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A Descriptive Analysis of Family Discussions About Everyday Problems and Decisions

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Skinner's *Verbal Behavior* (1957) and "An operant analysis of problem solving" (1966) were used to develop a coding system to analyze the relationships between verbal behaviors in family problem solving discussions. Taking solution statements as a target behavior, sequential relationships were examined with both subsequent and antecedent verbal behaviors, comparing families with higher and lower rates of solution statements. Results indicated that two categories of verbal behavior occurred both subsequent and antecedent to solution statements more frequently in families with higher frequencies of solution statements: Agreements and contingency statements. Results are discussed in terms of an operant theory of problem solving in which agreements may serve as reinforcers for solutions and contingency statements may serve as discriminative stimuli.

Problem solving has been treated experimentally (Catania, 1979, pp. 29-31, summarizing the work of Thorndike and Kohler), theoretically (Skinner, 1966), and clinically (D'Zurilla, 1986; Robin & Foster, 1988; Spivack, Platt, & Shure, 1976) as a set of centrally important survival behaviors that have been labeled as instrumental, adaptive, or operant. Behavior controlled by consequences was first studied in the early experimental study of nonhuman problem solving (Catania, 1979). Skinner (1966) provided an operant analysis of human problem solving, placing emphasis on the verbal behaviors that lead to the occurrence of solution behaviors. He labeled this verbal problem solving "rule-governed behavior," in which antecedent verbal behaviors (descriptions of relevant aspects of the environment, contingencies and solutions) partially control the topography and emission of solution behaviors. Clinical problem solving treatments have operationalized a series of problem solving behaviors that are taught to clients so that they will learn to solve their own problems without additional professional help (D'Zurilla, 1986; Robin & Foster, 1988; Spivack, Platt, & Shure, 1976).

While the nonhuman research tradition has included observational studies of problem solving, there is no equivalent body of data for the study of human problem solving. There have been two major research traditions, neither of which is based on direct observation of problem solving behaviors (with the exceptions of Luria, 1961, and Meichenbaum & Goodman, 1969, 1971). The first has been the formal (logical and verbal) analysis of work products and verbal responses to problem stimuli in the cognitive tradition. Examples include the study of thinking (Holland, Holyoak, Nisbett, & Thagard, 1986), scien-

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tific creativity (Tweney, Doherty, & Manatt, 1981), and social problem solving (Spivack, Platt, & Shure, 1976). Building on the western philosophical tradition, categories of problem solving verbal behaviors have been isolated, such as defining, questioning, comparing, categorizing, rephrasing, analyzing, imagining alternative behaviors and outcomes, deciding, planning, checking, and self-monitoring. This type of research about problem solving then takes the form of relating these written, spoken, or self-reported verbal behaviors to the experimental problem stimuli.

The second tradition has been the experimental analysis of human behavior. For instance, studies of rule-governed behavior have analyzed the functions of instructions and subject verbalizations in responses to problematic, (that is, unknown to the subject) experimental contingencies (Catania, Matthews, & Shimoff, 1982; Lowe, Harzem, & Hughes, 1978, 1979; Lowe, Beasty, & Bentall, 1983; Matthews, Catania, & Shimoff, 1985; Matthews, Shimoff, & Catania, 1987; Matthews, Shimoff, Catania, & Sagvolden, 1977; Shimoff, Catania, & Matthews, 1981). Although this work demonstrated the relationship of verbal stimuli to responding under laboratory conditions, it was not designed to observe the process of problem solving.

Observations of human problem solving were made in the study of verbal deficits in impulsive boys, using the think-aloud procedure for the direct observation of concurrent verbal and motor responses to problem tasks (Meichenbaum & Goodman, 1969, 1971, 1979; Meichenbaum, 1977). The deficits occurred as low rates or inadequate topographies of (a) descriptions of task-related stimuli, (b) monitoring or observation of one's own motor behavior, (c) anticipation of likely results, and (d) planning sequences of behavior. In a different experimental tradition, Luria (1961) also made direct observations of human problem solving with children as subjects. He and his colleagues observed the relationships between antecedent instructions, concurrent self-directed verbalizations, and problem solving motor behaviors. They found that the following verbal behaviors were related to problem solving behaviors: Instructions from adults (in mand form and in the form of intraverbal descriptions of contingencies), and statements by the children (often to themselves) including (a) tacts of task-related stimuli, (b) tacts of his or her own motor behavior, (c) intraverbal descriptions of possible recombinations of stimuli, and (d) planned sequences of future behavior.

Previous research has thus demonstrated (a) that verbal responses are related to motor responses to problematic stimuli (Catania, Matthews & Shimoff, 1982; Lowe, Beasty & Bentall, 1983; Lowe, Harzem & Hughes, 1978, 1979; Matthews, Catania & Shimoff, 1985; Matthews, Shimoff & Catania, 1987), and (b) that specific topographies of verbal response may be related to the occurrence of solutions (Luria, 1961; Meichenbaum & Goodman, 1969, 1971). Previous research, however, has not studied the process of human problem solving in a social context. Such problem solving is often verbal, imbedded in long streams of other verbal behaviors, and also imbedded in streams of social interaction. The present study examines the relationships between the generation of solution statements in family problem solving discussions and the occurrence of subsequent and antecedent statements generated by other speakers.

The goals of the study are to observe natural verbal problem solving topographies, and to explore relationships between high rates of solution statements and other surrounding statements in family problem solving discussions. The purpose of this exploration is to empirically identify general categories of verbal behavior that may control family problem solving about everyday problems. This knowledge would not only apply to Skinner's (1966) theoretical analyses, but also permit experimental analyses of family problem solving and, eventually, individualized interventions to increase low rates of family problem solving.

The selection of verbal behavior cate-

gories for this study was influenced by previous analyses of problem solving (Cerutti, 1989; Skinner, 1966), an operant analysis of verbal behavior (Skinner, 1957), and behavioral field studies of human social interaction (Patterson, Ray, Shaw, & Cobb, 1969). After the natural topography of family problem solving was assessed, several descriptive methodologies were employed to identify verbal behaviors that may control solution statements. First, every observed verbal behavior was assessed for covariation with solution statements (see Vyse, Mulick, & Thayer, 1984). Then, because covariation does not necessarily imply contingency, conditional probabilities (Mace, Lalli, & Pinter-Lalli, 1991) were calculated for all covarying behaviors, as both subsequents and antecedents of solution statements in families with well established verbal solution behavior. Those verbal behaviors that consistently were more likely to occur after or before solution statements than at other times were considered candidates for contingent relationships. As a final check against noncontingent relationships, the conditional probabilities for families with well established verbal solution behavior were compared with analogous probabilities for families with low rates of solution statements to determine if, as was expected, the conditional probabilities between potentially controlling variables and solution statements were higher for families with well established solution behaviors.

METHOD

Subjects

Eight intact, two-parent families with at least one adolescent child, agreed to participate in a previous study of family verbal interactions at a university psychological clinic (Warren, 1986). Four volunteer families, not seeking treatment, responded to a public announcement for families that met the criteria of having at least one adolescent child, coping adequately with that situation, and not seeking treatment for adolescent problems. Four other families, after requesting treatment at the clinic for adolescent problems, were asked to participate in the experimental procedure during the intake process, although the procedure was not designed to assess clinical problems. For their participation, the nonclinic families were paid $40.00 and the usual assessment fee was waived for the clinic families.

The eight families were comparable on all dimensions (Warren, 1986), being of lower middle to middle SES, with two to four children, and two parents. The families seeking treatment had significantly older children (oldest child mean age 22.75 years as opposed to oldest child mean age of 15.5 in those families not seeking treatment). However, because the clinic families' adult children did not participate in the study, the average ages of the children who participated in the study did not differ significantly between the nonclinic (14.2 years) and the clinic (15.1 years) families. Their ages ranged from 11 to 19 years.

Experimental Procedure

Although the behavior observations occurred in a clinical setting, this was not a study of clinical interactions or clinical problem solving. Rather, everyday problems of low to moderate intensity were discussed by the families. First, each family member selected items on a modified version of the Issues Checklist (Prinz, Foster, Kent, & O'Leary, 1979), a list of typical topics of disagreement in families with adolescent children that yields scores of the intensity of disagreement for each item. Warren (1986) then chose an issue for the family to discuss that every family member had selected as representing moderate disagreement. The families were instructed that they would be videotaped during two five-minute segments and that the experimenter would knock on the door at the beginning and end of each segment. Videotaping of the family problem solving discussions occurred in a therapy room that was equipped with a one way mirror at the university psychological clinic. For the first five-minute segment the instruction was: "Discuss this _____ problem

from the list." Problems included homework, chores, telephone use, jealousy between siblings, talking back to parents, etc. The instruction for the second segment was: "Plan to do something together." Most families planned to go to a restaurant, to go on a day outing, or to prepare for a vacation. The present study is a secondary analysis of the transcriptions of the videotaped problem solving discussions. The coders of the present study had no contact with the families other than viewing the videotapes and reading the transcripts.

Protocol Preparation

Coding was done with transcripts rather than with videotapes because of the molecular level of analysis and because of the number of codes. It was easier for the coders to repeatedly study specific statements and to compare them to coding criteria when looking at a printed page than when looking at a videotape.

First the videotapes were transcribed into typed form with as much naturalistic detail as possible, including all disfluencies (departures from written grammatical form), simultaneous statements, nonverbal vocalizations, and descriptions of concurrent nonverbal behaviors and communications. Since each of the eight families did two problem solving exercises ("Discuss a problem" and "Plan to do something together"), there were sixteen protocols. The transcripts were then re-typed into a format to facilitate coding, by (1) isolating codable statements on separate lines, (2) spacing the separate lines, and (3) putting some disfluencies (stuttering-like repetitions and nonverbal vocalizations) into brackets indicating that they were not to be coded. The task of the coders was then only to categorize the isolated statements, unimpeded by the tasks of separating codable statements out of complex dialogue.

Statements were defined as groups of spoken words roughly equivalent to simple sentences, but often grammatically incomplete. A statement in this study is equivalent to what others have called "utterance" (Rosenfeld, 1966) or "thought unit" (Bakeman & Gottman, 1986) or "tone unit" (Kreckel, 1981). For later sequential analyses, the coded statements were recombined into the pre-existing speeches. A speech is defined as a series of statements by one speaker, bounded by the speeches of the previous and the following different speakers (Rosenfeld, 1966).

Behavior Coding System

A coding system was developed in two steps: First, an a priori abstraction of categories, from Skinner (1957, 1966) and from field studies by Patterson, Ray, Shaw, & Cobb (1969); Robin & Fox (1979), and Raush, (1965). Second, an inductive examination was completed of the statements on the transcripts. In this way, a coding manual was constructed that accurately reflects the topographies of the actual statements, but that also is consistent with Skinner's analysis of problem solving and other verbal behaviors. Categories were retained for use in this study only if statements were found that could be so coded, while one category, quotation (echoic), was added. A coding manual was written that includes a list of the categories, a description of the range of statements to be coded within a category, typical words and verbal constructions, distinctions between categories, and a set of coding rules (Greene, 1989).

The following behavior categories were coded:

Solution statements were the target behavior. These were defined as statements that met the criteria defined by the instructions, that is a solution to the targeted behavior problem for the first task, or a suggestion of an activity that the family might do together for the second task. Examples: (1) For the problem of conflicts over telephone use, "He can get his own number and he can get his own answering service and that's it." (2) For something to do together, "We were thinking of going on a cruise, all of us, like in the summer."

Contingency statements included (a) if-then conditional statements, (b) statements of required behaviors, and (c) prototypical actors who are held to control certain con-

tingencies. These were the only topographies in this sample of verbal behavior that might function as rules (Skinner, 1966), that is statements of contingencies that might set the occasion for the occurrence of a solution. Examples: (a) "When we ask somebody to do something, it's because we have to spend that time bringing you to dancing school, bringing you here, bringing you to school." (b) "Uncle Joe doesn't have to go." (c) "What do you think I am, Rockefeller? No, I'm a nursery school teacher."

Descriptions of situations relevant to the solution Examples: "It'll be almost dark at 5 o'clock." "There's a lot of museums down there."

Agreement and disagreement statements were brief responses to the preceding speech, sometimes occurring alone but more often as the beginning statement of a following speech. "Okay." "All right." "No, no."

Evaluation statements applied some criterion (good, expensive, high class, etc.) to a preceding statement. "That sounds good." "That sounds fair."

Correctives (Raush, 1965) are goal-referenced statements about the ongoing talk, including (a) re-statements of the instructions or problem solving goals of the talk, (b) observations of behaviors or the affective tone of the talk which contribute to or hinder compliance with the instructions, and (c) suggestions that the talk return to the instructed task. Correctives may be similar to mands in that they function to return the discussion to a direction which the speaker asserts to be more reinforcing. "We're supposed to be talking about our trip." "You guys started off the conversation with 'it's not as bad as it used to be,' and now you're at each other's throats."

Noncomply was a refusal to answer a question or to respond to a solution statement or to comply with a corrective. "I'm not starting." "End of discussion."

Mands (Skinner, 1957, p. 35 ff.) are statements that request a behavior of the listener while specifying or implying a reinforcing or punishing consequence contingent on that behavior. In this sample of verbal behavior, mands were found with two topographies, (a) questions and (b) commands. (a) "What do you want to do with us?" is a request for a tact of a person. (b) "Just don't talk back to me anymore."

Tacts are statements that occur in the presence of "the world of things and events which the speaker is said to 'talk about'" (Skinner, 1957, p. 81). In this sample of verbal behavior, only the family members and the therapy room were present to be "talked about."

Tacts of persons, either of the speaker or of the other speakers, included tacts of behaviors, feelings, and preferences, and also trait-like descriptions. As in the case of intraverbals in these discussions, tacts of persons also have mand-like characteristics in that the speakers often were describing what they or others found punishing or reinforcing. Examples: "I don't talk back to you." "We want to go to the parade."

Tacts of experimental conditions included tacts of the experimenter or the experimental room (the curtains, the camera, etc.), but not references to the experimental instructions. Example: "That camera probably never shut off."

Echoics (Skinner, 1957, p. 55 ff.) were quotations of the verbal behavior of another speaker. "But can't you say, like you're saying now, 'I get upset with you,' or 'You're taking so-and-so's side,' you know, instead of, ah, 'I'm not talking to you,' 'You're impossible,' 'You don't listen to me.' "

Intraverbals (Skinner, 1957, p. 71ff.) are responses to prior statements, accounting for a large proportion of social conversation. In the present study, the instructions for the problem solving discussion may have functioned as an establishing operation which created mand-like conditions in that problems include punishers and solutions include reinforcers for some or all of the speakers. For this reason, intraverbal statements of solutions, contingencies, and situations relevant to problem solution may function as both mands and intraverbals.

Nonscorable were nonverbal vocaliza-

tions (laughs, grunts, etc.) or statements that were not recorded clearly enough for transcription.

Coder Training and Agreement

The three coders, including the first author, were graduate students in clinical psychology with experience with adolescents and their families. The initial coder training session lasted three hours and included: (a) Instruction in Skinner's (1966) theory of problem solving, (b) explanation of each coding category, (c) discussion of hypothetical examples of each coding category including typical words and constructions, and distinctions between categories, (d) discussion of coding rules, and (e) instruction in procedures for correcting coder drift from the coding criteria.

After the first training with the coding manual, the coders coded a transcript of a pilot tape on their own. In the second two-hour training session, the points of disagreement were discussed, with the result that ambiguities in the coding manual were clarified, a brief listing of the categories on a single page was prepared to facilitate coding, and the second coder reached a criterion of 90% intercoder agreement with the first author.

Then all protocols were coded by the first author and a randomly selected 62.5 % of the protocols were coded by a second coder. The second coders, but not the first author, were blind to the nonclinic or clinic status of the families. The coders examined the disagreements at the end of each coding session by explaining their rationales for using a specific code and then consulting the criteria for that code set in the coding manual. No codes were changed, but this feedback corrected drift from the coding criteria on an ongoing basis.

Overall intercoder was 82% (6402/7824), calculated statement by statement by dividing the number of statements where the second coder agreed with the first coder by the total number of statements and multiplying by 100. Reliability for individual behavior categories was calculated by dividing the number of times both coders ageed upon a behavior code by the total frequency observed by either the first or the second coder (House, House & Campbell, 1981). Agreements ranged from 99% for Questions to 30% for Non-complies. All except three reliabilities, those for Non-complies, Correctives, and Evaluations were above 80%. Only those behaviors with reliabilities above 80% were used in subsequent statistical analyses.

RESULTS

Distribution of Verbal Behaviors During Family Problem Solving

Figure 1 shows the proportions of the total statements that were observed to be each type of verbal behavior. Nearly half (45.1%) of the verbal behaviors were intraverbals, including the target behavior, Solution statements (3.2% of all statements), Agreements (6.7%), Contingency statements (ll.6%), Descriptions of situations relevant to problem solution (10.2%), Evaluations (6.2%), Disagreements (3.1%), Correctives (3.1%), and Noncomplies (1.0%). One third (34.1%) of the verbal behaviors were tacts, and of these the largest group (32.4%) were Tacts of Persons. Mands included Questions (12.5%) and Commands (4.1%).

Covariation of Solution Statements With Other Verbal Behaviors

Spearman's Rank Correlation Coefficients (Bruning & Kintz, 1977) were calculated for the frequencies of Solution statements correlated with the frequencies of each of the other verbal behaviors with intercoder agreements above 80% in the families' protocols. Frequencies of Agreements correlated significantly with frequencies of Solution statements, $r(7) = .76$, $p < .05$. Frequencies of Contingency statements correlated significantly with the frequencies of Solution statements, $r(7) = .86$, $p < .05$. Because no other coded verbal behaviors correlated significantly with Solution statements, only Agreements and Contingency statements were considered to be potentially controlling variables in subsequent analyses.

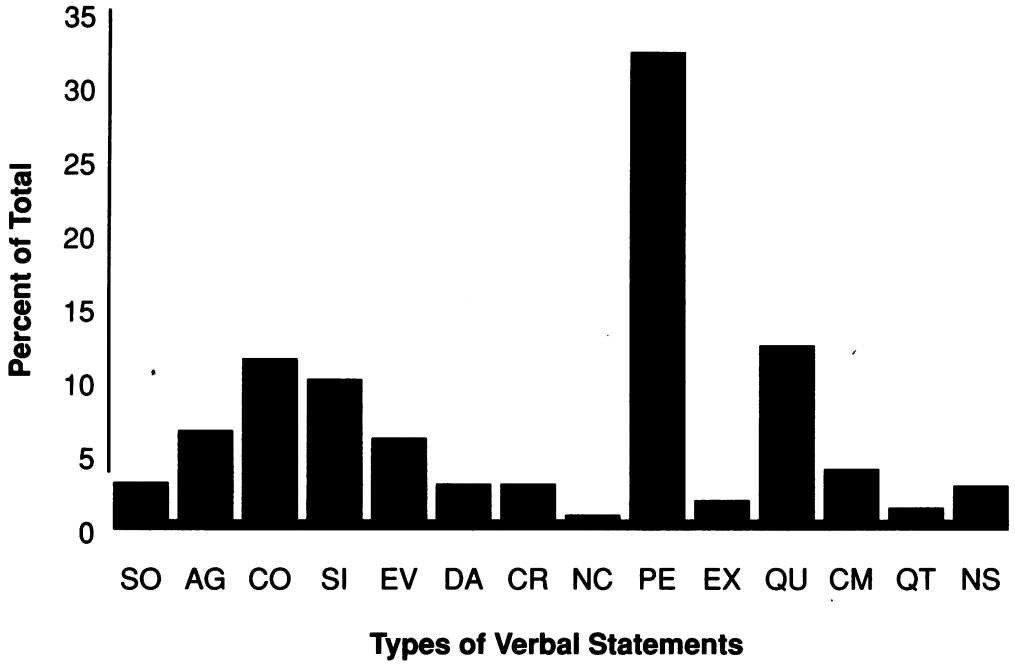

Fig. 1. Overall distribution of verbal behaviors, as percentages of all statements. Solution statements (SO), agreements (AG), contingency statements (CO), descriptions of situations (SI), evaluations (EV), disagreement (DA), correctives (CR), noncomplies (NC), tacts of persons (PE), tacts of experimental conditions (EX), questions (QU), commands (CM), quotations (QT), nonscorable (NS).

Conditional Probabilities of Solution Statements With Agreements and Contingency Statements in Families with Higher Rates of Solution Statements

Three families clearly showed higher proportions of Solution statements (6.7, 5.3, and 4.5) or an average of one Solution statement for every 18 statements, while four other families clearly showed lower proportions of Solution statements (3.2, 2.7, 2.2, and .5) or an average of one Solution statement for every 52 statements. Conditional probabilities (Mace, Lalli, & Pinter-Lalli, 1991) were used to assess possible subsequent and antecedent contingent relations in the families with high rates of (or well-established repertoires of) Solution statements.

Relationships Between High Rates of Solution Statements and Subsequent Verbal Behaviors

The conditional probabilities that, given a Solution statement, an Ageement would follow within three speeches were calculated for the three high rate families. The conditional probabilities were calculated by dividing the frequency with which Agreement statements follow Solution statements within three speeches by the frequency that Solution statements occur throughout the discussion. As Figure 2 shows, the mean conditional probability that a Solution statement would be followed by an Agreement was 55.5 (43.7, 45.0, and 77.9, respectively) for the families with high rates of solution statements. For the same families, the mean conditional probability that, given a Solution statement, a Contingency statement will follow was 37.7 (31.7, 36.1, and 45.4, respectively). All of these conditional probabilities compare favorably with the mean unconditional probabilities for Agreement (6.7) and Contingency statements (11.6) in Figure 1.

Relationships Between High Rates of Solution Statements and Antecedent Verbal Behaviors

The mean conditional probability that, given an antecedent Agreement, a Solution statement would follow within three speeches was 41.5 (33.1, 34.6, and 56.8 respectively) for the families with high rates of solution statements. The mean con-

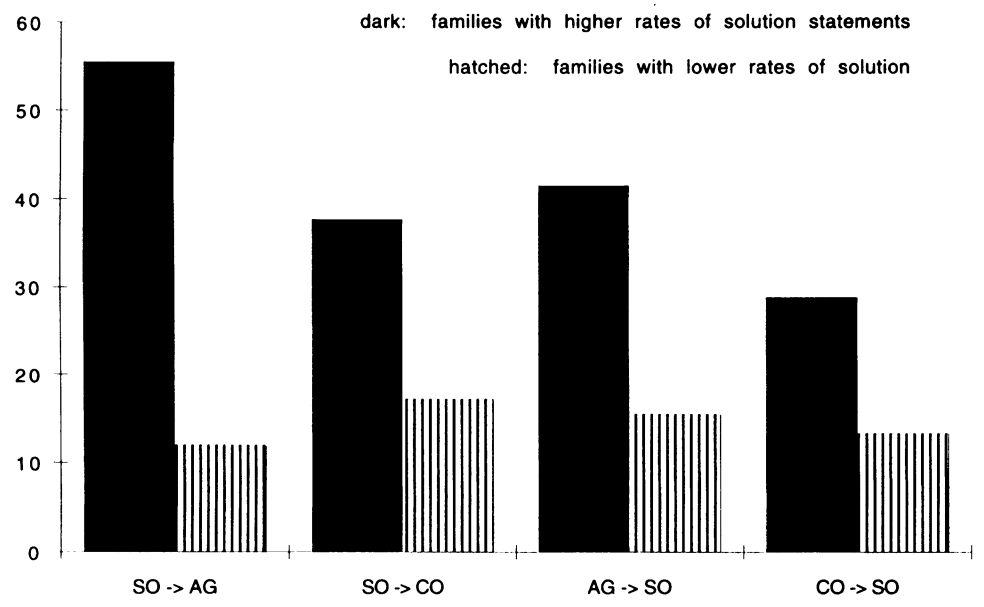

Fig. 2. Conditional probabilities of solution statements (SO) occurring within three speeches of subsequent and antecedent agreements (AG) and contingency statements (CO).

ditional probability that, given an antecedent Contingency statement, a Solution statement would follow within three speeches was 28.8 (26.4, 27.6, and 32.4, respectively). All of these conditional probabilities compare favorably with the mean unconditional probability for Solution statements (3.2) in Figure 1.

Comparison of Conditional Probabilities Between Solution Statements and Antecedent and Subsequent Behaviors in High Rate vs. Low Rate Families

Conditional probabilities of Solution statements occurring within three speeches of subsequent and antecedent Agreements and Contingency statements were calculated for the families with relatively low rates of Solution statements. Figure 2 shows the means of these conditional probabilities. One-tailed t tests were used to determine if the conditional probabilities for the high rate families were significantly greater than those for the low rate families.

Subsequent Relationships

The conditional probabilities between Solution statements and Agreements that occurred within the next three speeches were significantly greater for the high rate families than for the low rate families, $t(5) = 3.779$, $p < .02$. The conditional probabilities between Solution statements and Contingency statements within the next three speeches were also significantly greater for high rate than low rate families, $t(5) = 3.206$, $p < .05$.

Antecedent Relationships

The conditional probabilities between Agreements and Solution statements that occurred within the following three speeches were significantly greater for high rate than low rate families, $t(5) = 3.079$, $p < .05$. The conditional probabilities between Contingency statements and Solution statements that occurred within the following three speeches were also significantly greater among families with high rates of Solution statements than among families with low rates of Solution statements, $t(5) = 2.632$, $p < .05$.

Exhibit of Solution Statements Followed by Agreements

Speech 136—Father's SO: What about something like Puerto Rico? Or just, you know, do something like that.

Speech 137—Daughter's AG: Yeah.

Speech 151—Father's SO: Or we could go to an island like St. Martin or the Caribbean.

Speech 154—Daughter's AG: Yeah.

Speech 157—Father's SO: Have to have a disco.

Speech 162—Father's SO: Would you join in activities at the...? If we're at a hotel that they had organized ah...the kids there....

Speech 163—Daughter's AG: Yeah.

Exhibit of Contingency Statement Followed by Solution Statement

Speech 36—Father's CO: Well, they can't put another number in or whatever, unless you're.... If they just put it in, it becomes a....

Speech 37—Daughter's SO: Well, we can take the one out of the den. We'll just plug that one out. Okay? They wouldn't know that was there. We can plug the one in, the downstairs..., in the fam..., the one in the basement. Take that one out. They wouldn't know it was there.

DISCUSSION

A set of categories based on an operant theory of verbal behavior (Skinner, 1957, 1966) was used to code the verbal behaviors that occurred in problem solving discussions with eight families. This effort lent provisional support to Skinner's operant analysis of problem solving. Agreements and Contingency statements were found not only to covary with Solution statements, but also to be sequentially related, both antecedent and subsequent to Solution statements in families with high rates of Solution statements.

The results of this descriptive analysis indicate that when families are instructed to discuss problems and Solution statements occur with geater frequency, then Agreements and Contingency statements also occur more frequently in close sequential proximity.

These findings are consistent with an operant analysis of problem solving (Cerutti, 1989; Skinner, 1966), in which Contingency statements can function as discriminative stimuli for Solution statements, and Agreements might function as reinforcing social stimuli. Such verbal stimuli may reinforce Solution statements that in turn function as discriminative stimuli (rules) governing additional solution behaviors that would bring the speakers into contact with reinforcing contingencies. Skinner's interpretive analysis of problem solving suggested this sequence of problem solving behaviors, and the present study analyzed verbal behaviors that may have similar functions.

The results concerning Contingency statements confirm the findings of previous observational studies of problem solving (Luria, 1961; Meichenbaum & Goodman, 1969, 1971), in which descriptions of conditional or necessary relationships between behaviors and problematic stimuli ("if it's like that, then I should...") increased the likelihood of solution behaviors. Agreements also have been found to be reinforcing in other studies. For instance, Greenspoon (1955) found that a minimal agreement ("uh huh") increased the frequency of plural nouns, and Place (1988) found the continuation of verbal interaction to be a function of consequential agreements. An environment of higher rate approval statements has been observed to increase the frequency of child compliance with instructions, even when the approvals are not contingent on compliance (Atwater & Morris, 1988).

In the present study functional relationships are more difficult to analyze because the target behaviors occur in long sequences of verbal interaction with several speakers. For instance when several speakers are speaking rapidly, it is not always clear to whom an Agreement is a response. By contrast, in the studies by Luria (1961), and Meichenbaum & Goodman (1969, 1971) the talk was self-directed (not interactive) so that verbal descriptions of contingencies preceded or accompanied the motor behaviors of the same speaker. Place (1988) and Atwater & Morris (1988) studied dyadic interactions in which subsequent agreement or approval behaviors clearly follow antecedent behaviors.

Atwater and Morris (1988) found that specifically contingent approval statements did not seem to control compliance;

whereas a verbal environment with a higher density of approval statements seemed to set the occasion for a higher rate of compliance. The present study generated similar findings, with sequential analysis revealing that proximal (either antecedent or subsequent) Agreements and Contingency statements create a general environment in which Solution statements are more likely to occur. It seems likely, however, that there are also more specific functional interactions between antecedent and subsequent speakers and classes of verbal behavior that this descriptive analysis could not determine.

It is noteworthy that in the present study intraverbals accounted for nearly half (45.1%) of all verbal behaviors, in that problems were discussed and solutions suggested for situations that were not physically present to the speakers. The problem solving verbal behaviors that were found to covary and to be sequentially related (Solutions, Agreements, and Contingency statements) were all intraverbals. It was beyond the scope of this study to determine whether similar Solution statements functioned in other situations as mands that actually brought speakers and listeners into contact with reinforcing consequences (a circumstance that would be a solution to a problem). However, much of the discussion had a mand-like quality in that punishing problems and potentially reinforcing solutions were discussed.

In summary, Skinner's interpretive analysis of verbal behavior and problem solving behavior was the basis for the descriptive analysis of classes of verbal behavior, specifically Contingency statements and Agreements, that may function as discriminative stimuli and reinforcers for verbal problem solving. These verbal behaviors are consistent with an operant analysis of problem solving, and their correlations and temporal positions suggest functional relationships. More specific descriptive analyses might clarify whether Solution statements are controlled by a general verbal environment of Agreements and Contingency statements or whether there are more specific contingencies. Such descriptive analyses may then indicate directions for experimental attempts to increase the frequency of Solution statements in low rate families, such as increasing subsequent Agreement statements and/or antecedent Contingency statements.

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