

Cognitive-Behavioral Treatment of Recurrent Nonspecific Abdominal Pain in Children: An Analysis of Generalization, Maintenance, and Side Effects

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ABSTRACT

From 10% to 15% of school-aged children experience recurring abdominal pain. This study evaluated the efficacy of a cognitive-behavioral program for the treatment of nonspecific recurrent abdominal pain (RAP) using a controlled group design. The multicomponent treatment program consisted of differential reinforcement of well behavior, cognitive coping skills training, and various generalization enhancement procedures. Multiple measures of pain intensity and pain behavior were conducted, including children's self-monitoring, parent observation, teacher observation, and observation by independent observers. Results showed that both the experimental and the control groups reduced their levels of pain. However, the treated group improved more quickly, the effects generalized to the school setting, and a larger proportion of subjects were completely pain-free by 3- months follow-up (87.5% vs. 37.5%). There was no evidence for any negative side effects of treatment.

Recurrent abdominal pain (RAP) is a common complaint in children, with an estimated 10-15% of school-age children being affected (Apley, 1975; Barr & Feuerstein, 1983; Oster, 1972). A nonspecific syndrome is typically described as discomfort that occurs over a period of months and frequently interferes with daily activities and routines but is characteristically resolved completely between episodes. No specific organic disease is usually found. The pain is reported to be variable in duration (from a few seconds to a day) as well as in severity, quality, and time of occurrence (Bury, 1987; Hughes & Zimin, 1978). Although RAP is commonly considered a syndrome that children grow out of, available data concerning prognosis are conflicting. Some studies suggest that one third of the afflicted children continue to experience recurrent pain episodes for many years (Apley, 1975; Magni, Pierri, & Donzelli, 1987; Stickler & Murphy, 1979). However, Davison, Faull, and Nicol (1986) reported that as many as 25 of 26 children at a 6-month follow-up assessment were substantially pain-free. Few studies have used comprehensive pain assessment procedures in evaluating pain symptoms; most have relied on parental reports in interviews (McGrath, 1987).

The etiology of RAP has not yet been firmly established. Organic causes do occur, including constipation, worms, hernia, appendicitis, peptic ulcer, emulsion, metabolic disorders, lactose intolerance, spinal cord tumor, chronic intermittent volvulus, and lactose or sorbitol malabsorption (Apley, 1975; Buck & Bodensteiner, 1981; Eeg-Olofsson, Carlsson, & Jeppsson, 1981; Hyams, 1982; Janik & Bin, 1979; Lebenthal, Rossi, Nord, & Branski, 1981; Wald, Chandra, Fisher, Gartner, & Zitelli, 1982). Although organic etiology is found in only 5-10% of cases (Barr & Feuerstein, 1983), evidence is increasing that subtle physiological dysfunctions may play an important role, for example, intestinal gas syndromes, colonic inertia, colonic spasm, and chronic stool retention (Feldman, McGrath, Hodgson, Ritter, & Shipman, 1985). Psychological and family factors have also been proposed to account for the syndrome. These factors include the temperamental and personality characteristics of the child (e.g., submissiveness, anxiety, perfectionistic tendencies), the characteristics of parents (e.g., excessive anxiety, preoccupation with health concerns, overprotectiveness), and family conflict (e.g., marital discord). However, many studies have been based on uncontrolled clinical observation (e.g., Berger, Honig, & Liebman, 1977; Hughes, 1984; Hughes & Zimin, 1978), and few have compared children with RAP with appropriately selected control groups of pain-free children or with other clinical populations.

The treatment of RAP is still in its infancy. Traditional medical treatment by pharmacological means (e.g., antispasmodics, anxiolytics, and antidepressants) has not been demonstrated to be effective (Barr & Feuerstein,

1983). Standard pediatric care often consists of reassurance that there is no serious organic disease and that the child will grow out of it. Such care is claimed to be effective, although controlled outcome studies are lacking.

Recently, researchers have investigated the use of behavioral techniques derived from social learning theory (Bandura, 1977) and from more traditional operant learning theory (Fordyce, 1976). Behavioral techniques have been based on the assumption that pain behaviors produce contingent consequences (e.g., sympathy, attention, avoidance of nonpreferred activities) that function as reinforcers for pain behavior. However, only two studies using single-case designs have evaluated the efficacy of behavioral treatment with RAP. Sank and Biglan (1974) treated a 10-year-old boy with a history of RAP. Treatment comprised providing contingent consequences for gradually fewer reports of severe pain, lower abdominal pain ratings, and a gradual increase in school attendance. The results indicated reduced episodes of severe pain, reduced daily pain ratings, and improved school attendance. Miller and Kratochwill (1979) utilized a multiple baseline across home and school settings with a 10-year-old girl. Treatment consisted of a time-out procedure during which the child was placed in her room to rest with no TV, toys, or games following episodes of pain complaint. A gradual reduction in pain complaints occurred during treatment, with no pain complaints during a 1-year follow-up.

Other researchers have argued that children should be taught self-management skills such as relaxation, cognitive coping, distraction, and positive imagery (Masek, Russo, & Varni, 1984). Only one study has investigated the use of coping skills training with RAP. Linton (1986) treated an adolescent girl with a broad-spectrum behavioral package that included relaxation techniques and coping skills training. Favorable results were reported; however, the design used in that study precluded definitive conclusions regarding treatment efficacy.

Although these studies provide some support for the use of behavioral techniques, a number of issues need to be resolved before behavioral treatment can be viewed as a viable treatment option. First, two of the three studies (viz., Linton, 1986; Sank & Biglan, 1974) used AB designs that precluded the demonstration of adequate experimental control. Second, no studies have evaluated the effects of a multidimensional program incorporating strategies to modify pain behavior (contingency management) with the child's own resources for coping with pain sensations (coping skills training). Third, no study has assessed the generalization effects of treatment outside the home environment. Fourth, existing studies on RAP have not yet addressed whether treatment may be associated with any undesirable side effects (Kazdin, 1980). It is unknown whether treatment focused on pain reduction is associated with unplanned or nontargeted changes in other aspects of child behavior or adjustment.

The present study sought to extend the treatment literature by evaluating a cognitive-behavioral treatment for nonspecific RAP using a group design. Multidimensional pain assessment procedures included parent, teacher, and trained observer observational measures as well as children's subjective ratings of pain. The study also assessed the effects of treatment in the school setting and assessed possible negative side effects of treatment by including measures of the child's global behavioral adjustment both at home and at school.

Method

Subjects

Children who were 6-12 years old and were suffering from recurrent abdominal pain were recruited from referrals by pediatricians and family physicians and from self-referrals following media announcements calling for volunteers. Of 64 children who passed an initial telephone screening procedure, 33 were assessed by a gastroenterologist to exclude as much as possible any organic cause. The first 16 children who reached selection criteria and agreed to participate were included in this study. All children fulfilled Apley's (1975) criteria for nonspecific recurrent abdominal pain: (a) that the child's pain be paroxysmal in nature; (b) that the pain occur frequently over an extended time period, greater than three episodes over 3 months; and (c) that the pain be severe enough to result in a change in activity, that is, that it interfere with the child's daily living, recreation, relationships, or school attendance. Children were excluded if they had had major surgery, a major medical illness, lactose intolerance, constipation, a recent virus, or a persistent loose bowel syndrome. All children had been under the care of either a family physician or a pediatrician prior to their entry into the program. The mean age of the 16 children studied was 9 years (range = 6-12). Table 1 summarizes the demographic characteristics of the sample. None of the children met *Diagnostic and Statistical Manual of Mental Disorders (DSM-III*; American Psychiatric Association, 1980) criteria for other major psychopathology such as major depression, anxiety disorder, conduct disorder, or

specific learning disabilities. Three children had a history of school refusal and absence. All subjects were assured of treatment; no other inducements for participation were offered.

Table 1
Demographic Characteristics of Sample

Variable	Treatment Group	Control Group
Mean age of child (year)	9.10	9.90
Mean age of mothers (years)	35.50	38.10
Mean age of fathers (years)	37.60	39.80
Mean number of siblings	1.80	2.00
Percentage of two-parent families	62.50	90.00
Percentage of children with a history of pain or psychiatric disturbance in family members*		
Pain (organic and nonorganic)	62.50	50.00
Depression/suicide attempt	6.25	12.25
Alcoholism	6.25	6.25
Marital discord	6.25	0
Mental retardation	6.25	0
Hysterical conversion	6.25	0
Percentage of children with pain-related problems in family members	62.50	50.00
Percentage of children with history of school refusal	12.50	10.00
Average age of pain onset (years)	4.90	6.50

* Family members include parents' immediate families.

Assessment

The following dependent measures were used to assess the effects of treatment. The measures included four observational and two self-report measures.

Self-monitoring of pain. The child's pain intensity was measured via a visual analogue scale (VAS) 10-cm line with endpoint descriptors of *no pain* and *unbearable pain*. The child was instructed to place a mark at the point on the line that best indicated the intensity of his or her pain. The pain score was the distance of the mark from the left end measured in millimeters. The child recorded his or her pain intensity in a pain diary three times daily (before going to school, after returning home from school, and before going to bed). Recent research has shown that children above 5 years of age can reliably rate pain using the VAS procedure (Bush, 1987). A child's pain intensity was obtained by summing the three daily recordings for each day of the week to obtain a total weekly pain intensity score. Because there were no missing data for any of the children, total pain intensity scores were used instead of daily averages.

Table 2

Summary Definitions of Observation Codes

Category	Definition
	Parent pain observation record
Pain complaint	Instances of intelligible vocal protests about pain
Request for assistance	Request for assistance as a consequence of being in pain
Crying	Crying due to child being in pain
Nonverbal pain behaviors	
Guarding	Abnormally stiff, interrupted, or rigid movement while moving from one position to another
Bracing	A stationary position in which a limb supports another part of the body for a few seconds
Rubbing	Rubbing or holding the affected area of pain for a few seconds
Grimacing	Obvious facial expression of pain
Sighing	Any obvious facial exaggerated exhalation of breath accompanied by shoulders rising and then falling
Resting	Resting on the bed (other than bedtime) or lying down elsewhere without being engaged in any activity
	Observer observations
Deviant child behavior	
Noncompliance	Refused to initiate compliance with specific instructions within 5 s
Complaint	Any instance of verbal complaint involving whining, screaming, vocal protests, or displays of temper
Aversive-mand	Any instance of instruction directed to another person by child that is judged to be aversive
Physical negative	Any actual or threatened physical attack or damage to another person or destruction of an object
Oppositional	Other inappropriate behaviors that cannot be classified in other deviant categories (e.g., violating family rules, teasing)
Appropriate child behavior	
Appropriate interaction	Acceptable behavior lasting a full 25 s containing any intelligible verbalization by child
Engaged activity or play	Acceptable behavior or activity lasting a full 25 s that does not contain intelligible verbalizations
Nonaversive parent behavior	
Praise	Any nonaversive praise offered to child by parent
Contact	Any contact deemed to be nonaversive
Question	Any nonaversive request for information from child
Alpha instruction	Any verbal command that is clear, has a specific behavioral referent, and is presented nonaversively
Beta instruction	Any verbal command that is unclear, lacks a specific behavioral referent, and is presented calmly
Social attention	Any nonaversive attention, verbal or nonverbal, that cannot be scored under other categories
Aversive parent behaviors	
Aversive contact	Any contact causing or having the potential to cause pain or discomfort in the child
Aversive question	Any request for information deemed aversive due to content or tone of voice
Aversive alpha instruction	Any verbal command that is clear, has a specific behavioral referent, but is presented aversively
Aversive beta instruction	Any command that is unclear, lacks a specific behavioral referent, and is presented aversively
Aversive social attention	As for nonaversive social attention except deemed to be aversive due to content or voice presentation

Parent pain observation. Parents were instructed to use a pain observation record to systematically observe their child's pain behavior. The categories and definitions of child pain behavior appear in Table 2. The therapist first explained and then modeled each behavior that met the criteria for inclusion in each category. Mothers were asked to record the presence or absence of these behaviors using a time-sampling procedure. Parents conducted observations in 1-hr time blocks, between the time the child arose and went to school and again between the time the child returned from school and went to bed. During weekends, observations were performed on an hourly basis throughout the day. A weekly mean percentage of time intervals containing pain behavior was calculated. The mean scores for all subjects on child records of pain and parent observations of pain were obtained at baseline (over a 2-week period), at Weeks 1-4 (Test 1), at Weeks 5-8 (Test 2), at posttest (2 weeks), and at follow-up (2 weeks). Measures were taken twice during treatment to monitor the child's progress.

Teacher pain observation. The child's teacher kept an event record of the child's verbal pain complaints as well as his or her request to go to the sick room, presence in the sick room, and absence from school due to illness. Teacher observations were conducted across the school day, with the exception of morning and lunchtime recess periods. The teacher marked the presence or absence of each behavior on a daily basis over a 2-week period at pretreatment, posttreatment, and follow-up. A measure of child pain behavior at school (due to pain complaints) was obtained by summing, in each phase, the number of days in which pain behavior was observed or in which the child was absent due to pain complaints.

Parent-child interaction in the home. Observations of parent-child interaction were conducted by two undergraduate psychology students. These observers, who were blind to group assignment and to specific experimental hypotheses, received 8 hr of training in the use of the Family Observational Schedule (Sanders & Glynn, 1981). This instrument measures the percentage of time intervals of deviant child behavior and aversive parent behavior. It was modified in the present study to include additional categories of child pain behavior (see Table 2 for categories and definitions of behaviors). The pain behaviors were identical to those used by the parents' observation record. This time-sampling instrument consisted of observation blocks of 40 s (25 s for observation and 15 s for recording). This instrument was used to determine the existing level of oppositional child behavior and aversive maternal behavior and to assess whether changes in pain behavior would be associated with any undesirable increases in other problem behaviors over the course of treatment.

Oppositional behavior was focused on because it has been claimed that children with RAP are excessively submissive and compliant. Hence, oppositional behavior may covary with pain reduction. Pain behaviors were never observed during home observations by observers and, hence, were deleted from subsequent analysis. Observation sessions were held in the kitchen and lounge areas during the late afternoon and early evening for each family. Parents and children were asked to continue with their normal routines or activities within the vicinity where the observer was situated.

Reliability of home observations. Inter-observer reliabilities were calculated on 16 of 48 observations (33%). Agreements and disagreements were scored according to whether each observer had scored the presence or absence of the five categories of deviant child behavior and maternal aversive behavior on an interval-by-interval basis. Hopkins and Hermann's (1977) formulas were used to calculate overall reliability. Overall mean percentage agreement for deviant child behavior was 97%, with 97% agreement on nonoccurrences and 74% on occurrences. An overall kappa coefficient of .83 was obtained (Cohen, 1960).

Revised Behavior Problem Checklist (RBPC). The RBPC (Quay & Peterson, 1983) is an 89-item inventory that lists a range of behavioral symptoms. Parents rated the severity of problem behaviors on a 3-point scale. A measure of the total number of child problem behaviors present was obtained by summing the number of symptoms checked by parents.

Conners Teacher's Rating Scale (CTRS). The CTRS (Conners, 1969), comprising 39-items rated on a 4-point scale, is a checklist for teachers to assess children's behaviors such as conduct problems, inattentiveness, anxiety, and hyperactivity in a classroom setting. The instrument has been widely used as a dependent variable measure to assess the treatment effects of medication on children's behavior.

Experimental Design

A controlled group design of the pre-post type was used (Kazdin, 1980). The design involved two treatments X five time periods. After medical screening, subjects were randomly assigned to the treatment or the wait-list control group. The two masters-level clinical psychologists served as therapists and were randomly assigned to subjects.

Baseline phase. During the pretreatment assessment, children, parents, and teachers kept observational records as described previously. Parents and teachers also completed the questionnaire measures. The family was observed for 30 min by an observer in the home setting.

Treatment phase. All 8 children and their mothers were exposed to the same eight-session cognitive-behavioral treatment program. Treatment comprised two components: a behavioral component and a cognitive coping skills component. The behavioral component included self-monitoring of pain, a differential reinforcement of other behavior (DRO) schedule for increasing pain-free periods and prompting distraction, and competing activities. The cognitive component consisted of a cognitive self-control procedure that included self-monitoring, self-instruction, self-efficacy statements, self-administration of rewards, self-induced relaxation, and an imaginal strategy to reduce pain. Generalization enhancement and relapse prevention training were also incorporated into the treatment procedures.

During Session 1, possible explanations of children's pain behavior were presented to and discussed with parents. Because organic causes for the children's pain had been excluded as much as possible, the pain behavior was explained from a social learning theory perspective.

Session 2 involved teaching mothers to discriminate between sick and well behaviors. Parents were instructed to ignore nonverbal pain behaviors and to prompt and redirect children to an activity when a verbal pain complaint was made. If children complied, parents were instructed to praise them while ignoring verbal pain complaints if they continued. A DRO behavior chart was used in which a zero rate of pain behavior for a day was reinforced by the earning of a star. Stars were exchanged for back-up rewards that were nominated by the children. Rewards were made available when the criterion level for the weekly number of painfree days was attained. This procedure was used throughout treatment, with the criterion level revised weekly.

During Session 3, children's current coping strategies were discussed. A rationale for learning to self-manage pain was then explained. In Session 4, children were taught relaxation as a self-control skill. The cue-controlled relaxation procedure (Varni, 1983) was a modification of Jacobson's (1938) progressive muscle relaxation. In Session 5, an abridged relaxation exercise was introduced. In Session 6, a cognitive self-control procedure was introduced that was directed at changing children's thinking about pain. The children were led through the steps of monitoring their pain and instructing themselves to make self-coping statements (e.g., be brave, hang in there). They were then instructed to refocus their attention away from the pain and to relax. If there was a reduction in pain intensity, they were instructed to reinforce themselves with a positive self-verbalization. If the pain persisted, the final step was an imaginal strategy whereby they imagined their favorite cartoon character (e.g., muscle man) eating the pain away. The next session included further practice of the self-control procedure, but this time there was a distraction (viz., the parent and therapist were talking) and the children were engaged in a competing activity (walking). During the final session, future high-risk situations in which the pain was likely to reoccur were identified, and problem resolution strategies were practiced.

During the 8 weeks of treatment, children and parents in both treatment and wait-list control groups completed child pain diaries and parent pain observation records. Control group participants were instructed to continue to manage child pain complaints in their usual manner.

Posttreatment and follow-up phases. At the completion of the eight treatment sessions and again 3 months after the termination of treatment, all pretreatment measures were repeated for both groups.

Results

Changes in Child Reports and Parent Observations of Pain

Because there was high intersubject variability at baseline both within and between groups, the data were analyzed using a multivariate analysis of covariance (MANCOVA) in which the two groups were compared at Test 1, Test 2, posttest, and followup with baseline differences between groups being used as a covariate (Finn, 1980).

No significant difference was found on pain measures between groups at Phase 1 of treatment. However, inspection of Figure 1 clearly shows a marked decrease in child pain reports in the treatment group between Phases 1 and 2. The MANCOVA revealed a significant group effect at Phase 2 of treatment, $F(2, 11) = 4.55, p < .03$, suggesting a decrease in pain reports in the treatment group during this phase of treatment. The group effect was significant for both child reports, $F(1, 12) = 8.57, p < .01$, and mother observations of pain, $F(1, 12) = 5.53, p < .04$. The MANCOVA also revealed a significant group effect at posttreatment, $F(2, 11) = 3.95, p < .05$. Only the child report of pain was significant at this phase, $F(1, 12) = 6.47, p < .02$. No significant difference was found on pain measures between groups at follow-up.

A more rigorous test of the intervention is the number of pain-free children in each phase. All children experienced pain at baseline. The number of pain-free children in the treatment group increased to 6 (75%) at posttreatment and to 7 (7.5%) at follow-up. The corresponding figures for the control group were 2 (25%) and 3 (37.5%). A Fisher exact probability test revealed that group differences just failed to reach significance at posttreatment, but there was a significant difference at followup (Fisher exact test $p < .03$).

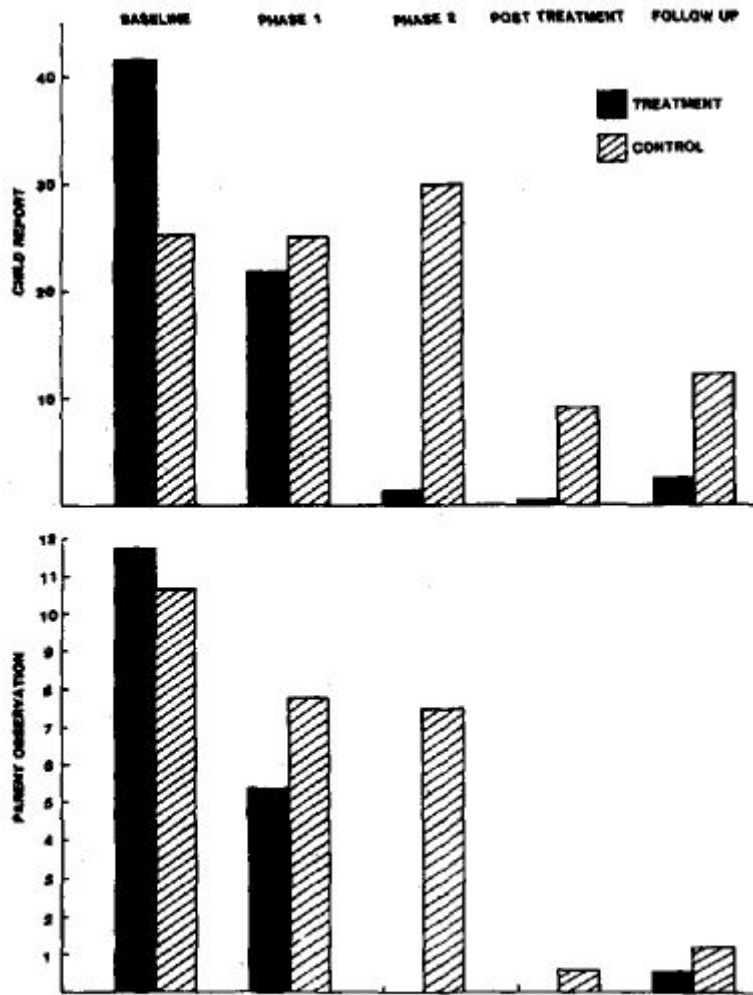


Figure 1. Mean intensity of child-reported pain across experimental phases (top) and mean percentage of intervals of pain behavior recorded by parents across experimental phases (bottom).

Changes in Teacher Records of Pain Behavior

The mean scores for this measure are shown in Figure 2. Despite random allocation to treatment groups, it is obvious that differences existed between groups at baseline. As such, group differences were tested using an analysis of covariance (ANCOVA) (Finn, 1980) in which baseline differences were used as a covariate. Comparisons were made between the groups for post- versus pretreatment and follow-up versus pretreatment. The ANCOVA revealed no statistically significant difference at posttreatment but revealed a significant group effect at pretreatment versus follow-up, $f(1, 13) = 5.21, p < .05$. The results indicate that teachers observed an improvement in the treatment group at follow-up and a slight deterioration in the control group.

Child Oppositional and Maternal Aversive Behavior

The mean percentage of intervals of Oppositional child behaviour and aversive mother behavior and mean scores for child problem behaviors on the RBPC and teacher ratings on the CTRS are presented in Table 3. The table shows little difference across phases. The multivariate analysis of variance (MANOVA) confirmed no significant differences between groups but indicated a significant phase effect at pre- versus posttreatment, $F(4, 11) = 6.46, p <$

.01, and at pretreatment versus follow-up, $F(4,11) = 3.38, p < .05$. Univariate analyses revealed that child problem behavior, as measured on the RBPC, was the variable significant at pre- versus posttreatment, $F(1, 14) = 23.98, p < .001$, and again at pretreatment versus follow-up, $F(1, 14) = 10.47, p < .01$. This result suggested that parents in both groups perceived their children as having fewer problem behaviors at posttreatment and follow-up. However, it is important to note that direct observations of deviant child behavior at baseline approximated the mean levels of

Discussion

This study comprises the first multidimensional assessment of generalization and maintenance effects of a cognitive-behavioral treatment program for recurrent abdominal pain. Overall, the results provide partial support for the usefulness of the cognitive-behavioral treatment program. Both the experimental and control groups improved on child and parent measures of pain over the course of the study. However, the experimental group responded more quickly, was associated with a higher incidence of complete elimination of pain, and produced more generalized effects across settings.

One explanation for the improvement of the control subjects is that RAP spontaneously remits in some children (Davison et al., 1986). However, the causes of such remission remain unclear. Future research must identify the children who are likely to remit from those whose pain becomes more persistent. Another possible explanation relates to the regression to the mean phenomenon. When children are selected for current extremes on commonly occurring phenomena, repeated testing may show their scores becoming more "normal." However, only 2 (25%) of the control children at posttreatment and 3 (37.5%) at follow-up were completely pain-free, whereas 6 (75%) of the treatment group at posttreatment and 7 (87.5%) at follow-up were pain-free. Therefore, these findings suggest that, although pain levels in the control group were reduced, pain problems were not completely resolved. The majority (62.5%) of control group parents still considered that their children needed treatment.

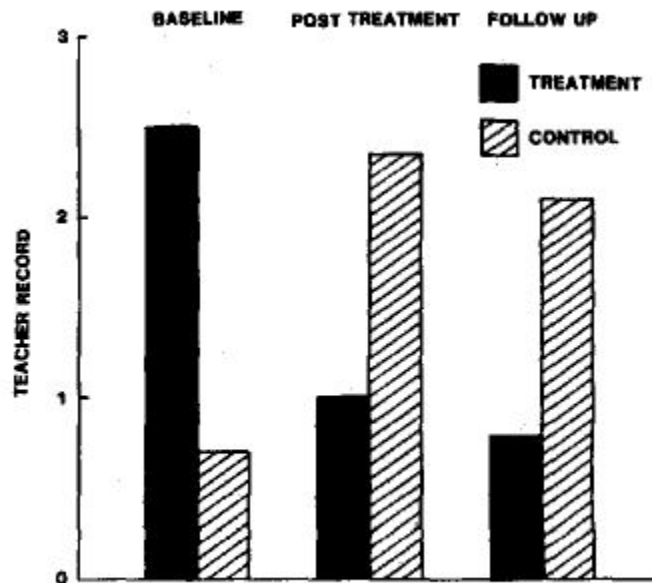


Figure 2. Mean frequency of pain behavior across baseline, posttreatment, and follow-up.

These results are consistent with other findings (e.g., Varni, 1981; Varni, Bessman, Russo, & Cataldo, 1980) that have successfully managed other pediatric pain conditions through the use of social contingencies and cognitive strategies. The cognitive interventions that train children to attend to their cognitive construction of pain and to develop self-control strategies may increase their sense of personal control of pain. Such a therapeutic response to pain may alter what Cataldo (1982) described as response suppression and learned helplessness, which develop when children are exposed to intense, unavoidable, and therefore uncontrollable aversive stimulation.

Behavior	Baseline	Posttreatment	Follow-up
Treatment group			
Deviant child behavior			
<i>M</i>	5.93	5.00	9.80
<i>SD</i>	3.40	3.70	3.70
Aversive mother behavior			
<i>M</i>	5.20	4.80	2.20
<i>SD</i>	4.80	4.80	3.90
Child problem behavior			
<i>M</i>	25.20	14.70	16.50
<i>SD</i>	9.60	8.40	12.70
Teacher rating			
<i>M</i>	12.20	19.90	11.50
<i>SD</i>	8.10	14.80	13.20
Control group			
Deviant child behavior			
<i>M</i>	8.70	9.00	9.80
<i>SD</i>	9.30	6.90	8.90
Aversive mother behavior			
<i>M</i>	2.70	8.40	5.60
<i>SD</i>	5.10	6.80	7.40
Child problem behavior			
<i>M</i>	17.60	14.00	6.70
<i>SD</i>	14.90	14.40	3.80
Teacher rating			
<i>M</i>	17.60	17.80	15.80
<i>SD</i>	7.60	6.80	13.50

This study was not designed to determine the individual contribution components in the treatment program (viz., the operant or the self-control procedures). A component analysis using a factorial design must be utilized to determine this. Future research must also determine the cost efficacy of the cognitive behavioral treatment program. A total of 8 hr was spent treating each child in the study. Some elements of the treatment may be redundant, suggesting that a more streamlined economical program could be developed for use in routine pediatric care.

There was no evidence that treatment resulted in any negative side effects. Independent observation measures indicated that the children engaged in low levels of deviant behavior (range = 5-9%) and that their mothers engaged in similarly low levels of aversive behavior (range = 2.2-8.4%) both before and after treatment. The observation results for deviant child and parent aversive behavior are similar to those reported by Sanders and Christensen (1985) using the same instrument for nonproblem children and their parents. Nevertheless, as pain levels decreased, there was no evidence of an emergence of other clinical problems.

This study was limited by the apparently heterogeneous nature of the sample and by the relatively small sample size. There was wide variability among children at the baseline phase in the amount of pain reported. Despite careful screening and random allocation, the treatment group's pain reports were higher than those of the control group. There was also the problem of an outlier in the treatment group. This outlier reported 3-4 times as much pain as the rest of the subjects in the group. This created statistical problems with the large within-subject variance, making it difficult for a significant group difference to be obtained at Phase 1 of treatment and at follow-up.

The study also raises some ethical considerations about training children to underreport pain. Because a small minority of children with RAP are subsequently diagnosed as having an organic basis to their pain, parents may inadvertently apply pain management strategies to problems requiring prompt medical treatment. These risks can be minimized by the careful selection of cases after thorough medical evaluation and by an appropriate behavioral

analysis of pain symptoms. Periodic independent review by a pediatrician to whom the child is encouraged to report pain symptoms, should they exist, may provide a further precaution. Parents should also be carefully trained to identify and respond to acute pain behaviors that clearly reflect organic causes.

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