neurological examination here at the hospital and a period of 4 weeks during which _______ will keep a record of her headaches, followed by weekly 1 hour visits to the Children's Hospital for 12 weeks. We will make every effort to arrange these visits at times that are suitable for you and your daughter.

We will also want _______ to keep a record of her headaches for a month following the 12 weeks of treatment, and again for 4 more weeks, 2 months after the treatment is finished. The treatment will consist of psychological behavioral therapy rather than medical intervention. We know that a lot of parents and doctors are concerned about treating headaches with drugs over an extended period of time, and so in this study we are evaluating the effectiveness of different kinds of non-drug treatments. There will also be some questionnaires for you and _______ to fill out at various points throughout the program.

Would you be interested in coming in for an appointment so that I can give you more details and answer any questions that you or your daughter might have? Good! Can you and _______ come in at _______ (date and time)?

APPENDIX D

Informed Consent

Informed Consent

There are a considerable number of adolescent girls who suffer from migraine headaches, and many of them experience frequent headaches that interfere with a variety of their everyday activities, including school. Parents and physicians prefer not to place these girls on medication for long periods of time, and thus other treatment alternatives are presently being investigated.

Drs. Humphreys and Keene of the Division of Neurology, and Drs. McGrath and Goodman of the Department of Psychology are evaluating treatments of migraine among adolescent girls (12-17 years). The psychological treatments include several relaxation techniques, cognitive restructuring techniques, different ways of describing and understanding headache, and techniques for coping with stress. The participants will be requested to phone in (to a telephone answering machine) specific information about their headaches, on a daily basis, throughout the duration of the study, and will complete some psychological tests at the beginning and end of the study.

After an initial 4 weeks (baseline) of phoning in headache data, participants will be randomly assigned to one of three treatment conditions: (1) individual treatment for 12 weekly sessions, (2) group treatment A for 12 weekly sessions, or (3) group treatment B for 12 weekly sessions. Following this 12 week period, all participants will continue to phone in headache information for a follow up period of 4 weeks. Participants will also be required to phone in headache information for a final 4 week period beginning 2 months after they complete the treatment program.

All discussions between therapist and adolescents will be kept in confidence. You may withdraw from this study at any time without affecting the availability of future treatment from the hospital. Any questions or comments you have may be directed at any time to Dr. McGrath or any member of the study at 737-2492.

I am informed of, and agree to participate in this study.

Adolescent's Signature: ____________________

I am informed of, and agree to have ______________ participate in this study.
(adolescent's name)

Date: ______________ Parent's Signature: ____________________

Witness: ______________ Relationship to Child: ____________________

APPENDIX E

Pediatric History Interview

Pediatric History Interview

1. Participant's Name: ______________________
   (first) (last)

2. Participant's Initials: ___ ___ ___

3. Participant's Birthdate: ___ ___ ___
   day mo yr

4. First and last name of participant's father: ____________

5. What is his highest level of education? ____________

6. What is his occupation? ____________

7. First and last name of participant's mother: ____________

8. What is her highest level of education? ____________

9. What is her occupation? ____________

10. Was this participant adopted? ________ (1 = yes, 2 = no)

11. What sex is the participant? ________ (1 = male, 2 = female)

12. What is your relationship to the participant? ________
    1 = mother, 2 = father, 3 = other relative
    4 = parent by adoption, 5 = person unrelated to the participant

13. What is this participant's age in years? ________

14. What is the participant's grade level? ________
    P = preschool, K = kindergarten
    For grades 1-13, enter the appropriate number.

15. What is the participant's first language? ________
    1 = English, 2 = French, 3 = Native-Canadian
    4 = Other, 5 = don't know

16. What is the participant's rank in the family? ________
    (2/3 means the second participant of three)

17. Does this participant have any of these sleeping problems?

    1. bad dreams or nightmares
    2. sleep walking
    3. head banging
    4. difficulty in getting to sleep
    5. other sleep problems
    6. don't know
    7. none of the above

18. How is the participant's progress in school?

    1. repeated 2 or more grades
    2. repeated 1 grade
    3. normal progress
    4. accelerated one grade
    5. special class
    6. don't know

19. Has she ever attended a special class for

    1. slow learners
    2. learning disabilities
    3. emotionally disturbed
    4. gifted
    5. other
    6. don't know
    7. no special class

Answers to the following quesitons should be made separately for:

a. pre-school years
b. school years, not including the past year
c. for the past year

20. Was this participant allergic to

    1. milk
    2. dust/pollen
    3. other foods
    4. animals
    5. other allergies
    6. don't know
    7. no allergies

    a. during the pre-school years? ____________________
    b. during the school years? ____________________
    c. during the past year? ____________________

21. Has she had nausea at times other than when sick, for example with the flu?

    1. only once
    2. occasionally
    3. about once/month
    4. about once/week
    5. almost every day
    6. don't know
    7. not at all

    a. during the pre-school years? ____________________
    b. during the school years? ____________________
    c. during the past year? ____________________

22. How severe was the nausea?

    1. complained of discomfort
    2. required medication
    3. required bed rest
    4. required medical consultation
    5. don't know

    a. during the pre-school years? ____________________
    b. during the school years? ____________________
    c. during the past year? ____________________

23. Has the participant suffered from vomiting, at times other than when sick?

1. only once
2. occasionally
3. about once/month
4. about once/week
5. almost every day
6. don't know
7. not at all

a. during the pre-school years? ______________
b. during the school years? ______________
c. during the past year? ______________

24. How severe was the vomiting?

1. complained of discomfort
2. required medication
3. required bed rest
4. required medical consultation
5. don't know

a. during the pre-school years? ______________
b. during the school years? ______________
c. during the past year? ______________

25. Was this participant constipated?

1. only once
2. occasionally
3. about once/month
4. about once/week
5. almost every day
6. don't know
7. not at all

a. during the pre-school years? ______________
b. during the school years? ______________
c. during the past year? ______________

26. How severe was the constipation?

1. no constipation
2. 2-3 days between bowel movements
3. 4-7 days between bowel movements
4. more than 7 days between bowel movements
5. don't know

a. during the pre-school years? ______________
b. during the school years? ______________
c. during the past year? ______________

27. Did the participant have diarrhea?

1. only once
2. occasionally
3. about once/month
4. about once/week
5. almost every day
6. don't know
7. not at all

a. during the pre-school years? ______________
b. during the school years? ______________
c. during the past year? ______________

28. How severe was the diarrhea?

1. 1-2 days
2. 3-7 days
3. more than 7 days
4. don't know

a. during the pre-school years? ____________________
b. during the school years? ________________________
c. during the past year? ___________________________

29. Has there ever been any blood in the participant's bowel movements?

1. only once
2. occasionally
3. about once/month
4. about once/week
5. almost every day
6. don't know
7. not at all

a. during the pre-school years? ____________________
b. during the school years? ________________________
c. during the past year? ___________________________

30. Has the participant had any of the following?

1. growing pains
2. car or other motion sickness
3. poor appetite
4. breath holding spells
5. fainting spells
6. convulsions
7. serious illness or hospitalization
8. don't know
9. none of the above

a. during the pre-school years? ____________________
b. during the school years? ________________________
c. during the past year? ___________________________

31. Did this participant complain of stomach pains?

1. only once
2. occasionally
3. about once/month
4. about once/week
5. almost every day
6. don't know
7. not at all

a. during the pre-school years? ____________________
b. during the school years? ________________________
c. during the past year? ___________________________

32. How severe were the stomach pains?

1. complained of discomfort
2. required medication
3. required bed rest
4. required medical consultation
5. don't know

a. during the pre-school years? ____________________
b. during the school years? ________________________
c. during the past year? ___________________________

33. How long did the stomach pains last?

1. a few seconds
2. less than 15 minutes
3. 15-30 minutes
4. 30-60 minutes
5. more than an hour
6. more than a day
7. ongoing
8. don't know

a. during the pre-school years? ____________________
b. during the school years? ____________________
c. during the past year? ____________________

34. What was the location of the stomach pain?

1. upper right abdomen
2. upper left abdomen
3. lower right abdomen
4. lower left abdomen
5. in the middle above the belly button
6. in the middle below the belly button
7. all around
8. don't know
9. all over abdomen

a. during the pre-school years? ____________________
b. during the school years? ____________________
c. during the past year? ____________________

35. When did the stomach pains occur?

1. usually at school
2. usually at home
3. usually when out somewhere
4. at no specific time
5. don't know

a. during the pre-school years? ____________________
b. during the school years? ____________________
c. during the past year? ____________________

36. Did the participant suffer from headaches?

1. only once
2. occasionally
3. about once/month
4. about once/week
5. almost every day
6. don't know
7. not at all

a. during the pre-school years? ____________________
b. during the school years? ____________________
c. during the past year? ____________________

37. How severe were these headaches?

1. complained of discomfort
2. required medication
3. required bed rest
4. required medical consultation
5. don't know

a. during the pre-school years? ____________________
b. during the school years? ____________________
c. during the past year? ____________________

38. How long did the headaches last?

1. a few seconds
2. less than 15 minutes
3. 15-30 minutes
4. 30-60 minutes
5. 1-3 hours
6. more than 3 hours
7. more than one day
8. ongoing
9. don't know

a. during the pre-school years? ______________________
b. during the school years? __________________________
c. during the past year? _____________________________

39. Where were the headaches usually located?

1. pain around or behind the eyes
2. pain across the forehead
3. pain at the temples
4. pain at the back of the head
5. pain at the top of the head
6. pain at the back of the neck
7. pain at the sides of the head
8. generalized overall head pain
9. don't know

a. during the pre-school years? ______________________
b. during the school years? __________________________
c. during the past year? _____________________________

40. Did the headaches occur

1. always on both sides of the head
2. always only on the right side
3. always only on the left side
4. sometimes on the right and other times on both sides
5. sometimes on the left and other times on both sides
6. sometimes only on the right and sometimes only on the left side
7. sometimes only on the right and sometimes only on the left side and sometimes on both sides
8. don't know

a. during the pre-school years? ______________________
b. during the school years? __________________________
c. during the past year? _____________________________

41. Describe the family situation.

1. both natural parents at home
2. one natural parent at home
3. one natural parent and one step parent
4. foster home
5. living with friends or relatives
6. adopted parents
7. don't know

42. Have any of this participant's brothers or sisters had problems in any of these areas?

1. speech	6. mental retardation
2. learning or reading problems	7. general health
3. emotional adjustment	8. don't know
4. vision	9. none of the above
5. hearing	

43. Have any of this participant's close relatives - parents, grand parents, brothers, or sisters - ever had any of the following?

1. diabetes	4. inherited disorder
2. nervous or mental disorders	5. don't know
3. heart disease or abnormality	6. none of the above

APPENDIX F

Migraine Headache Activity Card

Migraine Headache Activity Card

Headache at any of the following times today?
- Breakfast
- Lunch
- Supper
- Bedtime

At what specific times did you have a headache?

Did you take any medication for the headache(s)?
If so, what did you take for which headache?

Did you notice any other symptoms at the time of the headache(s)?
If so, what were they?

Do you have any ideas about what might have caused the headache(s)?
If so, what are your ideas?

Any additional comments or remarks?

Intensity Ratings (for each headache)

Ø = no headache

1 = slight headache - I am only aware of it if I pay attention to it

2 = mild headache - I can ignore it at times

3 = painful headache - I can't ignore it but I can do my usual activities

4 = severe headache - it's difficult for me to concentrate, I can only do easy activities

5 = very severe headache - such that I can't do anything

APPENDIX G

Current Headache Description

Current Headache Description

These questions refer to the headaches you have had in the past 4 weeks. Try and think about the headaches you have had during the past 4 weeks.

Q1. Do your headaches sometimes prevent you from doing such things as:

1. being with friends
2. school work
3. sleeping
4. reading or other quiet things you like to do by yourself?
5. watching TV
6. eating
7. don't know

Q2. What type of pain is your headache? Can you describe it?

1. steady
2. throbbing or pounding
3. dull
4. shooting
5. burning
6. squeezing or constricting
7. feels like something other than these things (describe)? ________
____

Q3. When you have a headache, do you ever feel:

1. dizzy
2. ringing in your ears
3. tingling in hands or feet
4. cold or numbness in hands or feet
5. like you want to be in the dark
6. like you want everything to be quiet
7. clumsy
8. don't know how it feels

Q4. Do you ever have any of these things when you have a headache?

1. nausea - feel like throwing up
2. vomiting - actually throwing up
3. stomach pain
4. constipation
5. diarrhea
6. trouble walking
7. trouble talking
8. don't know

Q5. When you have a headache, do you ever:

1. find things look blurry
2. see spots
3. see double
4. see coloured rings around things
5. have red, droopy or glazed eyes
6. have a stiff or painful neck
7. have trouble swallowing
8. don't know if you have any of these things

Q6. When you have a headache, do you ever:

1. blush, feel hot or have a fever
2. sweat a lot
3. get cold and clammy
4. blackout or faint
5. find your heart is beating fast
6. don't know if you feel any of these things

Q7. During a headache do you ever feel:

1. restless
2. irritable
3. upset
4. tired
5. depressed
6. extra energy
7. confused or have trouble thinking clearly
8. don't know

Q8. Can you sometimes tell when you are going to have a headache? Do you have any warning before it starts?

1. I see things differently
2. I hear things differently
3. I feel down, or very tired
4. I feel high or very energetic
5. I feel extra good
6. I feel silly
7. I feel different, not like myself, or have another symptom, such as ____________________
8. don't know

Q9. Does sleep make your headaches better?

1. always
2. sometimes
3. don't know
4. no, sleep doesn't help

Q1Ø. When you have a headache, does medication make it better?

1. always
2. sometimes
3. don't know
4. no, pills don't help

Q11. Do you think any of these things would cause your headaches?

1. allergies or certain foods ____________
2. change in the weather
3. being depressed or unhappy
4. being upset, afraid or angry
5. too much exercise
6. not enough sleep
7. being hungry
8. don't know if any of these things cause a headache

Q12. Do any of these things sometimes cause the headaches?

1. wind
2. music
3. loud noises
4. other noises
5. television
6. car travel
7. don't know

Q13. Would any of these things cause a headache?

1. sun
2. bright lights
3. glare
4. blinking lights
5. hot weather
6. cold weather
7. stormy weather
8. don't know

Q14. When are the headaches worse?

1. in the morning
2. in the afternoon
3. at night before bed
4. during the night, the pain wakes me up
5. at home
6. at school
7. don't know

Q15. How long do your headaches usually last?

1. a few seconds
2. less than 15 minutes
3. 15-30 minutes
4. 30-60 minutes
5. 1-3 hours
6. more than 3 hours
7. more than 1 day
8. ongoing
8. don't know

Q16. Where is the headache pain?

1. around or behind your eyes
2. across your forehead
3. beside your eyes at the temples
4. at the back of your head
5. at the top of your head
6. at the back of your neck
7. at the sides of your head
8. pain all over the head
9. don't know

Q17. Are the headaches:

1. always on both sides of the head
2. always on the right side
3. always on the left side
4. sometimes on the right and other times on both sides
5. sometimes on the left and other times on both sides
6. sometimes on the right and sometimes on the left side
7. sometimes on the right, sometimes on the left, sometimes on both sides
8. don't know

APPENDIX H

Rationale for Psychologically-Based Treatment of Migraine

Rationale for Psychologically-Based Treatment of Migraine

1. Causes of migraine

   a) Today we're going to talk about some of the causes of migraine headaches and what we can do about them.

   b) Migraine runs in certain families and some people inherit a tendency to develop migraine headaches.

   c) There are many different factors involved in migraine, both physical and emotional (give some examples), and one of the important ones, we believe, is stress. Let me explain.

2. Relationship between stress, bodily reactions, and migraine.

   a) Stress is a normal part of life, normal experience for every one, (give some examples of normal everyday stresses, i.e. tests at school, arguments with family or friends, etc.).

   b) For people with migraine, normal stresses and emotional upsets of everyday living can sometimes bring on a headache.

   c) Stress affects us physically by causing muscle tension, and chemical reactions that cause blood flow changes by making the blood vessels contract too much, then swell and expand too much.

   d) Muscle tension and swollen blood vessels cause the pain of headache.

   e) Pain itself causes more stress and tension and this makes the pain of the migraine even worse.

   f) By learning how to reduce stress in our lives, and to reduce our reactions to normal everyday stresses, we can reduce the likelihood of a migraine attack occurring.

   g) Do you understand how we think migraines can happen? Can you tell me simply in your own words?

APPENDIX I

Rationale for Individual and Group Behavioral Treatment Conditions

Rationale for Individual and Group Behavioral Treatment Conditions

1. Use of Relaxation techniques.

   a) The relaxation exercises that I am going to teach you over the next few weeks are designed to reduce tension and emotional stress which will have the effect of reducing the pain of a headache, and also the number of headaches that occur.

   b) In progressive relaxation you are taught to relax your whole body by individually relaxing all the different muscle groups.

   c) Relaxation is the opposite of stress and tension - therefore relaxation of muscle tension in the body acts to reduce stress.

   d) This method can be used to reduce stress in a particularly upsetting situation by blocking the strong emotional reactions that result in the physical changes in the blood vessels.

   e) This method can also be used to reduce the tension experienced from the pain of the headache and therefore reduce the severity of the pain.

   f) Does this make sense to you? Can you tell me how relaxation can help your headaches?

2. Use of 'Thinking Straight' techniques.

   a) Also, over the next few weeks, I'm going to teach you some 'Thinking Straight' techniques that you will be able to use to reduce the stress and tension that you sometimes feel.

   b) This will also help to prevent the changes in the blood vessels and the muscle tension that causes the pain of migraine.

   c) And this will help reduce the amount of pain you have and the number of headaches you get.

3. Relationship of self-talk, stress, and strong emotional reactions.

   a) To learn Thinking Straight, you'll need to pay attention to the things that you think or say to yourself in your head. This is called self-talk.

   b) Stress is partly the result of what we say to ourselves in our heads about our experiences and especially about our problems.

   c) So self-talk has an effect on how we feel. It's very important in contributing to good or bad feelings like joy or anger or resentment.

   d) This means that self-talk contributes to the strong emotional reactions that affect migraine headaches.

4. What is Thinking Straight?

   a) Thinking Straight is a method of changing your thoughts and attitudes by changing what you say to yourself in your head (self-talk).

   b) You will learn to think positive or good thoughts that work for you instead of negative or bad thoughts that make things worse.

   c) You will also learn to use self-talk to improve how you handle problems.

   d) I will show you how to come up with other ideas on how to handle problems in your head and choose the best way for each problem.

   e) Learning to Think Straight about your experiences and problems will lead to less stress and tension.

   f) Thinking Straight can be used to reduce stress in particularly upsetting situations and this will block the strong emotional reactions that lead to the swollen blood vessels and headaches.

   g) Thinking Straight can also be used to reduce the stress and upset of having a headache and so reduce the pain.

5. Checking the adolescent's understanding of the rationale.

   a) Tell me simply in your own words how Relaxation and Thinking Straight both work, and how they will help migraine headaches.

APPENDIX J

Rationale of Stress Reduction Placebo Control Condition

Rationale of Stress Reduction Placebo Control Condition

1. Use of Stress Reduction Techniques

a) We think that feelings or emotions can play an important part in the stress we feel.

b) Furthermore, if we don't really understand our emotions, this can cause us to feel more stress.

c) And if we sometimes don't express our feelings - that is, if we don't find some appropriate way to let our feelings out, then this can cause us to fell tense after a while.

d) So the stress and tension that we sometimes have because of our feelings can cause more headaches.

e) Over the next few weeks, we'll be doing something called stress reduction training.

f) You'll learn about how you react in different situations and how you get different feelings.

g) This will lead to a deeper understanding of feelings and emotions and will give you a better understanding of your own feelings.

h) You will also learn how to express some of your feelings more openly and easily.

i) When you know some more about your own emotions and how you get different feelings, and also how to express some of your feelings more easily, you'll feel less stress and your body can be less tense.

j) You can use your Stress Reduction Training in any upsetting situation. It can help you to block the strong emotional reactions that increase stress and tension and cause headaches.

k) Learning Stress Reduction Techniques will also help you to cope with a headache by helping you to reduce the tension you feel from the pain of a headache.

l) Do you have any questions?

m) Can you tell me in your own words how we think Stress Reduction Training works?

APPENDIX K

Treatment Manual

Individual and Group Behavioral Treatment Conditions

Treatment Manual

Individual and Group Behavioral Treatment Conditions

Treatment Session 1

1. For those participants who are in the group treatment condition, the first session is primarily an introductory session, during which they have an opportunity to meet one another, introduce themselves to each other, and share some information with one another about their own individual headache experiences.

The participants are asked to provide a little bit of background about themselves, eg. how old they are, what school they attend, what grade they are in, interests and hobbies, etc.

They are also asked to provide some historical information about their headaches, eg. when they first started, how long they have had migraines, what they've usually done about them in the past, what worked and what didn't work, etc.

We review how the Phone-In Headache Diaries have been going in general, and the participants are asked to make any comments or suggestions they might have regarding the diaries. I stress the importance of keeping these diaries on a daily basis and thank them for their continuing cooperation.

We briefly review the treatment rationales that were given during the second appointment, regarding the relaxation and Thinking Straight techniques, and the participants are informed that there will be weekly 'homework' assignments directly related to the skills they learn during the treatment sessions.

We discuss what will be done about missed sessions - specifically the requirement that if a session is missed, the participant must come in sometime during the week for an individual make-up session, and that no more than 2 sessions should be missed out of the total 10.

The only homework assignment from this first session is that participants in the group condition make a list of the names of all the other group members, and memorize those names over the next week. Also, they are asked to associate each name with some identifying feature or characteristic of each participant.

2. For those participants who are in the individual treatment condition, the same general information is requested and discussed, but of course, all interaction is limited to the therapist and the participant.

Any questions are answered and the appointment time for the next week is confirmed.

Treatment Session 2

1. Review of Rationale for Relaxation Training (see Appendix I).

2. Relaxation Overview.

a) Starting today, we'll do some deep breathing and a complete body relaxation exercise.

b) While doing the relaxation exercise today, you might feel some funny feelings in your body and that's O.K. You might feel tingling in your arms or legs, or you might feel cool or a little light-headed or a little strange.

c) Deep breathing is an important part of relaxation. It feels relaxing to breathe deeply. Demonstrate with a sigh. It feels good to sigh.

d) When you're doing deep breathing think of relaxation flowing in with each breath, and tension flowing out as you let each breath out.

e) Practice together with a few long deep relaxing breaths.

f) We will pay attention to all the important muscle groups in the body. First, we'll create tension in a muscle and then we'll relax it. This way, you will learn how to recognize tension in your muscles.

3. Demonstration

a) Demonstrate: Make a fist and squeeze tight. Squeeze hard until it hurts. Now let go. Let your hand go limp. Let the muscles relax. Feel how the tension is released and your hand relaxes.

b) This is how tension causes pain. This kind of muscle tension can cause the pain of your headaches.

c) Check relaxation in arm - keep your arm and hand relaxed while I lift it.

d) Demonstrate other body movements used in exercise:

hand, arm
shoulders up, back, forward
head to each side, forward
jaw clenched (note: not enough to cause pain)
eyebrows up, feel scalp
stomach in, out
thigh, lower leg, toes up, toes down

4. Relaxation Exercise

a) Record this on a tape that each participant can take home with her for practice sessions during the week.

b) "Make yourself comfortable. Begin relaxation exercise by breath ing slowly with deep breaths. Breathe relaxation in and breathe tension out".

c) Proceed with the progressive relaxation exercise in the following order.

d) Use such tension and relaxation terms as:

TENSION PHRASE	RELAXATION PHRASE
create some tension....	release the tension....
tense the muscles in....	feel the muscles relax....
tighten the muscles in....	feel the muscles loosen....
feel the muscles pulling in..	notice your arm (leg, etc.) feels heavier
feel the muscles tensing in..	notice how relaxed it feels.... notice the muscles are softer or looser.... notice how calm and peaceful....

e) Order of relaxation of parts of the body

left hand
left arm (press wrist down)
right hand
right arm
shoulders up towards ears
pull shoulders back
pull shoulders forward
right ear towards right shoulder
left ear towards left shoulder
head forward, chin to chest
feel how relaxed your shoulders and neck are
clench jaw, when relaxed let your tongue fall to the bottom of your mouth
screw up face, purse lips
eyebrows up, crinkle forehead, feel scalp
notice relaxation in arms, shoulders, neck and head, allow relaxation to flow down your body
breathe slowly, deeply, relaxation in, tension out
hold breath in
hold breath out
hold stomach in
hold stomach out
left thigh
right thigh
lower left leg, push down
lower right leg, push down
left foot, toes up
left foot, toes down
right foot, toes up
right foot, toes down

f) "Feel relaxation throughout body. Breathe slowly and deeply. Breathe in relaxation, breathe out tension".

g) "Now I'm going to count backwards from 5. Let your muscles stay calm, peaceful and relaxed and come out of the deep relaxed state and open your eyes. 5, 4, 3, 2, 1...."

h) Discuss how relaxation felt.

5. Review Rationale

a) Can you tell me again how relaxation can help your headaches?

6. Homework

a) Do the relaxation exercises at least once a day with your tape.

b) Discuss where and when might be the best place and time to do the relaxation exercise on a regular basis.

7. Closing

a) Confirm session time for next week.

b) Provide continuing encouragement to phone in headache information.

Treatment Session 3

1. Review of Rationale.

a) Stress and body changes, headache as stressor.

b) Can you describe how we think you get a headache, and how relaxation can help?

2. Relaxation Homework Check.

a) When did you do the relaxation exercises? How often? Where? How did it feel?

b) Were there any parts of your body that you couldn't relax very well? Were there some parts that were easier to relax than others?

3. Relaxation Without the Tension Phase.

a) Today we will try another type of relaxation exercise and we'll make another tape.

b) You have been practicing how to tense and then relax the different muscles in your body.

c) So now you should have a good idea of how different your muscles feel when they are tense and when they are relaxed.

d) In today's exercise we'll pay attention to each of the important muscles and relax them , without tensing them first.

4. Relaxation Exercise.

a) Record this on the reverse side of the cassette used in the last session.

b) "Make yourself comfortable. Begin relaxing by breathing slowly with deep breaths. Breathe relaxation in and breathe tension out".

c) Use such relaxation terms as:

release the tension....
let the muscles relax....
let the muscles loosen....
let the muscles soften....
notice your arms (legs, etc.) feel heavier....
notice how calm and peaceful....
notice the muscles are softer and looser....
let the relaxation flow....
notice how relaxed it feels....

d) Proceed with the progressive relaxation in the following order:

left hand	notice relaxation in arms, shoulders, neck and head
left arm	allow relaxation to flow down your body
right hand	breathe slowly and deeply, relaxation in, tension out
right arm	relax chest and stomach muscles
shoulders, let them droop	left leg
muscles in neck	right leg
jaw, let your tongue fall to the bottom of your mouth	left foot
face and cheeks	right foot
eyebrows and forehead	
scalp	

e) "Feel the relaxation throughout your body. Let the relaxation flow from the top of your head to the bottom of your feet. Let the tension flow out with the breath and breathe in relaxation".

f) "Pretend that you are lying on a beach. You can feel the warm sun shining on your body. Your arms and legs feel very heavy, like they are sinking into the warm sand. All your muscles feel soft and warm. Your whole body feels relaxed and calm and peaceful".

g) "Now I'm going to count backwards from 5. Let your muscles stay calm, peaceful and relaxed. Come out of the deep relaxation state and open your eyes. 5, 4, 3, 2, 1....."

5. Homework Instructions.

a) Do a relaxation exercise at least once a day. Practice with this side of the tape this week, and next week, you can choose which side you wish to continue with.

6. Closing.

a) Confirm session time for next week.

b) Provide continuing encouragement to phone in headache information.

Treatment Session 4

1. Relaxation Homework Check

a) How did you like this second form of relaxation as compared to the one we did 2 weeks ago?

b) When did you do the exercises and where? Everyday?

c) Were there any parts of your body that you couldn't relax, or were much more difficult to relax than other parts?

2. Review of Rationale for Thinking Straight Program (Appendix I).

3. Today we'll start to work on how self-talk works and how you can use it to cope with stress.

4. Remember we said that emotional reactions can be the result of self-talk or what we say in our heads. I'll give you an example of how it can work. Think of a subject at school that gives you the most difficulty.

5. Setting Up the Situation.

a) Let's say you're having a test in __________ today. You studied after school yesterday but not last night. A friend called and invited you out to a concert. She had free tickets and you couldn't pass that up, so you went and you didn't get any further studying done.

b) Today is the test. You go into the classroom; sit at your desk; the teacher passes out the test. You read it quickly and wouldn't you know it — you don't understand the first question.

c) Right away you're down on yourself. You say negative things such as "I don't know this stuff at all, I didn't study enough, I'm going to flunk, the teacher will think I'm stupid, my mother will be furious", etc. Do any of these thoughts sound familiar to you?

d) As you're saying all these things to yourself, how would you probably feel? (upset, unhappy, embarrassed, etc.?)

e) What if you said positive things? for example, "I'll leave that question out and come back to it later. I've been doing this stuff all month and I know it quite well. I'll start with what I know and maybe I'll get the other one later. One question is not going to make that much difference. I'll do my best and my best is usually O.K.

f) This is what we call Thinking Straight.

g) How would you feel then? More comfortable, eager to get started, relieved? What else?

h) Right. That's how self-talk can make you feel better. When you say positive things, you feel less upset, less stress.

6. Set up another example(s) using actual experiences of the partici-pant(s).

a) Let's try that again with something that has happened to (one of) you.

b) What sometimes happens to (one of) you that causes you to get upset or tense? Maybe you get butterflies in your stomach, or you feel really nervous or your hands get cold and clammy, or maybe you become flushed and flustered?

c) What would you say to yourself?

d) So it seems that you're saying a lot of negative things.

e) How does that make you feel?

f) So it seems that when you say negative things you really feel bad.

g) What could you say to yourself that could make you feel better? (Model if necessary).

7. Repeat the process above using another example or examples, until the participant(s) seems comfortable with the approach.

8. Summary of Thinking Straight as a Method of Coping with Stress.

a) Let's just review how Thinking Straight works.

b) Goal of program is to learn to cope with stress by changing thoughts and attitudes. We call that Thinking Straight.

c) This method involves substituting positive or good thoughts for negative or bad thoughts.

d) This leads to good feelings rather than bad ones and helps you to cope with a problem.

e) Also, this can help you learn to reason through a problem and figure it out in your head so that you can choose the best action to take.

f) This new approach to problems can result in less stress and therefore, less migraine.

g) The method works in all kinds of situations, and can also be used to cope with migraine. We'll talk more about that in later sessions.

h) We'll do Thinking Straight exercises by exaMining self-talk in many situations, how you felt afterwards, how it worked out. If it didn't work out well, you'll learn what you could say to yourself to make things work out better.

9. Use of Thinking Straight Diary.

a) I'd like you to start practicing Thinking Straight at home.

b) I'll give you a Thinking Straight Diary which you can use to help you. This will give you a place to record what happened in simple language, noting all important details (with whom, where, when, what).

c) I'd like you to record thoughts or self-talk, and feelings. Then you'll have a record of types of self-talk and their effects, so that you can see how this happens and works in everyday life experiences.

10. Homework Instructions

a) Every day before bedtime, take a few minutes to review in your thoughts what happened that day. Remember what you thought, what you felt, how it worked out.

b) Twice during the week, if you felt upset or stressed about something, describe the situation in your Diary. Also write down everything you said in your head and how you felt. If nothing upset you, choose something that didn't work out well, and use it instead.

c) Once in the week, describe what happened when you had a headache. Write down what you said to yourself about the headache and how you felt.

Note: If the participant is unable to identify an upsetting situation, ask if she has ever been bothered by one of the following:

1. Giving a talk in front of the class.
2. Having a part in a school play. Parents and friends are attending. You forget your lines and become flustered.
3. Talking to a new friend and not knowing what to say.
4. Going to the dentist to have a tooth pulled and worrying about it.
5. Not being invited to a party and a lot of friends are going.

d) At least 4 times a week, practice one of the two relaxation exercises that you have learned. Choose the one that you enjoy the most, or that seems to be most useful for you.

11. Closing.

a) Confirm treatment session time next week. Provide continuing encouragement to phone in headache information.

Thinking Straight Diary

Name:		Date:
What happended that upset you or made you tense?	What did you say to yourself in your head about it?	How did you feel?
1.		
2.		
3.		

Treatment Session 5

1. Review rationale for treatment. The role of stress and physical changes. The role of headache as a stressor.

2. Review role of role of self-talk in stress. Review of homework from last week, regarding self-talk and relaxation exercises.

a) What you say to yourself in your head can cause stress, bad feelings and bodily changes that cause migraine. Often, you can control migraine by getting rid of negative thoughts and ideas and substituting positive thoughts, i.e. thoughts that can work better for you.

b) Now let's look at your homework and see if you can do that. Review each situation, self-talk and how participant felt. What could you say to yourself that would work better?

c) Good. You can also say __________ (therapist gives some other ideas, other positive self-talk examples).

d) How do you think you'd feel then?

e) Did you practice the relaxation exercises? How often, when? Did you decide which side of the tape you prefer to use? Are you finding that it is getting easier to relax with the tape?

3. Role of 'Crooked Thoughts' in Negative Self-Talk.

a) Experience with many kids and adults has shown that behind negative thoughts or ideas we often find Crooked Thoughts. By Crooked Thoughts we mean certain beliefs or ideas that don't help us but work against us.

b) For example, some kids think that they have to do everything perfectly and they get really upset if they don't.
Or some kids think that everybody has to love them all the time, and they get very upset if someone criticizes them.
Another Crooked Thought that lots of kids have is that other people cause their problems, and there's nothing they can do about it.

c) Let's look at your homework and see if you have ideas like that sometimes. The focus is on relating negative cognition or thoughts to Crooked Thoughts, associated feeling and outcome. The therapist will try to state Crooked Thoughts as a broad principle which is specific to the participant's situation, but will permit generalization.

d) Often we find that kids have Crooked Thoughts because they expect too much of themselves or their parents (relate to participant's homework, if appropriate). Or they attach too much importance to everything that happens to them. Or, they say things that just make the situation worse instead of things that will help them to work it out. Does that make any sense to you?

e) so you see, sometimes we can feel bad about something, but it doesn't mean it's going to be a disaster for us. How we feel and what will happen can be quite different. And we can change how we feel by Thinking Straight.

4. Coping Self-Talk for a Headache

a) Now let's look at what you say to yourself when you have a headache. Imagine you're beginning to get a headache (use Imagery to evoke situation). What do you think about? What do you say to yourself?

b) How do you feel? When you feel upset about getting a headache and you're worried and tense about it, the pain will be worse and last longer.

c) You can cope with your headache by Thinking Straight. If you think positively about your headache, it won't hurt so much, and it may go away faster.

d) Here are some positive things you can say to yourself when you have a headache. Provide this list (see next page) of coping self-talk statements to the participant(s).

e) Have you ever said anything like that to yourself? Which ones do you think might help you?

f) For the next week, I'd like you to try saying these things when you have a headache, and see how it works.

5. Discussion of Homework

a) I'd like you to write down two situations that upset you, just like you did last week.

b) This time I'd like you to think of what's wrong with what you're saying. Are you exaggerating the problem? Is it as bad as you think it is? Then write down some positive thoughts that might work better. Take each negative thought and try to turn it around.

c) Also, do the same thing with headaches. Write down what you usually say and then try to change that to something more positive that you could say that would help you handle the headache.

d) Continue to practice one form of Full Body Relaxation at least 3 times this coming week.

6. Closing.

a) Confirm time for treatment session for next week.

b) Provide continuing encouragement to phone in headache information.

COPING SELF-STATEMENTS

I AT THE BEGINNING OF A HEADACHE

a) What is it I have to do? I can cope with this headache.
b) I can use my Thinking Straight to help me cope. I'll just think of the things I can do.
c) I can cope with this headache. I can make a plan to deal with it and adjust my other plans.
d) Don't worry! Worrying won't help anything. Just think about what you have to do and follow the plan.
e) I can handle it. I've had lots of headaches before. I won't let it get to me.

II TO COPE WITH THE PAIN

a) I can think of the pain as a test. I'll just take one step at a time and follow my plan.
b) I can handle the pain. I'll just relax, take it easy and do the best I can.
c) I won't think about the pain. I'll think about what I can do about it and do it.
d) Now don't panic. If I can get through the next fifteen minutes I'll be all right. I'll just think about what I need to do.
e) There, I did it! Now I can handle the next fifteen minutes. I'll follow my plan.

III TO COPE WITH THE SCARY FEELINGS

a) When the pain comes, I'll just stop and keep thinking about what I have to do.
b) Don't panic. Try to tune out the pain and tune in to something else.
c) Don't try to get rid of the pain. Just keep it under control. Take it one step at a time and it'll be all right.
d) It's not going well. I'll review my plan and try another strategy.
e) I won't let crooked thoughts mess me up. I'll just focus on Thinking Straight.

IV BEING NICE TO YOURSELF

a) I'm making it! I'll pass the test. I can handle it now.
b) I did it! I passed the test and I feel good about it. The next time will be easier.
c) I'm doing pretty well. It's not as hard as I thought. I'm doing better all the time.

Treatment Session 6

1. Review of Homework on Stress Situations.

a) Check especially for quality of positive thoughts.

b) Discuss difficulties. Identify Crooked Thoughts. Use role playing or modelling to illustrate how to counter.

c) Focus on outcome which follows positive thoughts versus negative thoughts.

2. How to Learn to Think Straight.

a) A good trick to stop Thinking Crooked is to ask yourself some questions whenever you catch yourself doing it:

1. Am I reading the situation right, or am I making a mountain out of a molehill?
2. Am I underestimating my ability to handle it?
3. What are the chances of it working out as bad as I'm afraid it will?
4. What if it does? What will probably happen?
5. What can I say that will work better?

b) Let's try doing this with some of your homework.

3. Review and Elaboration of Thinking Straight for Headches.

a) Check how it worked. Model more appropriate cognitions if there are difficulties.

b) Review list of self-talk statements given last week to cope with headache.

4. Introduction to Partial Relaxation

a) This week we're going to learn a new relaxation exercise. We call this one Partial Relaxation.

b) Partial Relaxation is something you can do to keep your body relaxed when you are doing other activities.

c) With Partial Relaxation, you will learn to let some parts of your body be relaxed and to use only the muscles that you need for what you are doing.

d) This will keep your muscles from tensing too much and let your body stay relaxed and help you to have fewer headaches.

5. Modelling Partial Relaxation

I Walking

a) Demonstrate walking across the room keeping your muscles very stiff and tense in an exaggerated way.

b) Ask the participant to point out to you the muscle parts that are too tense and that could be relaxed.

c) Relax the muscles as she points them out and continue until you are walking with a relaxed walk.

d) Discuss with the participant how some muscles must be tensed in order to stand upright and to walk, but other muscles can be relaxed while walking.

e) Stress relaxing arms, shoulders, jaw and face muscles while walking.

f) Ask the participant(s) to try walking in a relaxed way.

g) Check that her arms, shoulders, jaw and face muscles are relaxed.

II Writing

a) Demonstrate writing while sitting at the desk with stiff, tense muscles, in your legs, arms, fingers, shoulders, jaw and face.

b) Ask the participant to point out parts of your body that could be relaxed and relax these as she mentions them.

c) Discuss how arms and finger muscles must be tensed to write but not too tense.

d) Muscles in the other arm, shoulders, jaw, face and legs can be very relaxed.

e) Ask the participant to try writing in a relaxed way. (Make up some arithmetic questions or sentences to copy).

f) Check that her writing hand is not too tense. Suggest holding the pen loosely and pressing lightly when writing.

III Watching T.V.

a) Demonstrate sitting in a chair with muscles unnecessarily tensed.

b) Ask the participant to point out parts of your body that could be relaxed and relax these as she mentions them.

c) Ask the participant to sit in a relaxed way and check for unnecessarily tensed muscles, as above.

6. When to do Partial Relaxation.

a) It is important to remember to tense only the muslces that are needed to do what you are doing - walking, writing, watching T.V., or whatever.

b) Do you think you'll be able to do this? How will you remember to do the Partial Relaxation exercises when you are walking, writing or watching T.V.? Discuss environmental clues and reminders the participant could use to remember to do Partial Relaxation.

c) Does the Partial Relaxation exercise make sense to you? Can you tell me how we think it will help your headaches?

7. Homework Instructions.

a) Practice Partial Relaxation exercises at least 3 times a day, while walking, writing and watching T.V. Decide with the participant when, during each day, she is going to practice the Partial Relaxation exercises.

b) Each night before going to bed, think back over the day, and think about some examples of positive and negative self-statements that you used, and how you felt after telling yourself these positive and negative things.

8. Closing.

a) Confirm time for session next week.

b) Provide continuing encouragement to phone in headache information.

Treatment Session 7

1. Review of Homework.

a) Practice in application of cognitive techniques. Present problem requiring countering negative cognitions with positive cognitions. Use some problem situation(s) that the participant(s) has come across herself. Encourage participant to generate some of her own ideas for positive statements to use to counter the negative ones.

b) Review coping statements to use when participant has a headache. Discuss situations in which she has tried to use these statements, and how she felt afterwards.

c) Review practice of Partial Relaxation exercises. What Partial Relaxation exercises did you use? When did you do these, and how did you remember to do them? How could you remember to do these more often?

2. Introduction to Mini Relaxation Exercise.

a) Today you'll learn about Mini-Relaxation.

b) This exercise is like the Full Body Relaxation, but it's much shorter. In fact, it only takes about 15 seconds, and you can do it without anybody knowing that you are doing a relaxation exercise.

c) A Mini-Relaxation helps to relieve the tension in your body and make it more relaxed and calm.

d) You can do a Mini-Relaxation exercise if you feel yourself getting uptight or upset about something, or when you want to settle down to work at school, or anytime, just for fun.

3. Demonstration.

a) Mini-Relaxation is like a sigh. (Demonstrate a sigh). Sighing feels good.

b) In a Mini-Relaxation exercise you take a deep breath and let it out slowly. As you let your breath out, let all the stress and tension flow out of your body. Relax all your muscles. First, just practice with me taking a very deep breath, and slowly letting the breath out.

c) Take a breath and then feel the stress and tension flowing out of your body as you let the breath out.

d) How did that feel?

e) Remember to relax the muscles in your arms, shoulders, jaw and face, especially. Let's do it again. This time, as you let the breath out, count slowly backwards from five. When you reach one, let your lungs fill back up with air, and feel how relaxed and calm and peaceful your body feels.

f) Demonstrate this for the participant, then do a Mini-Relaxation with her. Check the participant's arms, shoulders, jaw and face to see that they are relaxed.

g) You can do Mini-Relaxation very quietly without anyone knowing.

h) Mini-Relaxations are also a way of reminding your body that it's better to be in a relaxed state than to be tense.

i) If you do it often during the day you can keep your body more relaxed and you'll feel less stress and tension.

j) When would be a good time of the day for you to do a Mini-Relaxation? Discuss 3 specific times during the day when the participant will practice this technique, eg.

i) when sitting down at desk at school after break or at the beginning of each class,

ii) when sitting down to eat,

iii) when waiting in line for something,

iv) when you find yourself getting upset, angry or frustrated.

4. Review Rationale.

a) Does the Mini-Relaxation exercise make sense to you?

b) Can you tell me how it will help your headaches?

5. Review of Partial Relaxation.

a) Show me how you would sit relaxed as you are watching T.V. or reading a book. Check that the participant's arms, legs, shoulders, jaw and face are relaxed.

b) How would you walk in a relaxed way? Check that arms, shoulders, jaw and face are relaxed.

c) Show me how you do Partial Relaxation exercises when you are at your desk writing. Check that appropriate body parts are relaxed.

d) When are some other times that your body is tense, that you could do Partial Relaxation?

6. Homework Instructions.

a) Do a Full Relaxation exercise 3 times this next week. You might want to try doing a Full Relaxation exercise without the tape. This way, if you end up somewhere without your tape recorder, and you are feeling very tense, you could take yourself through the exercise.

b) Do Partial Relaxation exercises when walking, writing, watching T.V. and any other time you notice that some muscles you are not using are tense.

c) Do Mini-Relaxation exercises according to the times discussed above.

7. Closing.

a) Confirm appointment time next week.

b) Continue to provide encouragement to phone in daily headache information.

Treatment Session 8

1. Review of Homework.

a) Did you do the 3 Full Relaxation exercises? Did you try it without the tape? When did you do the exercises? Which do you prefer to use — the tension-relaxation method or the straight relaxation method? Were there any parts of your body that you had trouble relaxing? Discuss these.

b) What Partial Relaxation exercises did you do? When did you do them? What helped you remember to do them? Did you notice any other time that you were tensing muscles unnecessarily? How could you better remember to do Partial Relaxation exercises throughout your day?

c) Did you practice Mini-Relaxations? When did you do these? How does a Mini-Relaxation exercise make you feel? Can you think of any other times that it would good for you to do the Mini-Relaxation exercises?

2. Using Attention Deployment for Headaches.

a) Today, we're going to learn another technique for changing the way we think. There are other ways you can control your headaches by changing what you think about.

b) A good way to do this is to change what you pay attention to. Instead of thinking about your pain, you can think of other things.

c) We know that pain is reduced, or can even disappear, when we don't pay attention to it, but think of other things. This is because we can usually only really pay attention to one thing at a time.

d) Have you ever seen someone get badly cut, perhaps in a hockey or football game? Often the person goes on playing, and he doesn't seem to realize he's cut until he sees some blood. Only then does it begin to hurt. That's because he's now aware of the injury.

e) Has anything like that ever happened to you? Discuss a situation that the participant recalls.

f) You can deal with the pain of a migraine the same way. That is, you can use your attention to help you control the pain. We'll do some exercises to teach you how to direct your attention to other things. O.K.?

3. Exercises for Attention Deployment.

a) Close your eyes, take a deep breath, relax and make yourself as comfortable as possible. Now let your attention go wherever it wants.

b) Attention is like a searchlight. Just let it wander around until it fixes on someting. When your attention stops on something, say out loud .... "I am aware of...." and finish the sentence.

c) Where is your attention? Is it on your body, or outside your body, somewhere in the room?

d) (If it's inside your body) Are you aware of the noises in the hall? (or flickering lights, or humming sound, etc. as appropriate). Not really, because you're attending to what's going on in your body.

e) (If it's outside your body, on external environment) Are you aware of your heart beating or your growling stomach or your cold hands, etc.? Not really, because you're attending to what's going on around you.

f) Just go on playing with your attention. Let it stop wherever it wants ..... Where is it now? Notice how things outside (or inside) fade from your attention.

g) Now, I want you to use that trick to take your attention away from your body. First pay attention to your hands. How do they feel? Are they warm or cool? Wet or dry? Notice that they feel _______. Now pay attention to the sounds in the hall. Listen to the typewriter, footsteps, voices, etc. Notice that you are less aware of how your hands feel.

h) When you have a headache you can do the same thing. You can pay attention to whatever you like to take your mind off the pain.

i) You could do this by paying attention to your breathing. Just concentrate on breathing in and out. Say "in" as you inhale, and "out" as you exhale.

j) You can also focus on other feelings in your body that you notice. For example, the beating of your heart, your pulse, or even the number of times you blink. Have the participant shift her attention to each of these, and focus on each of them for a minute or so.

k) Sometimes it's easier to pay attention to things outside us. You could pay attention to the sounds around you, or to the different colours in the room, or different kinds of materials like wood, carpet, steel, plastic, rubber, leather, etc. Have the participant attend to each of these, and have her list off the various sounds, colours and materials that she notices.

l) You can count ceiling tiles or floor tiles, or the number of pieces of furniture.

m) You can also play games in your head. For example, you can do mental arithmetic. Start with any number, add or subtract 3 (or whatever number you like) and keep doing that until you can't do anymore. Do one or two specific examples with the participant.

n) You could also play alphabet games. Do you the know the game "I packed my bag and in it I put one apple, one elephant, one telephone, one eraser, some roses, etc." (explain how it is played). You can play another variation of this game using different countries. You say, "I planned a trip around the world and first I went to Austria, then Australia, then Albany, than Yalta, etc."

o) Using these methods when you have a headache will help you to cope with the pain, so that you will feel less stressed, and experience less pain. Does that make sense to you?

4. Homework Instructions.

a) I'd like you to practice each of these different forms of Attention Diversion over the coming week. Practice at least one type every day. By the end of the week, I'd like you to decide which type(s) works the best for you, and describe it to me next week.

b) I'd also like you to try to use the Thinking Straight whenever you can when you feel a headache beginning. Remember to make a plan and try to stick to it. Then check how you're doing and be nice to yourself. Give yourself a compliment if you're doing well or some encouragement if you could do better.

c) Using the Thinking Straight Diary, I'd like you to keep a record of two times that you used the Thinking Straight ideas, and how they worked. Just write two things than happened to upset you, and what you thought and felt about it. Then write down the straight thoughts you used or would like to have used, and how that would feel.

d) Also, do the same thing for one headache.

5. Closing.

a) Confirm appointment time for next session.

b) Continue to provide encouragement to phone in daily headache information.

Treatment Session 9

1. Review of Homework.

a) Did you practice the Attention Diversion exercises I taught you last week? Which one or two did you find most helpful? Explain to me how you used it. Any problems, questions, etc. about this technique?

b) Are there any activities you like to do that sometimes take your mind off your headaches?

c) Sometimes getting involved in a really good mystery, or some other kind of book, or a game of some kind can help.

d) Try to use anything like that if it helped before, or if you think it could work.

e) Review the Thinking Straight Diary, both for the two upsetting situations, and also for the headache. Discuss alternative positive self-statements if the participant had any difficulty generating her own.

2. The Use of Fantasy and Imagery to Control the Pain.

a) Daydreaming is a method you can use to take your attention off your pain.

b) Have you ever noticed that if you get caught up in an absorbing daydream you don't really notice what's happening around you? Have the participant describe a situation like this that has happened to her.

c) Thinking about something pleasant is easier than trying not to think about the pain when you have a headache.

d) Thinking about pleasant things can also make you feel good and reduce the stress and tension of the headache.

e) A good way to do this is to "daydream on purpose", or to run a very pleasant movie in your head.

f) The more real your daydream is, the better it will work.

g) Really powerful daydreams can even cause bodily reactions, almost as if the experience were real.

h) I'll show you how that can work.

3. Preparing for the Fantasy.

a) Close your eyes, take a deep breath, relax and make yourself as comfortable as possible. Take it easy and forget what you've been thinking about.

b) Try to imagine that your mind is a movie screen and it's gone completely blank.

c) Now just listen to my voice, and try to make the image as real as you can on the movie screen.

4. Demonstration of the Lemon Fantasy.

a) On the screen you see a table with a pure white diner plate, all clean and shiny, with a bright yellow lemon on it.

b) You can see that the skin of the lemon is glistening almost as if there were dew on it. You see little bumps on the skin like goose bumps. You can almost touch the round, leathery, bumpy surface. It's very yellow and very bright against the white plate. It looks very real.

c) On the table beside the plate, there's a sharp steel knife. Pick up the knife and, holding the lemon steady, cut it through the middle. As you cut, you can feel the cool, wet, sticky juice running onto your fingers.

d) The smell fills your nose: it's sharp, tangy, tart — so sour you can almost taste it. Your nostrils open wide with the sharp, sour smell.

e) Now pick up one half, and taste it, it's so sour your mouth puckers. You taste the lemony flavour, and it's so tart you almost have to spit it out.

f) Did you smell the lemon? Did you feel your mouth pucker? What else did you feel? How real did this Fantasy seem to you?

5. Demonstraton of the Beach Fantasy.

a) Now, we're going to pretend to see a movie that makes most people feel really good, really relaxed.

b) First make yourself as comfortable as possible in your chair. Then close your eyes, and let yourself imagine the following scene on a movie screen. You're standing on a lovely white sandy beach overlooking a sparkling blue lake. Behind the beach there are cool, shady woods of pine and spruce and cedar.

c) It's a beautiful hot summer day, about noon. The sun is shining brightly. The sky is deep blue, so intense it almost doesn't look real. There are fat, white fluffy clouds drifting slowly across the sky. Watch the clouds drift lazily here and there.

d) It's a perfect summer day, absolutely beautiful, and you have nothing to do -- just laze around and enjoy yourself.

e) The sun is high in the sky, and very bright, very strong, very hot. Feel the heat on you. Feel the sun warming your skin. Feel little beads of perspiration forming on your forehead. Now there's a cool breeze gently blowing on your cheek. It feels so relaxing.

f) You start walking across the hot sand to the water. The sand is so hot your feet can hardly stand it. They're beginning to burn so you move swiftly into the water.

g) Now you feel the cool, refreshing water on your feet and legs. You laugh and dive in quickly and you feel cold, you're almost shivering.

h) You start to swim and soon you feel warmer and you're really enjoying your swim. You're all alone on the lake, except for a tiny sailboat way off in the distance. Everything is just perfect.

i) You decide to get out of the water. You want to go lie down, and enjoy the sun. You walk across the hot sand to your towel, dry off briskly, then stretch it out and lie down in the warm sun. You feel the rays of the sun tanning your skin.

j) You hear the lake gently lapping against the shore. You hear birds chirping and singing in the woods nearby.

k) The woods smell of pine and spruce, a tangy, spicy, delicious smell, sharp and refreshing. You walk into the woods, strolling slowly, aimlessly. You wander around, exploring rocks and flowers, and enjoying every moment.

l) Take a minute to really enjoy it, and then open your eyes slowly.

6. Reinforcing the Use of Fantasy to Control Pain.

a) Were the images real for you? Which images seemed more real? Which ones were harder for you to imagine?

b) Did the feelings in your body fit the daydream? Did you feel good, happy about having a truly nice day?

c) If you can become involved in a daydream like that when you have a headache, you'll find you'll be less conscious of the pain, and it won't hurt so much.

7. Homework Instructions.

a) I'd like you to try using this daydream during the coming week, and see how it works to help control the pain of a headache.

b) Also, I'd like you to make up a daydream of your own. Using some setting that you would find especially relaxing, I'd like you to make up a daydream with lots of descriptions of things you see, hear, smell, touch, and even taste. The more you can include descriptions of things you see, hear, smell, touch and taste, the more real you can make your daydream seem. Then, I want you to practice using this daydream at least once a day over the next week.

c) I want you to practice using the Attention Diversion techniques that you learned last week to help control the pain of a headache. You can specifically use the one that you found most useful for yourself.

d) I'd also like you to keep your Thinking Straight Diary again for this week. Describe two situations that happened to upset you, then write down how you felt, and what you said to yourself. Write down the negative self-talk that you started with, and then write down the positive self-talk that you used.

e) Continue to practice using the Full Relaxation exercise at least 3 times during the week. Also, continue practicing the Partial Relaxation exercises, and the Mini-Relaxation exercises every day. Remind the participant of the times that she was usually practicing these latter exercises.

Treatment Session 10

1. Review of Homework.

a) Have the participant describe the daydream that she composed to help her relax and control the pain of a headache. Help her if she had any problems doing the exercise. Help her add more descriptions of things she could see, hear, touch, smell and taste to help make the daydream seem more real.

b) Were you able to use your daydream, or the one I did with you last week to help you relax and control the pain of any of your headaches? Discuss how the daydream worked.

c) Review information from the Thinking Straight Diary. Again, provide any necessary assitance in generating positive self-statements to help counter negative self-talk.

d) Review the use of the relaxation exercises.

2. General Review of Full Body Relaxation, Partial Relaxation, and Mini-Relaxation.

a) Review the two different types of Full Body Relaxation, and discuss with the participant which one she prefers. How is one different from the other? Discuss when she practices this Full Body Relaxation, whether she does it with or without the tape, whether there are still any muscles that she has difficulty relaxing.

b) Review the use of Partial Relaxation. Describe what it is again in some detail. Have the participant demonstrate this form of relaxation, while walking, writing, sitting as though watching T.V. When does she usually try to practice this form of relaxing? Does she notice particular activities during which she seems to be more tense? How does she remember to remind herself to practice the Partial Relaxation exercise?

c) Review the use of Mini-Relaxation. Describe what it is again in some detail. Have the participant demonstrate this form of relaxation, and discuss when she has been practicing it. Does she have regular times during the day when she does Mini-Relaxations, or does she only use it in stressful situations. Encourage both.

3. Use of Relaxation Techniques in Stressful Situations.

a) Today we'll talk about ways to relax during stressful situations.

b) Remember we've talked about stress and how stress can cause more body tension and other body changes that can result in headaches.

c) Relaxation is the opposite of tension.

d) If you can remind your body to relax during a stressful time, this will reduce the amount of body tension that results from the stress.

e) And if you are less tense you will be able to avoid headaches.

f) You could use Mini-Relaxation or Partial Relaxation exercises when you are right in the middle of a stressful situation, when you start to get tense. Nobody would even know that you were doing relaxation exercises.

g) Or you could do a Full Relaxation when you're feeling really tense if you can be by yourself for a while.

4. Demonstration.

a) Let's think of a situation that might be stressful for you. This situation would probably be stressful for most people.

b) Say you're going to have a test at school. What subject gives you the most difficulty?

c) You're having a test in __________ today. You studied after school yesterday, but not last night. A friend called and invited you out to a concert. He(she) had free tickets and you couldn't pass that up, so you went. But you didn't do any more studying in the evening as you had planned.

d) Today is the test. You go into the classroom, sit at your desk, and the teacher passes out the test. You glance at it quickly and begin to get upset when you realize you don't know the first question. You can feel yourself getting really uptight and anxious and tense as you are worrying about this test.

e) What could you do to stay calm and to keep yourself from getting too tense and uptight?

i) Discuss Mini-Relaxations to relieve tension (as in a sigh) and and to keep your cool, keep you relaxed and calm. Discuss when to do Mini-Relaxation exercises and how to think of doing them when getting upset.

ii) Discuss role of Partial Relaxation exercises to practice while writing the test. Be careful to let unused muscles relax in legs, other arm, shoulders, and face. Be careful not to let the muscles in your writing hand be too tense, let them stay relaxed and calm with just enough tension to write. Discuss how to remember to do Partial Relaxation while writing the test. What could you use to trigger your memory to use this relaxation technique?

iii) Discuss regular practice with Full Relaxation exercise as a way of keeping your body relaxed and prepared to handle stressful situations.

f) How do you think you would feel during the test if you remembered to do Mini and Partial Relaxations? More relaxed, calmer, less tense, better able to think and write the test, feel less stress.

g) Let's think of another stressful situation for you. What sometimes happens to you that causes you to get upset or tense? Have the participant describe the situation, where, when, who is involved, etc...

h) Discuss how Mini and Partial Relaxation exercises could be used to enable you to stay calm, keep from getting too tense and feel less stress.

Treatment Session 11

1. General Review of Thinking Straight, Recognizing and Changing 'Crooked' Thoughts, Using Coping Statements, Attention Diversion and the Use of Fantasy and Imagery to Control the Pain of a Headache.

a) Discuss the importance of trying to stay aware of one's negative self-statements, and then countering with positive self-statements in order to change one's feelings and one's sense of being able to cope with the upsetting situation, or the headache.

b) Again, point out that the things we say to ourselves about a situation or a headache, can cause strong emotional reactions.

c) Review the typical 'Crooked Thoughts' (or irrational beliefs) that many people have, and discuss the importance of recognizing those irrational beliefs that the individual participant tends to experience. Then encourage her to try to change these counterproductive thoughts into something that will make her feel better about herself and her ability to cope with a stressful situation, or a headache.

d) Review the use of specific coping statements in response to a stressful situation, or a headache.

e) Review the use of the various Attention Diversion exercises that were taught, particularly noting the one(s) that the participant herself found to be the most useful.

f) Review the use of Fantasy and Imagery to control the pain of a headache. Review the specific daydream that the participant had composed.

2. Ask the participant to present a particularly stressful situation that she had recently found herself in, and discuss how she could use the numerous tecnniques reviewed above to reduce the stress and tension that she feels in similar situations.

a) Repeat this process with several stressful situations, and also with a headache situation.

Treatment Session 12

1. The general rationale for the treatment program is described again, (as in Appendix H).

2. The specific rationale for the relaxation and cognitive coping skills training program is described again (as in Appendix I).

3. This final session is used as a general review of all the techniques that the participant has learned to help her cope better with stressful situations in general, and with the pain of migraines in particular.

4. Participants are asked to describe which techniques they have found the most useful, and which ones have not been very useful.

5. They are encouraged to continue practicing the various relaxation and cognitive coping skills they have learned.

6. Participants are reminded of the importance of paying attention to their own specific headache triggers. They are also encouraged to control these specific triggers as much as possible.

APPENDIX L

Treatment Manual

Attention Placebo Condition

Treatment Manual

Attention Placebo Condition

Treatment Session 1

1. The first session is an introductory session, during which the participants have an opportunity to meet one another, introduce themselves to each other, and share some information with one another about their own individual headache experiences.

The participants are asked to provide a little bit of background about themselves, eg. how old they are, what school they attend, what grade they are in, interests and hobbies, etc.

They are also asked to provide some historical information about their headaches, eg. when they first started, how long they have had migraines, what they've usually done about them in the past, what worked and what didn't work, etc.

We review how the Phone-In Headache Diaries have been going in general, and the participants are asked to make any comments or suggestions they might have regarding the diaries. I stress the importance of keeping these diaries on a daily basis and thank them for their continuing cooperation.

We briefly review the treatment rationale that was given during the second assessment appointment, and the participants are informed that they will have to continue to phone in their daily headache information. Participants are asked to pay particular attention to the possible causes or triggers for their headaches, emphasizing the important role that emotional stresses can have in triggering headaches.

We discuss what will be done about missed sessions - specifically the requirement that if a session is missed, the participant must come in sometime during the week for an individual make-up session, and that no more than 2 sessions should be missed out of the total 10.

Participants are asked to make a list of the names of all the other group members, and memorize those names over the next week. They are also asked to associate each name with some identifying feature or characteristic of each participant.

2. Any questions are answered and the appointment time for the following week is confirmed.

Treatment Sessions 2-11

1. The general rationale for the treatment program is reviewed again.

2. Each session begins with a review of each participant's headache information from the previous week. Potential triggers for each headache are discussed, and ways in which such triggers might be controlled are also discussed.

3. In cases where a particular emotional stressor is thought to be the cause of a headache, participants are encouraged to discuss that stressor at some length. Participants are encouraged to discuss among themselves different ways of dealing with a particular problem situation, but are not given any specific guidance from the therapist regarding particular strategies or coping skills that they might use.

4. A continuing emphasis is placed on the important role of feelings, and how they are or are not expressed. Participants are encouraged to discuss with one another different strong feelings that they experience, and are regularly reminded that holding strong feelings in contributes to the possibility of the migraine process being triggered.

5. Participants are encouraged to become aware which feelings they often do experience and express, and which feelings they have more difficulty expressing. The group is offered as a safe and non-judgemental place to allow expression of a whole range of feelings.

6. Wherever possible, the witholding of strong feelings is connected to the onset or exacerbation of a migraine headache.

7. Participants are also encouraged to remain aware of the many other possible physical triggers for their migraine attacks.

8. Each week, participants are asked to pay particular attention to any significant emotional events in their lives (positive or negative), and to spend a little time each day reviewing how they handled the emotional aspects of each event.

9. At the end of every session, participants are again encouraged to continue phoning in their headache information, and are reminded of the appointment time for the following week.

Treatment Session 12

1. The general rationale for the treatment program is reviewed again.

2. With each participant in the group, a review is made of the most common physical triggers for her migraine attacks that she has learned about over the course of the program.

3. Also, with each participant in the group, a review is made of the most common emotional triggers for her migraine attacks that she has learned about over the course of the program.

4. Each participant is encouraged to summarize what she has learned about her own style of experiencing and expressing important feelings, and how this can contribute to the onset of migraines. Each participant is also encouraged to describe what kinds of changes she has made in her style of dealing with important feelings, and how such changes have affected her likelihood to get migraine headaches.

5. Each participant is encouraged to describe which feelings she is now most comfortable in expressing, and which feelings still provide a challenge in this regard.

APPENDIX M

Written Headache Diary

Headache Diary

Name: ______________________________

Week Beginning: ______________________

Fill in this form each night before going to bed.

Date	Time	Duration	Intensity	Medication	Other Symptoms	Possible Cause

INTENSITY RATINGS

Ø - No Headache

1 - Slight Headache - I am only aware of it if I pay attention to it.

2 - Mild Headache - I can ignore it at times.

3 - Painful Headache - I can't ignore it but I can do my usual activities.

4 - Severe Headache - It's difficult for me to concentrate, I can only do easy activities.

5 - Very Severe Headache - Such that I can't do anything.

APPENDIX N

Self-Evaluation Questionnaire

Self-Evaluation Questionnaire
Developed by C.D. Spielberger, R.L. Gorsuch and R. Lushene
STAI FORM X-1

NAME ______________________ DATE __________

DIRECTIONS: a number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1 = not at all 2 = somewhat 3 = moderately so 4 = very much so

1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I am regretful	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel rested	1	2	3	4
9. I feel anxious	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel "high strung"	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel over-excited and rattled	1	2	3	4
19. I feel joyful	1	2	3	4
20. I feel pleasant	1	2	3	4

Self-Evaluation Questionnaire

STAI FORM X-2

NAME ________________________________ DATE ______________

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you <u>generally</u> feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

1 = absolutely never 2 = sometimes 3 = often 4 = almost always

21. I feel pleasant ____	1	2	3	4
22. I tire quickly ____	1	2	3	4
23. I feel like crying ____	1	2	3	4
24. I wish I could be as happy as others seem to be ____	1	2	3	4
25. I am losing out on things because I can't make up my mind soon enough ____	1	2	3	4
26. I feel relaxed ____	1	2	3	4
27. I am "calm, cool, and collected" ____	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them ____	1	2	3	4
29. I worry too much over something that really doesn't matter ____	1	2	3	4
30. I am happy ____	1	2	3	4
31. I am inclined to take things hard ____	1	2	3	4
32. I lack self-confidence ____	1	2	3	4
33. I feel secure ____	1	2	3	4
34. I try to avoid facing a crisis or difficulty ____	1	2	3	4
35. I feel blue ____	1	2	3	4
36. I am content ____	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me ____	1	2	3	4

38. I take disappointments so keenly that I can't put them out of my mind ____________	1	2	3	4
39. I am a steady person ____________	1	2	3	4
40. I become tense and upset when I think about my present concerns ____________	1	2	3	4

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APPENDIX Ø

Birleson Self-Report (Depression) Inventory

Birleson Self-Report (Depression) Inventory, 1978

NAME ______________________ DATE ____________ # ____

Please place a check mark in the column beside each statement to show if the statement is true for you most of the time, sometimes, or never.

	Most	Sometimes	Never
1. I look forward to things as much as I used to.			
2. I feel like crying.			
3. I feel like running away.			
4. I get stomach aches.			
5. I like to go out and do things.			
6. I sleep very well.			
7. I have lots of energy.			
8. I enjoy my food.			
9. I can stick up for myself.			
10. I think life isn't worth living.			
11. I am good at things I do.			
12. I enjoy the things I do as much as I used to.			
13. I like talking with my family.			
14. I have horrible dreams.			
15. I feel very lonely.			
16. I am easily cheered up.			
17. I feel so sad I can hardly stand it.			
18. I feel very bored.			

APPENDIX P

Beitchman Self-Report Scale

Beitchman Self-Report Scale

NAME OF PARTICIPANT: ______________________ DATE: ________

Please check off the cirlce YES if you think the question is true. If you think the question is not true, check off the circle NO. Do not check off the circle YES and the circle NO for the same question. Remember this is not a test and there are no right or wrong answers.

		Yes	No
1.	It's OK for kids to bite their fingernails ______	Y	N
2.	Kids laugh at me ______	Y	N
3.	It's OK to get angry ______	Y	N
4.	I have many friends ______	Y	N
5.	My family is proud of me ______	Y	N
6.	I often get angry at my parents ______	Y	N
7.	When I need help my parents help me ______	Y	N
8.	I'll try anything ______	Y	N
9.	I feel someone will tell me I am doing things wrong ______	Y	N
10.	My parents understand me ______	Y	N
11.	I am always happy ______	Y	N
12.	Kids pick on me ______	Y	N
13.	Things are all mixed up in my life ______	Y	N
14.	I like everyone I know ______	Y	N
15.	It's OK to tell little lies ______	Y	N
16.	I am important to my family ______	Y	N
17.	It's OK to yell at your parents sometimes ______	Y	N
18.	Most kids I know like me ______	Y	N
19.	I worry about what other people will think about me ______	Y	N
20.	Scarey stories bother me ______	Y	N
21.	I am pretty sure of myself ______	Y	N

22.	Sometimes I think other kids want to beat me up__	Y	N
23.	I worry about what my parents will say to me_____	Y	N
24.	I am just as good as the next kid_____	Y	N
25.	I worry about what is going to happen_____	Y	N
26.	I am fun to be with_____	Y	N
27.	I am a nervous person_____	Y	N
28.	I get too many punishments_____	Y	N
29.	I have a bad temper_____	Y	N
30.	I am always good_____	Y	N
31.	Kids call me names_____	Y	N
32.	It's OK to make a mess_____	Y	N
33.	I think I am a pretty nice person_____	Y	N
34.	I cause trouble to my family_____	Y	N
35.	Sometimes even little things get me mad_____	Y	N
36.	I always tell the truth_____	Y	N
37.	I often get into trouble_____	Y	N
38.	I am always nice to everyone_____	Y	N
39.	I often have fights with kids_____	Y	N
40.	I get nervous when the teacher calls on me_____	Y	N
41.	It is hard for me to wait my turn_____	Y	N
42.	It's hard for me to keep my mind on anything_____	Y	N
43.	When I go to bed at night I worry_____	Y	N
44.	I do many bad things_____	Y	N
45.	It's OK to show-off_____	Y	N
46.	I always do the right thing_____	Y	N
47.	Sometimes even little things make me cry_____	Y	N
48.	Other kids boss me around_____	Y	N

49. If I got lost I could get back home__________ Y N

50. My parents expect too much from me__________ Y N

51. I am afraid of the dark__________ Y N

52. I have bad dreams__________ Y N

53. I always know what to say to people__________ Y N

54. Sometimes I get mad at myself__________ Y N

55. I am pretty good at most things I do__________ Y N

APPENDIX Q

Pre-Treatment Credibility Rating Form

Credibility Rating Form

Check one: Parent ______________ Adolescent ______________

	not at all	just a little	moder-ately	quite a bit	very
1. How logical does this type of treatment seem to you?	____	____	____	____	____
2. How confident would you be that this type of treatment would be successful in reducing headaches?	____	____	____	____	____
3. How confident would you be in recommending this treatment to someone who has headaches?	____	____	____	____	____
4. How confident would you be that adolescents could learn this tecnnique?	____	____	____	____	____

ANY COMMENTS? ____

APPENDIX R

Posttreatment Credibility-Therapist-Treatment Ratings

Credibility-Therapist-Treatment Ratings

Check one: Parent ____________ Adolescent ____________

I. CREDIBILITY

	not at all	just a little	moder-ately	quite a bit	very
a. How logical does the treatment you received seem to you?	____	____	____	____	____
b. How confident would you be in recommending this treatment to someone who has headaches?	____	____	____	____	____
c. How confident would you be that adolescents could learn this technique?	____	____	____	____	____

II. THERAPIST RATINGS

a. How skilled do you think your therapist was?	____	____	____	____	____
b. How understanding was your therapist?	____	____	____	____	____
c. How warm and friendly was your therapist?	____	____	____	____	____

III. TREATMENT RATINGS

a. How beneficial was your treatment in improving your migraine headaches?	____	____	____	____	____

Finally, last question!

Do you think that the Children's Hospital should make this treatment available to other adolescents suffering from migraine headaches?

very definitely no	no	perhaps	yes	very definitely yes
____	____	____	____	____

TREATMENT COMMENTS

1. What part of the program helped you the most?

2. What part of the program do you think would be most helpful for other teenagers with headaches?

3. What was the most useful thing you learned during treatment?

4. From what you have learned in the program, what do you think will be most helpful to you in the future?

5. What changes can we make to the program to improve it?

<u>ANY OTHER COMMENTS?</u>

APPENDIX S

Post Hoc Analyses of Headache Dependent Variables

Post Hoc Analyses of Headache Dependent Variables

Following completion of the headache data collection, a preliminary analysis of the within-group variability on the Baseline Headache Index was conducted. This post hoc analysis revealed a very high degree of variability in initial headache severity between subjects within all 3 treatment conditions. Given the existence of this high degree of within-groups variability, a decision was made to divide subjects within each treatment condition (by using a median split) into 2 subgroups, based on Baseline level of Headache Index. Thus, a 2-level severity factor was created -- high severity and low severity.

With the creation of this severity factor, further post hoc statistical analyses were performed (described in detail below) to investigate the interaction between initial headache severity and treatment condition over time. As discussed in the Introduction, Richter et al. (1986) reported a significant interaction between initial level of headache severity and treatment outcome. More specifically these authors reported that while their high severity patients showed significant reduction in headache activity following individually administered treatment (relaxation <u>or</u> cognitive coping), compared to the attention placebo group, their low severity patients did not. Thus, initial level of headache severity may be an important factor in treatment outcome.

Furthermore, while it is commonly believed that the more serious the presenting problem, the greater the need for a more individualized treatment approach, there is little, if any, empirical data to support this belief. Thus, the existence of a possible interaction between headache severity and effectiveness of treatment condition was thought to present an interesting, and perhaps fruitful, set of post hoc questions to pursue.

In order to statistically investigate this interaction between treatment condition and headache severity over time (a 3-way interaction), each of the four headache dependent variables (including Headache Index, Headache Duration, Headache Frequency and Number of Headache-Free Days During a Week) was analysed by means of a 3 (treatment condition) x 2 (severity) repeated measures analysis of variance, with time (3 levels) as the repeated factor. The discovery of a significant treatment condition by severity by time interaction on any of these dependent variables was followed by testing a set of 3 a posteriori complex contrasts with the Scheffe Multiple Comparison Procedure. The Scheffe Procedure is the most conservative of all the means comparison procedures, and provides an alpha rate (in this study, .05 was used) that is protected for all possible means comparison tests following a significant F-test on the repeated measures analysis of variance.

The 3 specific questions that were tested by means of the Scheffe a posteriori complex contrasts following a significant F-test of the 3-way interaction on the repeated measures analysis of variance were:

(1) From Baseline to Follow-Up, did subjects in the individual treatment condition show a significantly different degree of change in headache activity, as compared to subjects in the control condition, depending on initial level of headache severity?

(2) From Baseline to Follow-Up, did subjects in the group treatment condition show a significantly different degree of change in

headache activity, as compared to subjects in the control condition, depending on initial level of headache severity?

(3) From Baseline to Follow-Up, did subjects in the individual treatment condition show a significantly different degree of change in headache activity, as compared to subjects in the group treatment condition, depending on initial level of headache severity?

Each of these three post hoc complex contrasts was evaluated as a 2-tailed test in that these contrasts were tested as a posteriori contrasts, and thus, the directions of the differences were not predicted in advance.

The results of the a posteriori statistical analyses of the 3-way interaction between treatment condition, severity and time are presented below, under the sub-headings of each of the 4 headache dependent variables.

Headache Index

The 3 (treatment condition) x 2 (severity) repeated measures analysis of variance (with time as the repeated factor) of the Headache Index resulted in a nonsignificant overall F-test of the 3-way interaction between treatment condition, headache severity and time (see Table S1). Thus, further testing of the 3 a posteriori complex contrasts by the Scheffe method of means comparisons was not done. Means and standard deviations are presented in Table S2.

Insert Tables S1 and S2 about here

Table S1

Repeated Measures Analysis of Variance
Headache Index

Source	df	SS	MS	F-ratio	p
Treatment Condition	2	13550.71	6775.35	2.06	.142
Severity	1	44912.28	44912.28	13.67	.001
Treatment x Severity Interaction	2	4113.46	2056.73	.63	.540
Residual	36	118244.30	3284.56		
Time (repeated measure)	2	7027.95	3513.96	4.32	.017
Time x Treatment Interaction	4	9182.04	2295.51	2.82	.031
Time x Severity Interaction	2	12358.80	6179.40	7.59	.001
Time x Treatment x Severity Interaction	4	6419.83	1604.96	1.97	.108
Residual	72	58631.28	814.32		

Table S2

Means and Standard Deviations
Headache Index

	Baseline	Post-Treatment	Follow-Up
Low Severity			
Individual Treatment (n = 7)	*M* = 21.70 *SD* = 13.78	*M* = 13.43 *SD* = 11.55	*M* = 10.94 *SD* = 6.01
Group Treatment (n = 8)	*M* = 32.04 *SD* = 13.16	*M* = 24.56 *SD* = 18.85	*M* = 17.70 *SD* = 20.28
Attention Placebo (n = 7)	*M* = 25.49 *SD* = 11.59	*M* = 61.21 *SD* = 37.16	*M* = 60.61 *SD* = 50.27
High Severity			
Individual Treatment (n = 6)	*M* = 102.27 *SD* = 72.81	*M* = 28.23 *SD* = 32.09	*M* = 33.40 *SD* = 28.94
Group Treatment (n = 7)	*M* = 82.74 *SD* = 24.16	*M* = 73.17 *SD* = 62.59	*M* = 71.21 *SD* = 53.85
Attention Placebo (n = 7)	*M* = 91.49 *SD* = 35.46	*M* = 60.10 *SD* = 70.93	*M* = 66.09 *SD* = 65.72

The absence of a significant 3-way interaction between treatment condition, severity and time provides evidence that girls receiving individual treatment benefitted significantly from the program regardless of whether they began with high or low severity headache.

Headache Duration

The 3 (treatment condition) x 2 (severity) repeated measures analysis of variance (with time as the repeated factor) of Headache Duration resulted in a significant overall F-test of the 3-way interaction between treatment condition, headache severity and time, $\underline{F}$ (4,72) = 3.22, $\underline{p}$ = .017 (Table S3).

Insert Table S3 about here

Further investigation of this significant 3 way interaction by means of Scheffe tests of the 3 a posteriori complex contrasts described above resulted in no significant differences at the .05 level. That is, at the .05 level, (1) subjects in the individual treatment condition, with either high or low initial level of headache severity, did not show a greater reduction in Headache Duration over time, compared to the control condition, (2) subjects in the group treatment condition, with either high or low headache severity, also did not show a greater reduction in Headache Duration over time, compared to the control condition, and (3) subjects in the individual treatment condition, with either high or low headache severity, did not show a greater reduction in Headache Duration over time, compared to the group

Table S3

Repeated Measures Analysis of Variance
Headacne Duration

Source	df	SS	MS	F-ratio	p
Treatment Condition	2	2952.30	1476.15	2.63	.086
Severity	1	4962.49	4962.49	8.84	.005
Treatment x Severity Interaction	2	213.34	106.67	.19	.828
Residual	36	20199.44	561.10		
Time (repeated measure)	2	558.20	279.10	4.43	.015
Time x Treatment Interaction	4	449.66	112.41	1.78	.142
Time x Severity Interaction	2	767.08	383.54	6.09	.004
Time x Treatment x Severity Interaction	4	812.16	203.04	3.22	.017
Residual	72	4537.79	63.02		

treatment condition (the results of the tests of these 3 a posteriori contrasts are presented in Table S4).

Insert Table S4 about here

Further inspection of Table S4 reveals that the value of Contrast 2, while not significant at the .05 level, was significant at the .10 level, $|\underline{Y}| = 23.81$, $\underline{S}\ (4, 72) = 23.80$, $\underline{p} < .10$, 2-tailed test. That is, at the .10 level, depending on initial level of headache severity, subjects in the group treatment condition experienced a greater reduction in Headache Duration over time, compared to the control condition. Examination of the group means in Table S5 and the graphs in Figures S1 and S2 reveals that participants in the group treatment condition with low severity headache showed a trend toward significant improvement (at the .10 level) over time as compared to subjects in the control condition.

Insert Table S5 and Figures S1 and S2 about here

However, those girls in the group treatment condition with high severity headache did not show similar improvement (at the .10 level) over time as compared to the control group. The presence of this 3-way interaction provides an explanation as to why there was no significant <u>overall</u> reduction in Headache Duration for those girls in the group treatment condition compared to those in the control condition.

Testing for significance at the .10 level represents a very liberal test of the a posteriori contrast, and should only be interpre-

Table S4

Tests of 3 A Posteriori Complex Contrasts
of the 3-Way Interaction Between
Treatment Condition, Severity and Time

Headache Duration

Contrast	$\lvert \underline{Y} \rvert$	Error $\underline{MS}$	Critical Difference	* signif.
1 (Individual Treatment vs. Attention Placebo, High vs. Low Severity, over Time)	8.77	63.02	27.50	no
2 (Group Treatment vs. Attention Placebo, High vs. Low Severity, over Time)	23.81	63.02	26.52	no
	(23.81	63.02	23.80	.10)
3 (Individual Treatment vs. Group Treatment, High vs. Low Severity, over Time)	15.04	63.02	27.08	no

* using Scheffe's a posteriori means comparison test, error rate of .05, protected for all possible contrasts of the 3-way interaction.

Table S5

Means and Standard Deviations
Headache Duration

	Baseline	Post-Treatment	Follow-Up
Low Severity			
Individual Treatment (n = 7)	*M* = 7.04 *SD* = 5.22	*M* = 4.87 *SD* = 4.70	*M* = 3.74 *SD* = 2.42
Group Treatment (n = 8)	*M* = 12.66 *SD* = 6.76	*M* = 8.16 *SD* = 5.63	*M* = 5.78 *SD* = 6.29
Attention Placebo (n = 7)	*M* = 10.20 *SD* = 6.06	*M* = 20.03 *SD* = 14.60	*M* = 21.41 *SD* = 18.79
High Severity			
Individual Treatment (n = 6)	*M* = 26.25 *SD* = 18.91	*M* = 9.80 *SD* = 9.89	*M* = 11.63 *SD* = 9.94
Group Treatment (n = 7)	*M* = 26.49 *SD* = 7.30	*M* = 25.46 *SD* = 21.20	*M* = 23.33 *SD* = 14.10
Attention Placebo (n = 7)	*M* = 35.61 *SD* = 20.03	*M* = 21.96 *SD* = 28.79	*M* = 26.73 *SD* = 30.58

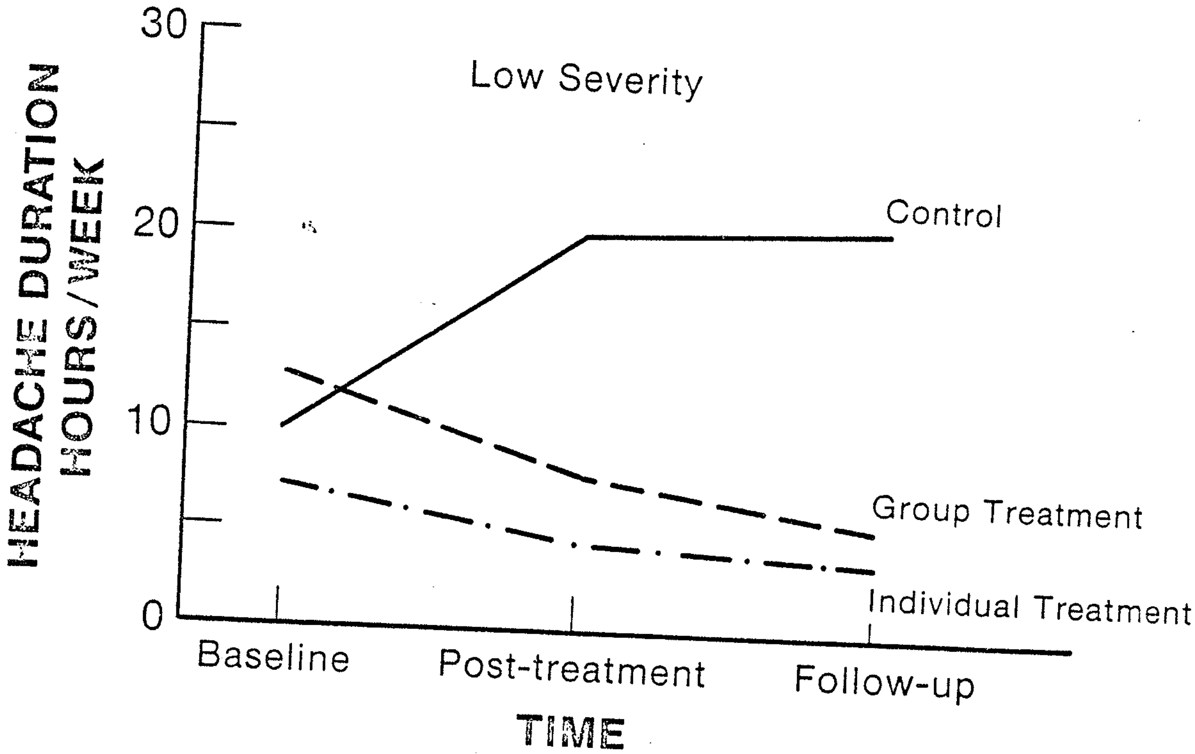

Figure S1

Mean Headache Duration at Baseline, Post-Treatment and Follow-Up for Low Headache Severity Subjects in the Three Treatment Conditions

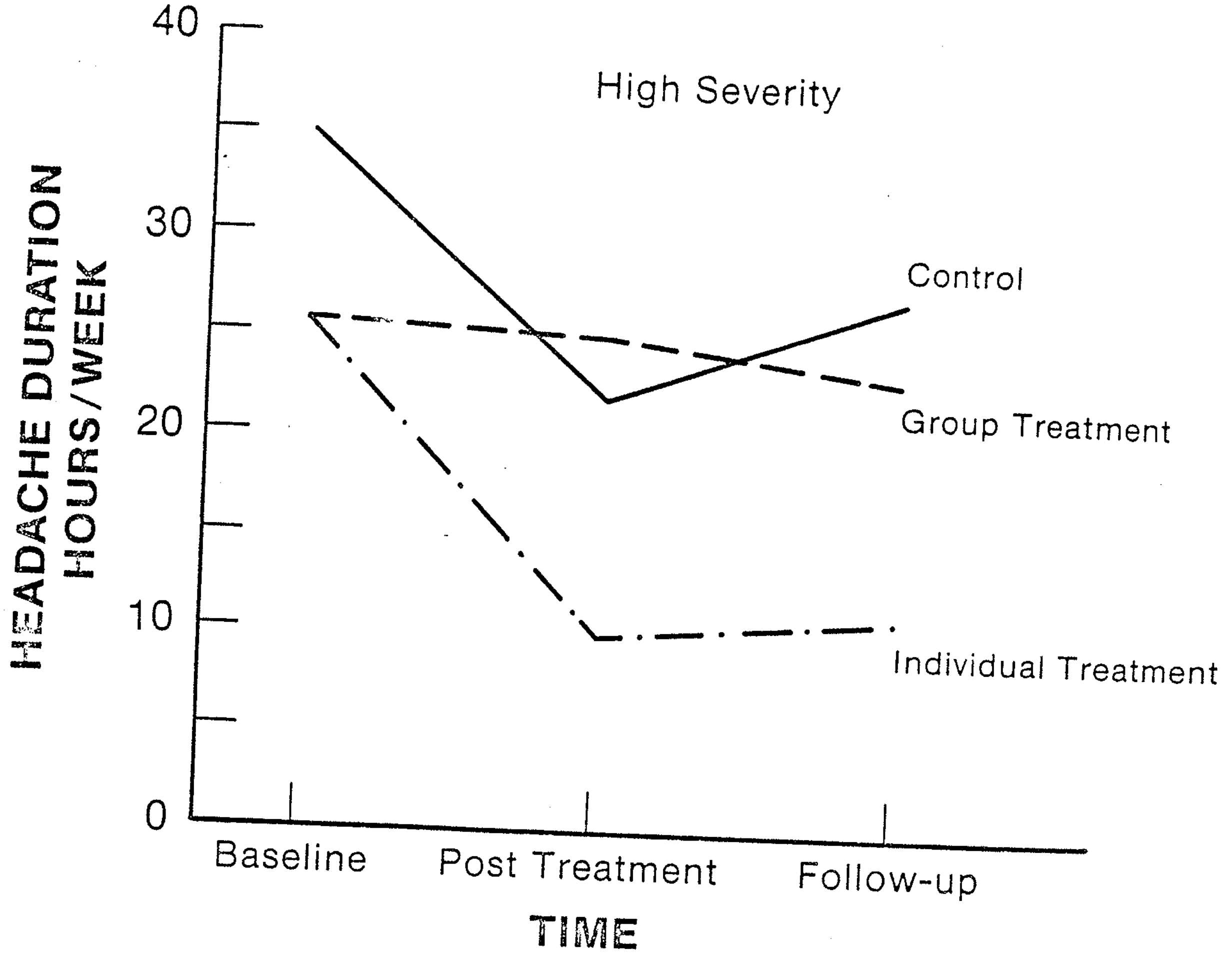

Figure S2

Mean Headache Duration at Baseline, Post-Treatment and Follow-Up for High Headache Severity Subjects in the Three Treatment Conditions ted as a trend toward significance. However, given the high within-groups variability, and the use of the most conservative a posteriori means comparison test (the Scheffe) to follow up the significant F-test ($p = .017$) of the 3-way interaction, it was believed that such a trend in the data should be noted and discussed.

Headache Frequency

The 3 (treatment condition) x 2 (severity) repeated measures analysis of variance (with time as the repeated factor) of Headache Frequency resulted in a nonsignificant overall F-test of the 3-way interaction between treatment condition, headache severity and time (see Table S6). Means and standard deviations are provided in Table S7. Thus, further testing of the 3 a posteriori complex contrasts by the Scheffe method of means comparisons was not done.

Insert Tables S6 and S7 about here

Number of Headache-Free Days During the Week

Again, as was the case with Headache Frequency, the 3 (treatment condition) x 2 (severity) repeated measures analysis of variance (with time as the repeated factor) of Number of Headache-Free Days during the week resulted in a nonsignificant overall F-test of the 3-way interaction between treatment condition, headache severity and time (see Table S8). Means and standard deviations are provided in Table S9. Thus, further testing of the 3 a posteriori complex contrasts by the Scheffe method of means comparisons was not done.

Table S6

Repeated Measures Analysis of Variance
Headache Frequency

Source	df	SS	MS	F-ratio	p
Treatment Condition	2	73.47	36.74	2.63	.Ø86
Severity	1	78.26	78.26	5.6Ø	.Ø23
Treatment x Severity Interaction	2	11.Ø5	5.53	.4Ø	.677
Residual	36	5Ø3.52	13.99		
Time (repeated measure)	2	1Ø8.84	54.42	2Ø.81	<.ØØ1
Time x Treatment Interaction	4	3.83	.96	.37	.832
Time x Severity Interaction	2	14.56	7.28	2.78	.Ø69
Time x Treatment x Severity Interaction	4	18.44	4.61	1.76	.146
Residual	72	188.3Ø	2.62		

Table S7

Means and Standard Deviations
Headache Frequency

	Baseline	Post-Treatment	Follow-Up
Low Severity			
Individual Treatment (n = 7)	M = 2.57 SD = 1.59	M = 1.96 SD = 1.82	M = 1.07 SD = .67
Group Treatment (n = 8)	M = 3.91 SD = 3.32	M = 2.22 SD = 2.20	M = 1.59 SD = 1.74
Attention Placebo (n = 7)	M = 4.46 SD = 2.30	M = 3.86 SD = 2.16	M = 3.64 SD = 2.25
High Severity			
Individual Treatment (n = 6)	M = 4.92 SD = 2.98	M = 2.63 SD = 2.23	M = 2.29 SD = 2.03
Group Treatment (n = 7)	M = 5.89 SD = 2.56	M = 4.61 SD = 2.76	M = 4.32 SD = 2.21
Attention Placebo (n = 7)	M = 7.68 SD = 4.92	M = 3.54 SD = 2.26	M = 3.71 SD = 2.92

Insert Tables S8 and S9 about here

Table S8

Repeated Measures Analysis of Variance
Number of Headache-Free Days During the Week

Source	df	SS	MS	F-ratio	p
Treatment condition	2	45.90	22.95	3.45	.043
Severity	1	37.25	37.25	5.60	.024
Treatment x Severity Interaction	2	13.65	6.83	1.03	.369
Residual	36	239.64	6.66		
Time (repeated measure)	2	40.72	20.36	18.97	<.001
Time x Treatment Interaction	4	.89	.22	.21	.933
Time x Severity Interaction	2	4.45	2.22	2.07	.133
Time x Treatment x Severity Interaction	4	8.83	2.21	2.06	.095
Residual	72	77.26	1.07		

Table S9

Means and Standard Deviations
Number of Headache-Free Days During the Week

	Baseline	Post-Treatment	Follow-Up
Low Severity			
Individual Treatment (n = 7)	*M* = 4.60 *SD* = 1.25	*M* = 5.11 *SD* = 1.83	*M* = 5.96 *SD* = .67
Group Treatment (n = 8)	*M* = 3.80 *SD* = 1.47	*M* = 5.08 *SD* = 1.69	*M* = 5.56 *SD* = 1.40
Attention Placebo (n = 7)	*M* = 3.39 *SD* = 1.39	*M* = 3.39 *SD* = 1.93	*M* = 3.63 *SD* = 2.17
High Severity			
Individual Treatment (n = 6)	*M* = 3.15 *SD* = 1.60	*M* = 4.82 *SD* = 1.52	*M* = 4.95 *SD* = 1.69
Group Treatment (n = 7)	*M* = 2.34 *SD* = 1.26	*M* = 3.13 *SD* = 2.02	*M* = 3.10 *SD* = 1.93
Attention Placebo (n = 7)	*M* = 1.70 *SD* = 1.33	*M* = 3.80 *SD* = 2.11	*M* = 3.70 *SD* = 2.62

Appendix T

Analysis of Information from the Current Headache Description Questionnaire

Percentage of Girls Responding Yes to Various Items on the Current Headache Description Questionnaire

Question	Baseline%	Post-Treatment%	Follow-Up%
Q1. Do your headaches sometimes prevent you from doing such things as:			
a) being with friends	55	39	38
b) school work	77	55	40
c) sleeping	48	41	36
d) reading or other quiet things you like to do by yourself	73	57	58
e) eating	36	27	24
Q2. What type of pain is your headache? Can you describe it?			
a) steady	48	39	36
b) throbbing or pounding	86	71	78
c) dull	27	18	11
d) shooting	57	34	56
e) burning	11	14	13
f) squeezing or constricting	77	68	69
Q3. When you have a headache, do you ever feel:			
a) dizzy	75	61	64
b) ringing in your ears	27	32	29
c) tingling in hands or feet	27	11	18
d) cold or numbness in hands or feet	34	30	36
e) like you want to be in the dark	61	64	76
f) like you want everything to be quiet	93	77	87
g) clumsy	41	36	40
Q4. Do you ever have any of these things when you have a headache?			
a) nausea-feel like throwing up	68	50	47
b) vomiting-actually throwing up	21	14	16
c) stomach pain	52	32	38
d) constipation	9	5	0
e) diarrhea	7	7	2
f) trouble walking	30	16	31
g) trouble talking	21	14	16

Percentage of Girls Responding Yes to Various Items on the Current Headache Description Questionnaire (cont.)

Question	Baseline%	Post-Treatment%	Follow-Up%
Q5. When you have a headache, do you ever:			
a) find things look blurry	52	41	36
b) see spots	30	23	18
c) see double	2	11	4
d) see coloured rings around things	2	7	11
e) have red, droopy, or glazed eyes	59	48	58
f) have a stiff or painful neck	55	61	49
g) have trouble swallowing	2	0	2
Q6. When you have a headache, do you ever:			
a) blush, feel hot or have a fever	86	61	64
b) sweat a lot	27	32	27
c) get cold and clammy	46	41	42
d) blackout or faint	18	16	11
e) find your heart is beating fast	32	27	27
Q7. During a headache, do you ever feel:			
a) restless	59	50	53
b) irritable	82	84	80
c) upset	61	50	53
d) tired	89	89	84
e) depressed	55	50	44
f) extra energy	5	5	9
g) confused or have trouble thinking clearly	71	55	47
Q8. Can you sometimes tell when you are going to have a headache? Do you have any warning before it starts?			
a) I see things differently	11	2	11
b) I hear things differently	9	7	2
c) I feel down, or very tired	27	23	11
d) I feel high, or very energetic	0	0	0
e) I feel extra good	2	0	0
f) I feel silly	2	0	0
g) I feel different, not like myself	25	25	27

Percentage of Girls Responding Yes to Various Items on the
Current Headache Description Questionnaire (cont.)

Question	Baseline%	Post-Treatment%	Follow-Up%
Q9. Does sleep make your headaches better?			
a) always	17	21	24
b) sometimes	66	59	53
c) don't know	2	5	4
d) no, sleep doesn't help	18	11	18
Q10. When you have a headache, does medication make it better?			
a) always	9	14	24
b) sometimes	34	34	38
c) don't know	9	18	4
d) no, pills don't help	48	30	33
Q11. Do you think any of these things would cause your headaches?			
a) allergies or certain foods	11	27	27
b) change in the weather	25	27	38
c) being depressed or unhappy	43	43	40
d) being upset, afraid or angry	64	55	60
e) too much exercise	23	32	22
f) not enough sleep	73	71	60
g) being hungry	34	43	38
Q12. Do any of these things sometimes cause the headaches?			
a) wind	16	16	24
b) music	18	18	18
c) loud noises	59	36	42
d) other noises	32	16	20
e) television	30	25	22
f) car travel	41	32	33
Q13. Would any of these things cause a headache?			
a) sun	41	55	51
b) bright lights	64	55	42
c) glare	36	32	27
d) blinking lights	25	30	18
e) hot weather	27	30	36
f) cold weather	14	18	18
g) stormy weather	9	5	7

Percentage of Girls Responding Yes to Various Items on the Current Headache Description Questionnaire (cont.)

Question	Baseline%	Post-Treatment%	Follow-Up%
Q14. When are the headaches worse?			
a) in the morning	18	14	9
b) in the afternoon	52	46	31
c) at night before bed	30	30	24
d) during the night, the pain wakes me up	2	2	0
e) at home	27	9	7
f) at school	34	11	11
Q15. How long do your headaches usually last?			
a) a few seconds	0	0	0
b) less than 15 minutes	2	0	2
c) 15-30 minutes	2	5	0
d) 30-60 minutes	9	7	11
e) 1-3 hours	46	55	36
f) more than 3 hours	36	30	47
g) more than 1 day	2	0	4
h) ongoing	0	0	0
Q16. Where is the headache pain?			
a) around or behind your eyes?	43	48	47
b) across your forehead	36	43	51
c) beside your eyes at the temples	61	52	49
d) at the back of your head	23	23	22
e) at the top of your head	32	30	20
f) at the back of your neck	16	14	4
g) at the sides of your head	36	23	27
h) pain all over the head	7	16	13
Q17. Are the headaches:			
a) always on both sides of the head	30	37	58
b) always on the right side	0	0	0
c) always on the left side	2	2	11
d) sometimes on the right and other times on both sides	2	7	4
e) sometimes on the left and other times on both sides	16	14	4
f) sometimes on the right and sometimes on the left side	2	5	2
g) sometimes on the right, sometimes on the left, sometimes on both sides	47	30	20