INFORMATION TO USERS

The most advanced technology has been used to photograph and reproduce this manuscript from the microfilm master. UMI films the original text directly from the copy submitted. Thus, some dissertation copies are in typewriter face, while others may be from a computer printer.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyrighted material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each oversize page is available as one exposure on a standard 35 mm slide or as a 17" × 23" black and white photographic print for an additional charge.

Photographs included in the original manuscript have been reproduced xerographically in this copy. 35 mm slides or 6" × 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.
Relaxation therapy, treatment compliance, and psychological variables in the treatment of childhood headaches

Wisniewski, Jack Joseph, Ph.D.
The Ohio State University, 1987
RELAXATION THERAPY, TREATMENT COMPLIANCE, AND
PSYCHOLOGICAL VARIABLES IN THE TREATMENT
OF CHILDHOOD HEADACHES

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

Jack J. Wisniewski, B.M., M.S., M.S.W.

****

The Ohio State University

1987

Dissertation Committee:                Approved by
Judy L. Genshaft
Jack A. Naglieri
James A. Mulick
David Hammer

Department of Human Services Education
College of Education
TO MY PARENTS
ACKNOWLEDGMENTS

I express sincere appreciation to Dr. Judy L. Genshaft for her guidance and encouragement throughout the research. Thanks go to the other members of my advisory committee, Drs. Jack A. Naglieri, James A. Mulick and David Hammer for their well-considered suggestions and comments. Gratitude is expressed to Daniel L. Coury, M.D. for his assistance in bringing this research to fruition. The technical assistance of Ron Rittenour and the support of the Kroger Company, Inc., is gratefully acknowledged. To Jim, I offer sincere thanks for your patience, tolerance, and unconditional support during the course of this project.
Vita

January 24, 1952 . . . . . . Born - Buffalo, New York

1973 . . . . . . . . . . B.M., State University of New York, Fredonia, New York

1975 . . . . . . . . . . M.S., Purdue University, West Lafayette, Indiana

1978 . . . . . . . . . . M.S.W., The Ohio State University, Columbus, Ohio

FIELDS OF STUDY

Major Field: School Psychology
TABLE OF CONTENTS

ACKNOWLEDGEMENTS  ........................................ iii
VITA ................................................................. iv
LIST OF TABLES ................................................. vii
INTRODUCTION .................................................. 1

CHAPTER

I. REVIEW OF THE LITERATURE ...................... 6

Introduction
Psychosomatic Symptom Checklist
Revised Children’s Manifest Anxiety Scale
Classification of Headaches
Prevalence of Headaches in Children
Characteristics of Children with Headaches
Childhood Headaches Treatment Research:
   Relaxation Therapy
   Compliance with Relaxation Therapy

II. THREE EXPERIMENTS ............................. 38

Experiment One: Purpose
Method
Results
Discussion
Experiment Two: Purpose
Method
Results
Discussion
Experiment Three: Purpose
Method
Results
Discussion

General Discussion ........................................... 94

List of References ........................................... 99

APPENDICES .................................................. 108

   A. Data Relative to Assessment Instruments
   B. Data Relative to Relaxation Therapy
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. C-PSC item-total correlations</td>
<td>46</td>
</tr>
<tr>
<td>2. C-PSC test-retest correlations for individual items</td>
<td>47</td>
</tr>
<tr>
<td>3. First Unrotated and Orthogonal Varimax Factor Analyses of the PSC</td>
<td>49</td>
</tr>
<tr>
<td>4. Frequency Distribution of C-PSC by Sex</td>
<td>52</td>
</tr>
<tr>
<td>5. Frequency Distribution of C-PSC Total Scores</td>
<td>53</td>
</tr>
<tr>
<td>6. Test-retest Correlations for C-PSC Total Scores</td>
<td>54</td>
</tr>
<tr>
<td>7. Test-retest Reliability of the RCMAS</td>
<td>56</td>
</tr>
<tr>
<td>8. Headache Rating Scale</td>
<td>68</td>
</tr>
<tr>
<td>9. Revised Headache Rating Scale</td>
<td>68</td>
</tr>
<tr>
<td>10. DAP, CDI, RCMAS, and C-PSC Means, Standard Deviations and significance levels for headache and control samples</td>
<td>91</td>
</tr>
</tbody>
</table>
INTRODUCTION

It is a rare individual who goes through life without experiencing a headache. In fact, for most adults, an occasional headache arouses minimal anxiety and is accepted as an inevitable, albeit uncomfortable, part of living. Typically, adults treat headaches with either over-the-counter analgesics, rest, home-made remedies, a combination of the above, or, by simply ignoring the symptoms and carrying on as usual (Barlow, 1984).

This attitude toward headaches is similarly predominant when considering children's headaches. Oftentimes, for example, even recurring headaches, if not frequent or particularly severe, are accepted by both parents and physician as an indication of a nervous temperament and of little consequence (Barlow, 1984).

Yet, obviously not all headaches may be dismissed so easily. For some children, chronic headaches impair performance both academically and socially. Bille (1962), for example, documented the symptomatology associated with migraine headaches in children. While variants of these headaches are numerous, migraines are typically associated with throbbing pain, nausea and vomiting. Abdominal pain is also common. Frequently, these symptoms reach an
intensity such that the child's concentration, learning and school attendance are adversely affected. Frequent tension or cluster headaches may have similarly disruptive effects.

To date, relatively little research has been conducted on the non-pharmacological treatment of headache in children. This is unfortunate given current pharmacological treatments are wrought with potentially harmful side-effects, including irritability, inducement of disorders of attention/activity (Gascon, 1984), dry mouth, dizziness, blurred vision, and fatigue (Shinnar and D'Souza, 1981). Clearly, proven non-pharmacological treatments are needed. As an encouraging sign, results of case-reports and uncontrolled studies using behavioral methods in the treatment of childhood headaches, while having limited generalizability, have demonstrated success in reducing headache frequency and intensity. Related to the effectiveness of behavioral methods, however, is: (a) the extent to which clients comply with or adhere to treatment regimens and (b) the extent to which psychological distress is associated with treatment outcome.

As defined by Haynes, Taylor and Sackett (1979), compliance is the extent to which a person's behavior (in terms of taking medication, following diets, or executing lifestyle changes) coincides with medical or health advice.
The term adherence may be used interchangeably with compliance. The definition is intended to be non-judgmental; whereas in particular situations the therapist, client, or circumstances may be appropriately blamed for noncompliance, the definition per se implies no fault.

Treatment compliance is increasingly being recognized as an important problem in the delivery of medical and psychological therapies. In fact, Shelton and Levy (1981) note that, given the serious consequences often associated with noncompliance, many professionals consider it to be the most serious problem they have. In reviewing a number of surveys, Haynes (1982), for example, noted that fewer than 30% of hypertensive patients benefit from treatment because of lack of compliance with medical advice despite convincing evidence that antihypertensive medication prevents premature death and suffering from such devastating complications as stroke and heart attack. Compliance difficulties lead to equally unfortunate consequences in the applied behavioral sciences.

In addition to compliance, research on the behavioral treatment of headaches should be sensitive to the relationship between psychological distress and the experience of chronic headache. While little research has been conducted in this area with child headache sufferers, studies using adult subjects have consistently found that
the experience of chronic headache is correlated with high levels of depression and anxiety (Blanchard and Andrasik, 1985). Adult headache sufferers have additionally been shown to score higher on a measure of psychosomatic distress than adults who do not experience chronic headaches (Andrasik et al., 1982). Research examining the extent to which these results pertain to child headache sufferers is needed. First, however, the psychometric properties of relevant assessment instruments need to be examined with a child population.

The present study consists of three major components. Experiment 1 presents a modification of the SUNYA Revision of the Psychosomatic Symptom Checklist (Attansio et al., 1984) suitable for administration to children and adolescents. Normative, reliability, and validity data are examined for a large sample of middle-school-aged children. Test-retest reliability of the Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1978) is also examined. Experiment 2 examines the effectiveness of relaxation therapy in the treatment of childhood headaches. Subjects are randomly assigned to one of two experimental conditions (a) relaxation therapy, or (b) a control group. Treatment effects are assessed by examining pre-post group mean differences on a variety of dependent measures. Experiment 3 examines differences between a sample of children with
chronic headaches and a matched nonheadache sample on the Children's Psychosomatic Symptom Checklist, Revised Children's Manifest Anxiety Scale, and Children's Depression Inventory.
CHAPTER 1

Review of the Literature

Introduction

This chapter presents a comprehensive review of the literature relevant to this study. First, detailed background information on the Psychosomatic Symptom Checklist and Revised Children's Manifest Anxiety Scale is presented. Second, literature on the classification and prevalence of headaches in children is reviewed along with research on the psychological characteristics of children with headaches. Last, research on the treatment of childhood headaches with relaxation therapy as well as compliance with relaxation therapy is discussed.

Psychosomatic Symptom Checklist

The Psychosomatic Symptom Checklist (PSC), as originally developed by Cox et al. (1975), is a self-report scale which contains 18 common psychosomatic complaints, each of which is given a rating by the subject on intensity and frequency. The scale was initially employed as part of an assessment battery with adult patients who suffered from muscle contraction headaches. In that study, twenty-seven adults from the general population were assigned to one of
three groups. Nine were assigned to auditory electro-
pyrograph (EMG) feedback, 9 to progressive relaxation
instructions, and 9 to placebo treatment; groups were
equated for subjects' headache frequency and locus of con-
trol scores. Results showed, in part, significant reduc-
tions in scores obtained on the PSC following treatment
for subjects in the biofeedback and relaxation groups, as
compared to subjects receiving the placebo treatment.
Reductions in psychosomatic complaints did not differ for
the two active treatment groups. This study, therefore,
provided preliminary evidence for the usefulness of the
PSC as a measure of treatment outcome. Similar findings
have been obtained in subsequent research.

For example, Holroyd et al. (1977), as part of an
assessment battery, administered the PSC to 31 adults with
tension headaches assigned to either stress-coping train-
ing, biofeedback training, or waiting-list control groups.
Results indicated significant reductions in obtained PSC
scores for subjects receiving either stress-coping or
biofeedback training compared to subjects in the waiting-
list control group. Similar to the finding by Cox et al.
(1975), reductions in psychosomatic complaints did not
differ for the two active treatment groups.

Similarly, Holroyd and Andrasik (1978) administered
the PSC, along with several other measures, to 39 adults
with chronic tension headaches assigned to one of two self-control treatment groups, a headache discussion group, or a symptom-monitoring control group. Results showed that only subjects in the cognitive self-control group and the headache discussion group reported significantly fewer psychosomatic symptoms following treatment.

Lastly, Holroyd et al. (1980) administered the PSC to 31 introductory psychology students who responded to announcements of an experimental treatment program for tension headaches. Subjects were assigned to either biofeedback, credible pseudotherapy, or symptom-monitoring groups. Results showed that subjects in both the biofeedback and symptom-monitoring groups reported significant reductions in the frequency of psychosomatic symptoms at post-test. Together, these studies demonstrate the validity of the PSC as an outcome measure in the treatment of adult tension headaches.

Andrasik et al. (1982) additionally demonstrated the usefulness of the PSC as a differential diagnostic tool. They administered the PSC, along with several other diagnostic instruments to 99 consecutive headache sufferers presenting to a university based headache treatment clinic; the PSC was additionally administered to 30 matched nonheadache controls. Results showed that muscle contraction, migraine, and combined subjects revealed a greater
degree of psychosomatic symptoms than did control subjects, with cluster subjects falling midway between these groupings.

While providing important information on the PSC, the above studies are limited due to inadequate knowledge of its psychometric properties. Attanasio et al. (1984) addressed this issue. They first modified the PSC so that all ratings were made on a 0 to 4 scale, where 0 indicated no problem and 4 indicated daily occurrence for the frequency dimension, or that the problem was extremely bothersome when it occurred for the intensity dimension. In the scale’s original form (Cox et al., 1975), non-occurrence of a given symptom contributed arithmetically to the total score. In addition, Attanasio et al. (1984) modified the scale by not permitting subjects to write in additional items. Normative and test-retest reliability data were obtained by administering this SUNYA Revision of the Psychosomatic Symptom Checklist to a large sample of introductory psychology students (N=698). Three subgroups of this sample were asked to retake the PSC at intervals of 1-, 4-, and 8-weeks. Validity data were obtained by administering the PSC, along with the Beck Depression Inventory (Beck et al., 1961), State-Trait Anxiety Inventory, Form X (Spielberger et al., 1970), and Rathus Assertiveness Scale (Rathus, 1973) to a second sample of
introductory psychology students (N = 249). Results of this study demonstrated good reliability for the PSC. Total score correlations for all three intervals were greater than .80 and did not differ significantly from one another, suggesting that its sensitivity to psychosomatic distress does not significantly decrease as a function of time. The relatively high individual item correlations similarly support the reliability of the PSC. In addition, the PSC was found to correlate minimally with measures of depression, anxiety and assertiveness, indicating it was measuring a unique trait. Consistent with this finding, results of a factor analysis indicated that there was one general psychosomatic distress factor being assessed by the PSC.

Together, the above studies support the use of the PSC as a treatment outcome measure with college students suffering from chronic headache. To date, however, no studies have examined the PSC with child headache sufferers. More research in this important area is needed. Specifically, the psychometric properties of the PSC need to be examined with a large sample from the pediatric population. Additionally, the ability of the PSC to differentiate between psychosomatic and nonpsychosomatic pediatric samples needs to be examined.
Revised Children's Manifest Anxiety Scale

The original Children's Manifest Anxiety Scale (Castenada, McCandless, and Palermo, 1956) is a 42-item self-report scale normed on 386 children from grades 4 through 6. Although widely used by both clinicians and researchers, the scale has been criticized by teachers who stated that some words were too difficult for slow learners and children with mental retardation, by researchers who wanted an instrument that could be used from grades 1 through 12, and by psychometricians who stated that many of the items failed to meet criteria of a good test item (Flanagan, Peters, & Conry, 1969). Reynolds and Richmond (1978), addressed these criticisms in their revision of the scale.

The Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1978) is a 37-item self-report questionnaire designed to measure manifest anxiety; students are asked to circle yes or no to each statement. Responses to 28 items on the questionnaire yield a total anxiety score and three subscale scores. Subscales include physiological anxiety, worry-sensitivity, and social concerns-concentration. In addition, 9 items are devoted to a social desirability or Lie scale. The scale was standardized on a sample of 4,972 children between the ages of 6 and 19 years and representing 13 states and more than 80 school
districts from all major geographic regions of the United States. Percentiles, $T$ scores ($50, SD = 10$) and Scaled Scores ($10, SD = 3$) are provided for students of each age by sex and race. The scale has good internal reliability (Kuder Richardson formula $20 = .83$ for the Total Anxiety score) and correlates well ($r = .85$) with scores on the Trait scale of the State-Trait Anxiety Scale for Children (Spielberger, Gorsuch, & Lushene, 1970). All items, with the exception of the Lie items, meet the following criteria: (a) item difficulty between $.30$ and $.70$, and (b) biserial correlation between an item and the total test of at least $.30$. Lie items correlate significantly with themselves and less than $.30$ with the Total Anxiety score.

To date, few studies have examined the test-retest reliability of the RCMAS. Test-retest reliability is a measure of the extent to which scores on a test can be generalized over different occasions (Anastasi, 1982, p. 109) and is important for an appropriate interpretation of obtained scores. Without adequate stability, it is impossible to determine the extent to which individual differences in test scores are attributable to "true" differences in the characteristics under consideration and the extent to which they are attributable to chance errors (Anastasi, 1982, p. 102). Two studies have reported on the
test-retest reliability of the RCMAS when administered to elementary age children. Using a 9-month retest interval, Reynolds (1981) administered the scale to 534 children from Grades 4, 5, and 6. Total anxiety scale scores correlated .68 across the 9-month period; the test-retest correlation for the Lie scale was .58. Pela and Reynolds (1982) tested on two occasions 99 Nigerian children, ages 8-11, with a 3-week interval between testings. The total anxiety score correlated .97 for the boys ($n = .52$), 98 for the girls ($n = .47$), and 98 for the combined group. While reliability coefficients for the Lie scale were similarly high, coefficients for the three subscales (physiological, worry-sensitivity, social concerns-concentration) were not reported. Results of these two studies show that the scale has good test-retest reliability for elementary age children when administered up to nine-months apart. Given that the scale is intended to be used with children from 7 to 17 years of age, however, more research is needed on the test-retest reliability with older children.

**Classification of Headaches**

In 1960, the National Institute of Neurological Diseases and Blindness established a committee with the mandate to formalize headache diagnosis. Their report, as presented in the *Journal of the American Medical Association* (1962) divided headache disorders into fifteen categories.
These categories were developed on the basis on clinical consensus and have served as the standard diagnostic scheme for chronic headache disorders since that time. Saper (1983) has additionally grouped the fifteen categories into primary and secondary categories. Primary, or chronic, headache disorders are those in which headache represents the clinical expression of physiological reactivity in the absence of persistent identifiable organic pathology. Secondary headaches are those in which head pain occurs as a consequence of identifiable pathology. Toxic and metabolic, structural, infectious, traumatic, and vascular diseases are examples. To date, behavioral therapies have focused on headaches defined as primary. These headaches and their definitions by the Ad Hoc Committee are listed below.

1. **Vascular Headaches of Migraine Type** - Recurrent attacks of headache, widely varied in intensity, frequency and duration. The attacks are commonly unilateral in onset; are usually associated with anorexia and, sometimes, with nausea and vomiting; in some, are preceded by, or associated with, conspicuous sensory, motor, and mood disturbances; and are often familial.

   Evidence supports the view that cranial arterial distension and dilation are importantly implicated in the painful phase, but cause no permanent changes in the involved vessel. Listed below are particular varieties of headache, each sharing some, but not necessarily all of the above-mentioned features.

   (A) "Classic" Migraine - Vascular headache with sharply defined, transient visual, and other sensory or motor prodromes or both.
(B) "Common" Migraine - Vascular headache without striking prodromes and less often unilateral than A and C. Synonyms are: "atypical migraine" or "sick" headache. Calling attention to certain relationships of this type of headache to environmental, occupational, menstrual, or other variables are such terms as: "Summer," "Monday," "weekend," "relaxation," "premenstrual," and "menstrual" headache.

(C) "Cluster" Headache - Vascular headache, predominantly unilateral on the same side, usually associated with flushing, sweating, rhinorrhea, and increased lacrimation, brief in duration and usually occurring in closely packed groups separated by long remissions. Identical or closely allied are: erythroprosopalgia (Bing); ciliary or migrainous neuralgia (Harris); erythromelalgia of the head or histaminic cephalgia (Horton); and petrosal neuralgia (Gardner et al.).

2. Muscle-Contraction Headache - Ache or sensations of lightness, pressure, or constriction, widely varied in intensity, frequency, and duration, sometimes long-lasting, and commonly suboccipital. It is associated with sustained contraction of skeletal muscles in the absence of permanent structural change, usually as part of the individual's reaction during life stress. The ambiguous and unsatisfactory terms "tension," "psychogenic," and "nervous" headache refer largely to this group.


4. Headache of Delusional, Conversion, or Hypochondriacal States - Headaches of illnesses in which the prevailing clinical disorder is a delusional or a conversion reaction and a peripheral pain mechanism is nonexistent. Closely allied are the hypochondriacal reactions in which the peripheral disturbances relevant to headache are minimal. They also have been called "psychogenic" headaches.
The vast majority of both treatment and assessment studies of headache, from either a psychological or biomedical perspective, have used the classification scheme of the Ad Hoc Committee or some slight variant of it (Blanchard and Andrasik, 1985). Despite the predominant view that chronic headache sufferers can be subdivided into these categories, an alternative view has arisen. This alternative view proposes that rather than having several different categories of headache, it is more persimmonious and more accurate to consider chronic headache sufferers as falling along a continuum for which the differences are quantitative rather than qualitative. Thus, this view holds that there are not separate categories of headache such as migraine and tension; instead there is chronic headache, which varies among individuals in intensity and frequency. Much of the work on this view, termed a psychobiological model of chronic headache, has been done by Bakal (1975, 1982). While there is a growing body of empirical data to support Bakal's model, its value in a clinical setting has yet to be satisfactorily demonstrated. Therefore, this study will adhere to the standard classification of chronic headache.
Prevalence of Headaches in Children

The natural history of headaches in children is an area which has not been extensively researched, especially as related to the U.S. population. For example, of the major studies completed, virtually all have been conducted with samples drawn from other countries. Of these, the most extensively cited is that of Bille (1962). Following are the results of his study based upon a summary provided by Blanchard and Andrasik (1985).

Bo Bille, of the University Hospital, Uppsala, Sweden, sent headache questionnaires to parents of all school children between the ages of 7 and 15 (9,059 children in all). He obtained an unusually high return rate of over 99%. Results were divided into four categories: never had headache (3,720 children), infrequent non-migrainous headache (4,316 children), frequent non-migrainous headache (610 children), and migraine headache (347 children). Results showed that all categories of headache steadily increased through age 15. For example, approximately 1.5% of the 7-year olds experienced migraine, whereas by age 15 migraine prevalence had increased to 5%. Prevalence rates for migraine were fairly uniform for boys and girls between the ages of 7 and 10. After age 10, prevalence rates for females began to exceed those of males; at age 15, 2% of males suffered from migraine headache versus 8% for females. Approximately 3% of the children
experienced frequent headache of a non-migrainous nature at age 7. By the age of 15, this had increased to nearly 16%.

As part of his study, Bille conducted a longitudinal investigation focusing on 73 children who suffered from migraines. These subjects were randomly selected from a subset of children with the more pronounced symptoms of migraine and a like number of carefully matched controls who were completely free of headache. Children termed "more pronounced" migraine sufferers experienced at least one migraine per month which resulted in either bed rest or complete disruption of normal activities. Comparisons between the two groups revealed the children with headache were more prone to recurrent abdominal pain, motion sickness, and sleep disturbance and, psychologically, evidenced greater anxiety, tension, nervousness, and perfectionistic qualities.

Controls were followed for 16 years and at the end of that time 8 (11%) were now found to have migraine headache. Children with migraine were followed for 23 years. During puberty and young adulthood, symptoms of migraine subsided for approximately 60% of the children. However, at the 23-year follow-up assessment, one-third of the children whose headaches had temporarily subsided were no longer in remission. At this point, 60% of the total sample remained troubled by migraine to a significant
degree. Long-term prognosis was found to be especially poor for females; 70% of them continued to experience migraine headache, compared to 50% for males.

Data on the natural history of tension headache is less clearly documented. For example, while Bille (1962) found that a substantial number of children experienced recurrent headache of a non-migrainous nature, precise determinations as to whether these were tension headaches (a likely hypothesis) cannot be made.

Whereas Bille (1962) based his study on information obtained from the parent rather than the child, Deubner (1977) collected data from both the child and parent and analyzed the results separately. In all, 600 subjects were randomly sampled from a population of subjects aged 10-20 years attending city or parochial schools in Cardiff, South Wales. Each subject was visited at home and completed a standard headache interview which was pretested on subjects aged 7-14 years. In addition, parents filled out a questionnaire about the child's headaches. Subjects were divided into five groups: no headache, and headache with zero, one, two or three of the features of migraine. The headache group was then divided into "other headache" group with zero or one feature, and "migraine" group, with two or three classic symptoms.
Results showed 22% of the total group denied having headaches in the previous year, and 30%, 29%, 14%, and 45% reported headaches with 0, 1, 2, and 3 features of migraine respectively. Consistent with Bille's (1962) data, females were more likely to have headache and more symptoms of migraine as noted in replies both from subjects and parents. Contrary to Bille's (1962) data, childhood migraine was not significantly associated with other periodic pain or vomiting syndromes. Given the limited number of studies in this area, it is not possible to say whether this is a result of their chance co-occurrence or selection artifact.

When either parent had migraine, the probability of the child's having migraine was increased by about 50%. When the mother was the affected parent, the effect was equal for boys and girls, but when the father was affected, the effect was greater for boys.

Sillanpaa (1982) presented data very consistent with those of Bille (1962). Seven-year-old children who began school in two large Finnish cities in 1974 were investigated for the occurrence of migraine and other headache: the subjects were again surveyed at the age of fourteen. A total of 2921 subjects participated in both studies. By the age of seven, headache had occurred in 37% and migraine in 2.7%; at the age of fourteen the figures were 69% and
10.6% respectively. In the group under eight years, migraine was more common in boys than in girls, but in groups older than that girls were in the majority. The prognosis for migraine which had begun before or at the age of seven was better for boys than for girls, while in girls more often that in boys, migraine which began in the early school years disappeared by the age of fourteen years.

**Characteristics of Children with Headaches**

It has long been believed that recurrent headaches are strongly associated with various personality characteristics. Data supporting this belief initially came from clinical observation; more recently, empirical methods have been employed to gather data. To date, much of the literature in this area has focused on adult headache sufferers.

Data from clinical observations have been influenced heavily by the work of Freida Fromm-Reichman (1937). In that work, Fromm-Reichman states that,

migraine is a physical expression of unconscious hostility against consciously beloved persons ...migraine patients turn their hostile activity from other persons against themselves...the persons introject the beloved and hated person so that injuring themselves means at the same time hurting the introjected person, and vice versa (pp. 27, 32).

Blanchard, Andrasik and Arena (1984) summarize that migraineurs have traditionally been described, usually on the basis of the uncontrolled clinical interview, as perfectionistic, rigid, orderly, compulsive, obsessive,
ambitious and preoccupied with success, resentful, unassertive, insecure, and unable to express aggressive feelings in a constructive manner. In contrast, individuals with tension headache have traditionally been characterized as worrisome, depressed, anxious, chronically tense, hostile, dependent, histrionic, and psychosexually conflicted.

The above work may best be characterized as falling under the rubric of "personality theories of headache" (Blanchard et al., 1984; Blanchard and Andrasik, 1985). As such, it appears to be a variant of Franz Alexander's (1950) psychoanalytic theory of psychosomatic disorders. Alexander postulated three necessary but not sufficient conditions for the development of any specific psychosomatic disorders: (a) an inherited "organ weakness" (vulnerability or physiological predisposition) to overrespond to stress in certain organ systems and to develop symptoms in that organ system; (b) a specific personality type or set of personality traits; and (c) a specific form of conflict, either intrapsychic or interpersonal. The personality theory of headache drops the "organ weakness" postulate.

In addition to the work originating from a largely psychoanalytic perspective, Dalessio (1972) reported on the work of Harold Wolff and his associates who, operating within an atheoretical psychosomatic perspective, conducted systematic interview assessment on a series of migraine
patients. He described the migraine patient as: (a) "usually ambitious and preoccupied with achievement and success"; (b) possessing a high degree of "perfectionism" and "endowed with a great deal of energy, push, and striving"; (c) having a "love of order" and "resistance to change variously expressed as inflexibility, inelasticity...and stubbornness"; (d) socially reserved, cool, and aloof.

Other data regarding personality characteristics and chronic headache come from more controlled studies employing standardized psychological tests. Kudrow and Sutkus (1979) for example, administered the MMPI to 258 untreated headache patients between the ages of 19 and 69. Diagnostic headache categories included: 1. Migraine alone; 2. Chronic scalp muscle contraction headache (SMC); 3. Combination headache (migraine and SMC); 4. Cluster headache; 5. Post traumatic cephalgia (P-Y); 6. Conversion cephalgia. Fifteen male and 15 female non-patient subjects of varying occupations and life styles served as controls. Comparing the mean scores of the validity and clinical scales, three significantly distinct groups emerged. Group A, migraine and cluster; Group B, SMC and combination headaches; Group C, P-Y and conversion cephalgia. This grouping applied to both women and men. Additionally, on a continuum of most normal to most neurotic patterns,
Group A was followed by Groups B and C. The often reported characteristics of perfectionism and rigidity were not present in this sample of migraineurs.

Sternbach et al. (1980) similarly administered the MMPI to 46 male and 136 female subjects seen for headaches at a Pain Treatment Center. Subjects were between 20 and 70 years of age and had no other significant medical or psychological disorder which could contribute either to the headache, or to the psychological test findings. Data on MMPI's from 50,000 medical patients (Swenson, Pearson and Osborne, 1973) was used as a control. Diagnostic categories included: migraine, muscle contraction, and mixed or combined. Results from this study also fell along a continuum of psychological distress, similar to the results of Kudrow and Sutkus (1979). Thus, subjects with vascular headaches showed the least degree of neurotic quality. Sternbach et al. additionally concluded that all three of their headache groups revealed similar clinically significant findings, the most prominent being mild masked depression associated with features of anxiety and somatization.

Andrasik (1982) administered a battery of psychological tests to headache subjects of four types: migraine (n = 26), muscle contraction (n = 39), combined migraine-
muscle contraction (n = 22 and cluster (n = 22). Results showed the headache groups fell along a continuum, beginning with cluster subjects, who showed only minimal distress, continuing through migraine and combined migraine-muscle contraction, and ending with muscle contraction subjects, who revealed the greatest degree of psychological disturbance. However, none of the headache groups could be characterized by marked elevations on any of the psychological tests, which contrasts with past research findings.

Fewer studies have examined psychological variables associated with child headache sufferers. Rangaswamy and Balakrishnan (1982) administered a measure of intellectual functioning (Binet-Kamath test) and personality adjustment (Bell Adjustment inventory) to 100 children between the ages of 10 and 15 (M = 12.6) referred for complaints in school of headache, lack of concentration, eye strain and poor memory. Normal adolescents of average school performance without headache and other somatic complaints were used as controls. Results indicated that children in the headache group obtained lower IQ scores (M = 87 vs 97.7) and significantly poorer adjustment scores (p ≤ .001) than children in the control group.

Rangaswami (1982) similarly administered the Eysenck Personality Inventory and the Middlesex Hospital
Questionnaire to 20 subjects between the ages of 15 and 40 who complained of tension headaches. Matched neurotic and normal control groups were used. Results showed that tension headache sufferers earned significantly higher introversion and neuroticism scores than normal controls. In general, subjects with tension headaches demonstrated clinical profiles similar to those obtained by the neurotic controls.

Childhood Headaches Treatment Research: Relaxation Therapy

Unlike treatment studies conducted with adult headache patients, well-controlled investigations have not been conducted with child headache sufferers (Hobbs, Beck, and Wansley, 1984). Therefore, conclusions regarding the effectiveness of relaxation therapy in particular, as well as other behavioral treatment strategies, are necessarily limited, suggesting areas for future research more than providing solid empirical data. Studies published to date frequently either lack adequate controls or utilize designs which preclude examining the contributions of individual treatment components. Hobbs, Beck and Wansley (1984) additionally note that suitable controls for non-specific factors such as therapist attention and subject expectancy generally have been lacking in studies in this area. In addition, little effort has been made to verify children's self-reports of change in headaches frequency
and/or duration, the major dependent measures employed in the studies. Following is a review of this literature.

Sallade (1980) employed relaxation therapy as one treatment component in the treatment of children with migraine headaches. Eight children (4 boys and 4 girls) ranging in age from 8 to 11 years were, for six weeks, provided instruction in use of a modified Feingold diet. They were subsequently provided relaxation methods involving deep-breathing, muscle tension and release, pleasant images, and pleasant thoughts for six weeks. During the third six-weeks period, a standard client-centered group counseling approach was used. Results indicated that the frequency of headaches was about the same during the baseline, diet education, and nondirective phases of treatment. However, the average number of headaches decreased by 50% during the relaxation treatment phase. No significant sex differences were found. While supportive of the efficacy of relaxation therapy, these results must be viewed with caution in that no control group was used and children's self-reports were not socially validated.

Diamond and Franklin (1976) treated 32 children between the ages of 9-18 who complained of migraine headache. Treatment consisted of biofeedback training to increase finger temperature as well as instruction in progressive relaxation exercise with autogenic phrases; relaxation
training was aided by biofeedback of forehead muscle tone (EMG). Results indicated that all but two children reported decreases in headache activity. The two children showing no improvement were also suffering from depression. As with the above study, no control group was used. Further, it is not possible to individually assess the effects of relaxation therapy.

Werder and Sargent (1984) treated 31 children (16 girls and 15 boys) between the ages of 7 and 17 who were experiencing either tension, migraine, or combination headaches. The authors utilized a self-regulation treatment approach including biofeedback training, progressive relaxation, autogenic phrases, self-awareness and guided imagery. Results indicated a 39% reduction in mean headache hours for subjects with tension headaches and a 71% reduction for subjects with migraine and combination headaches. Reduction in drug usage was about 87%.

In one of the few studies employing a controlled group outcome design, Labbe and Williamson (1984) compared autogenic feedback training with a waiting-list control group as a treatment for childhood migraine headaches. Autogenic feedback training consists of a combination of skin temperature biofeedback and autogenic training. Twenty-eight children between the ages of 7-16 participated in the study. Statistical analysis of headache activity indicated that the children in the treatment condition
were significantly improved at the end of treatment and at 1-month follow-up. No improvement was found for the children in the control condition. Using a criterion of 50% reduction of headache activity as a definition of clinical improvement, 93% of the children in the autogenic feedback condition were clinically improved at the end of treatment and at 1-month follow-up.

Waranch and Keenan (1985) treated 15 children, aged 10-17 years, in a behavioral medicine clinic by using relaxation, biofeedback, and behavioral counseling. All subjects were evaluated by a pediatric neurologist and the diagnoses were based upon medical history, physical examination and, where indicated, laboratory evaluation. Ten subjects were diagnosed with migraine headaches, 4 with migraine plus muscle contraction headaches, and 1 with tension headaches. No control group was employed. Results indicated that 8 of 15 children were headache-free and 5 others exhibited a marked reduction in headache frequency and severity. These gains were maintained for follow-up periods of 6-22 (M = 12.8) months.

Mehegan (1982) treated 20 migraine sufferers aged 6-12 over nine sessions with a package of behavioral medicine approaches including biofeedback-assisted relaxation and behavioral counseling. (Behavioral counseling included a variety of techniques, e.g., contingency
management and instruction in coping skills). The study employed a multiple baseline design, with five subjects in each of four groups receiving 3-, 6-, 9-, and 12-weeks of baseline respectively. Six dependent variables were measured on weekly self-report forms throughout baseline and treatment: mean intensity and duration of headaches, number of headache days, medication use, total hours of headache, and headache activity. Results indicated significant improvement in all dependent measures.

Fentress (1983) treated 18 children aged 8-12 diagnosed with recurrent, intermittent migraine. A controlled group outcome design was used involving three treatment conditions: (1) biofeedback of frontalis EMG, meditative relaxation and behavioral counseling, (2) progressive muscle relaxation, meditative relaxation and behavioral counseling without biofeedback, and (3) a wait-list control condition. Results indicated significant improvement for the treated children on four dependent variables: frequency, total hours, activity and headache free days. A comparison of the biofeedback and relaxation groups with one another demonstrated no significant difference on any dependent variable. While this study demonstrates the biofeedback need not be a component of successful treatment of childhood migraine, the singular effect of relaxation therapy cannot be determined.
Blanchard and Andrasik (1985, p. 167) reported preliminary findings on the treatment of migraines in children aged 8-16. Using a controlled group design, 16 children were assigned to progressive relaxation training, 14 to autogenic feedback and 18 to no-treatment. Results indicate significant improvement for subjects in both treatment groups. Although subjects in the relaxation group showed a poor initial response (at end of treatment), results at 1, 3 and 6-month follow-ups revealed comparable improvement to subjects receiving autogenic training. According to the authors, this poor showing of relaxation at end of treatment may reflect sampling artifact or indicate that at first children may have difficulty with relaxation training and then overcome the difficulty with continued practice. Subjects assigned to the wait-list condition revealed no meaningful changes over the course of the study. Tentative findings also suggest that "booster sessions" during follow-up may serve to minimize the degree of relapse for children having difficulty maintaining their earlier gains.

These studies provide encouragement for the application of behavioral methods in the treatment of childhood headache. Presently, however, more rigorous research methods are needed. To date, for example, only one controlled study has been conducted on the efficacy of relaxation therapy alone, although it is often employed
as one component of a behavioral intervention package. Given the relative ease with which relaxation procedures may be used, contrasted with the specialized equipment needed for biofeedback methods, more research in this area is warranted.

Compliance With Relaxation Therapy

Although relaxation therapy has been widely used to treat a variety of psychophysiological disorders, the extent to which clients comply with the recommended treatment procedures has been a relatively neglected area of research. One common component of relaxation therapy, for example, is home practice. Clients are typically instructed to practice the relaxation procedures one to two times per day, using a pre-recorded cassette tape. Until recently, relaxation researchers have either ignored the level of home practice adherence or have relied on self-reports of practice (Hillenberg and Collins, 1982). Both solutions are problematic in that they preclude a pure test of the efficacy of relaxation procedures. In particular, the first solution does not allow us to examine the extent to which treatment failures are related to clients not practicing the procedure. The second solution, given clients' self-reports may be artificially inflated, contributes to researchers rejecting a procedure which is potentially beneficial when carried out as directed.
To date, research on compliance in relaxation therapy has been conducted using only adult subjects. Martin, Collins, Hillenberg, Zaabin, and Katell (1981) used a short tone placed at various points on a relaxation tape to monitor generalized compliance. Subjects were provided with a sequence of tapes to be played in order and were asked to note if they heard a tone. The subject's report was then compared with the implanted code to assess compliance. This procedure inexpensively provided data on whether or not subjects listened to the tape. Additionally, however, the system is reactive in that subjects know they are being monitored. It also requires weekly contacts to provide a new sequence of tapes.

Taylor, Agras, Schneider and Allen (1983) assessed compliance by providing 23 hypertensive clients with relaxation tapes upon which a 60 Hz sound was superimposed. Tape recorders, also provided, had specially designed circuitry built in which monitored the amount of time and counted the number of times the tape was played. The authors established 10 minutes as a minimum amount of time for the event to be counted as a practice session. Results indicated that 39% of the subjects adhered accurately to the practice instructions. In contrast, 71% of the subjects self-reported accurate compliance with instructions. Overreporting was greater during the last 4 weeks of practice than during the first 4 weeks. Overall, blood
pressures dropped following treatment, although drops in blood pressures were not significantly related to amount of practice.

Jacob, Beidel, and Shapiro (1984) also assessed compliance to relaxation therapy with subjects diagnosed as having essential hypertension. Clients were provided with coded tapes to be used with home practice. At the end of each tape, a "relaxation word of the day" was provided. Subjects were instructed to record the word of the day on a monitoring sheet after each practice session along with the level of relaxation accomplished. Subjects were considered to have practiced relaxation if the code word recorded on the monitoring sheet was correct. Results showed an 82% adherence level. This result is likely an overestimate, however, for two reasons. First, it was entirely possible for subjects to fast-forward the tape to the point near where the code would appear and note it without actually listening to the tape. Therefore, the compliance rate would appear higher than it actually was. Second, results were based upon only a 61% return rate. Specifically, 17 subjects were scheduled to hand in their relaxation monitoring forms during each of nine visits, or a total of 153 visits. Only 109 adherence data points were handed in. Reasons for missing data points included missed appointments (8), failure to hand in monitoring sheets (22), and forgetting to identify the three-letter
code assigned to the tape (14). Objectively, these reasons must be viewed as instances of noncompliance. Therefore, the results are skewed, representing the results of subjects who were complying at a higher rate. For the same reason, results suggesting no relationship between relaxation practice and decline of blood pressure should be viewed with caution. Essentially, if respondents are skewed toward compliance, there was likely not an adequate range of compliant and noncompliant behaviors from which to obtain a significant correlation.

Hoelscher and Lichstein (1984) assessed the compliance to relaxation therapy of 21 subjects who met the DSM-III criteria for Generalized Anxiety Disorder. Subjects were between 22 and 57 years of age. Compliance was determined through use of a relaxation assessment device (RAD) hidden in the battery compartment of a commercially-available cassette-tape-player. The RAD consists of a digital wristwatch with a stopwatch function. The stopwatch function of the watch records cumulative playing time and is activated only when the PLAY function of the tape player is depressed. The practice relaxation tape was sealed in the tape-player to prevent using other cassettes. Results showed 85% of subjects exaggerated their actual level of relaxation practice; the average estimation was 126% higher than the actual practice time.
Whereas self-reports suggested that 70% of the subjects were fully compliant, the RAD revealed that only 25% adhered to the once per day practice instruction. Correlational analyses controlling for pre-test scores revealed a significant relationship between anxiety reductions and amount of relaxation practice confirmed by the RAD.

A related issue is the extent to which regular and frequent practice of relaxation therapy is important in order to maintain effects on a long-term basis. Libo and Arnold (1983) conducted a 1-5 year follow-up study of patients receiving biofeedback therapy. Patients had been taught between 5 and 7 techniques for home relaxation practice as one component of the biofeedback therapy. Patients, additionally, were categorized as falling into one of six diagnostic groups: migraine headache, tension headache, mixed headache, chronic pain, anxiety, and essential hypertension. Results indicated that patients who self-reported at least occasional relaxation practice self-reported maintenance of gains made in treatment.

Continued research in compliance to relaxation therapy is needed. Specifically, the relationship between relaxation practice and size of treatment effect needs to be examined using objective relaxation compliance data. Presently, studies which indicate no relationship between
amount of practice and treatment effect must be interpreted cautiously because if un reli ably high estimates of practice time were used, it would statistically be very difficult to obtain a significant correlation between amount of practice time and treatment given such estimates would seriously restrict the range of possible compliance scores; correlation coefficients depend on the variability, or extent of individual differences, within the group (Anastasi, 1982, p. 124).
CHAPTER II

Large numbers of children are affected by headaches which are severe and frequent enough to adversely affect daily activities, school performance, school attendance and family relations. Yet, little is known empirically about nonpharmacological treatments for these children. Pharmacological treatments, while sometimes effective, often have adverse side-effects. In contrast, the adult literature on headache treatments is more developed.

Relaxation therapy is one component often utilized in the treatment of childhood headache in case studies and uncontrolled studies published to date. Its effectiveness, however, has not been determined in a controlled study when used alone. Further, research on relaxation therapy, across a variety of problem areas, has, until recently, overlooked the question of the extent to which subjects are complying with the treatment regimen.

This study has several purposes. One purpose is to determine the extent to which specific personality variables are associated with child headache sufferers. Toward that end, the psychometric properties of a modification of the SUNYA Revision of the Psychosomatic Symptom Checklist are examined as well as its effectiveness in differentiating
between headache and nonheadache samples. The second purpose is to examine the effectiveness of relaxation therapy in the treatment of childhood headache. The third purpose is to determine the role compliance plays in the effectiveness of relaxation therapy. Following are three experiments designed to address these issues.

Experiment 1

Purpose

One purpose of this experiment is to examine the psychometric properties of a modification of the SUNYA Revision of the Psychosomatic Symptom Checklist with a large sample of junior high school students. Reliability, validity, and local normative data are calculated. In addition, this study examines the test-retest reliability of the Revised Children's Manifest Anxiety Scale with the same sample.

Method

Subjects and Procedure. Subjects included all students in grades 6, 7, and 8 who were attending a suburban, parochial school which includes grades 1 to 8. One hundred eighty-seven students were given a packet containing the Revised Children's Psychosomatic Symptom Checklist, Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1978), and Children's Depression Inventory (Kovacs, 1980/81). (see Appendix A). Packets were randomly distributed and
were prepared so that the assessment instruments appeared in counter-balanced order. Subjects comprised two 6th-grade, two 7th-grade, and two 8th-grade classrooms. After one-week, the Children's Psychosomatic Symptom Checklist and the Revised Children's Manifest Anxiety Scale were again administered, in counter-balanced order, to one of the two randomly selected 6th, 7th, and 8th grade classes. Five-weeks after the original administration of the scales, the Children's Psychosomatic Symptom Checklist and the Revised Children's Manifest Anxiety Scale were administered, in counter-balanced order, to the other 6th, 7th, and 8th grade classes. The Children's Psychosomatic Symptom Checklist scores of nine students who were absent during the original administration of the scales and who subsequently completed the scales during the second administration were included for purposes of computing normative data.

In all, for the Children's Psychosomatic Symptom Checklist (C-PSC), subjects included 91 boys and 105 girls who ranged in age from 11 yrs. to 14 yrs. (M = 12.1, SD = .94). The C-PSC was readministered to eighty-five of the students after one-week and to another eighty-one of the students after five-weeks; the two groups were equivalent with regard to age (M = 12.1, SD = .96 vs M = 12.0, SD = .88), and sex discrimination (46% boys in each group). Retest data for 30 subjects were missing due to either absenteeism
or failure to appropriately complete all items on the checklist.

For the Revised-Children's Manifest Anxiety Scale, subjects included 73 boys and 88 girls who ranged in age from 11 yrs. to 14 yrs. (M = 12.2, SD = .92). Eighty students were retested after one-week while another eighty-one were retested after five-weeks; the two groups were equivalent with regard to age (M = 12.2, SD = .94 vs M = 12.0, SD = .89) and sex distribution (45% boys vs 46% boys). Data for twenty-one subjects were missing due to absenteeism. In addition, data were missing for three subjects who did not respond because of an unintentional failure to turn over the face sheet of the instrument and unuseable for two subjects who circled both yes and no to a large number of items.

**Instruments.** Children's Psychosomatic Symptom Checklist (C-PSC). In the SUNY revision of the PSC, Andrasik et al. (1984) modified the scoring of the scale such that nonoccurrence of a given symptom did not contribute arithmetically to the total score. Ratings were, therefore, made on a 0-4 scale, where 0 indicated no problem and 4 indicated daily occurrence for the frequency dimension, or that the problem was extremely bothersome when it occurred for the intensity dimension. In addition, for standardization reasons, respondents were presented
with a fixed list of symptoms to which to respond and were not given an opportunity to add other symptoms, as in the original scale. These two modifications were kept in this children's version.

Changes were made, however, to make the scale more suitable for administration to children and adolescents. First, directions were extensively revised so as to be more explicit and easy to follow. Short sentences were used while steps involved in completing the scale were spelled out in a sequential manner. Second, changes were made in the vocabulary level of the scale so as to be more appropriate for children and adolescents. For example, respondents were asked to rate "How Often" they experience a given symptom and "How Bad" it is when they do experience it rather than rate the symptom's "Frequency" and "Intensity". In addition, the descriptors used in the 0-4 rating system were more simply worded. Third, substitutions were made on actual symptom items so as to, again, take into account children's vocabulary level. For example, the item "insomnia" was replaced with "trouble falling asleep." Similarly, the item "depressed" was replaced with "sad."

Children's Depression Inventory (CDI). The CDI is a self-report instrument designed to assess overall severity of depression in children. It was developed by Kovacs (1980/81) to parallel the Beck Depression Inventory. The CDI consists of 27 items which cover the symptoms of
depression including suicidal thoughts, hopelessness, and sad mood. The validity of the inventory is supported by good correlation with the Piers-Harris Self-Concept Scale ($r = .55$); test-retest reliability over a one-month period was .72 in a nonclinical sample (Friedman & Butler, 1979).

Revised Children's Manifest Anxiety Schedule (RCMAS). As noted in Chapter 1, this is a 37-item self-report questionnaire designed to measure manifest anxiety. Responses to 28 items on the questionnaire yield a total anxiety score and three subscale scores. Subscales include physiological anxiety, worry-sensitivity, and social concerns-concentration. In addition, 9 items are devoted to a social desirability or Lie scale.

**Scoring.** The C-PSC was scored in the same manner used by Andrasik et al. (1984) to score the SUNY Revision of the PSC. Therefore, two scores were obtained. First, individual item scores were obtained by multiplying "How Often" (frequency) scores by "How Bad" (intensity) scores. As stated by Andrasik et al. (1984), these scores indicate the degree of distress associated with each individual psychosomatic complaint. The minimum possible score for each item was 0 and the maximum was 16. Total scores were also obtained for each subject by summing these individual item scores over all 17 items. This score
indicates the degree of overall psychosomatic distress. The minimum score possible was 0 and the maximum was 272. The RCMAS and CDI were scored in standard fashion (Reynolds & Richmond, 1978; Kovacs, 1980/81).

Data Analysis. In order to examine the internal reliability of the C-PSC, item-total correlations and coefficient alpha were computed. A factor analysis, with a two-factor solution specified, was also performed. Lastly correlations between C-PSC total scores and scores on the RCMAS and CDI were computed. A frequency distribution was computed as well as local normative data in the form of mean total, frequency and intensity scores; sex differences were examined using t-tests for independent samples. Test-retest reliability coefficients were computed for each item on the C-PSC as well as for total C-PSC and RCMAS scores at 1- and 5-weeks retest intervals. Sex and grade differences were tested using Fisher's z to t transformation (Guilford & Fruchter, 1978; Jensen, 1980). Given the number of comparisons being made, alpha was set at .004 in order to keep the experimentwise error rate at .05 (Kirk, 1982, p. 106).

Results

Children's Psychosomatic Symptom Checklist. Item-total correlations are defined as the score for each subject
on every item correlated with each subject's total score, excluding that item. They are useful in selecting individual items such that the internal consistency or homogeneity of the scale is maximized (Anastasi, 1982, p. 201). Item-total correlations were computed for each of the 17 C-PSC items using the following formula (Nunnally, 1978)

$$R = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

in which

- $x$ is each subject's item score
- $y$ is each subject's total score minus item score
- $\sum x^2$ is the sum of the squares of each subject's item score
- $\sum y^2$ is the sum of the squares of each subject's total score minus item score.

Results are presented in Table 1 and indicate that the item-total correlations for items 3, 5, 6, 8 and 15 were generally lower than correlations for other items on the scale.
Table 1
C-PSC Item-Total Correlations

<table>
<thead>
<tr>
<th>Item</th>
<th>( r )</th>
<th>Item</th>
<th>( r )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.73</td>
<td>10</td>
<td>.71</td>
</tr>
<tr>
<td>2</td>
<td>.41</td>
<td>11</td>
<td>.69</td>
</tr>
<tr>
<td>3</td>
<td>.24</td>
<td>12</td>
<td>.53</td>
</tr>
<tr>
<td>4</td>
<td>.74</td>
<td>13</td>
<td>.64</td>
</tr>
<tr>
<td>5</td>
<td>.15</td>
<td>14</td>
<td>.67</td>
</tr>
<tr>
<td>6</td>
<td>.23</td>
<td>15</td>
<td>.27</td>
</tr>
<tr>
<td>7</td>
<td>.72</td>
<td>16</td>
<td>.60</td>
</tr>
<tr>
<td>8</td>
<td>.24</td>
<td>17</td>
<td>.69</td>
</tr>
<tr>
<td>9</td>
<td>.75</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The test-retest reliability of each item was examined at two time intervals: 1- and 5-weeks. For the total sample (see Table 2), individual item correlations were generally significant and exceeded \( r = .60 \) at both 1- and 5-week intervals. Exceptions included items 6 and 8 which had low correlation coefficients at both 1- and 5-week retest intervals and items 3 and 16 which had low correlation coefficients at a 5-week retest interval.

Given the relatively poor performance of items 3, 5, 6, 8, and 15 on the item-total correlation, the markedly poorer retest reliability of items 3, 5, and 8, and the experience gained from this examiner's use of the C-PSC in other settings, it was hypothesized that the vocabulary level required by items 3, 5, 6, 8 and 15 was simply too high to be readily understood by junior high students.
Data indicating that students consistently responded to these items by marking 0 was consistent with this hypothesis.

Table 2
C-PSC Test-Retest Correlations for Individual Item Scores

<table>
<thead>
<tr>
<th>Item</th>
<th>One-Week (N = 85)</th>
<th>Five-Week (N = 81)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>.75</td>
<td>.60</td>
</tr>
<tr>
<td>Item 2</td>
<td>.73</td>
<td>.36</td>
</tr>
<tr>
<td>Item 3</td>
<td>.56</td>
<td>-.02*</td>
</tr>
<tr>
<td>Item 4</td>
<td>.87</td>
<td>.64</td>
</tr>
<tr>
<td>Item 5</td>
<td>.86</td>
<td>.87</td>
</tr>
<tr>
<td>Item 6</td>
<td>-.03*</td>
<td>-.03*</td>
</tr>
<tr>
<td>Item 7</td>
<td>.80</td>
<td>.85</td>
</tr>
<tr>
<td>Item 8</td>
<td>.07*</td>
<td>.00</td>
</tr>
<tr>
<td>Item 9</td>
<td>.60</td>
<td>.69</td>
</tr>
<tr>
<td>Item 10</td>
<td>.85</td>
<td>.80</td>
</tr>
<tr>
<td>Item 11</td>
<td>.76</td>
<td>.72</td>
</tr>
<tr>
<td>Item 12</td>
<td>.79</td>
<td>.73</td>
</tr>
<tr>
<td>Item 13</td>
<td>.82</td>
<td>.65</td>
</tr>
<tr>
<td>Item 14</td>
<td>.86</td>
<td>.73</td>
</tr>
<tr>
<td>Item 15</td>
<td>.48</td>
<td>.91</td>
</tr>
<tr>
<td>Item 16</td>
<td>.70</td>
<td>.21*</td>
</tr>
<tr>
<td>Item 17</td>
<td>.53</td>
<td>.55</td>
</tr>
</tbody>
</table>

Note: Correlations significant at \( p \leq .01 \).

*Correlation not significant

Therefore, it was further hypothesized that these five items would be significantly intercorrelated but distinct from other items on the checklist.

All 17 items were subjected to a principal components factor analysis with squared multiple correlations in the
diagonal; a two-factor solution was specified. Table 3 lists the item loadings for each factor. Results showed that of the five items in question, four (3, 5, 6, 8) loaded significantly on the second factor. Item 15 did not load significantly on either factor. Factor one, which is best interpreted as general psychosomatic distress, accounted for 70% of the total variance. Based upon these total results, items 3, 5, 6, 8 and 15, interpreted best as a vocabulary difficulty factor, were dropped from all subsequent analyses. Being an important measure of reliability, coefficient alpha was computed for the newly modified checklist. Coefficient alpha represents the expected correlation of one test with an alternative form containing the
Table 3

**First Unrotated and Orthogonal Varimax Factor Analyses of the C-PSC**

<table>
<thead>
<tr>
<th>Item</th>
<th>&quot;g&quot;*</th>
<th>Factor 1*</th>
<th>Factor 2*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>.560*</td>
<td>.583*</td>
<td>-.012</td>
</tr>
<tr>
<td>Item 2</td>
<td>.311*</td>
<td>.209</td>
<td>.443*</td>
</tr>
<tr>
<td>Item 3</td>
<td>.176</td>
<td>.056</td>
<td>.490*</td>
</tr>
<tr>
<td>Item 4</td>
<td>.711*</td>
<td>.633*</td>
<td>.404*</td>
</tr>
<tr>
<td>Item 5</td>
<td>-.030</td>
<td>-.105</td>
<td>.288</td>
</tr>
<tr>
<td>Item 6</td>
<td>.211</td>
<td>.038</td>
<td>.707*</td>
</tr>
<tr>
<td>Item 7</td>
<td>.589*</td>
<td>.628*</td>
<td>-.078</td>
</tr>
<tr>
<td>Item 8</td>
<td>.245</td>
<td>.067</td>
<td>.731*</td>
</tr>
<tr>
<td>Item 9</td>
<td>.592*</td>
<td>.623*</td>
<td>-.040</td>
</tr>
<tr>
<td>Item 10</td>
<td>.624*</td>
<td>.661*</td>
<td>-.063</td>
</tr>
<tr>
<td>Item 11</td>
<td>.725*</td>
<td>.693*</td>
<td>.201</td>
</tr>
<tr>
<td>Item 12</td>
<td>.562*</td>
<td>.530*</td>
<td>.184</td>
</tr>
<tr>
<td>Item 13</td>
<td>.629*</td>
<td>.621*</td>
<td>.119</td>
</tr>
<tr>
<td>Item 14</td>
<td>.658*</td>
<td>.686*</td>
<td>-.048</td>
</tr>
<tr>
<td>Item 15</td>
<td>.246</td>
<td>.302*</td>
<td>-.201</td>
</tr>
<tr>
<td>Item 16</td>
<td>.547*</td>
<td>.548*</td>
<td>.052</td>
</tr>
<tr>
<td>Item 17</td>
<td>.687*</td>
<td>.649*</td>
<td>.219</td>
</tr>
</tbody>
</table>

Loadings ≥ .30 are noted.

same number of items. The square root of coefficient alpha is the estimated correlation of a test with errorless true scores (Nunnally, 1978, p.214). The following computational formula, as recommended by Anastasi (1982, p. 117), and provided by Ebel (1965, p.328) was used to compute coefficient alpha:

\[
\alpha = \frac{k}{k - 1} \left( 1 - \frac{n \bar{Q}^2 - \bar{T}^2}{n \bar{X}^2 - (\bar{X})^2} \right)
\]
in which:

\[ k \] is the number of items
\[ n \] is the number of students
\[ \sum_k n \text{ times } k \text{ times } n \] is the sum of the squares of the \( k \) times \( n \) individual question scores
\[ \sum_k \] is the sum of the squares of the \( k \) question total scores
\[ \sum_n \] is the sum of the squares of the \( n \) student total scores
\[ \sum_n \] is the sum of the \( n \) student total scores

A coefficient alpha of .83 was obtained.

Finally, Pearson correlation coefficients were computed between the C-PSC and the Revised Children's Manifest Anxiety Scale and Children's Depression Inventory. The C-PSC showed modest correlations of .57 with the Children's Depression Inventory and .56 with the Revised Children's Manifest Anxiety Scale.

Normative data were obtained from the initial administration of the checklist to the students. Mean total, frequency, and intensity scores were computed for the total sample as well as for boys and girls. For the total sample (\( N = 196 \)), the mean total score was 23.4 (SD = 22.4).

Boys earned a mean total score of 21.5 (SD = 18.6), while girls earned a mean total score of 25.1 (SD = 25.3).

A mean frequency score of 12.3 (SD = 7.7) was obtained for the total sample. Similar scores were obtained individually for boys (M = 11.7; SD = 7.6) and girls (M = 12.8; SD = 7.8).
For the total sample, a mean intensity score of 10.2 (SD = 7.3) was obtained. Boys earned a mean intensity score of 9.5 (SD = 6.5) while girls earned a mean intensity score of 10.8 (SD = 7.9). T-tests, comparing boy-girl differences on mean total (t = 1.1, p ≥ .1), frequency (t = -.96, p ≥ .1), and intensity (t = -1.2, p ≥ 1) scores were not significant. F tests (Winer, 1971, p. 39) examining the assumption of homogeneity of variance for sex differences in mean total (F (105,91) = 1.18, p ≥ 1), frequency (F (105,91) = 1.03, p ≥ .1), and intensity (F (105,91) = 1.02, p ≥ .1), scores were also not significant.

Frequency distributions for the total C-PSC scores for both boys and girls separately, as well as for all subjects combined, are presented in Tables 4 and 5 respectively. Results, as expected, indicate a skewed distribution wherein approximately 7% of the respondents earned scores higher than two standard deviations above the mean.

Test-retest reliability was examined at two time intervals: 1 and 5 weeks. Pearson product-moment correlation coefficients were computed for total scores. As shown in Table 6, total score correlations were high and statistically significant for boys, girls, and total samples at both 1- and 5-week intervals. Fisher's r to z transformation (Guilford & Fruchter, 1978, Jensen, 1980)
was used to examine differences in reliability coefficients between boys and girls and between 1- and 5-week intervals. Total score reliability correlations obtained by boys and girls were not.

Table 4
Frequency Distribution of C-PSC by Sex

<table>
<thead>
<tr>
<th>C-PSC Total Score</th>
<th>Boys N</th>
<th>%</th>
<th>Cum.%</th>
<th>Girls N</th>
<th>%</th>
<th>Cum.%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>13</td>
<td>14.30</td>
<td>14.3</td>
<td>17</td>
<td>16.20</td>
<td>16.2</td>
</tr>
<tr>
<td>5-9</td>
<td>15</td>
<td>16.50</td>
<td>30.8</td>
<td>11</td>
<td>10.50</td>
<td>26.7</td>
</tr>
<tr>
<td>10-14</td>
<td>11</td>
<td>12.10</td>
<td>42.9</td>
<td>14</td>
<td>13.30</td>
<td>40.0</td>
</tr>
<tr>
<td>15-19</td>
<td>10</td>
<td>11.00</td>
<td>53.8</td>
<td>12</td>
<td>11.40</td>
<td>51.4</td>
</tr>
<tr>
<td>20-24</td>
<td>11</td>
<td>12.10</td>
<td>65.9</td>
<td>12</td>
<td>11.40</td>
<td>62.8</td>
</tr>
<tr>
<td>25-29</td>
<td>7</td>
<td>7.70</td>
<td>73.6</td>
<td>11</td>
<td>10.50</td>
<td>73.3</td>
</tr>
<tr>
<td>30-34</td>
<td>7</td>
<td>7.70</td>
<td>81.3</td>
<td>3</td>
<td>2.90</td>
<td>76.2</td>
</tr>
<tr>
<td>35-39</td>
<td>7</td>
<td>7.70</td>
<td>89.0</td>
<td>7</td>
<td>6.70</td>
<td>82.9</td>
</tr>
<tr>
<td>40-44</td>
<td>2</td>
<td>2.20</td>
<td>91.2</td>
<td>3</td>
<td>2.90</td>
<td>85.8</td>
</tr>
<tr>
<td>45-49</td>
<td>0</td>
<td>.00</td>
<td>91.2</td>
<td>5</td>
<td>4.80</td>
<td>90.6</td>
</tr>
<tr>
<td>50-54</td>
<td>1</td>
<td>1.10</td>
<td>92.3</td>
<td>0</td>
<td>.00</td>
<td>90.6</td>
</tr>
<tr>
<td>55-59</td>
<td>3</td>
<td>3.30</td>
<td>95.6</td>
<td>2</td>
<td>1.90</td>
<td>92.5</td>
</tr>
<tr>
<td>60-64</td>
<td>1</td>
<td>1.10</td>
<td>96.7</td>
<td>0</td>
<td>.00</td>
<td>92.5</td>
</tr>
<tr>
<td>65-69</td>
<td>1</td>
<td>1.10</td>
<td>97.8</td>
<td>2</td>
<td>1.90</td>
<td>94.4</td>
</tr>
<tr>
<td>70-74</td>
<td>0</td>
<td>.00</td>
<td>97.8</td>
<td>1</td>
<td>.95</td>
<td>95.4</td>
</tr>
<tr>
<td>75-79</td>
<td>1</td>
<td>1.10</td>
<td>98.9</td>
<td>1</td>
<td>.95</td>
<td>96.4</td>
</tr>
<tr>
<td>Above 79</td>
<td>1</td>
<td>1.10</td>
<td>100.0</td>
<td>4</td>
<td>3.90</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Total Cases 91 105
Table 5

Frequency Distribution of CPSC Total Scores - Overall

<table>
<thead>
<tr>
<th>CPSC Total Score</th>
<th>N</th>
<th>%</th>
<th>Cum.%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>30</td>
<td>15.3</td>
<td>14.3</td>
</tr>
<tr>
<td>5-9</td>
<td>26</td>
<td>13.3</td>
<td>28.6</td>
</tr>
<tr>
<td>10-14</td>
<td>25</td>
<td>12.8</td>
<td>41.4</td>
</tr>
<tr>
<td>15-19</td>
<td>22</td>
<td>11.2</td>
<td>52.6</td>
</tr>
<tr>
<td>20-24</td>
<td>23</td>
<td>11.7</td>
<td>64.3</td>
</tr>
<tr>
<td>25-29</td>
<td>18</td>
<td>9.2</td>
<td>73.5</td>
</tr>
<tr>
<td>30-34</td>
<td>10</td>
<td>5.1</td>
<td>78.6</td>
</tr>
<tr>
<td>35-39</td>
<td>14</td>
<td>7.1</td>
<td>85.7</td>
</tr>
<tr>
<td>40-44</td>
<td>5</td>
<td>2.6</td>
<td>88.3</td>
</tr>
<tr>
<td>45-49</td>
<td>5</td>
<td>2.6</td>
<td>90.9</td>
</tr>
<tr>
<td>50-54</td>
<td>1</td>
<td>.5</td>
<td>91.4</td>
</tr>
<tr>
<td>55-59</td>
<td>5</td>
<td>2.6</td>
<td>94.0</td>
</tr>
<tr>
<td>60-64</td>
<td>1</td>
<td>.5</td>
<td>94.5</td>
</tr>
<tr>
<td>65-69</td>
<td>3</td>
<td>1.5</td>
<td>96.0</td>
</tr>
<tr>
<td>70-74</td>
<td>1</td>
<td>.5</td>
<td>96.5</td>
</tr>
<tr>
<td>75-79</td>
<td>2</td>
<td>1.0</td>
<td>97.5</td>
</tr>
<tr>
<td>Over 79</td>
<td>5</td>
<td>2.6</td>
<td>100.0</td>
</tr>
</tbody>
</table>
significantly different at 1-week (z = 1.30, p ≥ .1) or 5-week (z = .39, p ≥ .38) retest intervals. Similarly, there were no significantly different reliability correlations between 1- and 5-week intervals for either boys (z = .37, p ≥ .5), girls (z = .95, p ≥ .2), or the combined (z = .16, p ≥ .4) sample.

Table 6
Test-Retest Correlations for C-PSC Total Scores

<table>
<thead>
<tr>
<th></th>
<th>1 week</th>
<th>5 Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>r</td>
</tr>
<tr>
<td>Boys</td>
<td>39</td>
<td>.86</td>
</tr>
<tr>
<td>Girls</td>
<td>46</td>
<td>.92</td>
</tr>
<tr>
<td>Combined</td>
<td>85</td>
<td>.90</td>
</tr>
</tbody>
</table>

All correlations are significant at p ≤ .01.

Revised Children's Manifest Anxiety Scale. Table 7 presents the test-retest correlations and the pretest and posttest mean scores and standard deviations for the total scale and the four subscales with 1- and 5-week retest intervals. Pearson correlations ranged from .60 to .88 and were significant (p ≤ .01). In all cases, posttest means were somewhat lower than pretest means. For the Total Test score, paired t = 2.54, p ≤ .01 with a one-week retest interval; paired t = 3.69, p ≤ .01, with a five week retest interval. In addition, a comparison of Total Test scores for boys and girls showed a significant difference (t = 1.76,
with girls earning scores, on average, 1.6 points higher than those of boys.

Test-retest reliability coefficients were additionally computed separately for boys and girls at both 1- and 5-week intervals. At 1-week, $r = .88$ for boys ($n = 36$) and $r = .86$ for girls ($n = 44$); at 5-weeks, $r = .78$ for boys ($n = 37$) and $r = .77$ for girls ($n = 44$). Sex differences in retest correlation coefficients were tested using Fisher's $r$ to $z$ transformation (Guilford & Fruchter, 1978); differences were not significant (at 1-week, $z = .39$, $p \geq .35$; at 5-weeks, $z = .09$, $p \geq .46$).
Table 7: One-week (n=80) and Five-week (n=81) Test-retest Reliability of the RCMAS for 6th, 7th, and 8th Grade Students and Pretest-Posttest Means and Standard Deviations

<table>
<thead>
<tr>
<th></th>
<th>One Week</th>
<th>Five Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Total Test</td>
<td>12.2</td>
<td>11.2</td>
</tr>
<tr>
<td>Physiological</td>
<td>3.8</td>
<td>3.3</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worry-Sensitivity</td>
<td>5.4</td>
<td>5.1</td>
</tr>
<tr>
<td>Social-Concentration</td>
<td>3.1</td>
<td>2.8</td>
</tr>
<tr>
<td>Lie Scale</td>
<td>1.9</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Note: All Pearson correlations are significant at p ≤ .01.
For the total sample, retest correlation coefficients were computed; differences were examined using Fisher's $r$ to $z$ transformation (Guilford & Fruchter, 1978). With a 1-week retest interval, the following correlation coefficients were obtained: grade 6 ($r = .89$), grade 7 ($r = .90$), and grade 8 ($r = .78$). Results examining differences in correlation coefficients were as follows: grades 6 vs 7 ($z = -.17$, $p \geq .4$); grades 6 vs 8 ($z = 1.23$, $p \geq .1$); grades 7 vs 8 ($z = 1.5$, $p \geq .07$). Differences were not significant. At 5-weeks, the following correlation coefficients were obtained: grade 6 ($r = .87$), grade 7 ($r = .74$), and grade 8 ($r = .58$). Results examining differences in correlation coefficients were as follows: grade 6 vs 7 ($z = 1.27$, $p \geq .1$); grades 6 vs 8 ($z = 2.39$, $p \leq .01$); grades 7 vs 8 ($z = .97$, $p \geq .17$). Again, differences were not significant.

Discussion

Results of this study support the use of the C-PSC as a reliable measure of psychosomatic distress with children. First, the factor structure of the checklist, when items 3, 5, 6, 8, and 15 are deleted, demonstrates excellent internal consistency as measured by the significant factor loadings of most items on the first factor, good item-total correlations for all items, and an obtained coefficient alpha of .83. This indicates that all of the items are homogeneous and
measuring what has been labeled general psychosomatic distress. Second, the C-PSC demonstrates very good test-retest reliability over a period of five-weeks. This finding suggests that psychosomatic distress, as measured by the C-PSC, is reliably reported.

In addition, results of this experiment provide preliminary support for the validity of the C-PSC as a measure of psychosomatic distress. For example, the divergent validity of the C-PSC is demonstrated through its modest correlations with measures of anxiety and depression. This suggests that psychosomatic distress, as measured by the C-PSC, is different from anxiety, as measured by the RCMAS, and depression, as measured by the CDI. Last, normative data suggest that the C-PSC is sensitive to varying degrees of self-reported psychosomatic distress, at least within a sample of 6th, 7th, and 8th graders.

Results of this study additionally support the temporal stability of the Revised Children's Manifest Anxiety Scale over a five-week interval. With both 1- and 5-week retest intervals, reliability coefficients for the Total Test, as well as the three subscales and Lie Scale were generally excellent. Significant sex differences on Total Test scores should be interpreted with caution in that the 1.6 point difference in scores is likely of doubtful
clinical significance and may be more reflective of a willingness by girls to report more anxiety than boys. Previous research on other well-known anxiety scales has consistently shown that girls display greater anxiety than boys (Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960). This result does, however, support the use of different norms for boys and for girls, as provided in the manual (Reynolds & Richmond, 1985). While more research is needed on the test-retest reliability with students of high school age, the Revised Children's Manifest Anxiety Scale does appear to be a reliable measure for the assessment of anxiety of children.

Experiment 2

Purpose

The purpose of this experiment is to examine the following hypotheses, as stated in the null form:

H01 At the end of the experiment, there will be no statistically significant differences between the mean difference scores of the treatment and control group on headache status as measured by Headache Index, Headache-Free Days, Peak Headache Rating, Percent Improvement and Medication Index (Blanchard and Andrasik, 1985).
H02 There will be no statistically significant positive relationship between compliance rate, as computed from objective compliance data, and headache status, as measured by Headache Index, Headache-Free Days, Peak Headache Rating, Percent Improvement and Medication Index (Blanchard and Andrasik, 1985).

H03 There will be no statistically significant positive relationship between weekly Headache Index scores reported by subjects and weekly Headache Index scores reported by legal guardians.

Method

Subjects. Subjects initially included 4 male and 10 female chronic headache sufferers (migraine or muscle contraction) between the ages of 11 and 17 (M = 14.6; SD = 1.9). Subjects were referred by either a physician or other health professional at The Children's Hospital, Columbus, Ohio, or by a school nurse from 1 of 2 school districts within primarily upper-middle to upper socioeconomic level communities. Subjects were screened for the following inclusion and exclusion criteria:

Migraine headache - the subject must (a) report at least 2 migraine headaches per month (Labbe and Williamson, 1984), (b) report recurrent
headaches, separated by symptom-free intervals, and (c) any three of the following six symptoms:
(1) abdominal pain, nausea, or vomiting with the headache; (2) hemicrania, (3) a throbbing, pulsatile quality of pain; (4) complete relief after a brief period of rest; (5) an aura, either visual, sensory, or motor; and (6) a history of migraine headaches in one or more members of the immediate family (Prensky and Sommer, 1979).

Muscle-contraction headache - subjects must report (a) at least 2 headaches per month; (b) continuous headache of prolonged duration with the absence of neurological signs; (c) bilateral distribution; (d) generalized or "band-like" headaches; (e) absence of nausea or vomiting; and, (f) exacerbations temporally related to school performance, social functions, or familial stress (Jay and Tomasi, 1980).

Exclusion criteria included (a) meeting DSM-III (American Psychiatric Association, 1980) criteria for mental retardation or pervasive developmental disorders and/or (b) medical restrictions on the use of muscle tension relaxation techniques.
In all, data for 4 subjects were unuseable. One subject dropped out of the study after completing one-week of baseline data, while another dropped out after the first treatment session. Data for 2 other subjects were eliminated due to either failure to complete dependent measures or detection of the watch concealed in the battery compartment of the provided cassette player (see Apparatus section below). Therefore, for this experiment, 10 subjects were included (3 boys and 7 girls). Six subjects met inclusion criteria for migraine headaches while the remaining 4 met inclusion criteria for muscle contraction headaches. Subjects ranged in age from 12 to 17 years ($M = 13.5$, $SD = 1.3$).

Procedure. Each subject was sequentially assigned to one of the two treatment conditions. Thus, the first referred subject was assigned to the treatment group while the second referred subject was assigned to the control group, and so on. Upon referral, each subject, along with at least one legal guardian, was oriented by the experimenter with the following introductory comments (comments varied according to which treatment group the subject was assigned):

Relaxation Group: In this study, we are interested in learning more about a method of treating headaches in children which does not
require the use of any medication. The method is called relaxation training; it has been successfully used for many years to treat both adults and children with a variety of problems. Relaxation training involves learning how to completely relax all of the muscles in your body very quickly and very safely. Several studies have shown that this technique is effective in reducing the frequency and intensity of headaches in children; we want to find out more about that.

You may be wondering now how relaxation training would be helpful. Well, a lot of research suggests that stress is one factor which contributes to the development of headaches. Stress can sometimes come "from within us" like when we tell ourselves upsetting things or, it can sometimes come "from the outside" like when certain foods or noises affect us. Certainly, not everyone reacts to stress with a headache, but, in people who do tend to react that way, it seems that their bodies are just "naturally wired" to do that. It's not something they cause but it's something they can learn to control better. If you
agree to participate in the study, you will each be asked to complete a few psychological questionnaires. These are not difficult to complete, yet will help us learn more about "what works and perhaps what doesn't" with particular people. In addition, we will ask each of you to keep a record for three weeks on several aspects of your (to guardian, your child's) headache, for example frequency and intensity. Once we know what your headaches are like now, we'll be better able to determine if there has been a change after the relaxation training. You'll also be asked to keep this record for 2 more weeks toward the end of the relaxation training. This training will consist of eight 30-60 minute sessions held over four consecutive weeks. It is important to attend all of the sessions if you agree to participate. If for some reason you decide not to complete the study, however, you will certainly not be penalized in any way. In addition, you will be asked to practice the relaxation procedure once a day at home. In all, your participation in the study will take about 3 months - three weeks of keeping records, 5 weeks of relaxation
training, 2 more weeks of record keeping, and then, one month later, another 2 weeks of record keeping. The reason for keeping records again after one month is to see if the effects of relaxation last after treatment is completed. Are there any questions?

Control Group - Introductory comments for subjects in this group were identical to those in the relaxation group with one exception. Following completion of the first two paragraphs of the relaxation only group comments, subjects were given the following:

If you agree to participate in the study, you will each be asked to do several things. First, you'll be asked to complete a few psychological questionnaires. These are not difficult to complete, yet will help us learn more about "What works and perhaps what doesn't." Second, we will ask each of you to keep records on several aspects of your (to guardian; your child's) headache, for example frequency and intensity. In fact, we're going to ask you to keep records for what I'm sure will seem like a long time. Specifically, for three weeks at the beginning of the study and then for two more
weeks about one month later. Why so long? Well, during that time, a group of children very similar to your own, will be "testing out" the relaxation training program. Your child's training will begin immediately afterwards. In all, it will be approximately 10 weeks before we'd be in a position to administer the treatment to your child. The actual treatment will then consist of two 30-60 minute sessions twice a week for four weeks. This length of time is actually a little shorter than the time it would take to see a psychologist at Children's Hospital by appointment, simply because of the long waiting list. Are there any questions? (After all questions were answered, consent and headache monitoring forms were distributed and the psychological battery administered).

In order to increase compliance with headache self-monitoring, subjects in both groups were informed they would receive one pack of gum for each week of completed headache monitoring. In addition, they were informed that upon receipt of completed follow-up records, their name would be placed in a $30 lottery. Legal guardians were also informed that their names would be placed in a
separate $30 lottery upon receipt of completed follow-up records (Labbe & Williamson, 1984).

Instruments. Outcome data was derived from a Headache Diary (Blanchard and Andrasik, 1985). In its original form, subjects are asked to rate the level of headache activity four times per day, at roughly breakfast, lunch, dinner and bedtime, according to the scale shown in Table 8, as well as list the type and amount of medication, if any, taken. For purposes of this experiment, the Headache Diary was modified so as to be more appropriate for administration to children and adolescents. First, the wording of the scale was changed in order to more likely be understood by a population of children with a wide range of abilities (see Table 9). Secondly, visual depictions of pain intensity, correlated with verbal descriptions, were presented. Lastly, a section designed to assess compliance to treatment was added (see Appendix A).
Table 8

Headache Rating Scale

Headache Levels

0 = No headache
1 = Very mild headache, aware of it only when attending to it
2 = Mild headache, could be ignored at times
3 = Moderate headache, pain is noticeably present
4 = Severe headache, difficult to concentrate, can do undemanding tasks
5 = Extremely intense headache, incapacitated

Table 9

Revised Headache Rating Scale

Headache Levels

0 = No headache
1 = Very mild headache, aware of it only when paying attention to it
2 = Mild headache, could be ignored at times
3 = Medium headache, pain is noticeable
4 = Bad headache, difficult to think, can do easy tasks
5 = Very bad headache, can't do anything

Six dependent measures were derived from the headache diary. They are:

1. Headache Index. This is the average daily headache score for the week and is found by summing all 28 ratings from the week (4 ratings per day for 7 days) and dividing by 7.

2. Headache-Free Days. This is the number of days in a week for which the patient has no headache.
3. Peak Headache Rating. This is the single highest headache rating from among the 28 ratings for the week (Blanchard and Andrasik, 1985).

4. Percent Improvement. This is the Average Headache Index during baseline minus the Average Headache Index for the last 2 weeks of treatment divided by the Average Headache Index during baseline times 100.

5. Medication Index. An average daily Medication Index is calculated by summing the products of the number of doses of a drug multiplied by its potency scale value (Blanchard and Andrasik, 1985). Potency scale values are determined through tables developed by Coyne et al. (1976) and Blanchard and Andrasik (1985).

6. Relaxation-Compliance Percentage. Parents of each subject were asked to keep a record of the daily number of times relaxation was practiced. For each subject, a compliance rate was computed by dividing actual practice time by requested amount of practice time and multiplying by 100.
The social validity (Wolfe, 1978; Kazdin, 1977) of the headache diary was demonstrated by Blanchard et al. (1981). In their study, the correlation between the percent improvement scores of 62 headache patients and ratings from significant others was a highly significant $r = 0.44 \ (p \leq .002)$.

Each subject was asked to keep an account of his headache activity, using the Headache Diary, for 3 weeks prior to the start of treatment. Diaries were additionally kept for 2 weeks beginning with the last week of treatment, and for 2 weeks beginning one-month following completion of treatment. Compliance data was collected during the first 3-weeks of treatment. In addition, one legal guardian of each subject was asked to complete diaries during the same periods of time, giving their best estimate of the subject's headache activity and compliance to treatment.

Treatments. Subjects were randomly assigned to one of two treatment conditions:

1) Relaxation Group. Relaxation therapy was based on procedures set forth by Bernstein and Borkovec (1973) in their book Progressive Relaxation Training: A manual for the Helping Professions (see Appendix B). These procedures are themselves based upon the work of Jacobson (1938).
Session 1 consisted of introductions, review of the rationale for relaxation therapy in the treatment of headaches and demonstration and practice of the procedure using 16 muscle groups. The rationale for relaxation via muscle tension (see Appendix) was presented following the model proposed by Bernstein and Borkovec (1973, pp. 19-20). Following the presentation of the rationale, the therapist modeled relaxation of the first muscle group. Group members were then given an opportunity to practice relaxing that muscle group. This process continued until all 16 muscle groups had been demonstrated and practiced. Lastly, the therapist led group members sequentially through all 16 muscle groups (Bernstein and Borkovec, 1973, pp. 21-26).

Session 2 began with a review of the subjects' experiences with relaxation. Next, the therapist again took subjects through the 16 muscle group relaxation procedure:

Session 3 began with a review of the subjects' experience with relaxation followed by the therapist taking subjects through the 7 muscle group procedure.

Session 4 was conducted in an identical fashion to Session 3.

Session 5 began with a review of the subjects' experiences with relaxation followed by the therapist taking subjects through the 4 muscle group procedure.
Session 7 began with a review of the subjects' experiences with relaxation followed by the therapist taking subjects through the 4 muscle group procedure using recall and counting only.

Session 8 will begin with a review of the subjects' experiences with relaxation followed by the therapist taking subjects through the relaxation procedure using counting and cue-control procedures only.

Following each treatment session, subjects were instructed to practice the relaxation procedure once a day at home. Subjects who reported practicing once each day were verbally reinforced by the therapist.

2) No Treatment Control. Subjects in this treatment condition, along with one of their legal guardians, were asked to complete pre- and post headache diaries with no intervening treatment. Following completion of data collection, they were provided the same treatment as described above.

Apparatus. A Magnavox D7160 Band Radio Cassette Recorder, specially equipped with an analog watch placed in the battery compartment and an appropriate practice tape (tape contents consisted of the relaxation procedure as practiced during the treatment sessions that week) was provided for home practice. The analog watch, which was preset to 12 noon by the therapist, was designed to
activate whenever the function switch was set to Tape
and the Play button was depressed. Both the battery com-
partment and tape door were secured in order to prevent
detection of the watch or removal of the practice tape.
Because the relaxation procedure changed with each success-
ive week of treatment, subjects were required to bring
the recorder and tape with them to the first treatment
session of each week of treatment for a new cassette
player with an updated practice tape. Actual practice
time was recorded by the therapist by opening the battery
section and viewing the amount of time which had elapsed.
The watch was then reset to 12 noon and the machine was
prepared for use for the following week.

Monitoring the extent to which subjects were learn-
ing the relaxation procedure - Three measures were used to
monitor the extent to which subjects were learning the
relaxation procedure subjective, objective and physiologi-
cal. The subjective measure consisted of a variant (see
Appendix 8) of the Subjective Unit of Disturbance (SUD)
Scale introduced by Wolpe and Lazarus (1966). Employing
a pre-post session design, each subject was asked to rate
his or her level of tension at the start and completion of
each relaxation session on a scale of 0 to 50. A SUD
difference score was computed for each subject.
As an objective measure of the extent to which subjects were learning the relaxation procedure, each subject was evaluated by his or her therapist during each relaxation session using a scale designed for this study (see Appendix). The scale was written so as to measure the extent to which subjects demonstrated behaviors consistent with relaxation and relaxation training. A total score was computed for each subject.

Lastly, a Computer Instruments Corporation Heart Speedometer Model 8519 was used to obtain pre- and post session measures of each subject's number of heart beats per minute. A pre-post difference score was computed for each subject per session. A reduction in heart beats per minute has been identified as consistent with a relaxed state (Benson, 1975).

Therapists. Relaxation training for all subjects assigned to the treatment group was provided by a female clinical social worker (MSW) employed in the Adolescent Clinic at Children's Hospital, Columbus, Ohio. A doctoral student in school psychology at The Ohio State University provided training for 4 subjects assigned to the control group; this researcher provided training for one subject in the control group. All training for control group subjects was provided following their completion of pre- and post-test data. The therapists were blind to the
experimental group subjects were assigned.

The therapists providing relaxation training were trained in the procedure by this experimenter. Training was conducted during two one-and-one-half hour sessions. During the first session, Progressive Relaxation Training (Bernstein & Borkovec, 1973) was reviewed and questions pertaining to the text were answered (therapists had previously been given a copy of the text for review). In addition, relaxation procedures to be used in this study were verbally reviewed after which time therapists participated, as clients, in an actual relaxation training session conducted by this experimenter. Session two consisted of role-playing activities designed to practice and reinforce proper relaxation training techniques. At the conclusion of training, therapists demonstrated the minimum skills necessary for delivery of relaxation training by successfully meeting the criteria stated in Appendix B, as judged by this experimenter.

Debriefing. At the completion of treatment, subjects were informed that level of relaxation practice was electronically monitored. The following comments were made:

The major question this study sought to answer was whether or not relaxation therapy is effective in the treatment of childhood
headaches. One assumption we made was that the amount of relaxation practice would be related to how effective the procedure would be in relieving headaches. Thus, the more someone practiced, the more relief he/she would obtain. That's why we asked you to keep a record of the number of times you actually practiced during each week.

We were faced with a problem, however. From past research we knew that people frequently, and, for very many good reasons, have difficulty accurately keeping track of the number of times a specific behavior occurs. Therefore, we decided to independently monitor the amount of practice. Inside the recorder we lent you was an electronic device which counted the amount of actual practice time. It started every time the "PLAY" button was depressed and stopped whenever the recorder was turned off. Having this kind of "objective" information was essential if we were truly to determine whether amount of practice made any difference. We will now be better able to determine what a "good" amount of practice will be for future headache patients. Your willingness to complete the records is greatly appreciated and the information you
provided will prove to be very valuable. I apologize for not being completely "up front" with you from the beginning. The danger was that if you knew you were being monitored you would likely change your behavior in some way and then the results of the study would have been less helpful to future headache patients. From this point onward, I can assure you that everything is "as it appears to be."

Are there any questions?

Results

Monitoring of the relaxation response. Analysis of monitoring data was undertaken for three reasons: (a) to determine whether subjects reported significant reductions in SUD scores following relaxation training sessions, and (b) to determine whether subjects' overt behavior during relaxation training was consistent with a relaxed state, and, (c) to determine whether subjects earned significantly lower heart rate scores following relaxation training sessions. Data for subjects in both the treatment and control groups were included in the analyses. This was possible because subjects in the control group were provided relaxation training immediately following completion of pre- and post headache monitoring. Relevant data was, therefore, available. Including control
group treatment data was **appropriate** because treatment group vs. control group differences were not being examined in these analyses. Rather, the questions being addressed involved any subjects' subjective, objective, and physiological responses to relaxation training sessions.

On the subjective measure, mean SUD differences ranging from -45 to 45 were obtainable. A difference of -45 indicated maximum subjective increase in tension level, a difference of 0 indicated no subjective change in tension level, while a difference of 45 indicated maximum subjective reduction in tension level. For all subjects, a per session SUD reduction of \( M = 10.3 \) (\( SD = 8.1 \)) was obtained. This difference was significant at \( p \leq .01 \), (paired \( t = 10.9 \)).

On the objective measure, subjects earned a per session rating of 0 to 5. A rating of 0 indicated minimal overt behaviors consistent with a relaxed state. A rating of 5 indicated maximum overt behaviors consistent with a relaxed state. Subjects earned a per session rating of \( M = 4.6 \) (\( SD = .70 \)).

As a physiological measure, differences in subjects' pre- and post-session heart rates were computed. For all subjects, a significant reduction of \( M = 6.6 \) (\( SD = 3.4 \)) was observed (paired \( t = 7.1, p \leq .01 \)). Together, results from these subjective, objective and physiological measures indicate subjects achieved a heightened state
of relaxation during the relaxation training sessions.

**Compliance with treatment.** Data from subjects in both treatment and control groups were included. The unit of analysis consisted of the total of each subject's reported, actual, and requested practice time per week. Reported time was defined as the total amount of time a subject reported practicing relaxation that week. Actual time was defined as the total amount of time appearing on the analog watch for that week. Requested time was defined as the total amount of time the subject was asked to practice each week (210 minutes for the 16 muscle group and 105 minutes each for the 7 and 4 muscle groups). Comparisons between reported and actual times and between requested and actual time were computed. In all, with \( N = 10 \), objective compliance data was obtained for 28 of 30 total weeks of relaxation training; data from two weeks of training were missing due to therapist error in recording actual times.

Of the 28 weeks, data from 19 indicated subjects overreported their actual practice time. That is to say, subjects stated they practiced more than they actually did. Data from 9 weeks indicated subjects underreported their actual practice time. That is to say, subjects reported practicing less than they actually did. These results are analyzed separately below.
Looking at the data from the 19 overreported weeks, subjects reported practicing, in all, 2660 minutes. Actual practice time was 1145 minutes while requested practice time was 2730 minutes. Comparing reported to actual times, subjects overreported by 132%. Comparing actual to requested times, subjects achieved a compliance rate of 0.42. That is, subjects practiced 42% of the time they were requested.

Looking at the data from the 9 underreported weeks, subjects reported practicing, in all, 1016 minutes. Actual practice time was 2178 minutes while requested practice time was 1365 minutes. Comparing reported to actual times, subjects underreported by 147%. Comparing actual to requested times, subjects achieved a compliance rate of 1.6. That is, subjects practiced 60% more than they were requested. Follow-up contacts with all of the subjects in this group indicated that other family members used the provided cassette player in order to: (a) experience what the relaxation training was like, (b) practice on a regular basis, or, in one instance, (c) transcribe the relaxation tape for future use. Actual practice time was consequently inflated and it is therefore inaccurate to view these data as instances of underreporting.

In order to obtain estimates of the actual compliance rate and overreporting percentage for the entire sample, data from the "underreporting" group were modified such
that subjects' reported time was accepted as a perfect predictor of actual time. In other words, subjects' actual time was modified to correspond perfectly to subjects' reported time. This modification assumed that any discrepancy between reported and actual time was explained by use of the cassette player by other family members. For the entire sample, subjects reported practicing 2660 minutes. Actual practice time totaled 1145 minutes while requested practice time totaled 2730 minutes. Comparing reported to actual practice times, subjects overreported by 59%. Comparing actual to requested times, subjects achieved a compliance rate of .59. That is, subjects practiced 59% of the time requested.

Compliance rate and overreporting percentage were also computed separately for subjects in the treatment and control groups; modified underreporting data were used in this analysis. For the treatment group, subjects achieved a compliance rate of .45 and overreported practice time by 108%. For the control group, subjects achieved a compliance rate of .63 and overreported by 70%. There were no statistical differences between groups in compliance rate ($t = .59, p \leq .38$) or overreporting percentage ($t = 1.33, p \leq .1$).

**Treatment Effectiveness.** Mann-Whitney U-Tests for differences between independent samples were used to
Examine treatment and control group differences in Headache Index, Headache Free Days, Peak Headache Rating, and Medication Index scores were not significant; differences in Medication Index scores approached significance at $u = 3, p \leq .03$.

**Clinical Significance.** Percent Improvement scores were computed for each subject at the end of treatment. Subjects were rated as improved if their Percent Improvement score was 50% or higher; Slightly Improved if their Percent Improvement score was between 20 and 49%, and Unimproved/Worse if their Percent Improvement score was less than 20%. For the 5 subjects in the treatment group, 3 were rated as Improved, 1 was rated as Slightly Improved, and 1 was rated as Unimproved/Worse. In contrast, for the 5 subjects in the control group, all were rated as Unimproved/Worse. Following completion of relaxation training, 3 subjects in the control group were subsequently rated as Improved, 1 subject was rated as Slightly Improved, and 1 subject was rated as Unimproved/Worse.

One-month follow-up data was obtained for 6 subjects (4 from the treatment group and 2 from the control group). Four subjects who were rated as Improved immediately following treatment were again rated as Improved at follow-up. Two subjects who were rated as Slightly Improved immediately following treatment were rated as Unimproved/Worse at follow-up.
Compliance Rate and Pre-Post Headache Index Difference Scores. A compliance rate (actual time divided by requested time) was computed for each of the 10 subjects in this experiment. To obtain a measure of the relationship between compliance to treatment and treatment effect, a Pearson correlation coefficient was computed between compliance rate and pre-post Headache Index difference scores. A nonsignificant correlation coefficient of .42 was obtained.

Correlation Between Subject and Parent Weekly Headache Index. Headache Diaries were completed by subjects' parents for a total of 31 out of 70 weeks. A Headache Index was computed for each week. To obtain a measure of the relationship between subjects' and parents' ratings of subjects' headache, a Pearson correlation coefficient was computed between the weekly Headache Index, as determined by subjects' ratings and the weekly Headache Index as determined by parents' ratings. A significant correlation coefficient of .91 was obtained ($p \leq .001$).

Discussion

This study examined the extent to which relaxation therapy is effective in the treatment of migraine and muscle contraction headaches in children. In addition, treatment compliance was subjectively and objectively measured and correlated with treatment effectiveness.
Lastly, the social validity of the Headache Diary was examined. Significant findings were obtained in each of these areas.

Relaxation Therapy. This study provides support for the effectiveness of relaxation therapy alone in the treatment of migraine and muscle contraction headaches in children. Significant differences between treatment and control groups were found in Headache Index scores. Although difficult to interpret clinically, the Headache Index provides the most sensitive measure of daily headache activity. From a clinical perspective, 60% of all the subjects were improved following treatment while another 20% were Slightly Improved. Furthermore, results of limited follow-up data suggest that treatment effects are generally maintained over at least a brief period of time. The long-term maintenance of treatment effects is unknown although similar research employing relaxation therapy as one component has generally supported the maintenance of treatment effects over 6 months to one year (Blanchard & Andrasik, 1985; Waranch & Keenan, 1985). Further research on the long-term benefits of relaxation therapy alone is needed.

Results of this study compare favorably with those of studies employing a multi-factored treatment regimen. For example, Werder and Sargent (1984) reported a 39%
reduction in mean headache hours for children treated for tension headaches, and a 71% reduction for children treated for migraine and combination headaches using a self-regulation treatment approach including biofeedback training, progressive relaxation, autogenic phrases, self-awareness and guided imagery. In this study, similar results (80% of subjects either Improved or Slightly Improved) were obtained using only one treatment component. Replication of these results with other samples is needed. However, they suggest relaxation therapy alone can explain much of the improvement noted in other studies. Research examining the differential impact of treatment components used in conjunction with relaxation therapy is needed.

Given the small sample size in this study, reliable judgments regarding the differential effectiveness of relaxation therapy in the treatment of children with migraine vs muscle contraction headaches cannot be made. Research with adult headache sufferers indicates relaxation therapy provides greater symptomatic relief for individuals with muscle contraction headaches than with migraine headaches (Blanchard & Andrasik, 1985). In this study, subjects classified as having migraine headaches as well as subjects classified as having muscle contraction headaches were rated as Improved following treatment. Studies which systematically compare the differential effects of relaxation
therapy with these two groups of headache sufferers are needed.

Compliance. This study marks the first time objective compliance data is being reported for relaxation therapy with a pediatric sample. Results are consistent with similar studies conducted with adult samples and indicate treatment compliance is a significant problem in the use of relaxation therapy. Overall, subjects practiced the relaxation procedure 53 percent of the time requested of them and overreported their actual practice time by 59%. The initially unexpected finding that 9 subjects underreported their actual practice time is plausibly explained by other family members using the cassette player provided for home practice. Under those conditions, actual practice times would be higher than reported practice times. Given the commitment of time and energy required for participation in this study, it is very conceivable that parents would be curious about the therapy process and interested in "testing it out" themselves. Given the circumstances, it is defensible to accept those subjects' reported practice times as accurate. At worst, these subjects' reported times may be overestimates of their actual practice time, contributing to a high estimate of overall compliance rate and low estimate of percent of overreporting when combined with data from other subjects.
Results of the relationship between compliance rate and treatment effect are more difficult to interpret.

Studies using adult subjects which have examined the relationship between compliance with relaxation training and treatment effectiveness have generally yielded conflicting results. Some have found no relationship between compliance and treatment effectiveness (Taylor et al., 1983), while others have found a significant positive relationship (Hoelscher & Lichstein, 1984). In this study, the correlation between compliance rate and treatment effectiveness was not significant. This result raises the question as to whether relaxation therapy has "active" treatment components for headache reduction. For example, Agras et al. (1982) and Redman et al. (1974) demonstrated strong expectation effects in relaxation therapy when used with adult hypertensive patients. Similar expectation effects may occur in pediatric populations although more research is needed in this area.

Headache Diary. Results of this study support the social validity of the Headache Diary given the highly significant correlation observed between weekly Headache Indexes derived from subject and legal guardian reports. Although subject and guardian were asked not to "compare notes" while completing the Headache Diaries, one possible explanation for the high correlation between the responses
would be that subjects and guardians colluded in writing down identical responses. The data argues against this type of collusion, however, in that only 3 instances were observed wherein Headache Indexes for the same week were identical for subject and guardian.

Experiment 3

**Purpose.** The purpose of this experiment is to test the following hypothesis stated in the null form.

$H_0$ There will be no statistically significant differences between scores obtained on the Children's Depression Inventory, Children's Psychosomatic Symptom Checklist, or Revised Children's Manifest Anxiety Scale by subjects having headaches and scores obtained by matched non-headache controls.

**Method**

**Subjects.** Subjects included, in part, all the subjects in Experiment 2. In addition, 14 non-headache controls were obtained either from the pool of subjects comprising the sample in Experiment 1 or from participants in a junior level high school sociology class who were administered the same assessment instruments. Controls were identically matched for sex and were matched as closely as possible for age. For example, the mean age for the headache sample was 14 yrs., 6 mos. ($SD = 1.9$) while the mean age
for the matched controls was 14 yrs. 4 mos \((SD = 1.9)\).

Similarly, for the headache sample, the mean age for boys was 13.3 \((SD = 1.4)\) compared with 13.2 \((SD = 1.1)\) for boys in the control sample; the mean age for girls in the headache sample was 15.0 \((SD = 1.9)\), compared with 14.7 \((SD = 1.9)\) for the girls in the control sample. Controls were randomly chosen and included on the basis of being the first to match the headache sample on sex and age. When an identical match on age was unavailable, the subject with the closest approximation was included. Controls were excluded if they scored higher than 4 on item 1 of the C-PSC, suggesting a chronic headache problem. Eleven of the headache subjects were from a middle or upper socioeconomic level; three were from a low socioeconomic level. All 14 of the nonheadache controls were from a middle or upper socioeconomic level.

Procedure. Subjects in both the headache and control groups were administered the C-PSC, Children's Depression Inventory, and Revised Children's Manifest Anxiety Scale in counterbalanced order. In addition, the Draw A Person (Naglieri, 1987) was administered to subjects in the headache sample in order to determine whether earned C-PSC, CDI, or RCMAS scores were significantly correlated with ability level. \(T\)-tests were used to compare scores obtained on all the instruments for the two samples.
Given multiple comparisons were made, the Bonferroni procedure (Kirk, 1982), p. 106) was used to keep the experimentwise error rate at .05; alpha was therefore set at .01. For the headache sample, Pearson correlation coefficients were computed between obtained scores on the Draw A Person and obtained total scores of the C-PSC, Children's Depression Inventory, and Revised Children's Manifest Anxiety Scale.

**Instruments.** The C-PSC, RCMAS, and CDI are described in Experiment 1. The Draw A Person (Naglieri, 1987) is an easily administered, reliable, and valid nonverbal measure of ability. Studies conducted to date have demonstrated that the DAP has high test-retest, inter-rated, and intra-rater reliability. In addition, construct validity, as demonstrated in part of the age-to-age progression of raw scores, and concurrent validity, as demonstrated by high correlations between the DAP and other measures of nonverbal ability, are good (Naglieri, 1987).

**Results**

For the headache sample, the obtained DAP total standard scores correlated $r = .01$, with the C-PSC, $r = .08$ with the Revised Children's Manifest Anxiety Scale, and $r = -.35$ with the Children's Depression Inventory. These Pearson correlation coefficients were not significant with $df = .12$ and therefore suggest that comparisons between
treatment and control groups on obtained C-PSC, RCMAS and CDI scores were not influenced by differential nonverbal ability levels between the two groups.

Table 10

**DAP, CDI, RCMAS, and C-PSC means, standard deviations, and significance levels for headache and control samples.**

<table>
<thead>
<tr>
<th></th>
<th>Mean (Headache)</th>
<th>Mean (Control)</th>
<th>SD (Headache)</th>
<th>SD (Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DAP</strong></td>
<td>10.6</td>
<td>10.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CDI</strong></td>
<td>8.2</td>
<td>8.5</td>
<td>5.6</td>
<td>6.4 NSD</td>
</tr>
<tr>
<td><strong>RCMAS</strong></td>
<td>12.5</td>
<td>10.3</td>
<td>6.4</td>
<td>4.5 NSD</td>
</tr>
<tr>
<td><strong>C-PSC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>39.1</td>
<td>13</td>
<td>29.1</td>
<td>9.8 *</td>
</tr>
<tr>
<td>Total Score Minus Item 1</td>
<td>29.2</td>
<td>12.6</td>
<td>27.0</td>
<td>9.7 NSD</td>
</tr>
<tr>
<td>Frequency Score</td>
<td>17.8</td>
<td>5.4</td>
<td>7.1</td>
<td>5.4 *</td>
</tr>
<tr>
<td>Frequency Score Minus Item 1</td>
<td>14.5</td>
<td>8.6</td>
<td>6.9</td>
<td>5.3 *</td>
</tr>
<tr>
<td>Intensity Score</td>
<td>15.5</td>
<td>6.8</td>
<td>8.8</td>
<td>5.1 *</td>
</tr>
<tr>
<td>Intensity Score Minus Item 1</td>
<td>12.6</td>
<td>6.4</td>
<td>8.3</td>
<td>4.8 NSD</td>
</tr>
</tbody>
</table>

* significant at \( p \leq .05 \)

NSD = nonsignificant difference

Table 10 presents the obtained means and standard deviations for subjects in both the headache and control
samples on the CDI, RCMAS, and C-PSC. There were no significant differences between scores obtained by the headache sample and scores obtained by the control sample on the Children's Depression Inventory ($t = -0.13, p \geq 0.38$) or the Revised Children's Manifest Anxiety Scale ($t = 1.1, p \leq 0.38$). Similarly, there were no significant differences between groups on the three subscales of the Revised Children's Manifest Anxiety Scale: physiological anxiety, worry-oversensitivity, and social concerns-concentration. Differences on the physiological anxiety and worry-oversensitivity scales approached significance however at $p < 0.1$. In contrast, significant differences between groups were obtained on the C-PSC.

C-PSC total scores earned by the headache sample were significantly higher than C-PSC total scores earned by the control sample ($t = 3.19, p \leq 0.005$). In addition when each subject's score earned on Item 1 (headaches) was subtracted from the C-PSC total scores for both groups, differences approached significance ($t = 2.19, p \leq 0.025$).

Group differences on mean C-PSC Frequency and Intensity scores were also examined. For the headache group, a mean Frequency score of 17.8 was obtained whereas a mean Frequency score of 8.9 was obtained for the non-headache group; this difference was significant at $t = 3.69, p \leq 0.005$. Similarly, a significant difference was observed in mean intensity scores. The headache group
earned a mean intensity score of 15.5 whereas a mean intensity score of 6.8 was obtained for the nonheadache group \( (t = 3.22, p \leq .005) \). When the contribution of Item 1 (headaches) was subtracted from each subject's score, a significant difference in Frequency score was still observed \( (t = 2.52, p \leq .01) \), while the difference in intensity scores approached significance at \( t = 2.39, p \leq .025 \).

**Discussion**

Consistent with the adult literature, child headache sufferers earned significantly higher scores on a measure of psychosomatic distress (C-PSC) than matched nonheadache controls. Group differences in frequency scores on the C-PSC were also significant, indicating headache sufferers reported experiencing psychosomatic symptoms more frequently than matched controls. In contrast, no differences were found between groups on measures of anxiety or depression.

Headaches and control subjects responded similarly on both the Revised Children's Manifest Anxiety Scale and the Children's Depression Inventory. This result is difficult to explain given adult headache sufferers have consistently demonstrated higher levels of anxiety and depression than matched controls (Blanchard et al., 1984). More research is needed in this area in order to determine
whether these results are unique to this particular sample or the assessment instruments used or whether they are reflective of child-adult differences in response to chronic headaches.

As an ancillary finding of this experiment, the validity of the C-PSC as a measure of psychosomatic distress is supported in that the obtained scores differentiated between psychosomatic and nonpsychosomatic samples. The SUNYA Revision of the Psychosomatic Symptom Checklist has previously been found to differentiate between two adult psychosomatic and nonpsychosomatic samples (Andrasik, et al., 1982).

General Discussion

This study examined several issues related to the assessment and treatment of children with chronic migraine or muscle contraction headaches. In the assessment area, a checklist previously used with and normed upon adult populations was modified so as to be suitable for administration to children. Psychometric properties of this checklist were found to be excellent. In addition, the psychometric literature on the Revised Children's Manifest Anxiety Scale, a commonly used measure of anxiety, was expanded in an important area, namely, test-retest reliability. In the treatment area, relaxation therapy alone was found to significantly reduce the experience of migraine
and muscle contraction headaches in children. In addition, compliance to treatment was objectively observed to be a significant problem with this pediatric population. The impact of this problem on treatment effectiveness remains unclear, however. Lastly, support was seen for the social validity of the Headache Diary in assessing pediatric headaches. These results will now be discussed in light of the strengths and limitations of this study.

**Strengths.** In the assessment area, strengths of this study include: (a) the large sample size from which psychometric data for the Children's Psychosomatic Checklist, Revised Children's Manifest Anxiety Scale, and Children's Depression Inventory were derived, (b) the administration of assessment instruments in a counterbalanced order. Together, these factors contribute to the level of confidence which may be placed in the obtained results.

In the treatment area, use of a control group is noteworthy, especially in light of the majority of research in this area which has utilized noncontrolled experimental designs. The design used in this study allowed for much greater control of threats to the internal validity of the study as described by Campbell and Stanley (1966). In addition, the development of pictorial cues for use in the Headache Diaries was reflective
of an effort to be sensitive to the need for age-appropriate materials when working with children. Empirical analysis of the contribution of these pictures in encouraging compliance with record keeping remains to be done. However, on an informal level, subjects appeared to respond favorably to the pictorial depictions of headache pain.

The greatest strength of this part of the study was in the development of an objective measure of treatment compliance. Given the notorious unreliability of self-report data, objective measures were much needed. That only 1 subject "discovered" the hidden recording device attests to the viability of obtaining compliance data via this method. Additionally, subjects appeared quite accepting of the purpose of the device during debriefing sessions. This finding is important in that researchers would need to examine very carefully the use of any deception which contributed to the psychological distress of subjects.

Limitations. In the assessment area, this study is limited in that the sample from which the psychometric data for the C-PSC and the Revised Children's Manifest Anxiety Scale were derived consisted of 11 to 14 year olds, whereas the subjects in Experiment 3 ranged from 11 to 17 years of age. Given the excellent psychometric
properties of the instruments derived from the experimental sample, it is unlikely that a significant change would be noted with a slightly older population. However, this issue needs to be examined empirically in future research.

A more serious limitation of this study involves data obtained in Experiment 2. These results are limited primarily by the small sample size. Of primary concern is the extent to which obtained results generalize to a child headache population. Replications of these results with other samples of child headache sufferers are needed. This latter point is especially important because the power of statistical tests decreases as sample size decreases. The power of a test reflects the ability of a decision rule to detect from evidence that the true situation differs from a hypothetical one (Hays, 1981, p. 250). Applied to this experiment, it is difficult to determine whether nonsignificant findings were truly supportive of the null hypotheses or whether they were reflective of the relative insensitivity of the tests to small, but real, differences.

Implications for Future Research. It is important for future studies to examine the psychometric properties of the C-PSC and the test-retest-reliability of the RCMAS with adolescents between 15 and 18 years of age. To date, research has only been conducted in this area with younger
children. In addition, further research is needed to determine whether the C-PSC can effectively differentiate between non-headache psychosomatic and nonpsychosomatic populations. Its effectiveness as a measure of treatment outcome also remains to be empirically examined.

Results of Experiment 2 are supportive of using relaxation training in the treatment of childhood headache. Further studies need to explore any differential effects of relaxation therapy in the treatment of children with muscle-contraction versus migraine headaches. Studies with adults have consistently shown relaxation therapy alone less effective with migraine headache sufferers than with muscle-contraction headache sufferers. Given the nonsignificant correlation obtained between compliance rate and treatment outcome, future studies should also examine the role of treatment expectations upon treatment outcome. Use of a credible placebo group should be considered.
List of References


APPENDIX A

Related to Assessment Instruments
PLEASE NOTE:

Copyrighted materials in this document have not been filmed at the request of the author. They are available for consultation, however, in the author's university library.

These consist of pages:

Pages 109-116
APPENDIX B

Relative to Relaxation Therapy
1. The therapist's voice becomes softer as the relaxation procedure progresses  
   yes no
2. The pace of the therapist's voice slows as the relaxation procedure progresses  
   yes no
3. The volume of the therapist's voice noticeably increases following the signal to tense a muscle group  
   yes no
4. The speed of the therapist's voice noticeably increases following the signal to tense a muscle group  
   yes no
5. The tension in the therapist's voice noticeably increases following the signal to tense a muscle group  
   yes no
6. The volume of the therapist's voice noticeably decreases following the signal to relax a muscle group  
   yes no
7. The speed of the therapist's voice noticeably decreases following the signal to relax a muscle group  
   yes no
8. The tension in the therapist's voice noticeably decreases following the signal to relax a muscle group  
   yes no
9. The therapist, on average, directs the subject to tense each muscle group, except the feet, for 6-8 seconds  
   yes no
10. The therapist, on average, directs the subject to tense the feet for 5 seconds or less  
    yes no
11. The therapist uses only the tension/relaxation pattern which he/she was provided (Appendix B)  
    yes no
12. The therapist directs the subject, by using relaxation pattern, to relax each muscle group for 20-30 seconds, on average, following the signal to relax  
    yes no
13. The therapist follows the provided order of muscle groups within the 16, 7 and 4 muscle group sequences  
    yes no
Relaxation and Tension Pattern

Tension Pattern
1. concentrate on the tension
2. focus on the feelings of tension and tightness
3. hold the tension there
4. feel the tension in...
5. concentrate on the tightness and strain
6. feel the strain in the muscles
7. make the muscles work

Relaxation Pattern
1. just releasing, unwinding, and letting go
2. concentrating on the feelings of relaxation
3. the warmth and heaviness of relaxation
4. continuing to release
5. noticing the difference between the tightness of tension and the warmth and heaviness of relaxation
6. becoming more and more relaxed
7. letting all the tension go
8. focusing on these muscles as they relax completely
9. noticing what it feels like as the muscles become more and more relaxed
10. focusing all your attention on the feelings associated with relaxation flowing into these muscles
11. just enjoying the pleasant feelings of relaxation as the muscles go on relaxing more and more deeply, more and more completely
12. there's nothing for you to do but focus your attention on the very pleasant feelings of relaxation flowing into this area
13. just enjoying the feelings in the muscles as they loosen up, smooth out, unwind, and relax more and more deeply
14. just experiencing the sensation of deep, complete relaxation flowing into these muscles
15. more and more deeply and completely relaxed
16. just letting them go, thinking about nothing but the very pleasant feelings of relaxation
17. just let those muscles go and notice how they feel now as compared to before
18. notice how these muscles feel when so completely relaxed
19. notice how these muscles feel when so completely relaxed
20. pay attention only to the sensations of relaxation as the relaxation process takes place
21. calm, peaceful, and relaxed

Ending -- 1. slowly begin to open your eyes and move your muscles again
2. get up when you're ready
Sequences for Muscle Relaxation

16 Muscle Group (Sessions 1 & 2)

1. Right hand and forearm
2. Right biceps
3. Left hand and forearm
4. Left biceps
5. Forehead
6. Eyes and nose
7. Mouth and jaw
8. Neck (front and back)
9. Shoulders, chest, and upper back
10. Abdominal or stomach region
11. Right thigh
12. Right calf
13. Right foot
14. Left thigh
15. Left calf
16. Left foot

How to Accomplish

Fist
Elbow into side
Fist
Elbow into side
Eyebrows up or deep frown
Squint hard and wrinkle nose
Clench teeth and force lips back
Counterpose (head will shake) or push head back
Deep breath and shoulder blades back (Pressure both ways)
Tighten stomach up as if to hit self
Tighten against self
Toes up
Curl toes down and point inward
Tighten against self
Toes up
Curl toes down and point inward

7 Muscle Group (Sessions 3 & 4)

1. Right arm
2. Left arm
3. Facial muscles
4. Neck and throat
5. Chest, shoulders, upper back, and abdomen
6. Right thigh, calf, and foot
7. Left thigh, calf and foot

4 Muscle Group (Sessions 5 & 6)

1. Left and right arms, hands and biceps
2. Face and neck
3. Chest, shoulders, back, and abdomen
4. Left and right upper leg, calf, and foot
Sequences (continued)

Sessions 7 = Going through the 4 muscle group procedure using recall and counting only, followed by cue-control procedures (Use tension/release if S not relaxing in a particular muscle group), pp. 35-36 in Bernstein and Borkovec.

Sessions 9 = Using counting and cue-control procedures only. If any muscle group is not relaxed, follow up with recall. If still not relaxed, use tension/release.
Session 7

Begin by encouraging subjects to get comfortable and take several deep breaths.

Recall: Go through each of the 4 muscle groups in the following manner:
"O.K., now I'd like you to focus all your attention on the muscles of the arms and hands and very carefully identify any feelings of tightness or tension that might be present there now. Notice where this tension is and what it feels like."

"O.K., and now, relax, just recalling what it was like when you released these muscles, just letting them go and allowing them to become more and more deeply relaxed."

30 seconds of relaxation patter

"O.K., again I'd like you to focus all your attention on the muscles of the arms and hands, this time very carefully identifying where any remaining tension is, focusing all of your attention on it, noticing what it feels like."

And now, relax, just recalling what it was like when you released these muscles, just letting them go and allowing them to become more and more deeply relaxed."

30 seconds of relaxation patter

Ask for subject to signal if feeling any tension.
   If one subject responds with yes, go through actual tending of that muscle group and then proceed to next muscle group, without again checking tension level of subject.
   If subjects respond with no, go to next muscle group.

Repeat above procedure until all 4 muscle groups are completed.

Counting

"As you remain very deeply and completely relaxed now, I'm going to count from one to ten, and, as I count, I'd like you to allow all the muscles all through your body to become even more deeply and more completely relaxed on each count. Just focus your attention on all the muscles in your body and notice them as they become even more and more deeply relaxed as I count from one to ten."
Session 7 (continued)

Cue-control

Verbalize yourself three times the word relax (as subject exhales) and encourage subjects to do the same, verbalizing to themselves. Allow 30 seconds for subjects to practice this on their own. Then, end the relaxation, by counting down from 4; 4, pointing out sounds in the room, 3, moving tips of toes and fingers, 2, moving feet and hands, and 1, opening eyes.
Begin by encouraging subjects to get comfortable and take several deep breaths.

**Counting**

"As you allow yourself to become relaxed now, I'm going to count from one to ten, and, as I count, I'd like you to allow all the muscles all through your body to become even more deeply and more completely relaxed on each count. Just focus your attention on all the muscles in the body and notice them as they become even more and deeply relaxed as I count from one to ten."

One, two, noticing the arms and hands becoming more and more relaxed now - 2 relaxation patter, three, four focusing on the muscles of the face and neck as they become even more deeply relaxed now - 2 patter

five, six, allowing the muscles in the chest, shoulders, back, and abdomen to relax even more deeply now - 2 patter.

seven, eight, noticing the muscles of the legs and feet becoming more and more completely relaxed - 2 patter

nine, ten.

Repeat above procedure directing subjects to release any tension that's left.

Ask if any tension in 1st muscle group:
If yes, go through recall procedure. Ask again,
   If yes, go through actual tensing/release and then proceed to next muscle group.
   If no, proceed to next muscle group

If no, ask if any tension in next muscle group, and repeat. (Follow this procedure for all 4 muscle groups).

**Cue-control**

Verbalize yourself three times the word relax and encourage subjects to do the same, verbalizing to themselves. Allow 30 seconds for subjects to practice this on their own. Then, end the relaxation, by counting down from 4, 4, pointing out sounds in the room, 3, moving tips of toes and fingers, 2, moving feed and hands, and 1, opening eyes.
Subjective Criterion for Demonstrating Subjects' Relaxation Response

Pre-session measure:

Draw a circle around the number which best describes how much tension you feel right now.

5 10 15 20 25 30 35 40 45 50
No tension Normal tension A lot of tension at all

Post-session measure:

Draw a circle around the number which best describes how much tension you feel right now.

5 10 15 20 25 30 35 40 45 50
No tension Normal tension A lot of tension at all

Pre-Post difference score =
Objective Criteria for Demonstrating Subjects' Relaxation Response

Heart rate (Pre) ________

1. Subject demonstrates slow and regular breathing by the end of the relaxation session  yes  no
2. Subject infrequently (4 times or less) opens his/her eyes during the relaxation procedure  yes  no  #times __
3. Subject infrequently (4 times or less) fidgets in the chair during the relaxation procedure  yes  no  #times __
4. Subject infrequently (4 times or less) attempts to talk to the therapist during the relaxation procedure  yes  no  #times __
5. Subject complies with all therapist's instructions to tense and release specific muscle groups.  yes  no

Total "yes" score = ________ Heart rate (Post ______

Cassette Time ______________