DECREASING BURNED CHILDREN'S PAIN BEHAVIOR: IMPACTING THE TRAUMA OF HYDROTHERAPY

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We evaluated the effects of cartoon viewing with the use of a star feedback chart on two burned children's pain behavior during their physical therapy sessions. In addition, the degree to which the observational data corresponded with physical therapists' and mothers' ratings of the children's pain, fear, and cooperativeness was examined. Using a reversal single-subject design, the results showed that the children's pain behavior substantially decreased during experimental treatment sessions compared to their baseline levels. The rating scale data indicated that the physical therapist's and mother's rating of pain, anxiety, and cooperativeness were all correlated significantly with the observational data ($p < .05$). The contributions of respondent and operant conditioning to the occurrence and treatment of pain behavior in burned children are discussed.

DESCRIPTORS: pain, burn, burn treatment, hydrotherapy, behavioral pediatrics

The burn injury is one of the most serious and prevalent forms of trauma inflicted on children. Of the two million thermal injuries that occur each year, nearly one-half of the victims are children (Dimick, 1977).

Severe, multifaceted psychological consequences are suffered by burned children (Clarke, 1980; Emig & Lloyd, 1977; West & Schuck, 1978). A hospitalized burned child faces isolation, immobilization, extreme pain, and disfigurement. In response to the aversive aspects of hospitalization and treatment, the burned child frequently manifests severe behavior problems including tantrums, noncompliance, and aggressiveness (Mieszala, 1977). In addition, because the children must maintain high levels of caloric and fluid intake, sedatives which might be useful for pain reduction (and which may induce lengthy periods of sleep) must often be avoided or used in small dosages in order that the child remain alert and able to consume the foods and liquids necessary to prevent

dehydration. Thus, the burned child poses a difficult treatment management problem to hospital personnel. Frequently, staff who treat burned children become fatigued and disinterested in their work. In part, this is due to repeated exposure to children's continuous screaming (Long & Cope, 1961).

A number of authors have reported that one of the most painful aspects of hospitalization for many burn victims is the actual treatment of their wounds (e.g., Long & Cope, 1961). A frequently used treatment is the open treatment of burns (Peterson, 1977). The open treatment of burns generally is conducted with individuals who have extensive second-degree burns. The major advantages of the open treatment are that it allows easy inspection of wounds and it inhibits infection (Peterson, 1977). The procedure involves exposure of the wounds, devitalized (burned) skin removal, and daily coverage of the burns with a topical, antibacterial agent.

A number of painful experiences occur during the open treatment of the patient's thermal injuries. For example, the removal of bandages can be painful as the bandages often stick to the burned area. The subsequent exposure of the wounds to the air is also quite painful. During hydrotherapy, patients can experience discomfort due to their hy-

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persensitivity to temperature changes. Debridement, removal of the dead tissue, is associated with extreme pain. Finally, the treatment can be highly aversive to patients as it provides an occasion to see their wounds which often are bleeding.

For many burned children, the open treatment procedure is the most aversive aspect of their hospitalization. It is during this treatment that children exhibit a number of behaviors associated with intense pain (Savedra, 1977). Just prior to and during the treatment, children frequently scream, thrash, cry, and complain of pain in an attempt to escape the situation (Long & Cope, 1961).

The children's pain behavior generally worsens during the course of their hospitalization (Rudowski, 1976). During initial treatment sessions, they may exhibit little or no pain manifestations. In part, this may result from the lack of physical sensation in the burned area due to damaged nerve endings. With time, however, normal physiological sensations for pain return and as treatment progresses, children exhibit less and less tolerance of painful stimuli (Savedra, 1977). Respondent and operant conditioning play an important role in children's display of pain behavior during the course of treatment (Fordyce, 1976; Varni, Bessman, Russo, & Cataldo, 1980). The burned child encounters frequent pairings of environmental stimuli with pain. Thus, the child learns to experience pain in the presence of certain conditioned stimuli. Negative and positive reinforcement of children's pain behavior may function to increase that behavior over time. For example, children's crying and thrashing intermittently may result in escape from or delay in the treatment procedure or in increased reinforcing attention from adults (Varni *et al.*, 1980).

Our pilot data corroborated the reported upward trends in burned children's pain behavior. Observational data collected on three severely burned children during treatment of their wounds indicated marked increases (approximately 50%) in pain behavior across treatment sessions. The increases were particularly dramatic during early treatment sessions but remained high during subsequent sessions.

In spite of the problems associated with the treatment of severely burned children, few researchers have attempted to reduce the aversive consequences the child may suffer during treatment. Studies conducted have usually been descriptive accounts of supportive therapy for burn victims and the families (Seligman, MacMillan, & Carroll, 1971). Only one clinical case report (Weinstein, 1976) described the application of procedures for reducing children's pain during the open treatment regimen. In the Weinstein (1976) study, one child's display of pain during open treatment was reduced when the child was trained to use meditation and self-instructional techniques. However, the study did not use an experimental design and lacked objective measurement of the dependent variable.

Varni *et al.* (1980) provided one of few experimental demonstrations that burned children's overt pain behavior can be affected by manipulating environmental events. Using a combination of multiple-baseline and reversal designs, Varni *et al.* reduced a 3-year-old child's verbal and motoric pain behavior in three settings. The experimental settings were the child's bedroom, the clinic where the child was to wear splints, and the physical therapy sessions where the child was to complete exercises. The experimental treatment, differential reinforcement, provided the child with rewards and praise contingent on the nonoccurrence of pain behavior. In the Varni *et al.* study, however, the effects of the intervention during an open treatment procedure were not explored.

We evaluated the use of a multicomponent behavioral treatment approach for reducing the pain behavior exhibited by severely burned children during the open treatment procedure. Specifically, cartoon viewing and a star feedback chart during treatment were evaluated as strategies for reducing children's pain behavior. It was hypothesized that the response independent viewing of cartoons would function as a distraction strategy and thereby decrease children's manifestations of pain. Although distraction techniques have been used with adults for pain management (Langer, Janis, & Wolfer, 1975), they have been rarely used with children

(Meichenbaum & Turk, 1976). The star feedback chart was used as an inexpensive incentive for the children to use TV viewing as a distraction technique.

A second purpose of the study was to examine the child and adult observers' ratings of the child's pain, fear, and uncooperativeness throughout the study. Specifically, the ratings were obtained to assess whether reductions in pain behavior were reflected in the children's and adult observers' judgments of the child's feelings and behavior.

METHOD

Patients

Two girls, Melissa and Beth, participated in the study. Both were hospitalized throughout the study and received a variation of the open treatment of their burns as prescribed by their admitting physician. They were chosen because they were between the ages of 4 and 11 (and therefore likely to enjoy cartoons) and were to receive treatment of their burns for a lengthy period of time (at least 3 weeks). They were consecutive admissions to the pediatric burn unit.

Melissa was 4 years old, with second- and third-degree burns over 29% of her body surface, as a result of a house fire. Melissa was hospitalized on the day she was burned and began physical therapy 2 days later. Figure 1 shows the body areas where Melissa was burned, illustrated on a burn chart commonly used in hospitals (Lund & Browder, 1944). The numerals and letters (which correspond to percent body surface for different ages) on the bodies are used to calculate percent of body surface burned. As indicated by the shaded areas in Figure 1, Melissa's burns were located on her arms, neck, face, back, and legs.

Beth, a 6-year-old, sustained second- and third-degree burns on 35% of her body surface as a result of an accident in which hot grease was spilled on her. As seen in Figure 1, Beth's burns were located primarily on her face, head, shoulders, arms, and back. Beth was hospitalized the day she was burned and began physical therapy 4 days later.

Setting

The study was conducted in the hydrotherapy unit of the Physical Therapy Department, University of Mississippi Medical Center. Both patients received two treatment sessions daily, 5 days a week. The hydrotherapy room was 11 × 7 m and contained three whirlpool tubs. Each tub was enclosed by curtains when in use. The same tub was used for the morning and afternoon sessions. Generally, one or two tubs were in use by other patients during data collection. Melissa and Beth did not participate in the study concurrently; therefore, only one of the girls was in the room at any point. A videotape monitor for cartoon viewing was placed adjacent to the patient's tub during experimental treatment phases. The girls' mothers were present during most baseline and treatment sessions.

A 27-year-old female physical therapist conducted Melissa's treatment, and a 22-year-old female physical therapy student conducted Beth's treatment. One of several physical therapy aides assisted in the treatment when the child resisted.

Observational Data Collection

One male and one female research assistant collected all observational data. Both were employed by the medical center and were familiar with observational procedures. During treatment sessions one or both of the observers stood near the child but did not interact with the child, the mother, or the physical therapist. Data collection began when the child entered the hydrotherapy room and ended with the conclusion of the open treatment procedure. Observations lasted approximately 45 minutes.

During data collection the observers recorded the occurrence of child, parent, and physical therapist behaviors during continuous 30-second intervals. Observers used synchronized stopwatches to mark the beginning and end of an interval. Reliability data were obtained during approximately 20% of the sessions.

Experimental Design

A reversal, single-subject experimental design was used to evaluate the effects of cartoon viewing

RELATIVE PERCENTAGE OF AREAS AFFECTED BY GROWTH

AGE	AGE IN YEARS					
	0	1	5	10	15	ADULT
A - 1/2 of head	9 1/2	8 1/2	6 1/2	5 1/2	4 1/2	3 1/2
B - 1/2 of one thigh	2 3/4	3 1/4	4	4 1/4	4 1/2	4 3/4
C - 1/2 of one thigh	2 1/2	2 1/2	2 3/4	3	3 1/4	3 1/2

Figure 1. Location of Melissa's and Beth's burns displayed on a standard burn chart.

and the awarding of stars on the children's display of pain. The experimental treatment was introduced following baseline data collection and was withdrawn for single sessions. Lengthy periods of withdrawal of the experimental conditions, as is typically used in the single-subject reversal design, were not conducted due to ethical constraints. Specifically, the intensity of the children's pain precluded the withdrawal of potentially effective treatment for lengthy periods.

Dependent Measures

Observational data. To evaluate the children's display of pain and the consequences provided to the children by their parents or the physical therapist, the occurrence of the following behaviors was recorded. The behavior categories were based on the behavior rating scale used in Katz, Kellerman and Siegel (1980).

1. Verbal pain. The child cried, screamed, groaned, or verbally attempted to delay or terminate treatment.
2. Motoric pain. The child flailed, behaved aggressively (i.e., hit, bit, or kicked), or exhibited a nonverbal attempt to delay or terminate treatment (e.g., stiffened her body in an attempt to avoid being placed in the whirlpool).
3. Negative physical contact. The physical therapist or parent made an attempt to coerce or restrain the child by using physical force.
4. Positive physical contact. The physical therapist or the child's parent touched the child in an affectionate, noncoercive manner.
5. Positive interaction. The child's parent or the physical therapist verbally interacted with the child in a nonpunitive, noninstructive manner.
6. Negative interaction. The physical therapist or the child's parent threatened or criticized the child.

The degree to which the child watched TV during the experimental conditions was evaluated. Cartoon viewing was defined as 5 consecutive seconds within a 30-second interval in which the child's eyes were open and directed toward the television.

Rating Scale Data

The parent, physical therapist, and the child completed behavior rating scales immediately following each session. The parent and the physical therapist rated the degree to which the child was fearful, cooperative, and in pain during the treatment session. Each dimension was evaluated using a 9-point rating scale. End points on the cooperation scale were "very uncooperative" and "very cooperative." The end points on the fear scale were "very calm" and "in a panic." The pain scale end points were "no pain" and "extreme pain." The order of the three scales rotated each session.

The child rated her perception of the degree of pain experienced during the treatment session by using a pictorial rating scale. The scale used was a combination of the arousal and pleasure scales of the self-assessment mannequins developed by Lang (1980). The child chose one of the five pictures on the scale that best represented the way the child felt during treatment. (The self-assessment mannequin is available in a cartoon version and a version for use with a computer. Both can be obtained from Peter J. Lang, Clinical Psychology, Box J-165, JAMHC, University of Florida, Gainesville, Florida 32610.)

The degree to which the child enjoyed the cartoons during experimental treatment sessions was evaluated. After each TV session, she completed a 5-point scale that ranged from "I enjoyed the TV very much" to "I did not enjoy the TV at all."

Procedure

During all sessions both children received essentially the same medical treatment for their burns. Observational data collection began with Melissa's second physical therapy session and with Beth's first session. Sessions occurred twice a day until the child's physician determined that the burns were sufficiently healed. Due to the Christmas holidays, Melissa did not attend physical therapy for 1 week during her hospitalization. During that week, treatment of her burns was conducted on the pediatrics unit and data were not collected. With rare exception, the child's mother or a relative was pres-

ent and assisted the physical therapist during the sessions.

Prior to the first baseline session, permission to conduct the study was obtained from the child's mother. The mother was told that we were studying ways to reduce children's pain during their burn treatment.

Data collection during all sessions began as the child entered the hydrotherapy room. When the child entered the room, she was placed in a chair and her bandages were removed. Next, the child was asked to step into, or was placed in, the whirlpool where she sat for approximately 20 minutes. The physical therapist began removing the child's devitalized tissue and crusted antibacterial dressing while the child was in the tub. This procedure continued for approximately 15 minutes after the child was taken out of the tub. The child's devitalized tissue and the lotion were removed by rubbing wet gauze across the skin, cutting the peeled skin with scissors, or by pulling the skin off with forceps. Silver sulfadiazine, an antibacterial lotion, was then applied to the child's burned areas and these areas were wrapped in gauze. The treatment and observational data collection ended when the child was bandaged.

Immediately after data collection the mother, the physical therapist, and the child completed the rating scales. The observer told the mother and physical therapist to circle the number on each of the three scales that best described the child during the treatment session. In explaining the pictorial scale to the child, the observer described how each person in the scale was different and ranged from sad to happy. To ensure that the child understood the scale, she was asked to point to the picture that was similar to her when she was having fun playing. After the child appeared to understand the scale, she was asked to "show me the person that tells how you felt today." Explanations concerning the pictorial scale were abbreviated as the child evidenced an understanding of the rating format.

Baseline. No attempts were made to alter the behavior of the physical therapist, the child, or the child's parent during baseline. The physical ther-

apist was told to conduct the child's treatment as she normally would.

Cartoon viewing and star feedback chart. Prior to the first experimental session the child was told that she could watch cartoons on that day and was asked to choose one of two cartoons (e.g., Popeye or Bugs Bunny) to watch. After choosing a cartoon, the observer showed the child a colorful graph depicting the percentage of intervals in which she displayed either verbal or motoric pain during each previous session. The ordinal line on the chart represented percent pain behavior and was labeled with the numerals 1–10. The number "1" represented the occurrence of pain during 10% of the total intervals and number "10" represented 100% of the intervals. The abscissa was labeled "sessions." The top of the chart was labeled "Melissa's (Beth's) Pain."

After the child chose a cartoon, she was given an explanation of the purpose of the TV and the procedures for earning stars. The observer explained the procedures to Melissa whereas the physical therapist explained the experimental program to Beth. Each child was told that watching TV could help her to forget about her pain, help her to feel better, and make the time go by faster. She was instructed to pay very close attention to the TV during her treatment. The child was told that she could earn stars on the chart by crying less than she did during the previous baseline days. Differences in levels of pain manifestations (e.g., intense vs. a little pain) were explained and illustrated by pointing to high and low baseline days on the child's chart.

Following the session, the child was told how high her level of motoric and verbal pain was during the session. If the child exhibited a low level of pain behavior she was allowed to place a star on the chart. (A low level was defined as a 25% or more reduction in pain behavior from the level exhibited during the final 1 or 2 days of the previous baseline condition.) The star was placed over a dot that marked the percentage of intervals in which the child exhibited pain behavior during the session.

The instructions given prior to the first session

were repeated prior to the second but were discontinued during the remaining treatment sessions. During all subsequent sessions, the child was given a choice of cartoons, instructed to watch TV, told how TV could help her feel better, and how she could earn a star. Each day the child was awarded stars on the chart when she maintained a low level of pain behavior. Percent pain calculations illustrated in the child's chart were derived from the observer's data.

Return-to-baseline. During the return-to-baseline sessions the child neither watched TV nor was shown the chart that depicted her pain. Prior to the beginning of the session, the child was told by the observer that the TV was broken that day. No instructions were given to the child's mother or the physical therapist.

RESULTS

Interobserver agreement was computed by dividing the smaller frequency of occurrence by the larger frequency and multiplying the figure by 100. Percent agreement for each behavior category was 93% (verbal pain), 71% (motoric pain), 71% (positive interaction), 86% (negative interaction), 75% (positive physical contact), and 73% (negative physical contact).

Observational Data

Melissa. Figure 2 shows the percentage of intervals in which Melissa exhibited pain behavior (verbal, motoric or both) during each experimental session. Motoric and verbal pain categories were collapsed as motoric manifestations. Melissa's display of pain behavior during baseline averaged 68% (range = 41%–83%) and showed an upward trend across the condition. There was a decrease in Melissa's pain manifestations with onset of cartoon viewing and star feedback chart. During the first treatment condition, Melissa's pain behavior averaged 57% (range = 43%–75%).

During the return-to-baseline probe (Day 15) Melissa's pain behavior immediately increased to 77%, representing a 35% increase over the treatment pain levels. During the second experimental

treatment phase, Melissa's pain manifestations decreased to an average of 44% (range = 27%–64%) and trended downward across the condition. The overall percent change in Melissa's pain behavior from baseline probe sessions to the second treatment was 43%.

Mother or physical therapist positive interactions with Melissa occurred during a mean 33% of the total intervals during baseline and probe sessions and 14% during experimental treatment sessions. Adults engaged in positive physical contact with Melissa an average of 6% of the intervals during baseline and probe sessions and 1% during treatment sessions.

A similar pattern occurred with adults' negative attention to Melissa. During baseline and probe sessions, negative interaction with Melissa occurred during a mean 3% of the intervals; and during treatment sessions, 4%. Negative physical contact with Melissa averaged 11% during baseline and probe sessions and 20% during treatment sessions.

Thus, cartoon viewing and the use of star feedback chart somewhat functioned to suppress adults' positive attention yet occasioned negative attention to Melissa.

Beth. Figure 2 shows the percentage of intervals in which Beth exhibited pain manifestations during each experimental session. Beth's pain behavior during baseline averaged 37% (range = 0%–76%) and showed a substantial upward trend. This is consistent with the fact that burn victims experience increased pain across time as normal physiological sensations in the burned area return (Saviedra, 1977). With the onset of the first experimental treatment condition, Beth's pain manifestations immediately decreased and averaged 35% across the condition (range = 7%–53%). The mean percent decrease in pain manifestations during treatment compared to the final four baseline sessions averaged 42%.

During the return-to-baseline probe (Days 12 and 13), Beth's display of pain behavior increased to a mean 58% (range = 50%–60%), representing a 45% increase over pain behavior exhibited during the previous treatment condition. However, as seen in Figure 2, the second experimental treat-

Figure 2. Percentage of 30-second intervals during which Melissa (upper graph) and Beth (lower graph) exhibited motoric or verbal pain or both during each experimental session.

ment phase resulted in a reduction of pain to a mean of 40% (range = 12%–56%). The percent decrease in Beth's pain behavior from baseline probe sessions to the second treatment was 31%. With the return-to-baseline probe (Day 20), pain behavior was 80%. Beth's pain manifestations averaged 42% during the final treatment condition (range = 25%–66%).

Beth's mother and the physical therapist talked positively to her during an average of 8% of the total intervals during baseline session and 6% during experimental treatment session. Negative interactions with Beth did not vary substantially; they occurred a mean of 1% of the time during all experimental conditions. Both positive and negative physical contact occurred less than 1% of the total intervals during treatment and no-treatment conditions. Thus, all adult interaction with Beth occurred infrequently and did not vary systematically across experimental phases.

Rating Scale Data

Pearson product-moment correlation coefficients were obtained for ratings of pain, fear, and cooperativeness and the percent pain intervals measured by the observational coding system. The observational measure of pain correlated significantly ($p < .001$) with the physical therapists' ratings of pain ($r = .57$), and cooperativeness ($r = -.63$).

The same pattern of relationship found between the physical therapists' ratings and the observational data also occurred with the mothers' ratings. Significant Pearson correlations were also obtained between the observational data and the mothers' ratings of pain ($r = .35$, $p < .01$), fear ($r = .43$, $p < .01$) and cooperativeness ($r = -.58$, $p < .001$). Thus, although all parent and physical therapist ratings were significantly correlated with the observational data, the strongest association was with ratings of the children's cooperativeness. The children's ratings of pain were not correlated with the observational data or with any of the adults' ratings.

Process and Social Validity Measures

To evaluate the degree to which cartoon viewing was associated with the children's display of pain,

Pearson product-moment correlations between the two variables were computed across sessions for each child. The percentage of total intervals in which Beth did not exhibit pain was significantly correlated with the percentage of total intervals that she watched cartoons ($r = .45$, $p < .05$). With Melissa, an even stronger positive relationship between the two variables was found ($r = .76$; $p < .01$). Thus, for both children, cartoon viewing was associated with a reduction in the display of motoric and verbal pain.

The degree to which the children enjoyed the cartoons was evaluated daily after each experimental treatment session. Using a 5-point rating scale (1 = I did not enjoy the TV at all, 5 = I enjoyed the TV very much), Melissa reported a mean rating of 4.03; Beth reported 4.27.

DISCUSSION

This study is the first experimental evaluation of a procedure for reducing burned children's pain behavior during extremely painful open treatment sessions. The results suggest that cartoon viewing and a star feedback chart produced decreases in two burned children's manifestations of pain during physical therapy sessions. In addition, both children reported enjoying cartoons; a report substantiated by the children's daily ratings of TV enjoyment and by the significant correlation found between the children's exhibiting low levels of pain concurrently with high levels of cartoon viewing.

The experimental treatment may be conceptualized as having components of both respondent and operant paradigms. As mentioned previously, the various stimuli associated with the physical therapy procedures may function to signal the occurrence of pain behavior prior to or in the absence of physiologically based pain sensations or both (Varni et al., 1980). The experimental treatment introduced a set of competing contingencies. Cartoon viewing may have functioned to interrupt the pairing of environmental stimuli with pain and thus, decrease the saliency of the conditioned, pain eliciting stimuli.

The increases in burned children's pain behavior may, in part, be due to reinforcement of the be-

havior. Children's screaming, crying, thrashing, and tantruming may intermittently result in treatment delay or treatment modification and thus be negatively reinforced. The awarding of stars for low levels of pain behavior introduced an alternative contingency: The children were rewarded for the nonoccurrence of pain behavior.

It is unknown whether treatments for reducing burned children's pain behavior are most effective when they contain both respondent and operant conditioning procedures. However, our pilot data indicated that television viewing without the use of the star feedback chart produced only slight decreases in three burned children's pain behavior. Perhaps other respondent procedures such as relaxation or systematic desensitization would be more effective than the current treatment.

The treatment effects obtained here were clinically significant. This is substantiated by the reports from the parents, physical therapists, and the children, all of whom thought the treatment had been beneficial. In addition, it should be noted that pain behavior, unlike behavior such as disruptiveness or inattentiveness, probably cannot be reduced to extraordinarily low levels due to the fact that the child victim experiences severe, physiologically based pain. That is, it is likely that a high floor effect is operating on the potential effects of psychological treatments with burn patients.

Although both Melissa and Beth exhibited less pain behavior during experimental treatment sessions than they did during baseline sessions, the results were more marked with Beth. Several factors may account for this differential outcome. First, due to holiday vacations, baseline data collection on Melissa was delayed and therefore the onset of the experimental treatment phase occurred at a later point with Melissa than with Beth. It could be that for the treatment to be most effective, it must begin prior to the children experiencing severe pain for several days. Second, the differences in treatment responsiveness may have been due to changes in parent-child interactions. Specifically, during experimental treatment sessions, as compared to baseline, Melissa's mother decreased her positive interactions with Melissa and increased her

negative interactions. Beth's mother did not vary her interactions during the treatment phases. Thus, TV viewing and a star feedback chart may be maximally effective only when burned children's parents maintain consistent levels of positive interactions. Finally, treatment differences may simply have been a result of idiosyncratic characteristics of the two children. Differences in the children's enjoyment of TV, tolerance of pain, or their methods of coping with pain all may have influenced the effectiveness of the treatment.

The physical therapists', the mothers', and the children's rating scale data were not as sensitive to the effects of the experimental treatment as were the observational data. This does not seem surprising, given that the scales required the rater to make inferential judgments about the children's feelings and attitudes. In addition, the rating scales may have measured something other than verbal and motoric pain behavior as defined in the observational code. For example, the mothers' ratings may have been influenced by the children's behavior during other times of the day. The children may have rated physiologically based private events that were unaffected by the experimental treatment.

The physical therapists' ratings of the children's cooperativeness were more highly correlated with the observational data than either the pain or the fear ratings. One explanation for this finding is that cooperativeness may be a less inferential characteristic to rate than either pain or fear and, therefore, more highly influenced by the children's actual behavior. Alternatively, the higher correlation could be due to the fact that the observational code measured behavior more accurately labeled non-cooperativeness rather than either fear or pain.

Ethical questions are raised by this study. It could be argued that children's pain behavior during open treatment of their burns is an appropriate and perhaps effective method of coping with physiologically based pain and should not be manipulated. Perhaps screaming, crying, and verbalizing about the presence of pain sensations and the reinforcing attention such behavior elicits are important components of effective pain management.

However, the goal of our study was not to suppress pain behavior nor to eliminate or modify parental attention to the child. Rather, the goal was to offer the child nonpunitive alternatives to, and incentives for controlling her pain behavior. In support of the treatment, the children reported enjoying the cartoons. Likewise, the parents reported that the children were proud of their star charts and enjoyed displaying them in their rooms.

Data are not available on the differential effects of various treatments on burned children's behavior or self-reported feelings. Therefore, we do not recommend that clinicians and researchers attempt to suppress all pain behavior. Instead, it is our opinion that expression of pain behavior in some circumstances may be of benefit to the child. Treatments such as that described here should be applied discriminatively and sensitively. The empirical treatment of burned children is difficult from both a methodological and clinical perspective. Because burned children's levels of pain behavior increase across time, stable baselines are not obtained and thus, the researcher must contend with data that are nonequivalent across observations. We found intervention with burned children to be very difficult. The horrors that must be witnessed in order to evaluate burned children's behavior can not be overstated. Although all involved in this research have had much previous exposure to children and adults suffering from illness and trauma, on several occasions observers became faint while observing the children's disfigurement, bleeding, and screaming.

It may be because of the difficulties encountered in experimentally evaluating treatments for burned children that there has been so little clinical research in the area. However, the development and evaluation of methods for reducing burned children's pain behavior both in and out of the hospital is clearly needed. Although our findings suggest that television viewing and a star feedback chart were effective in reducing two children's pain behavior, the findings should be replicated with other children. In addition, the results suggest that the topography of parent-child interactions during physical therapy sessions may play an important

role in the amount of pain behavior exhibited by the burned child. Future research might examine the effect of parents' interactions during physical therapy sessions.

Although the treatment used here decreased the children's pain behavior, it may be that other treatment procedures would be more effective. In particular, filmed modeling and training in specific coping techniques have been effective in reducing children's anxiety during painful medical procedures (Melamed & Siegal, 1975; Peterson & Shigetomi, 1981). Future research should examine the use of these pain reduction strategies with burn victims as an alternative, or augmentation, to the current procedures.

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