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The Relationship Between Adults' Behavior and Child Coping and Distress During BMA/LP Procedures: A Sequential Analysis

RONALD L. BLOUNT

SUSAN M. CORBIN

JAMES W. STURGES

University of Alabama

VICKY V. WOLFE

University of Western Ontario

JAMES M. PRATER

L. DENISE JAMES

University of Alabama

The influence of the immediate social environment on the child's ability to cope during painful medical procedures was examined. Transcriptions and audiotapes of verbal interactions among residents, nurses, mothers, fathers, and children that occurred during bone marrow aspirations and lumbar puncture procedures were scored using the Child-Adult Medical Procedure Interaction Scale (CAMPIS). Using Sackett's lag analysis to determine conditional probabilities, during the medical procedure it was found that adults' reassuring comments, apologies to the child, giving control to

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Request for Reprints and for copies of the CAMPIS should be addressed to Ronald L. Blount, Department of Psychology, University of Alabama, Box 870348, Tuscaloosa, AL 35487–0348.

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the child, and criticism of the child typically preceded child distress. Also, when the child emitted any one of eight distress behaviors, adults generally attempted to reassure the child. Child coping typically was preceded and followed by adult commands to the child to engage in coping procedures, by nonprocedural talk to the child, and by humor directed to the child. Implications for future research are discussed.

All children who undergo medical procedures will experience some distress. This is particularly so with pediatric oncology patients who must frequently undergo painful bone marrow aspirations (BMA) and lumbar puncture (LP) procedures. These procedures are usually repeated at least every 2 weeks during the early phases of treatment and during any relapses. In order to be more helpful to children undergoing painful procedures, valid assessments of the children's distress, (Katz, Varni, & Jay, 1984; Varni, 1983; Varni, Katz, & Dash, 1982) and the factors which influence that distress are necessary.

The most notable assessment studies in the oncology area have been conducted by Katz, Kellerman, and Siegel (1980, 1982), and Jay, Ozolins, Elliott, and Caldwell (1983). Katz et al. (1982) developed the Procedural Behavior Rating Scale-Revised (PBRS-R), an observer recording scale for 11 child behaviors indicative of distress. Work with the PBRS and PBRS-R indicated that younger children exhibited more diffuse verbal and physical expressions of distress over a longer duration, that girls exhibited higher levels of anxiety than boys, and that children do not habituate with repeated procedures. The Observation Scale of Behavioral Distress (OSBD; Jay et al., 1983) was developed, in part, based upon the PBRS-R. With the OSBD, Jay et al. (1983) found that three predictor variables (child's age, parental anticipation of child's pain, and number of previous BMAs) accounted for 86% of the variance in children's distress scores. Further, parent Trait Anxiety scores were found to correlate with children's distress ($r = .46$; $p < .01$). These data suggest the potential influence of parents' behaviors on children undergoing medical treatments and indicate the need for a comprehensive conceptualization of the factors that influence pediatric pain.

There have been several attempts to directly assess parental effects on the child's distress during medical procedures. The manipulation typically utilized has been the inclusion or removal of the parent from the treatment or pretreatment environment. Results are equivocal as to whether parental (usually maternal) presence reduces (Frankl, Shiere, & Fogels, 1962; Vernon, Foley, & Schulman, 1967) or exacerbates (Gross, Stein, Levin, Dale, & Wojnilower, 1983; Shaw & Routh, 1982; Shirley & Poyntz, 1941) child distress. Moreover, simple presence or absence does not identify specific parental behaviors that might be responsible for facilitating or hindering the child's ability to cope.

It should also be noted that most scales in the area of pediatric pain focus only on child distress, ignoring child coping behaviors and other routine behaviors that the child engages in during medical procedures. The importance of the direct assessment of coping behavior is underscored in a study by Dahlquist et al. (1986) in which children were asked if they used the coping skills they had been taught immediately prior to a stressful medical procedure. Only one-third of the children reported using a coping strategy, even though they

had just completed training. An additional question which the study suggests is whether adult prompts to the child to engage in coping procedures may result in an increased probability of coping. Having a coach present has been used with beneficial results (Jay, Elliott, Ozolins, Olson, & Pruitt, 1985) and, as the study by Dahlquist et al. (1986) indicates, the absence of coaching has been associated with failure by the majority of children to perform coping procedures. However, there are no data showing that coaching per se is intimately related to the performance of coping behaviors. Further, because child coping and adult coaching behaviors have seldom been directly assessed, any relationship between them could only have been inferred through decreases in distress, not directly demonstrated.

One example of a more comprehensive assessment of pediatric distress is the Dyadic Prestressor Interaction Scale (DPIS) by Bush, Melamed, Sheras, and Greenbaum (1986). The scale was designed to assess the frequency of occurrence of 4 child and 6 maternal behavior categories during 5 minutes of uninterrupted mother-child interaction in the waiting room prior to medical procedures. The authors found that distraction by the mother and low rates of ignoring the child were associated with low rates of child distress. Maternal reassurance was associated with low rates of active exploration and high rates of distress. Although the DPIS represents the most systematic attempt to date to assess the influence of social interactions on children's emission of coping, as well as distress behaviors, its utility has been investigated only in the period prior to the medical procedures and it is limited to dyadic (maternal-child) interactions.

In summary, there have been only limited efforts to assess the impact of the social environment on child coping and distress during painful procedures. This paucity of data regarding the possible consequences on the child of particular adult behaviors leaves parents, medical staff, and behavioral scientists in the position of guessing about the most therapeutic ways to interact with the child during painful, emotion-filled events.

One suggestion that has been proposed for adults is that they give the child control over some aspect of the procedure. This may be done by allowing the child to exert behavioral control (Ross & Ross, 1988); that is, controlling when the painful procedure starts or stops. The utility of this approach was supported in one study (Neal, 1978), in which allowing pediatric dental patients to control the termination of painful procedures resulted in increased tolerance for longer treatment periods.

Another strategy that is frequently utilized in the absence of sufficient supporting data is for adults to reassure the child. Intuitively, this approach makes sense and is frequently utilized by staff and parents. However, in the only study which has empirically assessed the impact of reassurance (Bush et al. 1986), it was found to be associated with higher levels of distress.

The consequences are simply too great merely to continue guessing what effect behavior X has on behavior Y in the pediatric treatment room. At this early stage in the evolution of this area, psychologists should attempt to assess actual behavior-behavior relationships (Cone, 1986), rather than being guided by untested hypotheses. One method for empirically determining the relation-

ships that exist in this social situation is through the use of sequential analysis methodology (Bakeman & Gottman, 1986). When properly used, this methodology has the capability of facilitating theory building about relationships in the treatment room through an inductive process (Sidman, 1960). In other words, assessing the myriad of behavior-behavior relationships that exist in that setting would provide empirical guidelines for how best to program the social environment so that it is beneficial to the child. Such an inductive approach is not without precedent, as is best exemplified in behavioral psychology by the early work of Ferster and Skinner, (1957); Skinner (1938).

The current study extends previous research in the area of pediatric pain management in several important ways. First, it assesses the behaviors of the adults and the child during the entire medical procedure. Second, there are a larger number of categories in which to classify adult and child verbal behavior than the categories previously used in this literature. Also, child coping behaviors, as well as distress behaviors, are assessed. This larger number of behavioral categories allows for a more fine-grained analysis of the influences of specific behaviors on other behaviors and, therefore, may increase the utility of these results for developing effective treatment programs. Third, rather than focusing on static measures of behavior, such as would be obtained by anxiety inventories or total distress scores, this study examines the elaborate, dynamic, social interaction (McFall & McDonel, 1986) of the participants who would normally be present in the actual environment in which the child undergoes the medical procedures. The method of analysis for this study is Sackett's lag analysis (Bakeman & Gottman, 1986; Sackett, 1979), which has been used to study social interactions and sequences of behavior in the marital (Gottman, 1980), child development (Bakeman & Adamson, 1984) and family interaction (Hops et al., 1987) literature. Such an analysis provides an empirical base for understanding the impact of a particular behavior on another behavior in the pediatric treatment room, thus facilitating theory building. In addition, the influence of giving the child control over the medical procedure and reassuring the child, two commonly suggested behaviors for adults to engage in, were examined. Based upon observation of the interactions during the medical procedure, both behaviors were expected to be associated with child distress, rather than coping. Finally, it was expected that child coping behaviors would occur most often in the presence of nonprocedural talk to the child and commands to engage in coping strategies. Conceptually, nonprocedural talk appears to be the appropriate adult cue for the child coping behaviors of nonprocedural talk and humor (distraction), while commands to engage in coping strategies appear to be the appropriate antecedent for audible deep breathing.

METHOD

Subjects and Setting

The subjects were 14 boys and 9 girls between the ages of 5 and 13 years (M = 117 months: SD = 39 months) who were diagnosed as having acute lymphocytic leukemia, the parent(s) of those children, and the medical staff

who were present during the BMA and LP procedures. The medical staff included the resident who performed the procedure and at least one of two nurses. Eleven of the children received only the BMA, whereas 12 received both the BMA and LP. The mean length of the treatment sessions was 22 min (*SD* = 10 min). Seven of the children were treated on an outpatient basis. The children were at various stages in the progression and treatment of the disease. The mean length of time since their initial diagnosis was 40 months (*SD* = 52 months). Neither the children nor the parents received any systematic, formal training in coping procedures. All of these procedures took place in a hospital treatment room. Informed consent was obtained from the parent(s) and child prior to subject participation.

The first and/or fourth author were present in the treatment room, but did not interact with the child or adults during the procedures. Medical staff, parents, and children were asked to behave as usual. Since the research was conducted at a teaching hospital, it was not uncommon to have additional personnel present during medical procedures.

Measurement

Audiotapes were made of the BMA/LP treatment procedures. Recording started after the physician entered the treatment room in which the child was present and ended 1½ minutes after completion of the final medical procedure. From these audiotapes, transcripts were made of the verbal interactions that occurred during the treatment. The transcripts and audiotapes were coded together using the Child-Adult Medical Procedure Interaction Scale (CAMPIS: Blount, Corbin, & Wolfe, 1987), which allows categorization of the subject, speaker, phases of the medical procedure, and adult or child vocal content. The child vocal distress codes and the adult content codes were partially derived from previous research (Hops, Wills, Patterson, & Weiss, 1972; Jay et al., 1983).

The adult codes included adult-to-adult and adult-to-child vocalizations. The child content codes included those indicative of child distress (crying, screaming, verbal resistance, requests for emotional support, verbal fear, verbal pain, verbal emotion, and information seeking; see Elliott, Jay, & Woody. 1987; Jay et al., 1983), normal talk that occurs during a medical procedure (child informs about status, requests for relief from nonprocedural discomfort, makes assertive procedural verbalizations, child discusses his or her general condition), and those that could clearly be classified as coping behaviors. The child coping behaviors included nonprocedural talk by the child and humor by the child (both of which indicate distraction from the medical procedure), audible deep breathing, and making coping statements. These behaviors are commonly considered to be indicative of coping (e.g., Jay, 1988: McCaul & Malott, 1984). It should be noted that the coping procedures indicated above were used even though the subjects were not trained in their use. It's likely that the children or adults were exposed to these procedures through child birth classes, stress management classes or the media. The behaviors coded are delineated in Table 1.[1]

[1] A complete copy of the CAMPIS is available upon request.

TABLE 1
CAMPIS CONTENT CODES

ADULT VOCALIZATIONS	
ADULT TO ADULT	
1. HMA	Humor Directed To Adults
2. NPTA	Nonprocedure-Related Talk To Adults
3. PTA	Procedure-Related Talk To Adults
4. CGCT	Child's General Condition Related Talk
ADULT TO CHILD	
5. HMC	Humor Directed To Child
6. NPTC	Nonprocedure-Related Talk To Child
7. CCS	Command To Use Coping Strategy
8. CPA	Command To Engage In Procedural Activity
9. PRAS	Praise
10. CRIT	Criticism
11. NPC	Notice Of Procedure To Come
12. REASU	Reassuring Comment
13. GCC	Giving Control To The Child
14. APOL	Apology
15. BCC	Behavioral Commands To The Child
16. CST	Checking Child's Status
17. EMP	Empathy
CHILD VOCALIZATIONS	
18. CRY	Crying
19. SCRM	Scream
20. VRES	Verbal Resistance
21. EMSUP	Emotional Support
22. VFEAR	Verbal Fear
23. VPAIN	Verbal Pain
24. VEMOT	Verbal Emotion
25. INSEK	Information Seeking
26. CIA	Child Informs About Status
27. RRD	Request Relief From Nonprocedural Discomfort
28. MCOP	Making Coping Statement
29. NPTC	Nonprocedural-Related Talk By The Child
30. APV	Assertive Procedural Verbalizations
31. BRTH	Audible Deep Breathing
32. HUM	Humor By The Child

Rater Training

A total of six raters completed a 3 month training program. Initially, they studied the CAMPIS and the coding procedures. The observers then practiced coding sections of training transcripts, which had been coded by the first and second authors. This was done independently, with discussion of their responses. Upon meeting the criterion of 80% agreement with the training transcripts for three consecutive days, raters were allowed to code actual tran-

scripts. When coding transcripts for data analysis, raters would initially code a transcript, then listen to the recording. Listening to the recordings was necessary because some codes, such as humor and criticism, were partially defined by having elicited laughter, or by harshness of voice tone, respectively.

Transcription and Coding

The transcripts were constructed by one of three undergraduates and one graduate student. Each transcript was reviewed by a minimum of three people prior to coding in order to assure that it accurately reflected the speaker, content, and sequence of the vocalizations. A dictaphone was used to assist with the transcription. Occasionally, the content of vocalizations was not identifiable. This was indicated on the transcripts, and the unidentifiable vocalizations were coded as "Other." Vocalizations were recorded in order of occurrence. For portions of recordings, when many people were talking at once, decisions regarding sequence were made on a word by word basis. For example, the child may have said, "Don't. . . . Don't. . . . Don't. . . . Mommy." Between the second and third "Don't" the resident may have asked, "Are you okay?" The sequence would be displayed as indicated below:

Child: Don't. . . . Don't.
Resident: Are you okay?
Child: Don't. . . . Mommy.

The first "Don't. . . . Don't" would be coded once as verbal resistance. Even though two codable vocalizations indicative of verbal resistance were observed, the events were examples of the same category, spoken in sequence by the same person, and therefore were recorded as one event. The same vocal content code was recorded for successive vocalizations only when the speaker changed, indicating an exchange of information or an interruption in the flow of information. In the example above, the resident's vocalizations would be coded as checking the child's status. The final child vocalizations were coded, in order, as verbal resistance and as a request for emotional support, since "Don't" and "Mommy" are examples of two different content codes.

If two or more speakers began at the same time, the clearer or louder vocalization was recorded first. Even though when listening to a tape without stopping it, there appeared to be many simultaneous vocalizations, review of short sections of the tape allowed for a high degree of resolution, and revealed the sequence of the vocalizations. For the most part, speakers took turns, if only for very brief periods. Vocalizations which were continuous and simultaneous with other vocalizations, such as crying, screaming, and deep breathing, were arbitrarily transcribed and coded as every third content code during the period in which they occurred. The rationale for this was that particular cues would be related to both the beginning and the duration of these three behaviors. A child vocalization also could be coded as crying or screaming and some other child content code, if the vocalization fit the definition for another code. When this happened, the code for crying or screaming was recorded immediately following the other code for that vocalization. Deep breathing was not observed to occur with other child behaviors.

Reliability and Data Analysis

Interrater reliability was assessed with the use of independent raters on 25% of each transcript, scoring either the first, second, third, or fourth quarter of the transcript. The quarter selected was randomly varied. Six raters coded the data, using different pairings of observers. Since the raters scored transcripts or tapes, it was not necessary for raters to code simultaneously. The obtained Kappa reliability figures (Gottman, 1979) were .80 for adult codes and .92 for child codes. Reliability was also calculated for each of the 35 individual codes using the formula for percentage agreement (e.g., Gelfand & Hartmann, 1984). Using this formula, three behaviors were eliminated from further consideration because the percentage agreement was below 70%. Those behaviors eliminated were suggestions for managing child behavior (40%), current general status comments (68%), and child's general condition related talk (67%). The mean percentage agreement for the 32 remaining codes was 89%, with a range from 71 to 100%.

For analysis, the data were collapsed across subjects and phases of the medical procedure. Further, all adults were considered together rather than as resident, nurse, mother, and father. Collapsing was done in order to assure a sufficient number of observations to justify determining significance based upon *z*-scores (Bakeman & Gottman, 1986, 137–141), given the large number of CAMPIS codes (a larger coding system requires larger numbers of observations). There were 9,599 separate vocalizations in the data base.

Data were examined using Sackett's lag analysis (Bakeman & Gottman, 1986; Gottman, 1979; Sackett, 1979) to determine conditional probabilities and construct behavioral chains with each behavior serving as the criterion (the starting point). Using lag analysis, the lag one behavior is the most frequently occurring behavior adjacent to the criterion. The lag two behavior is the most frequently occurring behavior two positions from the criterion, and so on.

The analyses were conducted for five lags and were done for both forward and reverse directions. That is, the analyses were conducted from the first observation for each subject to the last, and from the last observation to the first. Forward lag analyses indicate the behaviors that most frequently follow the criteria. Conducting the analyses in reverse allows for an evaluation of the behaviors that precede criterion behaviors. Reverse lag analysis is a particularly useful procedure for determining the antecedents for important, but low rate, behaviors (J. M. Gottman, personal communication, December 15, 1988). Behavioral chains were formed by first selecting the most probable behavior at each lag for a given criterion. The Lag One Correction Rule (Gottman, 1979, pp. 10–11) was used to assist in the development of chains. This rule dictates that behavioral chains terminate when the most probable behavior at a lag is the same as the criterion, when the behavior at a particular lag is not the most probable lag one behavior to follow the behavior immediately preceding it in the chain, or when the *z*-test of conditional against unconditional probabilities is nonsignificant.

RESULTS

The results of conducting lag analyses are displayed in Table 2 and Table

TABLE 2
BEHAVIORS THAT FOLLOW CRITERION BEHAVIORS: RESULTS OF SACKETT'S LAG ANALYSIS FORWARD

	Lags				
Criterion	1	2	3	4	5
1. HMA (241)	HMA .32				
2. NPTA (1392)	NPTA .71				
3. PTA (779)	PTA .50				
4. CGCT (123) (by adult)	CGCT .50 (by adult)				
5. HMC (101)	HMC .20				
6. NPTC (520) (to child)	NPTC .29 (by child)	NPTC .38 (to child)			
7. CCS (449)	CCS .19				
8. CPA (380)	CPA .26				
9. PRAS (481)	PRAS .19				
10. CRIT (21)	CRY .29				
11. NPC (564)	NPC .17				
12. REASU (1252)	REASU .26				
13. GCC (72)	CRY .16	REASU .16			
14. APOL (50)	CRY .18	REASU .16	REASU .22	REASU .14	REASU .22
15. BCC (82)	REASU .15				
16. CST (405)	CIA .31	CST .16			
17. EMP (69)	REASU .12				
	EMP .12				
18. CRY (776)	REASU .26				
19. SCRM (181)	REASU .23	REASU .17			
20. VRES (199)	REASU .21				
21. EMSUP (231)	REASU .24	REASU .23	REASU .18		
22. VFEAR (14)	REASU .21	REASU .36			
23. VPAIN (300)	CRY .15	REASU .21	REASU .21	REASU .19	REASU .15
24. VEMOT (45)	REASU .20	REASU .13	REASU .15	REASU .16	
		CCS .13			
25. INSEK (184)	REASU .60	REASU .33	REASU .24	REASU .18	REASU .22
26. CIA (197)	CST .28	CIA .15			
27. RRD (12)	NPTA .17				
	CPA .17				
	BCC .17				
	CST .17	CIA .25			
	CRY .17				
28. MCOP (17)	NPC .18				
29. NPTC (219) (by child)	NPTC .63 (to child)	NPTC .33 (by child)			
30. APV (65)	REASU .35	REASU .17	REASU .18	REASU .22	REASU .18
31. BRTH (139)	CCS .27				
32. HUM (39)	HMC .32				

Note. $p < .0001$ for each finding.
The numbers in parenthesis indicate the total number of occurrences of that behavior in the data base.

3. In each table, criterion variables 1–17 are adult behaviors and 18–32 are child behaviors. Table 2 indicates the behaviors that most often follow the criterion variables and Table 3 indicates the most probable antecedents for each criterion. Significance was determined by the use of z-scores (Allison & Liker, 1982). Each of the conditional probabilities are significant at the $p < .0001$ level (the smallest z-score attained was 10.0). A total of 136 tests for significance were conducted (69 forward and 67 reversed). The use of Bonferroni's correction (see Bakeman & Gottman, 1986; Miller 1966) indicates that an experiment-wise alpha level of less than .05 was maintained.

Child Distress Behavior

Behaviors that were followed by/preceded child distress. As predicted, when using the forward lag analysis (see Table 2), giving control to the child (GCC, #13) was followed most frequently by child distress (crying) with a conditional probability of .16. The two other adult behaviors typically followed by child distress included criticism (CRIT, #10) and apologies (APOL, #14). These were both followed by crying with a .29 and .18 conditional probability, respectively.

When conducting the analysis in reverse (see Table 3), the most likely antecedent for seven of the eight child distress codes (#s 18–25) was adult reassuring comments (REASU). The conditional probabilities ranged from .15 to .38. Reassurance was the most likely behavior to precede child distress for up to five lags. The remaining child distress code, screaming (SCRM, #19), was preceded by another distress behavior, verbal pain, at lag one (.20 conditional probability), but was preceded by reassuring comments at lag two. It should also be noted that reassurance served as the lag one antecedent only for seven of the eight child distress codes and one other low frequency child behavior. It was not the lag one reverse behavior for any of the remaining child codes.

Behaviors following child distress. In Table 2 it can be seen that reassuring comments was the most frequently occurring behavior to follow seven of the eight child distress codes (codes 18–25), The conditional probabilities ranged from .21 to .6O. In addition, it was the most frequently occurring behavior for up to five lags following child distress. The eighth child distress code, verbal pain (VPAIN, #23), was followed by crying at lag one (.15 conditional probability) and was followed by reassuring comments as the most frequently occurring behavior for lags two through five. Reassuring comments was the most frequently occurring behavior following only one of the seven remaining child codes.

Analysis of distressing setting events. Analyses were conducted to clarify further the relationship between children's distress behaviors and adult reassuring comments. For these analyses, adult content codes were divided into three categories: Commands to use coping strategies (CCS), reassuring comments (REASU), and other adult vocalizations. Child codes were divided into two categories: child distress codes (#s 18–25) from Table 1, and all other child codes. Forward and reverse lag analyses were conducted for each subject. The comparison of interest for the lag one forward data was between the z-scores

TABLE 3
BEHAVIORS THAT PRECEDE CRITERION BEHAVIORS: RESULTS OF SACKETT'S LAG ANALYSIS REVERSED

	Lags				
Criterion	1	2	3	4	5
1. HMA (241)	HMA .32				
2. NPTA (1392)	NPTA .70				
3. PTA (779)	PTA .50				
4. CGCT (123) (by adult)	CGCT .50 (by adult)				
5. HMC (101)	HMC .20				
6. NPTC (520) (to child)	NPTC .27 (by child)	NPTC .38 (to child)			
7. CCS (449)	CCS .19				
8. CPA (380)	CPA .26				
9. PRAS (481)	PRAS .19				
10. CRIT (21)	SCRM .43				
11. NPC (564)	NPC .17				
12. REASU (1252)	REASU .26				
13. GCC (72)	GCC .13 CRY .13				
14. APOL (50)	REASU .18	REASU .20	REASU .16	REASU .14	REASU .14
15. BCC (82)	CRY .20	REASU .21	REASU .15		
16. CST (405)	CIA .14	CST .16			
17. EMP (69)	CRY .17	REASU .17	REASU .25	REASU .23	REASU .19
18. CRY (776)	REASU .20	REASU .19 CRY .19			
19. SCRM (181)	VPAIN .20	REASU .16			
20. VRES (199)	REASU .15				
21. EMSUP (231)	REASU .21	REASU .17	REASU .17		
22. VFEAR (14)	REASU .29	REASU .21			
23. VPAIN (300)	REASU .21	REASU .16	REASU .16	REASU .16	REASU .16
24. VEMOT (45)	REASU .38				
25. INSEK (184)	REASU .28	REASU .24	REASU .23	REASU .17	REASU .17
26. CIA (197)	CST .65	CIA .15			
27. RRD (12)	VEMOT .17	REASU .17			
28. MCOP (17)	REASU .29 CCS .24	REASU .29			
29. NPTC (219) (by child)	NPTC .69 (to child)	NPTC .33 (by child)			
30. APV (65)	NPC .17	NPC .17			
31. BRTH (139)	CCS .44	CCS .26	CCS .20	CCS .20	CCS .14
32. HUM (39)	NPTC .28 (to child)	HUM .21			

Note. $p < .0001$ for each finding.
The numbers in parenthesis indicate the total number of occurrences of that behavior in the data base.

generated with reassuring comments as the criterion (starting point) and distress as the target, and the *z*-scores generated with commands to use coping strategies as the criterion and distress as the target. Using reverse lag analysis, the comparison of interest was between the *z*-scores generated when distress was the criterion and the target was either reassuring comments or commands to use coping strategies.

Paired *t*-tests were conducted for the lag one forward comparisons and for the lag one reverse comparisons. There were significant effects for both the lag one forward analysis, $t(22) = 3.53$, $p < .002$, and the lag one reverse analysis, $t(22) = 7.98$, $p < .0001$. Given the directionality of the findings, this means that the probability of distress was higher following reassurance than following commands to use coping strategies (results of the forward lag analysis). Also, reassurance was more likely than commands to engage in coping strategies to be an antecedent for child distress (results of the reverse lag analysis).

Child Coping Behavior

Behaviors that were followed by/preceded child coping. Conducting analyses forward (see Table 2) indicated that, as expected, nonprocedural talk to the child (NPTC, #6) was followed by nonprocedural talk by the child at lag one (.29 conditional probability). The lag two behavior was nonprocedural talk to the child (.38 conditional probability), indicating that a distracting conversation with the child was occurring. No other adult behaviors were followed most often by a child coping behavior.

The reverse analyses (see Table 3) again revealed that nonprocedural talk by the child (NPTC, #29) was preceded by nonprocedural talk to the child (.69 conditional probability), which was preceded by nonprocedural talk by the child at lag two (.33 conditional probability). In other words, 69% of the instances of this distraction behavior were immediately preceded by what appears to be the conceptually appropriate antecedent, nonprocedural talk to the child. Deep breathing (BRTH, #31) was preceded by commands to engage in coping strategies (CCS). It should be noted that 44% of the occurrences of breathing were preceded by CCS at lag one, and that breathing was preceded by CCS for five lags. This indicates that breathing seldom occurred without being preceded by adult coaching. Makes coping statements, a low frequency behavior, was preceded almost equally by reassuring comments (.29 conditional probability) and commands to engage in coping strategy (.24 conditional probability). Humor by the child (HUM, #32) was preceded at lag one by nonprocedural talk to the child (.28 conditional probability), which was preceded at lag two by humor by the child (.21 conditional probability). Again, this indicates that distracting talk by adults facilitates distracting talk by children (in the form of humor), and visa versa.

Behaviors that followed child coping. Referring to Table 2, nonprocedural talk by the child (NPTC, #29) was followed at lag one by nonprocedural talk to the child (.63 conditional probability), which was followed by nonprocedural talk by the child (.33 conditional probability). Deep breathing (BRTH, #31) was followed by commands to engage in coping strategies at lag one (.27 conditional probability). Humor by the child (HUM, #32) was followed by humor directed to the child at lag one (.32 conditional probability). In each of these

cases it appears that adults were responding in such a way as to facilitate the continuation of the behavior the child was engaging in at the time. The low frequency behavior of makes coping statements; (MCOP, #28) was the only exception to this rule in that it was followed at lag one by notification of procedure to come (.18 conditional probability).

DISCUSSION

This research indicates that particular adult behaviors are closely associated with either coping or distress behaviors by the child undergoing painful BMA and LP procedures. For these children, none of whom had received coping skills training, engaging in the coping behaviors of nonprocedural talk and humor (distraction) typically was preceded and followed by nonprocedural talk to the child and, to some extent, by humor directed toward the child. These adult behaviors appear to provide the cues necessary for eliciting and maintaining this form of distraction for the child. Deep breathing was similarly closely associated with commands to use coping strategies. Usually this command took the form of adults saying to the child "breath" or "take a deep breath." The child's audible breathing was commonly observed within a couple of behaviors following these commands. It was very uncommon to observe a child breathing without these adult prompts. It is likely that the child coping behaviors of humor and nonprocedural talk are more effective during the early nonpainful aspects of the procedure, and deep breathing would be more appropriate immediately prior to and during the more painful phases.

The clinical implications of these findings are direct and deserving of further investigations. These data suggest that, in addition to teaching the child how to engage in distracting conversation and deep breathing, formally teaching parents and/or staff how to frequently and more effectively elicit these behaviors at the appropriate times might result in increased child coping and decreased distress. Providing the parents and staff with effective means to decrease child distress may also lower their own distress. We should also note that the general technique of adult coaching could be used to cue children to engage in coping strategies other than the ones assessed in this investigation.

This study also suggests that psychologists and others should be cautious in encouraging adults to engage in those behaviors which we found to be most closely associated with child distress. The most frequently occurring behavior among these is reassuring comments. In terms of frequency, reassurance accounted for 18% of all adult vocalizations and 28% of all vocalizations directed toward the child. The results of this investigation and that of Bush et al. (1986) suggest that a study involving the experimental manipulation of the level of reassurance would be appropriate to determine more conclusively its effects on distress.

Apologies and criticism, although low frequency behaviors, were also closely related to child distress. It is not difficult to imagine how criticism might serve to cue distress from a child in pain. Apologies, on the other hand, may serve as a cue for release of emotional behavior by the child at a time when such release may not be beneficial.

The results also suggest that adults do not need to give too much control

to the child at critical periods during the procedures. The highest probability behavior for most children in the presence of a painful stimulus is distress in one form or another. Giving them control leaves them to their own devices as to how to manage themselves in this painful situation. Giving control at the beginning of a procedure by saying "Tell me when you are ready," allows the child to delay by crying or other distress behaviors. This may serve as a negative reinforcement paradigm. Instead of giving the child control, this could be thought of as the parents and staff abdicating control during the painful procedures (W. H. Redd, personal communication, March, 1987). However, it should be noted that parents and staff usually do not know what to do to help the child: a situation that is likely to increase their own distress and anxiety. One procedure that has been used with some success is setting limits by allowing the child decisional control rather than absolute or behavioral control (see Ross & Ross, 1988, p.94). With decisional control, the child may be offered a choice of left or right arm for receiving an injection, or offered a choice of the procedure beginning in three or seven seconds, rather than after an indefinite delay, as is typical of behavioral control. It should be noted that only instances of behavioral, not decisional control, were observed in this study.

In addition to the aforementioned heuristic implications of the current research, it should also be noted that CAMPIS allows for the possibility of closer monitoring after intervention. Specifically, the CAMPIS allows for the monitoring of the application of independent variables (the desirable independent variables are taken here to be adult commands to engage in coping strategies, nonprocedural talk directed toward the child, and humor directed toward the child: the undesirable independent variables include reassuring comments, criticism, apologies, and giving control to the child), as well as monitoring of dependent variables (typically distress behaviors by the child, but also child coping behaviors as well). In this way, behavior therapists could help assure the integrity of the application of the independent variable (Peterson, Homer, & Wonderlich, 1982), as well as monitor the dependent variables of interest.

The current study also has certain limitations. In spite of the fact that the 35 CAMPIS codes offer a high degree of specificity for the analysis of large pools of data, it would be necessary to combine codes in order to detect patterns in the flow of interaction for individual subjects. The current study suggests that the child codes could be combined into the categories of distress, coping, and neutral behaviors. The adult codes, likewise, could be combined into the categories of distress promoting, coping promoting, and adult neutral behaviors. However, combining of codes should come only after determining the impact of discrete behaviors on other discrete behaviors. This study should be viewed as basic assessment research to more precisely determine behavior-behavior relationships and possible antecedents and consequences for child coping and distress. In this study, the distress promoting behaviors were reassuring comments, giving (behavioral) control to the child, criticism, and apologies. The coping promoting behaviors were commands to engage in coping strategies, nonprocedural talk to the child, and humor directed to the child. However, it should be remembered that this study was not an ex-

perimental investigation and does not firmly establish causal relationships between the criterion behaviors and those behaviors that occur at the various lags. What this study has done is to determine conditional behavioral probabilities and outline sequences of behavior, providing a detailed description of the interactions that occur in the pediatric treatment room.

It also should be noted that this research was conducted with a relatively small number of subjects from only one hospital. It is possible that these findings do not reflect the typical interactional patterns of most adults and children in pediatric treatment rooms. Also, there was no control in this study for the effects of age, sex, previous experience with medical procedures, or child personality attributes (e.g., Peterson & Toler, 1986). Therefore, these results should be taken as general guidelines, rather than as concrete indications of how particular children, families, and staff with particular characteristics will behave. Finally, in its current form, the CAMPIS is used for coding vocal rather than motoric behavior. This means that this study does not provide information regarding the impact of touch, proximity, eye contact, etc. on child coping and distress. Research on the impact of nonvocal behaviors on the child would provide additional guidelines about the complex social interactions in the medical treatment room.

Although not a liability in itself, it is also likely that investigations of this type will produce data that will challenge some traditional views as to what serves to increase or decrease child distress or coping. However, in this investigation those questions are addressed empirically, rather than relying on clinical lore or impressions. This study could be viewed as providing a functional analysis of the effects of adults' vocal behaviors on the vocal behavior of children in the stressful situation. Behavioral observation and a functional analysis have been the hallmarks of the interrelated activities of behavioral assessment and therapy (Hawkins, 1986).

As with all initial investigations, there are many other questions that remain to be asked regarding the role of the social environment on children undergoing painful events which are beyond the scope of any single study. Some of these include the differential reaction of the child to parents versus medical staff, differences in interactions that occur according to the phase of the medical procedure, differences in the patterns of interactions that occur for high versus low distress and high versus low coping children, and experimentally manipulating adult behaviors to more conclusively determine their effects on child distress and coping.

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