Treatment Utility of Brief Descriptive versus Brief Functional Analysis of Food Acceptance in Individuals with Developmental Delay

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Abstract

Comparison of brief descriptive versus brief functional analysis was undertaken to identify variables maintaining food acceptance in 4 individuals with developmental delay and chronic food refusal. Cone's (1997) 3-phase assessment model (information gathering, interpretation, verification) guided behavioral assessment. A fourth phase was included to assess treatment utility of descriptive versus functional analysis. In Phase 1, specific antecedents and consequences to food acceptance were investigated, via staff questionnaires and then using a descriptive analysis to identify variables correlated with food acceptance (e.g., verbal attention, physical attention, verbal/physical attention combined, and no additional antecedent or consequence i.e., other than those stimuli involving food stimuli themselves). In Phase 2, behavioral experts reviewed this information to identify variables to be included in the functional analysis. In Phase 3, functional analysis identified controlling relations of those same variables for eating behavior. In Phase 4, individualized treatments derived from each assessment method were applied to compare their effectiveness. An alternating conditions design was implemented in the functional analysis and treatment phases. The main dependent measure was percentage of 10 s intervals in which acceptance of food (food deposited in mouth within 5 s of presentation) occurred. Brief behavioral assessment was useful in identifying controlling variables for eating. Descriptive and functional analyses yielded variation in the specific variables identified across participants and experts in behavior analysis derived different treatments from each assessment. However, acceptance of food was similar for treatments derived from descriptive versus those derived from functional analysis suggesting that either assessment method was effective in identifying controlling

variables. Nonetheless, functional analysis produced two benefits: either simplifying treatments or revealing additional variables to include in treatment. Thus, Cone's (1997) model was supported and holds promise for uncovering the multiplicity of controlling variables for eating, so that effective treatment packages may be conducted to assist individuals with difficulties in eating behaviors.

Treatment Utility of Brief Descriptive versus Brief Functional Analysis of Food Acceptance in Individuals with Developmental Delay

Feeding problems can occur at a rate of 45% or higher for children with normal or delayed development (e.g., O'Brien, Repp, Williams, & Christopherson, 1991). Food-refusal behaviors may include crying, turning away from the spoon, clenching teeth, expelling food, fighting, gagging and, at times, vomiting (e.g., Babbitt et al., 1994). Problems of food selectivity and refusal can result in chronic malnourishment, excessive weight loss, diminished growth, increased susceptibility to infection, and in gastrointestinal malabsorption; as well as in other negative physical, cognitive and developmental consequences (e.g., Bithoney & Dubowitz, 1985; Luiselli, Evans, & Boyce, 1985). The Diagnostic and Statistical Manual of Mental Disorders, (4th ed.) lists Feeding Disorder of Infancy or Early Childhood, Anorexia Nervosa, and Eating Disorder Not Otherwise Specified as diagnostic options for individuals with other serious eating problems.

Chronic food refusal may be due to medical or environmental circumstances or to their combination (e.g., Bithoney & Dubowitz, 1985; Heffer & Kelley, 1994). Environmental factors such as those implicated in mismanagement of children's behavior during feeding or in aversive eating experiences typically are presumed to play an integral role in the problem (e.g., Bithoney & Dubowitz, 1985; Iwata, Riordan, Wohl, & Finney, 1982b; Werle, Murphy, & Budd, 1993). Consequences identified as related to development and maintenance of food refusal behaviors include provision of social attention, presentation of toys or of a preferred food, and removal of the nonpreferred food (e.g., Babbitt et al., 1994; Iwata et al., 1982; Sanders, Patel, LeGrice, & Shepherd,

1993). In dealing with food refusal, the role of remote antecedents or setting events also is often considered (Wahler & Fox, 1981). They may range from degree of deprivation (or time elapsed since the last meal) to earlier personal interactions during the meal (e.g., negative interactions with caregivers) to critical environmental events (e.g., tube insertion).

Behavioral treatments have had considerable success alleviating problem feeding behaviors. Success has been demonstrated in the general population (e.g., Iwata, et al., 1982b) as well as in children with special medical problems such as cystic fibrosis (e.g., Singer, Nofer, Benson-Szekeley, & Brooks, 1991; Stark et al., 1993), short-gut syndrome (e.g., Linscheid, Tarnowski, Rasnake, & Brams, 1987), and deafness and blindness (e.g., Luiselli, 1993).

In research on treatment of chronic food refusal, the focus frequently has been on manipulating consequences of behaviors during feeding, such as social praise or toy play for acceptance and escape prevention for expulsion, (e.g., Cooper et al., 1995; Coe et al., 1997; Luiselli, 1989b; Riordan, Iwata, Finney, Wohl, & Stanley, 1984; Werle et al., 1993). However, antecedents to food refusal also have been investigated (Johnson & Babbitt, 1993).

While many strategies have focused on treatment alone, behavioral assessment of variables implicated in food refusal also has been pursued. (e.g., Munk & Repp, 1994; Sanders et al., 1993). However, further research in the area of assessment of food refusal behavior is necessary, utilizing the full array of assessment strategies commonly implemented for other problem behaviors. For example, a variety of non-feeding related behaviors have been investigated using several types of behavioral assessment methods

including indirect observation methods (interview) as well as direct observation methods such as descriptive (correlational) analysis, and functional (experimental) analysis (e.g., Iwata, Dorsey, Slifer, Bauman, & Richman, 1982a; Lerman & Iwata, 1993).

Indirect assessment methods have been utilized in areas other than food refusal, with instruments such as the Motivation Assessment Scale (Durand & Crimmins, 1988) and the Functional Analysis Interview Form (O'Neill, Horner, Albin, Storey, & Sprague, 1990); however, these indirect methods have not always proven reliable or valid (e.g., Iwata, Vollmer, & Zarcone, 1990; Vollmer & Smith, 1996). It may, therefore, be necessary to use indirect methods in conjunction with other direct assessment techniques (e.g., Iwata, 1994).

Two additional assessment techniques, sometimes referred to as functional assessment, include techniques of both descriptive analysis and functional analysis (e.g., Cone, 1997; Sturmey, 1996). A descriptive analysis involves directly observing behavior and its potential controlling variables in the environments in which they occur. A high degree of correlation between particular environmental events and the problem behavior leads to formulation of hypotheses about the behavior's maintaining variables.

Different types of descriptive analyses have been utilized. One method employs a narrative account with an antecedent-behavior-consequence analysis; another utilizes frequency or interval recording procedures to document occurrences of prespecified events related to the interactions of others with the participant, and the behaviors of the participant (e.g., Bijou, Peterson, and Ault, 1968; Lerman & Iwata, 1993). In this latter method, sequences of behaviors and the corresponding environmental contingencies are tracked through time. Thus, it permits collection of data on multiple events and

quantification of such data. This type of analysis has been applied to a variety of behavior problems including bizarre speech (Mace & Lalli, 1991) and food refusal behavior (e.g., Babbitt et al., 1994).

In the area of feeding disorders researchers have generally relied on descriptive analysis which can be implemented directly in the natural environment. Descriptive analysis does, however, have limitations in that the obtained data are only correlational and thus, suggestive, but not conclusive, regarding controlling variables for behavior (e.g., Bijou et al., 1968). In fact, Mace, Lalli, and Pinter-Lalli (1991) suggest that the main reason for a descriptive analysis is "to provide an empirical basis for the formulation of hypotheses of possible functional relationships between aberrant behavior and environmental variables" (p. 170). Further, they suggest that "experimental methods are necessary to verify the functional relationships that were suggested by the descriptive data" (p. 170).

Functional analysis is a behavioral assessment technique which attempts to identify, via experiment, environmental determinants (i.e., antecedents and consequences) for specific responses of an individual (e.g., Neef & Iwata, 1994). Experimental or functional analysis involves direct and systematic manipulation of potential maintaining variables. Assessment procedures may range from analogue experimental conditions manipulating naturally occurring contingencies for target behaviors directly in the (natural) environment in which the behavior normally occurs; to conditions arbitrarily designed based on information from the research literature indicating potential controlling conditions for the behavior of interest, implemented in a laboratory like setting.

Functional analysis may be superior to other assessment methods mainly because it is an experimental method (i.e., with control), and thus may be more effective for identifying causal relationships (e.g., Iwata, et al., 1990). Consequently it should increase reliability and validity in the identification of controlling variables such as attention of others, sensory and perceptual consequences, access to materials or activities, and escape-avoidance of aversive demand conditions (e.g., Mace, Lalli, & Pinter-Lalli, 1991). Once specific controlling variables have been identified, treatment can be designed to increase the rate of the target behavior. Since some of the variables described above are similar to the apparent controlling variables related to food refusal and acceptance; and since a functional analysis was useful in identifying these types of controlling variables with other problem behaviors; it may then, also be useful in the area of food refusal and acceptance.

Indeed, functional analysis has proven effective in assessing a variety of maladaptive behaviors such as self injurious behavior (e.g., Bergen, Holborn, Scott-Huyghebaert, 2002; Iwata et al., 1982a; Kennedy & Souza, 1995; Lerman & Iwata, 1993) and aggressive behavior (Northup et al., 1991), as well as in assessing separate topographies of aberrant behavior (Derby et al., 1994). However, there are limitations to a functional analysis. For example, although a functional analysis may assist in designing treatment strategies, the procedures may be complex and time consuming (e.g., Axelrod, 1987; Lennox & Miltenberger, 1989). Furthermore, it may not always be possible to directly manipulate variables associated with the specified behavior (e.g., decreasing the number of meals offered or increasing the length of time between meals) for ethical reasons (Lerman & Iwata, 1993).

In the area of food refusal, in terms of behavioral assessment, several types of analyses have been successfully employed such as descriptive analysis for both antecedents or consequences for feeding problems (e.g., Johnson & Babbitt, 1993; Munk & Repp, 1994; Sanders et al., 1993). Munk and Repp's (1994) behavioral assessment model focused solely on antecedents of food refusal such as type and texture of food. However, they recommended extension of their assessment model to investigate changes in the consequences for the participant's eating behavior in order to identify environmental variables (e.g., social attention, termination of food presentation, a change to preferred food) that maintain rejection or expulsion of food. Furthermore, they recommended that more data be acquired on the effects of treatment based on such assessment results.

In related research, assessment strategies have been applied after treatment to investigate consequences that may be controlling food refusal behavior. Cooper et al. (1995) conducted a component analysis, in which certain variables were systematically removed from treatment to identify active variables in multicomponent treatment packages for children with feeding problems. This enabled determination of components in the treatment package that were maintaining the target behavior.

While a component analysis after treatment has utility for investigating contingencies controlling food refusal behavior, pre-intervention assessment strategies also may be useful in formulating an effective treatment package. Introduction of descriptive analysis or functional analysis prior to treatment serves a function identical to that of component analysis after treatment by allowing contingencies controlling behavior to be identified. Pre-treatment descriptive analysis or functional analysis may offer

additional benefits, since an efficient treatment package utilizing only the necessary components may be designed directly from the descriptive analysis or functional analysis information. Furthermore, linking descriptive and functional analysis may provide advantages in terms of validating the conditions identified by each assessment method (e.g., Kazdin, 1992; Mace & Lalli, 1991).

Different types of functional analysis research have been conducted, with an important interest being the effects of extended versus brief analyses. A functional analysis has typically involved 40 to 60 assessment sessions over an extended period of time (e.g., 600 to 900 minutes). However, Northup et al. (1991) demonstrated that a functional analysis can be conducted in a period typical of psychological evaluations (approximately 90 min) in outclinic settings, allowing more individuals to be assessed in this shorter period of time. In addition, Bergen et al., (2002) successfully utilized brief functional analysis (six 10- min sessions for each of four conditions) to explore the control of different degrees of social attention on precursory behavior to self injury (i.e., hands at or above the level of the participant's shoulder rather than actual eye-gouging). These results are important because they provide evidence of the treatment utility and cost-efficiency of brief functional analysis as an assessment procedure (e.g., Northup et al., 1991; Yates, 1985). Without doubt, food refusal is an area that requires efficient assessment and intervention.

A second important research interest involves comparison of results from descriptive versus functional analyses (e.g., Derby et al., 1994; Lerman & Iwata, 1993; Mace & Lalli, 1991; Sasso et al., 1992). The two methods do not always consistently identify variables related to maintenance of the specified behavior. This inconsistency has

provoked speculation that a descriptive analysis may not always be sufficient to determine variables that maintain aberrant behaviors. Consequently, a functional or experimental analysis has been considered the best available standard for comparison, since the utility of experimental analysis has been previously demonstrated and because, generally, it has been viewed as the ideal method (the "gold standard") for establishing functional relations (e.g., Lerman & Iwata, 1993; Mace, 1994).

Lerman and Iwata (1993) further contend that these inconsistencies and lack of support for the use of descriptive analysis are important because inaccurate assessments may lead to implementation of treatments that would not be beneficial for certain behaviors or individuals. This, of course, could have serious implications in areas of high risk or life threatening behaviors such as self injurious behavior or severe food refusal.

Alternatively, however, a descriptive analysis may better identify the actual maintaining variables in the natural environment. Or indeed, perhaps descriptive analysis and functional analysis may be equally valid depending upon the specific assessment circumstances. Perhaps the best standard for comparison is not to functional analysis data but to treatment effectiveness (e.g., Mace, 1994). Lerman and Iwata's (1993) research included assessment only and did not present treatment data to support conclusions about maintaining variables for the descriptive or experimental analyses. Comparing data from a descriptive to that of a functional analysis may provide a false sense of confidence in the functional analysis data. As Cone (1997) notes, "This question is perhaps best answered by outcome criteria "(p 267). Thus, it may be best to compare the results of both descriptive analysis and functional analysis to treatment effectiveness based on

information gathered from each assessment method; a method referred to as "treatment utility" (e.g., Hayes, Nelson, & Jarrett, 1987).

Cone (1997) has argued for a modified conceptualization of the behavioral assessment and treatment process which would further direct methods of investigation. Drawing on Carr et al.'s (1994) conceptualization of functional assessment as involving three stages; descriptive, categorization (hypothesis forming), and verification, Cone outlines three distinct phases in the assessment process: (a) information gathering (descriptive), (b) hypothesis formulation (interpretative), and (c) hypothesis testing (verification). Furthermore, while all three phases are subsumed within the term "functional analysis procedure"; "functional analysis", itself, refers exclusively to activities in Phase 3, the hypothesis testing phase (although such activities are based upon what was identified in Phases 1 and 2). In contrast, a "functional assessment" refers solely to the activities of Phases 1 and 2 of Cone's (1997) model. It is important to note that the terms descriptive and functional assessment and analysis have often been used interchangeably in the literature.

For Cone (1997) functional analysis, the experimental manipulation of potential controlling variables of behavior, occurs to verify hypotheses formulated (in Phase 2) from information gathered in Phase 1 of the assessment. Treatment utility (which may be considered Phase 4), based on this functional analysis, allows a further step forward in verifying hypotheses from the functional analysis. As Cone states, treatment utility offers a "functional analysis of functional analysis" (p.270). While the verification phase focuses on demonstrating that control over the behavior by hypothesized variables has actually occurred, Cone states "The ultimate answer depends on showing the

effectiveness of interventions based on the functional analysis" (p. 270). Thus, treatment utility of the functional analysis itself must be demonstrated.

Thus, my investigation was of treatment utility of brief behavioral assessment procedures (descriptive and functional) in the context of food refusal behavior. While a pre-treatment assessment of some type may assist in designing effective treatment strategies, it is not clear whether a functional analysis offers greater treatment utility over a descriptive analysis for chronic food refusal. Therefore, conducting both a pre-treatment brief descriptive and subsequent brief functional analysis will enable an initial judgment to be rendered. Two benefits may be accrued. Firstly, the treatment itself may be more effective and efficient (Cone, 1997). Secondly, and just as importantly, unnecessary complexity in teaching a multi-component treatment package to the individuals who actually feed the client in the natural environment, may be avoided by including only previously identified controlling variables. This second benefit may be particularly important given the relationship of parental stress (which might be augmented with complex treatment packages) to feeding disorders (e.g., Budd et al., 1992; Drotar, 1988).

My research was conducted according to Cone's (1997) three phase assessment model of information gathering (descriptive), hypothesis formulation (interpretative), and hypothesis testing (verification). A fourth phase, treatment utility, was added. Thus, in the first phase, a behavioral assessment occurred in the natural environment based on information obtained from caregivers. Information related to food acceptance behavior, antecedents and consequences for accepting food (e.g., food type, social attention) were gathered both informally and formally through interviews and questionnaires from individuals who normally fed the participants, and through behavioral observations

(descriptive analysis) at regular mealtimes. My study targeted food acceptance versus food refusal for both practical and social reasons. Implementing a functional analysis on food refusal did not appear practical due to the potential risk to the participant during functional analysis of investigating conditions which could potentially increase food refusal; especially given the lowered food intake already apparent prior to their inclusion of participants in the study. In addition, implementing conditions associated with food acceptance rather than on food refusal may have enhanced the acceptability of the research in the applied setting (e.g., Arndorfer, Allen, & Aliazireh, 1999) and taking this constructionist approach (Goldiamond, 1975) provides a more positive focus for trainers and staff.

In the second phase, interpretation of variables implicated in the descriptive analysis was conducted by enlisting experts in behavioral assessment to review the percentages of food acceptance related to each condition identified during Phase 1. Conditions were identified and ranked by the experts as to their association with food acceptance. These conditions then were included in the next phase (verification) for the functional analysis conditions.

The third phase, verification, included a functional analysis to verify information from the descriptive analysis. The functional analysis occurred in the natural environment where the participants normally ate, by directly and systematically manipulating antecedents or consequences for acceptance of food in an attempt to identify the active environmental variables that controlled food acceptance behavior. The functional analysis information also was presented to the same experts for interpretation.

In the fourth phase, treatment was conducted to validate information from both the descriptive and functional analyses. This phase consisted of once again repeating Cone's verification phase. That is, treatments derived by experts from the information from each assessment method were implemented in order to verify the assessment information via treatment effectiveness.

Five research questions were addressed: (a) was a brief behavioral assessment useful in identifying controlling variables for eating, (b) did descriptive and functional analysis yield the same information in terms of variables that may be maintaining eating behavior, (c) if not, would utilizing different assessment information (descriptive versus functional analysis) to design treatment strategies be differentially effective in increasing food acceptance, (d) was there a difference in cost effectiveness of each assessment procedure based on related treatment results, and (e) was Cone's model useful in determining controlling variables for eating during assessment to include in treatment?

Method

Participants and Setting

Four individuals with developmental delay, residing in a residential and treatment facility in Winnipeg, Canada, participated in the research. Individuals with a history of chronic food refusal, but who also demonstrated food acceptance (i.e., were not tube dependent), were selected. Participants had been determined safe to consume food/liquid orally, via interviews with the Unit Coordinators who prescribed the regular eating routine and diet, as authorized by each participant's physician and dietitian. The dietitian used the conventional measures (Health and Welfare Canada, 1988) of weight for height status for children (for Dana and Franie) and body mass index (BMI = kg/m^2) for adults

(Carrie and Colleen), as reported below. All participants were judged by a dietician to require nutritional intervention. Pseudo names are used for all participants and informed consent (Appendix A) was obtained from the parents and/or guardians of the individuals prior to data collection.

Carrie was 21 years of age; she had been diagnosed with mental retardation, gastroesophogeal reflux, and spastic quadriparesis. She also had a seizure disorder for which she received 5 mg of Clobazam daily. She required a wheelchair for seating and mobility and was fed by the staff in her wheelchair. She had a history of poor eating, and received 20 mg of Omeprazole daily, which acts to decrease stomach acid. She was offered a chopped diet of approximately 9240 KJ daily (2200 kcal) which should have promoted weight gain; however she continued to have difficulty gaining or maintaining weight due to food refusal. Carrie weighed 24.9 kg and was 135.2 cm tall. Her body mass index (BMI) was below the desirable range at less than 15 kg/m^2 (BMI < 15) and her triceps skinfold measure also placed her below average (less than 5^{th} percentile) for body fat.

Dana was 17 years of age. He had been diagnosed with profound mental retardation, spastic quadriparesis, hearing impairment, and blindness. He had dysmorphic features, which interfered with lip closure, and he experienced regurgitation. He had lived at home until approximately 4 years of age. Dana had a history of self injurious behavior for which he received 50 mg of Clonidine three times per day. He required a wheelchair for seating and mobility and was fed by the staff in his wheelchair. He also had a history of being difficult to feed, spitting out and refusing food and liquid. He received 20 mg of Omeprazole daily. He was offered a blended diet of approximately 11760 KJ (2800 kcal)

daily, which was deemed to be greater than his estimated body requirement, in order to promote weight gain. His meals were supplemented with skim milk powder, extra fat, polycose, and high calorie drinks but he continued to have difficulty gaining or maintaining weight due to food refusal. He weighed 27.3 kg, was 146.9 cm tall, and his weight for height status was well below average at less than the 5th percentile.

Franie was 10 years of age. She had been diagnosed with mental retardation and microcephaly. She had lived at home until approximately 4.5 years of age. She had a history of screaming spells and self injurious behavior for which she received 20 mg of Prozac daily. She required a wheelchair for seating and mobility and was fed by the staff in her wheelchair. She had a history of being difficult to feed, as she spit out and refused food and liquid. She was offered a regular chopped diet of approximately 7102KJ daily (1691 kcal) but continued to have difficulty gaining or maintaining weight due to food refusal. She weighed 24.2 kg, was 133 cm tall, and her weight for height status was below the 25th percentile.

Colleen was 32 years of age. She had been diagnosed with severe mental retardation, spastic quadriparesis, gastroesophogeal reflux, and hydrocephalus (controlled with a shunt). She also had a seizure disorder (generalized) controlled with 75 mg of Phenobarb daily and 2 mg of Lorazepam PRN. Colleen was able to vocalize but not verbalize and was dependent for all activities of daily living. She required a wheelchair for seating and mobility and was fed by the staff in her wheelchair. She also had a history of being difficult to feed, spitting out and refusing food and liquid. She was offered a blended diet of approximately 11760 KJ daily (2800 kcal) which was greater than her estimated requirement. Her meals were supplemented with polycose, margarine,

milkshakes, and a high calorie, nutrient rich pudding but she continued to have difficulty gaining or maintaining weight due to food refusal. She weighed 33.8 kg and was 143 cm tall which placed her below ideal weight as determined by her dietitian. Her body mass index was lower than desirable even for a nonambulatory person (BMI = 15.6) and her triceps skinfold measure placed her well below the average range for body fat.

Assessment of Eating Habits

Pre-selection information. Food intake was recorded during regular mealtimes for a 2 week period by the usual care providers on the living unit. They recorded amount eaten by judging whether the individual consumed 0, 25, 50, 75, or 100% of their meal. Residents who consumed less than 75% of their meals, on average, were considered for further stages of the research. In general, the meal with the lowest percentage of consumption was targeted and this occurred at lunch for Dana (50.0%, Range across meals 0-100%) and Franie (53.8%, Range across meals 25-100%) and for supper for Colleen (43.1%, Range across meals 0-100%). Although lunch was not the meal with the lowest percentage of consumption for Carrie (91.6%, Range across meals 25-100%) it was chosen for the research in order to accommodate the needs of the ward and coordinate with the observers and feeders. Although consumption appeared high for Carrie at this meal, she was still chosen for inclusion in the research given that the ward and dietician reported long term difficulty with food refusal, that other meals had lower consumption and, when samples of specific meals were taken it was clear that intake was not consistently high, as described below.

In addition, it was possible to obtain two or three random samples from meals over the two week period for all participants, in which the plate was weighed before and after

feeding and grams consumed for each meal was calculated. In general, mean percentage of grams consumed was less than 50% for all participants chosen; and more specifically for Carrie was 22.8% (Range14.2-31.5%), for Dana was 30.0% (Range 20.0-40.0%), for Franie was 19.7% (Range 12.0-28.6), and for Colleen was 13.4% (Range 12.5-14.2%).

Assessment and treatment sessions. Assessment and treatment procedures were conducted in the area where the individual usually ate meals and in some cases locations changed from day to day. In descriptive analysis sessions the resident assistant staff person fed the participant whereas in the functional analysis and treatment sessions the experimenter conducted feeding sessions. A videotaper and observer/feeder were present for all sessions. Carrie was fed by consistent staff within each phase and by the same experimenter in functional analysis and treatment phases. Dana was fed by seven staff through the descriptive analysis sessions. In the latter half of these sessions there was only one staff feeder the same as in the first sessions. He was fed by one experimenter through the functional analysis sessions, and by two experimenters during treatment sessions (one of which was the same as in functional analysis). One experimenter conducted the first half of the treatment sessions and one the last half and each treatment had equal numbers of sessions conducted by each experimenter. Franie was fed by seven staff interspersed across sessions in the descriptive analysis sessions. The circumstances for functional analysis and treatment sessions were similar to that for Dana. Colleen was fed by five staff interspersed across sessions in the descriptive analysis sessions, and by the same person in the functional analysis and treatment sessions.

Apparatus and Materials

Assessment and treatment materials included regular meals, as determined by the dietitian and sent to the Living Unit from the kitchen, eating utensils, face cloths, and bibs. A Sony CCD-TRV30 handycam video recorder and Maxell T-120 video tapes were used to record sessions. A Sony Trinitron KV-2781R television was used to view sessions for primary data scoring as well as for interobserver agreement and treatment integrity checks. An Optimus CTR-108 Cassette audio tape recorder was used to record and play the audio tape (Scotch BX 90 m Audiocassette) which provided 10 s audible interval cues for scoring the videotapes. A standard metric scale (Roscan Deluxe Diet Scale) was used to weigh the food. A RadioShack InterTan Easy-Set CountUp/Down Timer stop watch was used to time the trial components for antecedent, food offering, acceptance or refusal, consequence, and intertrial interval periods during the functional analysis and treatment sessions.

A data sheet was designed to record pre-selection food intake. Also, data sheets were prepared to record antecedents, target behavior and consequences for descriptive analysis, functional analysis and treatment sessions. Data sheets for the feeder to record acceptance and to guide food and drink offers and social stimuli for functional analysis and treatment were prepared for each participant. Different data sheets were used when physical social stimuli were included and when physical social interactions were excluded. A data sheet also was prepared for treatment integrity checks for functional analysis and treatment. A Questionnaire for the Caregiver was prepared (See Appendix B), and two questionnaires were prepared for the experts in behavior analysis: one to determine the functional analysis conditions from the descriptive analysis information (See Appendix C) and one

to determine treatment conditions based on the information from the descriptive analysis and from the functional analysis (See Appendix D). Checklists were prepared for activities for the primary and IOR observer for the descriptive analysis, for functional analysis for the feeder which also included a description of the general feeding procedure and an outline of all conditions, and for treatment for the feeder and videotaper.

Definitions

Participant Behavior

Accept. This was defined as opening the mouth and allowing the food to be deposited within 5 s of presentation. The amount offered was based on each individual's physical abilities but generally consisted of a level teaspoon. If the individual accepted the food within the 5 s, even if refusal behavior had occurred, the offering still was considered accepted. If food was accepted into the mouth but expelled prior to the end of the 10 s interval, a Refusal was recorded.

Food types. These were recorded as P (potato, rice, pasta), V (vegetable of any sort), M (meat), S (soup), L (salad), D (dessert), K (milk), and X (mixture of any two foods offered on the spoon/fork at the same time other than the residue from the previous offering). This was included because it had occurred in the descriptive analysis where the feeder added two foods mixed together on the same spoonful.

Feeder Behavior

Verbal attention. This included any vocalization directed to or about the participant by the feeder or other staff member including statements about the participant, feeder, food, or situation. (e.g., "good for you", " He doesn't want to eat", " Look what you did. Now I'm all dirty"). Verbal attention also included any vocalizations that were

not clear statements (e.g., mmmm, tsktsk, ohhhhh), as long as they were directed to the participant.

Physical attention. This consisted of any physical stimuli that did not include the initial offering of food to the participant. (e.g., kisses, holding hands that was not restraining, touching cheek, wiping mouth with cloth or spoon).

Restraint. This was defined as any instance of restricting the movement of the hand, arm, head or body so as to control the individual to prevent refusal behavior such as raising arm, turning head, or refusing to open mouth. It included holding down the arm, holding the head, or holding the chin.

Removal of physical attention/restraint. This was defined as any instance of removal of physical attention or restraint that began prior to the food offering, continued during the food offering, and was removed only after Acceptance or Refusal of the offering occurred.

Introduction of new food. This was recorded when the following occurred: during an interval, any instance of offering a different food (different than the food first offered in the interval) which occurred after an Acceptance or Refusal (i.e., as a consequence).

Combinations. This included any combination of feeder stimuli as described above that occurred simultaneously.

Offering. This occurred when a spoonful/forkful of food was moved toward the participant past a predetermined place defined by the outside of the wheelchair nearest the feeder. This food must not previously have been offered to the participant in the interval or previously have been inserted into the participant's mouth (that is, it must not have been a previously expelled mouthful of food).

Dependent Variables

Percentage of Accepts

The main dependent variable was percentage of accepts for each condition during each session. Data were gathered via videotape during meal times and the video-taped sessions were observed later. The target behavior (accepts) and each corresponding antecedent and consequence were recorded in sequence (antecedent, behavior, consequence) during each 10 s interval using a partial interval continuous 10 s recording method (e.g., Iwata et al., 1982b, Mace & Lalli, 1991). Only the first occurring sequence of antecedent(s), acceptance or refusal behavior, and consequence(s) was recorded in each 10 s interval. During this first sequence all antecedents and consequences that occurred were recorded in temporal order in relation to acceptance, or refusal behavior.

For the descriptive analysis, the percentage of accepts for each antecedent and consequence condition was obtained by calculating the frequency of 10 s intervals that an accept occurred when it was preceded by each antecedent condition or followed by each consequence condition, divided by the total number of intervals in which a meal item was offered for that condition, multiplied by 100 (Lerman & Iwata, 1993). For the functional analysis and treatment phases the percentage of accepts was obtained by dividing the frequency of accepts occurring in each condition by the frequency of 10 s intervals in which a meal item was offered for each condition, and multiplying by 100.

The descriptive analysis data were graphed across blocks of sessions partly because they were somewhat variable across sessions and partly to decrease the number of data points to allow a visual presentation of the data similar to that for the functional

analysis. See Figures 1, 4, 7, and 10 for more detail regarding the blocking of sessions for descriptive analysis.

Cost-effectiveness

Cost-effectiveness of descriptive analysis versus functional analysis was assessed for the total bites accepted for each treatment condition based on the respective assessment methods. Costs were assessed based on the general hourly wage of an individual with a minimum of a BA in Psychology trained to conduct assessments of this type in the Psychology Department at the Centre ($15). Separate cost effectiveness indices were calculated for each participant. The amount of time to conduct the sessions and obtain the data for each assessment method was calculated and multiplied by the hourly wage. The cost of viewing the tapes to obtain the data was included in the calculations but the cost of feeding the participant was not included, as there was essentially an equal amount of feeding time in each assessment. This provided a measure of the total cost to conduct each assessment for each participant. Next, the cost to conduct each treatment was calculated similarly which provided a measure of the total cost to conduct each treatment for each participant.

Next, the total number of bites accepted for each treatment condition based on the respective assessment methods was divided by the total cost for each assessment method and their respective treatments. This provided a measure of cost per unit of outcome (e.g., cost per increase in accepts) for each treatment, for each individual (Yates, 1985).

Research Design for Assessments and Treatment

During the functional analysis an alternating conditions design was utilized (Kazdin, 1982, p. 177). During the treatment phase, alternating treatments were

comprised of packages of components identified as controlling variables in the descriptive analysis or the functional analysis (Kazdin, 1982).

Reliability Measures for Assessments and Treatment

Each session was videotaped to enable checks for agreement on responses of both the participant and caregiver during the descriptive analysis (Billingsley, White & Munson, 1980) and for treatment integrity checks during the functional analysis and treatment sessions (Kazdin, 1992) to ensure that conditions were conducted as they were intended. The primary and secondary observer practiced scoring until they reached at least 85% agreement for three sessions for each participant for correspondence on all events (both for type of event and for the order of occurrence of the event within the sequence) within each interval. Agreement for three sessions for Carrie was 90.5%, for Dana was 93%, for Franie was 99.5%, and for Colleen was 96%.

Reliability measures were obtained for scores from independently viewed videotapes. Videotapes from sessions were randomly selected for scoring and during the descriptive analysis 40% were chosen for Carrie, 55% for Dana, 50% for Franie, and 89% for Colleen. During the functional analysis 25% were chosen for Carrie, 42% for Dana, 67% for Franie, and 33% for Colleen. During treatment 25% were chosen for Carrie and Dana, 26% for Franie, and 27% for Colleen (see Appendices E and G). During the functional analysis and treatment, tapes were viewed once. Videotapes for the descriptive analysis were viewed three times in order to be able to record all antecedents, consequences, food offered, participant behaviors and their temporal relationship to each other. The viewings consisted of recording the food type offered and the acceptance or refusal of it. During subsequent viewing all of the antecedents and consequences and their

temporal position were recorded until the observer was satisfied that the session was accurately recorded.

Interobserver Agreement

Three types of agreement data were obtained. The percentage agreement was obtained by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. First, a point to point correspondence was calculated for each accept. Agreement for overall accepts is depicted in Appendix E for descriptive analysis, functional analysis and treatment. The mean percentage agreement for all participants for descriptive analysis was at least 98% (Range 98.5-100%), for functional analysis it was at least 90.5 (Range 90.5-97.7%), and for treatment was at least 90% (Range 90.0-96.1%).

Second, a point to point correspondence was obtained for each antecedent, participant behavior, and consequence administered. Appendix F indicates the percentage agreement for the descriptive analysis for all participants. Agreement on the complete interval for all components and their temporal relationship for each interval was over 89% (Range 89.5-98.0%) for all participants.

Third, a point to point correspondence between recordings of the sequence of both the antecedent and subsequent behavior, or both the behavior and subsequent consequence was calculated for each trial (See Appendix F). The results thereby documented whether the target behavior occurred in relation to specific antecedents or consequences (Lerman & Iwata, 1993). Appendix F also indicates percentage of sessions viewed and agreement for all antecedents and consequences (in relation to the target behavior) for participants. Mean percentage agreement for all antecedents and

consequences was higher than 90% (Range 90.2-100%) for each category for all participants.

Treatment Integrity

Treatment integrity measures index the degree to which an independent variable is implemented as it was described technologically (e.g., Gutkin, Holborn, Walker, & Anderson, 1992; Kazdin, 1992; Peterson, Homer, & Wonderlich, 1982; Billingsley, White, & Munson, 1980). It was assessed for both the functional analysis and treatment sessions. For treatment integrity checks during the functional analysis and treatment, the observers were "blind" as to the specific conditions being scored. Two independent observers viewed the videotaped sessions and recorded correct implementation of critical procedural components on the part of the experimenter regarding presentation of appropriate antecedents and consequences during the functional analysis and treatment sessions. A percentage was obtained using the formula (TA x 100)/TT where TA indicates the number of experimenter behaviors emitted in correspondence with the assessment or treatment procedure, and TT denotes the total number of behaviors that the experimenter could have emitted (Billingsley, White, & Munson, 1980).

Treatment integrity measures for all participants as well as percentage of sessions chosen are depicted in Appendix G. These measures reflect a point to point correspondence for the correct administration of all important procedural components related to the antecedent behavior on the part of the feeder, participant behavior, and consequence behavior on the part of the feeder. For all participants, for each component in the functional analysis the percentage agreement was over 87% (Range 87-100%). This lower percentage occurred only for Franie for food type, otherwise percentages were over

97.3%. For treatment the percentage agreement was over 86.6% (Range 86.6-100) for each component. The lowest percentage occurred only for Dana for the presentation of correct antecedent; otherwise percentages were over 92.1%.

Procedure

The research was conducted in four phases, information gathering, interpretation, verification, and treatment utility (Cone, 1997). In the first phase (information gathering) questionnaires were provided to caregivers to assist in designing behavioral and stimulus categories and response and stimulus definitions for the descriptive analysis, which also was conducted in this phase. The descriptive analysis consisted of direct, mealtime observations occurring in the natural mealtime environment. The information obtained in this phase, from the caregiver assessments and from the descriptive analysis, provided information to assist in forming hypotheses in the second phase as to what variables were controlling each participant's food acceptance.

In the second phase (interpretation), the information obtained from the descriptive analysis was analyzed in terms of percentage of food acceptance exhibited for the different naturally occurring conditions. That is, interpretation of the data from the descriptive analysis by experts in behavior analysis allowed hypotheses to be developed and therefore, determination of conditions to include in the functional analysis.

In the third phase (verification), a functional analysis was conducted to test hypotheses derived in Phase 2. At the end of this phase further interpretation of the data was conducted by experts in behavior analysis. Thus, a comparison of data from both the descriptive and functional analyses was conducted to determine, for each assessment method, hypotheses as to which variables controlled food acceptance. The information

from the descriptive and functional analyses then was used to design treatments specific to each assessment method, as chosen by experts in behavior analysis.

Subsequently, the fourth, or treatment phase, was implemented. Alternating treatments, comprised of components identified as controlling variables specific to the descriptive and functional analyses (Kazdin, 1982), were implemented. Relative treatment effectiveness was evaluated by comparing percentage of acceptance across sessions for each treatment.

Brief Assessments

Both descriptive analysis and functional analysis were brief and equivalent in duration. These assessments occurred over a period of approximately 120 minutes. Thus, if a participant's regular meal required 20 min to complete, then the descriptive assessment included information from six meals (six meals at 20 min equal 120 min of assessment time). The functional analysis then was conducted for an equal total amount of time (12 sessions at 10 min per session equals 120 min of assessment time). As a result the decision was made to repeat four conditions 3 times each. In actuality, the total duration of the assessment for each participant varied depending on the length of his or her regular meal during the descriptive analysis (See Appendix H). Sessions ranged from 122 min 30 s to 134 min 50 s during the descriptive analysis and from 124 min to 136 min during the functional analysis (See Appendix I). Thus, although assessments for each participant were not exactly 120 min, they varied at most by a minute or two across assessments for each participant.

Phase 1. Information Gathering

Caregiver assessment. In order to begin to identify the variables controlling eating, caregivers were given a questionnaire (Appendix L) which included open ended questions (e.g., "Why do you think this individual refuses to eat?") and then subsequently included questions which more specifically designated potential controlling contingencies based on the literature on chronic food refusal (e.g., consequences to choose from were listed and included such items as verbal or physical attention or whether the resident was given a preferred food). Caregivers were asked questions related to the resident with respect to foods that were regularly consumed or rejected, meal duration and amounts consumed, and reports of environment-behavior relations related to feeding. Caregivers were asked to identify specific types of food refusal behaviors, as well as situational variables (antecedents and consequences) which they hypothesized exerted control over eating. The questions were adapted from general questionnaires (Bryan & Pressman, 1995; Linscheid & Rasnake, 1985) and included general categories of behaviors, antecedents, and consequences (Babbitt et al., 1994; Iwata, Riordan, Wohl, & Finney, 1982b; Luiselli, 1989a).

This information was reviewed by the experimenter in order to obtain information regarding refusal behaviors and social stimuli presented before or after food presentation as identified by staff in these questionnaires. This information was actually quite consistent across participants. Refusal behaviors included pushing food away, spitting food out, turning away, throwing food, crying, and refusing to open mouth. Stimuli included coaxing, ignoring, socially rewarding, holding/restraining, gently stroking the

face, and talking softly. These behaviors and stimuli then were included for observation and recording in the descriptive analysis, which follows.

Procedure for descriptive analysis. Next the descriptive analysis then was conducted. This assessment presumed to identify the naturally occurring rates of the target behavior (i.e., food acceptance) and specific immediate antecedents and consequences (e.g., type of social attention) correlated with acceptance. During the descriptive analysis immediate antecedents to acceptance such as stimuli presented by the caregiver were recorded, including verbal stimuli, physical stimuli, restraint, and combinations of these stimuli. Similarly, consequences immediately following acceptance were recorded, including stimuli as noted above for antecedents plus food type changes. Removal of physical stimuli and removal of restraint were additional categories of consequences, since they resulted in an immediate change in the environment and thus, could affect behavior.

Assessment sessions were conducted in the regular eating environment with the regular resident assistant. Resident assistants were instructed to feed the participant in their usual manner. Meals, as sent from the kitchen, were utilized for these descriptive analysis sessions. These sessions occurred for the entire duration of the meal.

During the descriptive analysis one research assistant videotaped the meal and followed a Checklist of Activities for Videotapers For The Descriptive Analysis which outlined the actions to engage in when entering the unit to arrange for the session to begin. Just prior to the session the assistant set up the video camera, and after checking to ensure that the resident assistant was ready to begin feeding, activated the tape recorder to begin the interval count. Each participant was observed for approximately 120 min. The

number of minutes observing each meal varied as well as the number of meals observed per participant. Each one depended on how long it usually took each participant to consume meals (See Appendix H) in order to accumulate at least 120 min of observed meal behavior.

Phase 2. Interpretation

Three Ph.D. experts in behavior analysis, two with over 25 years experience and one with over 10 years experience, interpreted the descriptive analysis data (except only two experts for Franie, in this phase only). Instructions are included in Appendix C. The behavioral assessment experts independently viewed the graphed presentation of the dependent variable (accepts) for each of the 8 conditions for each participant in order to determine which conditions exerted most control over acceptance (Figures 1, 4, 7 and 10). These experts then independently ranked, in order, the four conditions most related to food acceptance and the one least related to food acceptance. There was complete agreement between the experts on the four conditions for all participants. This assisted in forming hypotheses as to which variables were controlling acceptance of food and in determining conditions to include in the functional analysis.

Selection of functional analysis conditions. Using the experts' rankings the three conditions most associated with food acceptance and the one least associated with food acceptance were used to form hypotheses and, subsequently were included in the functional analysis. These variables were manipulated during the functional analysis, allowing a comparison between results from the descriptive and functional analyses.

Phase 3. Verification

As previously noted, this phase consisted of conducting a functional analysis to test hypotheses based on information obtained in the descriptive analysis as to variables controlling food acceptance.

General procedure for implementation of functional analysis conditions. Sessions generally were conducted as described above; however, prior to each offering or after each instance of food acceptance, depending on the condition, the experimenter presented the contingencies related to the particular assessment condition. Conditions included contingencies related to physical or verbal caregiver stimuli such as: (a) verbal social stimuli (e.g., "You sure don't like this today" or "You're smart today, aren't you" or " Here comes some milk" and so on), (b) physical stimuli (e.g., hug, rub on cheek etc.), or (c) combinations of conditions such as verbal and physical stimuli occurring at approximately the same time after acceptance. A more complete description of all conditions follows.

Antecedent conditions.

Verbal Antecedent: (VA). A verbal stimulus similar to that offered in the descriptive assessment was presented to the participant within the 5 s prior to presentation of food on each trial and lasted for approximately 2 s.

Physical Antecedent (PA). A physical stimulus similar to that offered in the descriptive analysis was presented to the participant within the 5 s prior to presentation of food on each trial and lasted for approximately 2 s.

Verbal Physical Antecedent: (VPA). Both a physical and verbal stimulus similar to that offered in the descriptive analysis were presented to the participant within the 5 s

prior to presentation of food on each trial and lasted for approximately 2 s. The physical and verbal stimuli did not have to occur simultaneously but both must have been presented within the 5 s interval.

No Antecedent: (NA). No stimulus of any kind (e.g., touch, talk, look) occurred with the participant for a full 5 s prior to presentation of food on a trial.

Consequence conditions.

Verbal Consequence (VC). A verbal stimulus was presented to the participant similar to the types provided during the descriptive analysis within 5 s following an Accept and lasted for approximately 2 s.

Physical Consequence: (PC). A physical stimulus was presented to the participant similar to the type provided during the descriptive analysis within 5 s following the initiation of an Accept and lasted for approximately 2 s.

Verbal Physical Consequence (VPC). Both a physical and verbal stimulus was presented to the participant (similar to that presented in the descriptive analysis) within 5 s. following an Accept and lasted for approximately 2 s. The physical and verbal stimuli did not have to occur simultaneously but must both have been presented within the 5 s interval.

No Consequence: (NC). No stimulus of any kind occurred with the participant for the full 5 s following the initiation of an Accept.

Session and trial procedure for functional analysis. Each of the four chosen conditions was presented 3 times in a counterbalanced order across days. In order to make the assessment time equal to the descriptive analysis, data for the functional analysis were collected by choosing the cumulative amount of time to conduct the meal during the

descriptive analysis and dividing by the number of functional analysis sessions. Specific information for each participant is outlined in Appendix I. Whatever functional analysis condition had been chosen was implemented for the duration of the meal. The meal itself, however, was presented for a duration equal to the longest amount of time it took to conduct a meal in the descriptive analysis, unless the individual competed the meal prior to that time limit. Review Appendix H for temporal information regarding descriptive analysis.

Meal duration. Meal duration during the functional analysis approximated the upper limit of time as determined by duration of meals during the descriptive analysis. Thus, for Carrie meals were presented for a total of 26 min and 30 s, which was the longest duration of a meal during the descriptive analysis. For Dana meals were presented for 17 min 30 s, for Franie for a total of 13 min 20 s, and for Colleen 17 min. If all items were consumed before the end of the time period, then the session was ended. This determination of meal duration during the functional analysis was not necessary for research purposes but was implemented to ensure that participants were offered their meal for a period of time similar to that during the descriptive analysis sessions. That is, since the total assessment time was equated for descriptive and functional analysis, the functional analysis sessions were shorter than the descriptive sessions, since the total time during the functional analysis spanned across 12 sessions (See Appendix I). However, it was important to offer each meal for an amount of time similar to what normally would have occurred in their regular environment, so that participants had an opportunity to finish their meal.

In the functional analysis sessions the regular meal, as sent to the Living Unit by the kitchen, was administered during regular mealtimes in the usual meal setting and food offerings were rotated amongst the variety of foods (Iwata et al., 1982b) in a predetermined counterbalanced order. In addition, in order to ensure that the ratio of liquid to solid food was comparable to that during the descriptive analysis, the number of food offerings in the descriptive analysis was divided by the number of drink offerings to obtain a ratio of food to drink offerings specific to each participant. These ratios ranged across participants from offering a drink every 4^{th} trial to every 12^{th} trial and were implemented in the functional analysis. Also, in order to equate the type of physical stimuli that occurred after food acceptance in the descriptive analysis with the conditions in the functional analysis, a specific procedure was implemented following food acceptance during the functional analysis conditions and during treatment (Fisher, Piazza, & Chiang, 1996). Stimuli similar to ones that would normally be presented to the individual, based on the information from the descriptive analysis sessions, were implemented. Three types of physical stimuli occurred during the descriptive analysis; touching the participant, wiping the participant's mouth with a cloth, and wiping the participant's mouth with a spoon. These were presented in a counterbalanced order across intervals requiring a physical stimulus. During sessions for conditions in which no physical stimulus occurred, the feeder gently wiped the participant's mouth once on a variable ratio 20 trial schedule to remove any food.

Each specified condition was presented before or after each instance of the target behavior (Accept). Thus, the antecedent was presented before the food offering and the consequence was presented after an accept. The consequence was presented after the

initiation of accept (food deposited in mouth) rather than after swallowing the food had occurred in order to make procedures consistent with those in the descriptive analysis and with what was considered an accept, since it was too difficult to reliably assess that swallowing had taken place on the videotape during the descriptive analysis.

General feeding procedure. The same procedures used in the descriptive analysis for videotaping were implemented during the functional analysis and treatment phases. At the beginning of the feeding session the experimenter greeted the participant and noted that it was meal time ("Hi, (name of participant). It's (meal) time."). In general, during all functional analysis sessions a spoonful of food was placed just touching the participant's lips and the experimenter waited 5 s for a response. Trials consisted of 5 s antecedent presentation, 5 s food offering, 5 s for Acceptance or Refusal to occur, 5 s consequence presentation, and 5 s intertrial interval. For all trials targeted for a specified consequence, if the participant accepted the food within 5 s and did not expel the food within 5 s, the experimenter provided a predetermined stimulus (e.g., "You did great." or "Yummy") for at least 2 s within the 5 s following the Acceptance. The experimenter then marked an Acceptance on the data sheet during the next 5 s (intertrial interval), and then proceeded to the next trial. During the functional analysis conditions, if the participant refused the offering the experimenter marked a Refusal on the data sheet and began timing the intertrial interval.

Meal items were offered in the order designated on the data sheet. If the sheet indicated that a meal item which was no longer available (i.e., the participant had finished it all) was to be offered, then a slash was recorded on the data sheet for that trial and the

experimenter offered the meal item designated on the next trial on the data sheet. However, this occurred infrequently.

Immediately after the 5 s consequence interval had occurred, the intertrial interval began and lasted for 5 s unless the individual was still eating food. If so, the experimenter waited until the individual had swallowed the spoonful of food before presenting the next offering. During the intertrial interval (ITI) the experimenter did not interact with the participant in any way (e.g., did not look at, touch, or talk to).

Phase 4. Treatment Utility

As previously noted, this phase was implemented in order to compare relative effectiveness of treatments based on the descriptive versus the functional analysis. Conditions identified from the separate assessment methods (descriptive and functional analyses) were selected by the experts, and corresponding treatments were designed. Treatments then were implemented and a subsequent comparison of treatment effectiveness was conducted.

Selection of treatment conditions. Information previously identified by the experts for both the descriptive analysis and functional analysis was re-presented to the experts. (See Appendix D for instructions and Figures 2, 5, 8, and 11 for the graphs viewed). The experts were instructed to indicate which condition(s), from each assessment method, they would include in treatment in order to increase acceptance of offerings during mealtimes. They were free to choose more than one condition from each assessment method to include in treatment, but if more than one condition was chosen they were instructed to rank order these conditions.

Thus, separate treatment packages comprised of the components specific to the two assessment methods were chosen for inclusion during treatment. Treatment was designed so that the contingencies identified to be controlling a participant's food acceptance behavior specific to each assessment method were administered to increase food acceptance. For example, if verbal attention alone was systematically related to food acceptance, treatment consisted solely of verbal attention for food acceptance. Thus, treatments were either single component or multi-component (e.g., both verbal and physical attention or verbal attention as both antecedent and consequence).

General treatment procedures. Procedures identical to those which occurred during the functional analysis for presentation of meal items, presentation ratios of liquid to solid food, meal time session procedures, and duration of the meal were implemented during treatment. Types of verbal and physical stimuli and presentation order of physical stimuli also were identical to those that occurred during the functional analysis sessions.

Comparison of the two treatments. Treatments then were implemented and data from the two treatments were compared for each participant in order to ascertain treatment effectiveness. That is, did either assessment method provide more information regarding common controlling variables for food acceptance, and result in the design of a more effective treatment, as indicated by a comparison of percentage of accepts for each treatment?

Results

Individual data will be presented for each participant in turn. Results for descriptive analysis always will be considered first for each participant followed by those for functional analysis and finally by those for treatment. Cost-effectiveness calculations

appear in a separate section at the end. Data were analyzed via visual inspection of graphed data (see Johnston & Pennypacker, 1980; Kazdin, 1992; Martin & Pear, 1996).

The descriptive analysis data represent the percentage of 10 s intervals in which food acceptance (an accept) occurred preceded by a specific antecedent or followed by a specific consequence, calculated for each session for each participant. See Appendix J for mean percentages of acceptance during each antecedent and consequence condition across sessions for each participant; and also for overall mean percentage of acceptance across sessions. Although restraint occurred during the descriptive analysis sessions, it was not included further in the research for ethical reasons. That is to say, I was not prepared to have feeders hold down participants' hands so that they could not push the spoon away, or hold the participants' heads in a forward position so that they could not refuse an offering during the functional analysis or treatment sessions (see Luiselli, 1989a; O'Brien et al., 1991). Intervals with restraint were recorded as occurring for Dana, Franie and Colleen; however for the most part fewer than 10 intervals with restraint occurred per condition across all descriptive analysis sessions. The exceptions were for Dana where more than 10 intervals occurred when restraint was presented alone (124 intervals) and with a verbal stimulus (73 intervals) as an antecedent; and for Colleen when restraint was presented alone as an antecedent (23 intervals).

In addition, for each participant, any other condition that occurred in fewer than 10 intervals across all descriptive analysis sessions was excluded from further analysis, since percentages calculated from such small numbers may have inaccurately weighted their importance (see Appendix J). For all participants there were fewer than 10 intervals per condition for all food changes, for removal of physical stimuli and, for restraint (as noted

above). For Carrie the next lowest number of intervals for any condition was 22, for Dana 15, for Franie 26, and for Colleen 21. However, the majority of conditions had greater than 100 intervals of occurrence of the particular condition across descriptive analysis sessions.

The major categories of conditions that emerged from the descriptive analysis consisted of both Antecedents [Verbal Antecedent (VA), Physical Antecedent (PA), Verbal and Physical Antecedent (VPA), No Antecedent (NA)]; and Consequences [Verbal Consequence (VC), Physical Consequence (PC), Verbal and Physical Consequence (VPC), and No Consequence (NC)]. Food, of course, also was offered in each interval and thus, the NA and NC conditions denote that no other planned stimuli were offered, other than those relating to food. These eight conditions were observed for all participants; however, the degree of involvement of each condition varied across sessions both within and among participants.

When evaluating the descriptive analysis and functional analysis data, the three experts agreed on all conditions and treatments for all participants. See Appendix K for a summary of means for conditions chosen by the experts from each assessment type, as well as the derived treatments.

Carrie

Caregiver Assessment Information

For Carrie two caregivers with at least 5 months experience feeding her were interviewed. This information was reviewed by the experimenter. The information indicated that techniques which were most effective in increasing food consumption

included coaxing, ignoring, talking softly to Carrie and "entertaining" her at meals by talking to her and joking with her.

Descriptive Analysis

The percentages of acceptance for antecedents and consequences are depicted across sessions in Figure 1 for Carrie and show considerable overlap in the data paths. The descriptive analysis data (including graphed data and condition means) were presented to the behavior analysis experts. While there was considerable overlap in the data points, the experts agreed that the three variables having the most positive effect on acceptance, in decreasing order were VPC (M = 91%), VPA (M = 82%), and PC (M = 82%) all with data points generally indicating high percentages of accepts across sessions; and VC (M = 49%) as least effective, with data points clearly lower than other conditions in two of the three sessions (See Figure 2, top, for these conditions by themselves). Thus, for Carrie, both verbal and physical social attention combined as consequence or antecedent, appeared to control eating. In addition, physical attention alone as a consequence also was effective. Perhaps verbal and physical stimuli presented as consequences served to reinforce accepts and when presented as antecedent stimuli set the occasion for an attending response for the food offering. Also, physical stimuli alone as a consequence may be an effective reinforcer for acceptance of food.

Functional Analysis

The four conditions identified above then were implemented three times each during the functional analysis for Carrie (See Figure 2, bottom). These data paths also overlapped. However, the experts agreed that the most and least effective conditions, in order, were VPA (M = 72%), VC (M = 57%), VPC (M = 57%), and PC (M = 49%). From

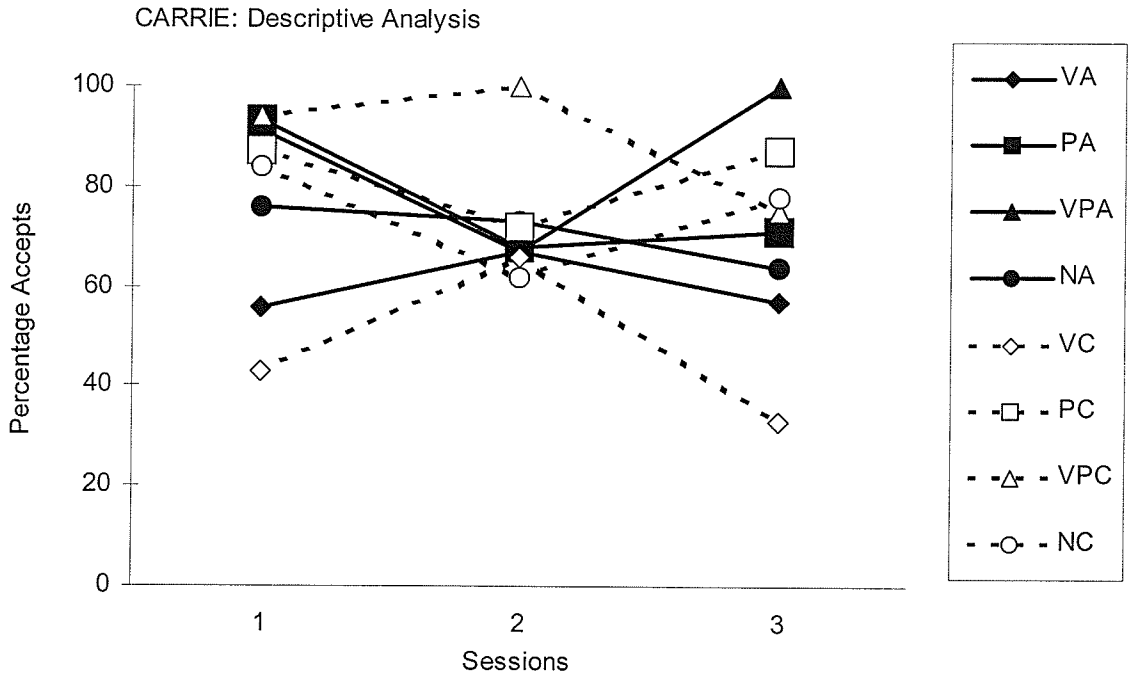

Figure 1. The percentages of accepts for Carrie for antecedent and consequence conditions in the descriptive analysis are depicted across data points in blocks of two sessions. Carrie had five descriptive analysis sessions and thus the last data point reflects one session only. Antecedent conditions are depicted by closed symbols and solid lines and consequence conditions are depicted by open symbols and dashed lines.

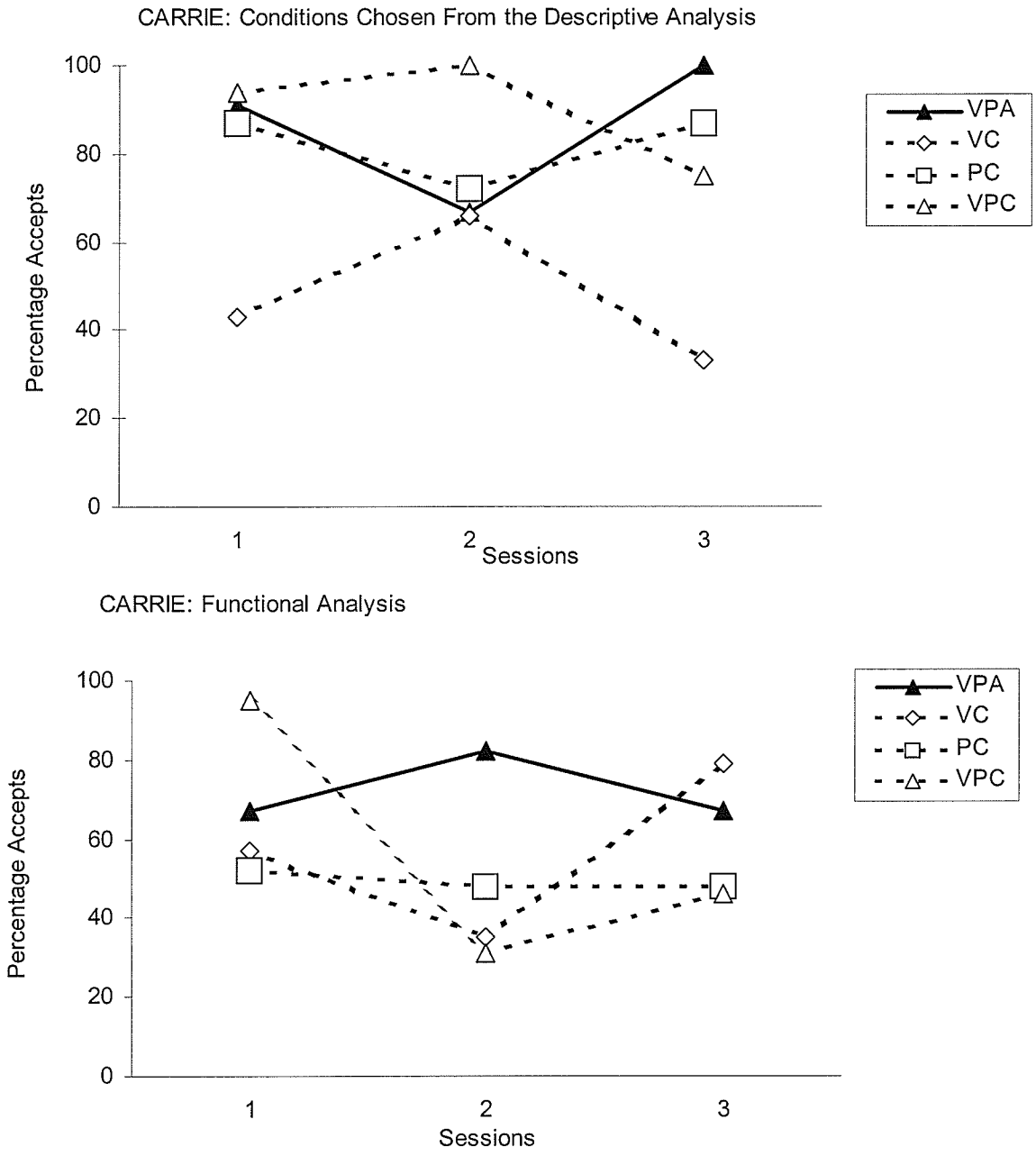

Figure 2. The conditions chosen by the experts in behavior analysis from the descriptive analysis for Carrie are presented (top). These conditions were implemented in the functional analysis. Percentage accepts for Carrie for all conditions in the functional analysis are presented (bottom). Antecedent conditions are depicted by closed symbols and solid lines and consequence conditions are depicted by open symbols and dashed lines.

these results it was hypothesized that providing verbal and physical stimuli prior to offering a bite of food (i.e., as an antecedent) was most consistently effective in increasing eating, suggesting that this combination of stimuli may have set the occasion for an attending response for the subsequent food presentation. Thus, the descriptive analysis identified VPC, VPA, and PC and the functional analysis identified VPA, VC, and VPC as controlling conditions. While there was overlap in the conditions, different hypotheses still could be formed from each assessment method.

Treatment

Choosing treatment conditions. Both the descriptive analysis (Figure 2, top) and functional analysis information (Figure 2, bottom), and respective means, were presented to the experts in behavior analysis to determine treatments based on each assessment method. For Carrie the treatment chosen by the experts based on the descriptive analysis consisted of VPA/VPC and for the functional analysis consisted of VPA. From the descriptive analysis it was hypothesized that presenting both verbal and physical stimuli, as both antecedents and consequences should increase food acceptance (perhaps by occasioning an attending response for the food offering and providing a reinforcer for accepts); while from the functional analysis it was hypothesized that implementing both verbal and physical social stimuli as antecedents would be more effective.

Treatment results for percentage accepts are presented for Carrie in Figure 3. The VPA/VPC condition, the treatment based on the descriptive analysis, appears to be slightly more effective in that it out performs the VPA treatment in 5 of the 8 sessions. However, there was substantial variability in the data and there was relatively little difference in the means for each treatment (VPA/VPC, M = 39%, VPA, M = 34%). Thus,

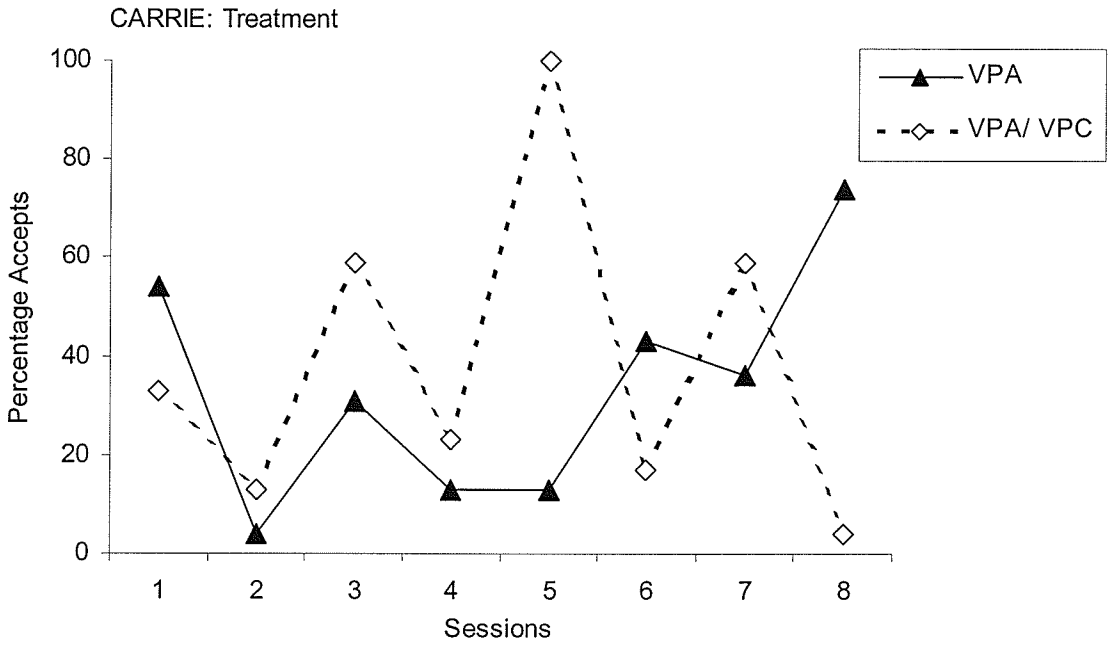

Figure 3. Percentage of accepts for Carrie for each treatment condition are presented. The treatment based on the descriptive analysis is VPA/VPC and the treatment based on the functional analysis is VPA.

adding the verbal and physical stimuli as a potential reinforcer (based on the descriptive analysis) did not appear to add substantially to the effectiveness of treatment.

Dana

Caregiver Assessment Information

The 4 caregivers who responded all had at least 3 years experience feeding Dana. They indicated that helpful techniques to increase accepts for Dana included coaxing, telling him to open his mouth, talking to him, holding him, gently touching him, talking softly to him, and ignoring him.

Descriptive Analysis

The percentages of accepts obtained for each antecedent and consequence condition are plotted across sessions for Dana in Figure 4. During the descriptive analysis sessions there was a change in feeders in the latter sessions. The new feeder did not introduce all conditions previously apparent during meals. This change in feeders produced an unusual situation in the graphed data. That is, for some of the latter sessions, certain conditions were not introduced and consequently, there was no opportunity to assess associated percentages of accepts. Therefore, there are no data points depicted on the graph for those occasions. For example, there is no final data point for VC and VPC or for the third data point for VA because the feeder did not present those stimuli during sessions. Contrast this with data points 3 and 4 for VPA in which the feeder did present the condition but for which there were no accepts. Thus, in the former situation the condition was not presented, while in the latter, the condition was presented but there were no accepts. This is the only participant for whom these circumstances pertained. It

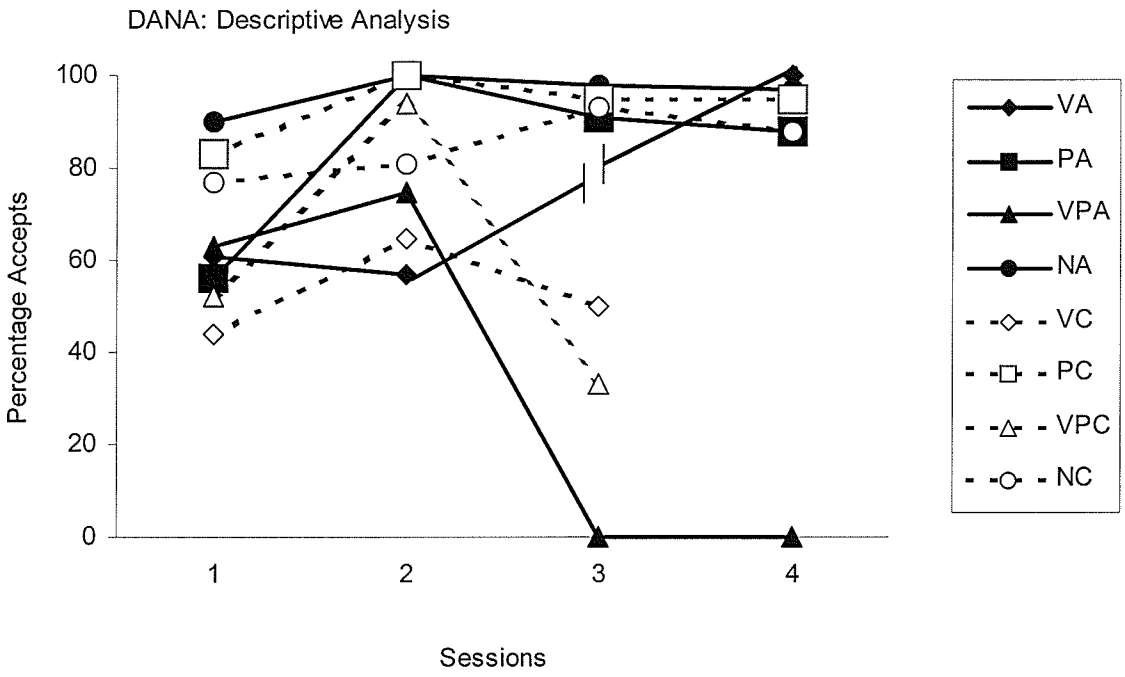

Figure 4. The percentages of accepts for antecedent and consequence conditions in the descriptive analysis are depicted across data points in blocks of three for Dana. He had 11 sessions and thus, the last data point reflects two sessions rather than three. Antecedent conditions are depicted by closed symbols and solid lines and consequence conditions are depicted by open symbols and dashed lines. Not all conditions were presented in the latter sessions and therefore there was no opportunity to assess accepts for these conditions during these sessions. This is reflected by the fact that there are no data points for the latter sessions for some conditions (VC, VPC) while the third data point is missing for VA.

should be noted that the drop to 0 % for data points 3 and 4 for VPA also may have been due to the staff change resulting in an alteration in the style of presenting these stimuli.

As with Carrie, the descriptive analysis data were presented to experts in behavior analysis to determine conditions most and least associated with accepts. The conditions identified by the experts as most associated with accepts for Dana were NA (M = 96%), PC (M = 90%), and NC (M = 89%), while VPA (M = 35%), was chosen as least associated with accepts. See Figure 5 (top) for these conditions by themselves. For Dana, not presenting any stimulus prior to or after an offering could be effective in increasing his eating. Thus, for Dana, perhaps the food itself as an antecedent stimulus functioned to control eating; or perhaps not adding any other stimuli ensured that he was not distracted from eating. Physical consequences appeared approximately equivalent to the food alone (NC) as a reinforcer for eating.

Functional Analysis

Again, as with Carrie, the conditions identified above were to be implemented three times each during the functional analysis. A complication occurred in this phase for Dana in that his self injurious behavior had increased again on the ward and the Psychology staff had re-implemented a behavioral program. This program also was carried out during meals. Because of this increase in self injurious behavior some meals were difficult for him. Given that the NA condition essentially was the same as the NC condition, only the first three sessions of either NA or NC in the randomized sequence, were included (designated as NA/NC in Figure 5). Consequently, because only one sequence of the NA/NC was included there are only 9, rather than 12 sessions (as for the

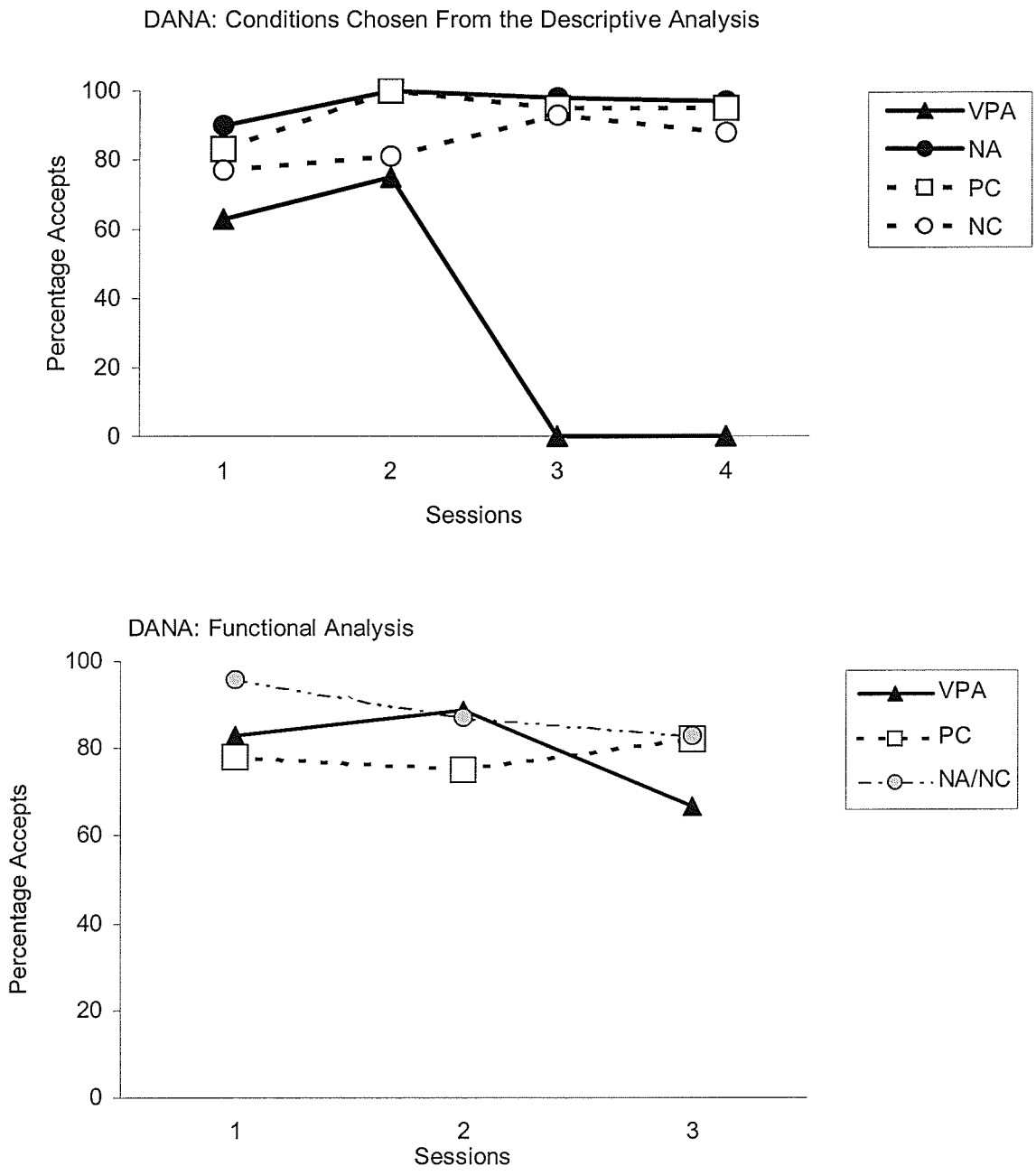

Figure 5. The conditions chosen by the experts in behavior analysis from the descriptive analysis for Dana are presented (top). Percentage accepts for Dana for the functional analysis are presented (bottom). Because of an increase in self injurious behavior on the ward, only 9 rather than 12 sessions were included in the functional analysis. In both graphs, antecedent conditions are depicted by closed symbols and solid lines and consequence conditions are depicted by open symbols and dashed lines.

other participants), depicted in the graph. That is, there were three conditions presented 3 times each rather than 4 conditions presented 3 times each.

The percentages of accepts across sessions for each condition are depicted for Dana in Figure 5 (bottom). Percentage accepts was high for all conditions. These functional analysis data were presented to the experts who agreed that the most effective conditions, in decreasing order, were NA/NC (M = 89%), VPA (M = 80%), and PC (M = 78%). From these results it was hypothesized that not presenting any stimulation either before or after a presentation should be most effective in increasing eating relative to any of the other conditions implemented. That is, presenting supplementary antecedent stimuli may set the occasion for a behavior that would interfere with eating. Further, antecedents and consequences related to the food itself may be sufficient to control food acceptance.

For Dana the descriptive analysis identified NA, PC, and NC and the functional analysis identified NA/NC, VPA, and PC as conditions controlling food acceptance in descending order of effectiveness. Thus, there was considerable overlap in the conditions identified by both assessment methods, with the exception of VPA by functional analysis alone.

Treatment

Choosing treatment conditions. As with previous participants, the descriptive analysis data (Figure 5, top) and functional analysis data (Figure 5, bottom) were evaluated by the experts to determine treatments based on each assessment method. For Dana, the treatment chosen by the experts from the descriptive analysis information was NA/PC (do not present stimuli that could occasion behavior that could interfere with

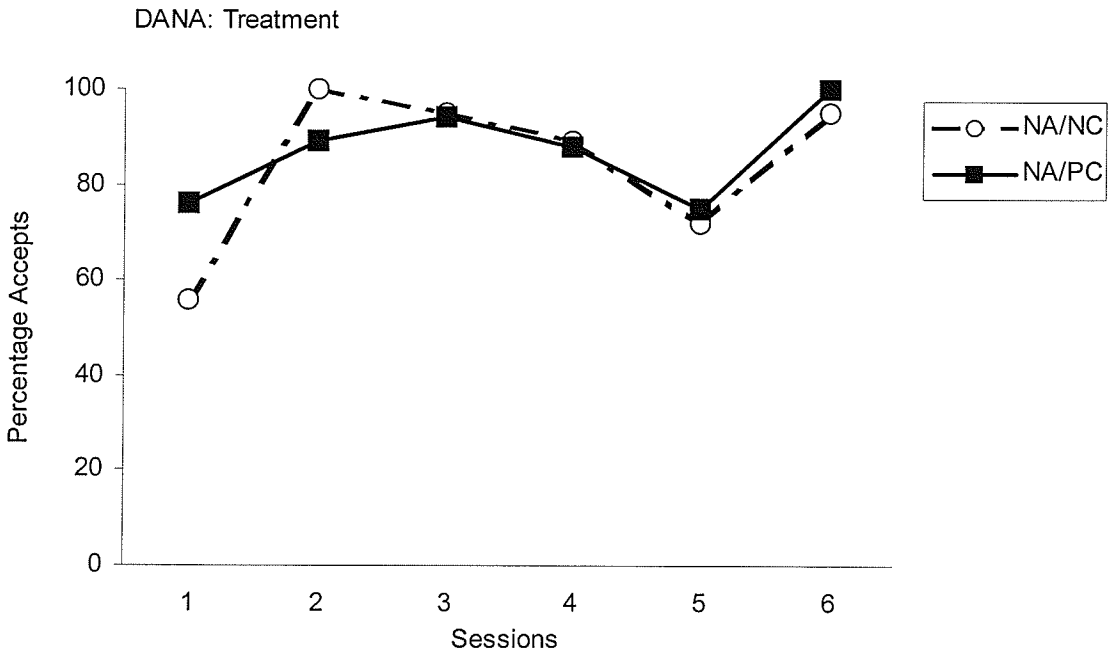

Figure 6. The percentage of accepts for treatments based on the descriptive analysis and functional analysis for Dana is depicted. The treatment based on the descriptive analysis is NA/PC and the treatment based on the functional analysis is NA/NC.

eating and add physical stimuli as a reinforcer for accepts) and from the functional analysis was NA/NC (do not add any stimuli before or after an offering that could occasion behavior that might interfere with eating). Food itself may be sufficient to control eating.

Treatment results for Dana are presented in Figures 6. The percentage accepts during both treatment conditions was high with little difference between them (NA/PC, M = 87% vs NA/NC, M = 85%). Adding physical stimuli as a reinforcer (based on the descriptive analysis) did not appear to add to the effectiveness of treatment.

Franie

Caregiver Assessment Information

The two caregivers that responded to the questionnaire had 4 months and 1 year experience respectively in feeding Franie. Stroking her face, talking softly to her, telling her what she was getting for the meal, coaxing her, ignoring her, and hugging her were identified as techniques that they had implemented to increase Franie's acceptance of food.

Descriptive Analysis

Figure 7 illustrates the percentages of accepts for each antecedent and consequence condition across sessions for Franie. Again while there was considerable overlap in the data points the experts agreed that for Franie, NC (M = 69%), NA (M = 60%), and VA (M = 54%) were ranked, in that order, as being most associated with accepts, and VPC (M = 38%) as least associated with accepts (See Figure 8, top for these conditions by themselves). For Franie, then, providing no stimulation either before or after an accept

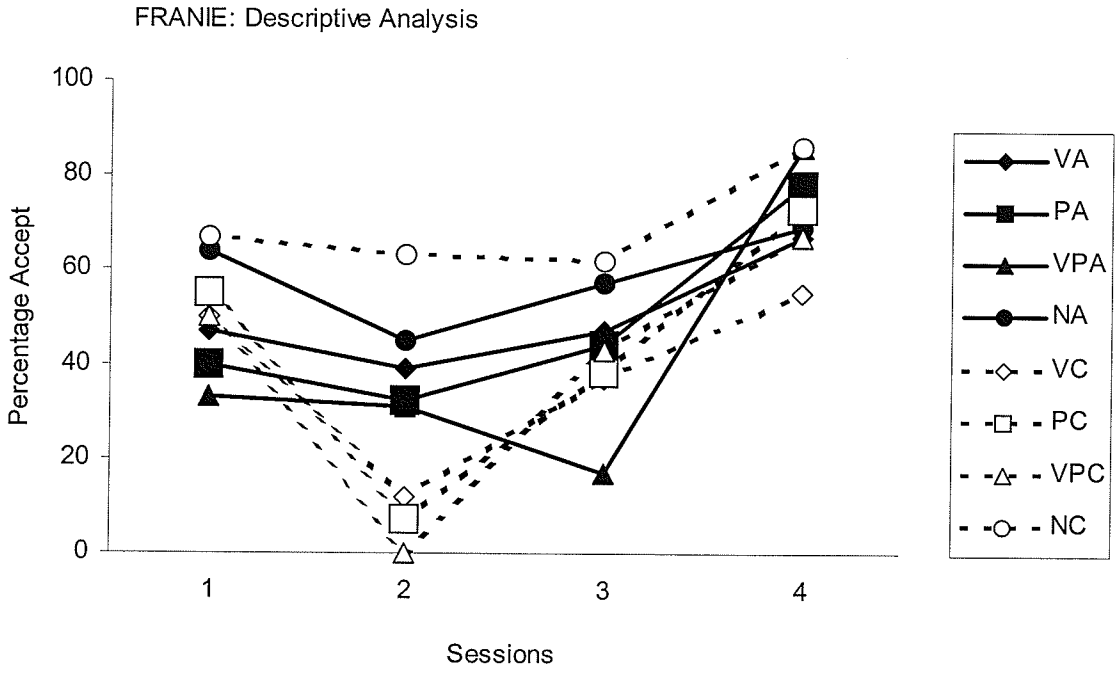

Figure 7. The percentages of accepts for antecedent and consequence conditions in the descriptive assessment are depicted across sessions for Franie. There were 12 sessions which are presented in 4 blocks of 3 sessions each. Antecedent conditions are depicted by closed symbols and solid lines and consequence conditions are depicted by open symbols and dashed lines.

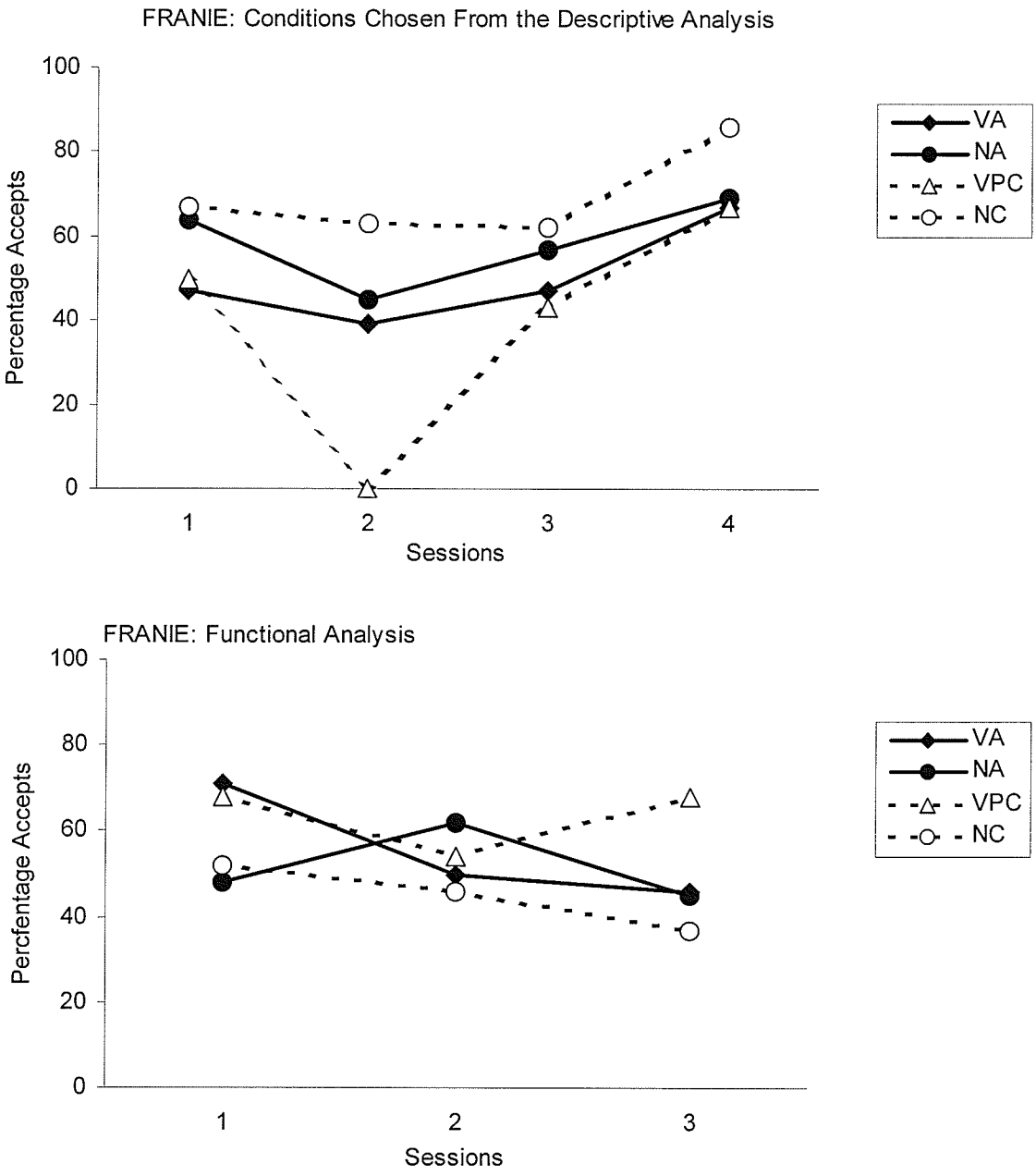

Figure 8. The conditions chosen by the experts in behavior analysis from the descriptive analysis for Franie are presented (top). Percentage accepts for Franie for all conditions in the functional analysis are presented (bottom). Antecedent conditions are depicted by closed symbols and solid lines and consequence conditions are depicted by open symbols and dashed lines.

appeared most effective in increasing eating. Thus, for Franie, food alone may have been a sufficient controlling stimulus for eating.

Functional Analysis

The conditions identified above were then implemented three times each during the functional analysis. The percentages of accepts during each session for each condition are presented for Franie in Figure 8 (bottom). There was considerable overlap of all conditions across sessions. The experts' ranking suggested that for Franie, the three conditions exerting most control, in descending order were VPC (M = 63%), VA (M = 56%), and NA (M = 52%). The condition exerting least control over accepts was NC (M = 45%). It seemed then that adding verbal physical consequence after taking a bite may reinforce accepts. The descriptive analysis identified NC, NA, and VA and the functional analysis identified VPC, VA, and NA. Thus, although some similar conditions were identified from the two assessment methods, the respective hypotheses were different.

Treatment

Choosing treatment conditions. The descriptive analysis data (Figure 8, top) and functional analysis data (Figure 8, bottom) were presented to the experts in behavior analysis to determine treatments based on each assessment method. For Franie the experts chose the treatment based on the descriptive analysis as NA/NC (perhaps food alone functions as a controlling stimulus for eating and as a sufficient reinforcer for eating; or perhaps presenting any additional antecedent stimuli before an offering could occasion behavior that could interfere with eating). Treatment based on the functional analysis consisted of VPC (presenting verbal and physical stimuli after an accept may act as a reinforcer).

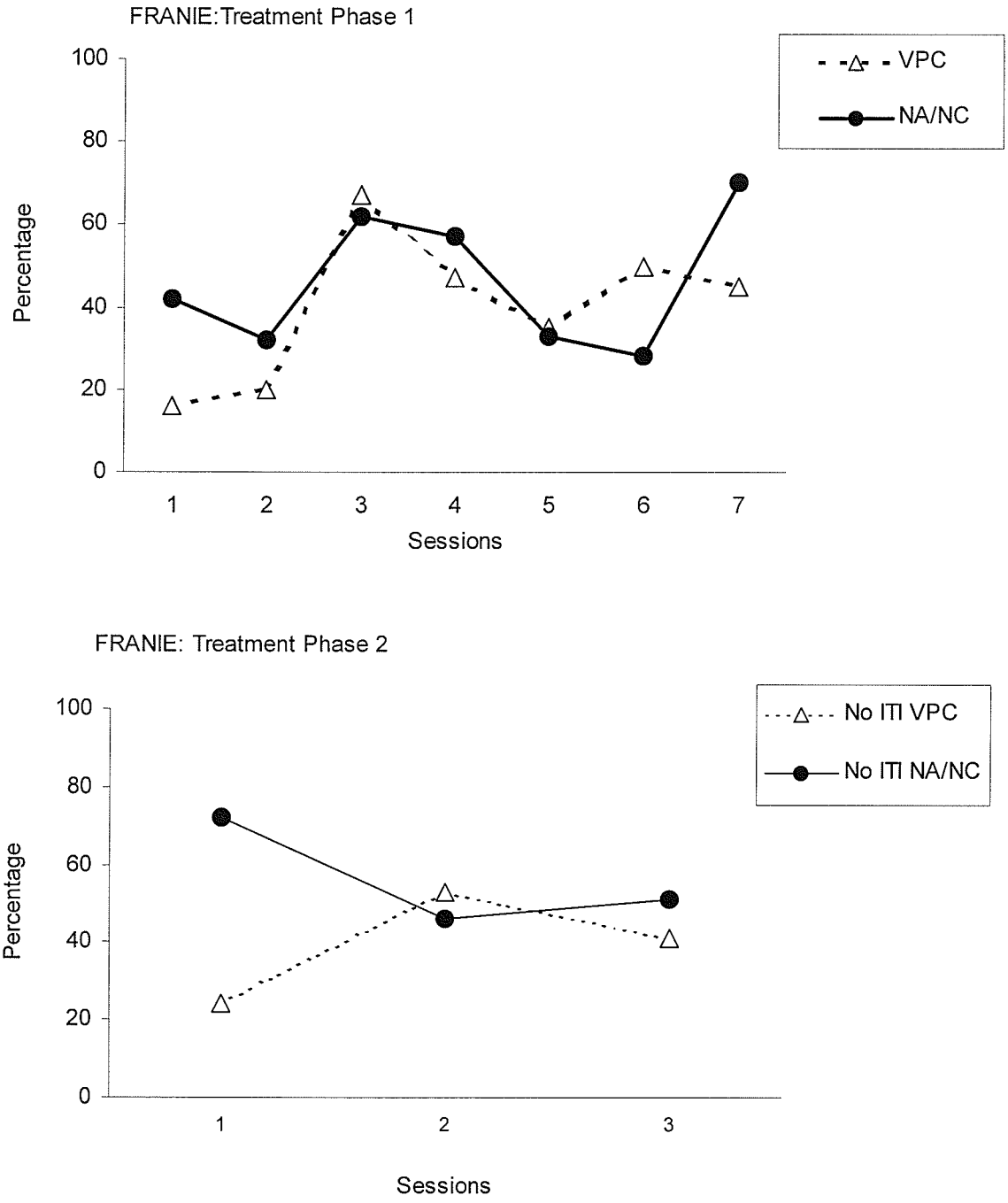

Figure 9. The percentage of accepts for treatments based on the descriptive analysis and functional analysis for Franie is depicted (top). The treatment based on the descriptive analysis was NA/NC and that for the functional analysis was VPC. The percentage accepts for the No ITI treatments are depicted (bottom). The condition based on the descriptive analysis was No ITI NA/NC while that for the functional analysis was No ITI VPC.

Treatment Phase 1. This treatment phase consisted of implementing treatments derived from the assessments, and chosen by the experts, as previously noted. For Franie, the data are presented in Figure 9 (top). There was little difference between treatments with a small advantage (M = 46 vs 42%) in favor of NA/NC identified from the descriptive analysis. These results suggest that adding VPC had little effect on food acceptance.

The results also suggested that the percentage of accepts during the treatment phase was somewhat lower than overall acceptance during the descriptive analysis (M = 54%). It also was noted that Franie appeared to "lose interest" as the meal time went on perhaps due to the slower rate of offering the food. It was subsequently hypothesized that the rate of offerings during treatment may have been slower than during the descriptive analysis sessions (i.e., in the natural setting) for Franie.

Treatment Phase 2. In this phase additional sessions were conducted in which the rate of offerings were increased. This was accomplished by discontinuing the intertrial interval (ITI 5 s) during each trial administration for each of the two treatments. Figure 9 (bottom) indicates that there was an increase in food acceptance in the first session only for the No ITI NA/NC condition, which was not sustained in sessions 2 and 3.

Colleen

Caregiver Assessment Information

The two caregivers that responded had 1 and 2 years experience respectively in feeding Colleen. Techniques identified to help increase accepts included coaxing her, gently stroking her, and talking softly to her.

Descriptive Analysis

For Colleen, the percentages of accepts during each antecedent and consequence condition are depicted across sessions in Figure 10. There was considerable overlap in the data paths. These descriptive analysis data for Colleen also were presented to the experts in behavior analysis. For Colleen, PC (M = 75%), PA (M = 64%), and VPC (M = 58%), were chosen by the experts as being most associated with accepts and VC (M = 29%) as least associated with accepts. See Figure 11 (top) for a graph of these conditions by themselves. Presenting physical stimuli both before and after a food acceptance appeared most effective in increasing food acceptance. Physical stimuli as an antecedent appeared to exert stimulus control for attending to eating and physical stimuli as a consequence appeared to reinforce food acceptance.

Functional Analysis

The conditions identified above by the experts for Colleen, were then implemented three times each during the functional analysis. The percentages of accepts during each session for each condition for Colleen are presented in Figure 11 (bottom). The PC condition, which had consistently lower data points than other conditions in the first and third session, spiked higher than all other conditions during the second session.

The conditions chosen by the experts, as most associated with food acceptance, in order were VPC (M = 58%), PC (M = 42%), and PA (M = 37%). The VC condition (M = 36%) was chosen as least effective in increasing food acceptance. It seemed that offering both verbal and physical stimuli after a bite may reinforce food acceptance. In summary, for Colleen the descriptive analysis identified PC, PA, and VPC and the functional analysis

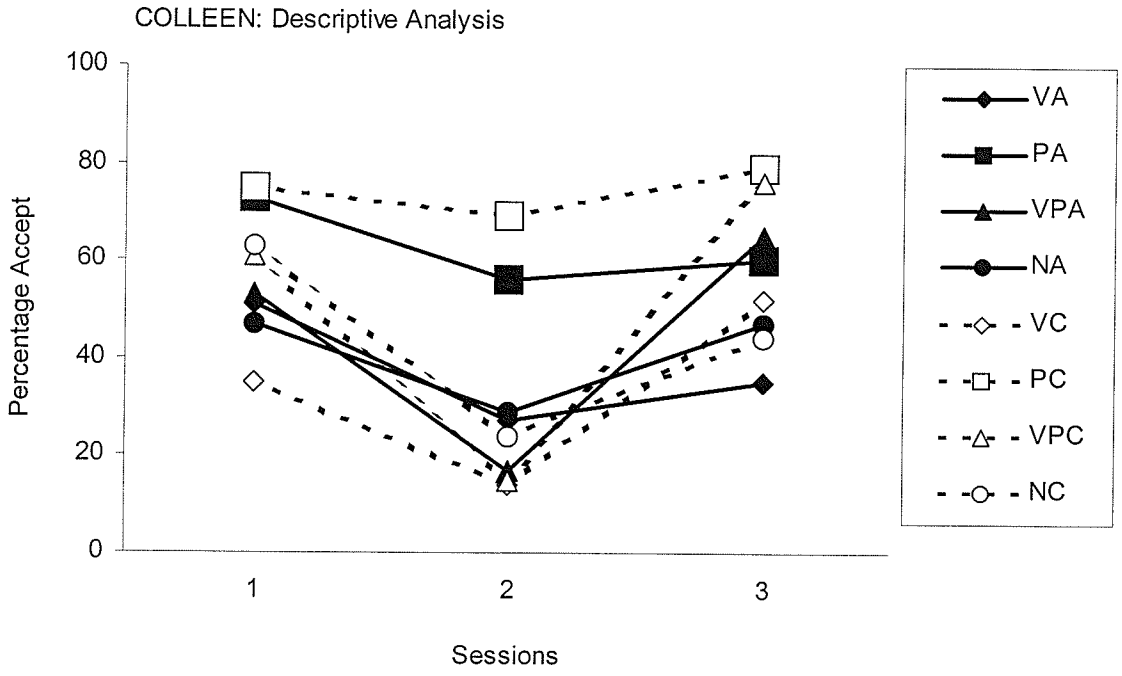

Figure 10. Percentage of accepts for each antecedent and consequent condition during the descriptive analysis for Colleen is depicted. Colleen had nine sessions which are presented in blocks of three sessions. Antecedent conditions are depicted by closed symbols and solid lines and consequence conditions are depicted by open symbols and dashed lines.

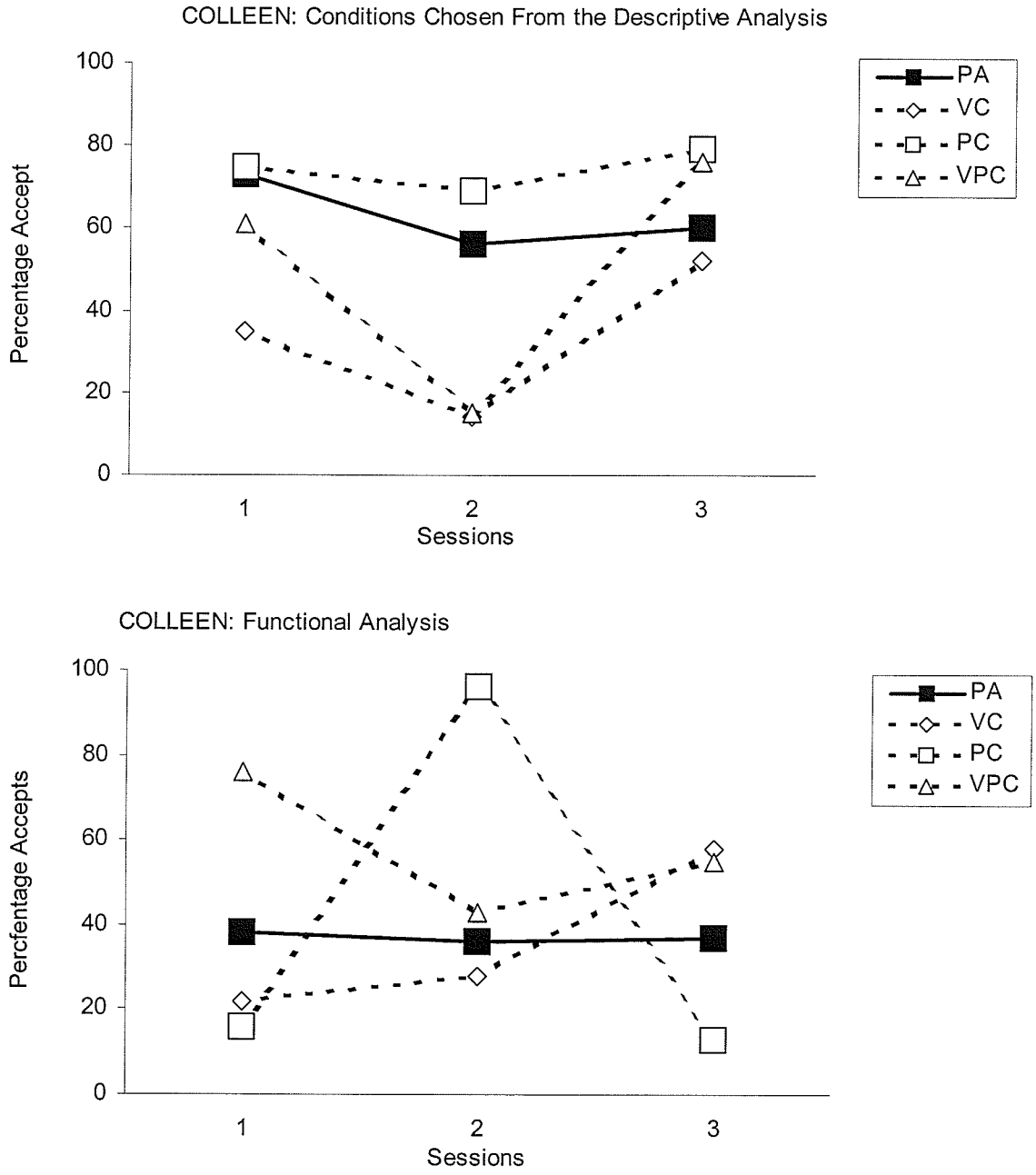

Figure 11. The conditions chosen by the experts in behavior analysis from the descriptive analysis for Colleen are presented (top). Percentage accepts for Colleen for all conditions in the functional analysis are presented (bottom). Antecedent conditions are depicted by closed symbols and solid lines and consequent conditions are depicted by open symbols and dashed lines.

identified VPC, PC, and PA as conditions controlling accepts, in descending order of effectiveness. Thus, while identical conditions were identified by the two methods of assessment, order of effectiveness varied.

Treatment

Choosing treatment conditions. Data from the descriptive analysis (Figure 11, top) and functional analysis (Figure 11, bottom), again were evaluated by the three experts to determine treatments based on each assessment method. The experts chose PA/PC as the treatment based on the descriptive analysis (add physical stimuli as an antecedent to occasion an attending response and as a reinforcer for accepts) and VPC as that from the functional analysis (add verbal and physical stimuli as reinforcement for accepts).

Treatment Phase 1. During Phase 1 the treatments derived from each assessment method were implemented as with the other participants. These data are presented in Figure 12. They indicate that the data points on 8 out of the 12 sessions were higher for the treatment based on the descriptive analysis PA/PC; the mean (PA/PC, M = 43%) also was slightly higher than that for the treatment based on the functional analysis VPC, M = 37%). However, the difference in treatments was not substantial. It also was noted that the mean accepts for both treatments (M = 40%) was lower than desired to promote weight gain and thus, further manipulation of the variables under investigation was undertaken.

Treatment Phase 2. Because physical stimulation was one of the conditions associated with food acceptance in both assessment methods, it was further manipulated. It was hypothesized that physical touch directly by the feeder (Experimenter touch), rather that by the washcloth or spoon, may increase the percentage of accepts, given the role that

parental physical stimuli may have on eating (e.g., Pollitt et al., 1975). Consequently, conditions containing only such physical stimuli were included [E(PA/PC)]. This condition was compared to a condition in which the same type of physical stimuli was introduced as a consequence alone [E(PC only)]. This allowed an analysis of the effects of adding this type of stimulation as a physical antecedent. Thus, the effects of PC were compared to a condition where PA was added.

These two treatments then were presented in an ABA design to ascertain whether there were differential effects. The results are presented in Figure 13. In the first phase A when physical stimuli were presented both as an antecedent and consequence [E (PA/PC)] acceptance was near zero in the first session but increased substantially in the second session and remained relatively stable at this level across subsequent sessions (M = 24%). In Phase B when physical stimuli were presented just as a consequence [E (PC only)] acceptance immediately decreased nearly to 0% and remained low and relatively stable across subsequent sessions (M = 10%). In the second Phase A when again physical stimuli were presented as both an antecedent and consequence [E (PA/PC)] acceptance increased slightly in the first session and then steadily increased across the next two sessions dropping somewhat in the last session (M = 22%).
In addition, there was a decrease in accepts in both treatment conditions [E (PA/PC) M = 24% and 22% and E (PC only) M = 10%] as compared to either of the original treatment conditions (PA/PC, M = 43% and VPC, M = 37%). These results imply that the original type of physical stimuli were more effective. It also points out the potential importance of verbal stimuli as a controlling variable, since higher percentages of accepts were obtained

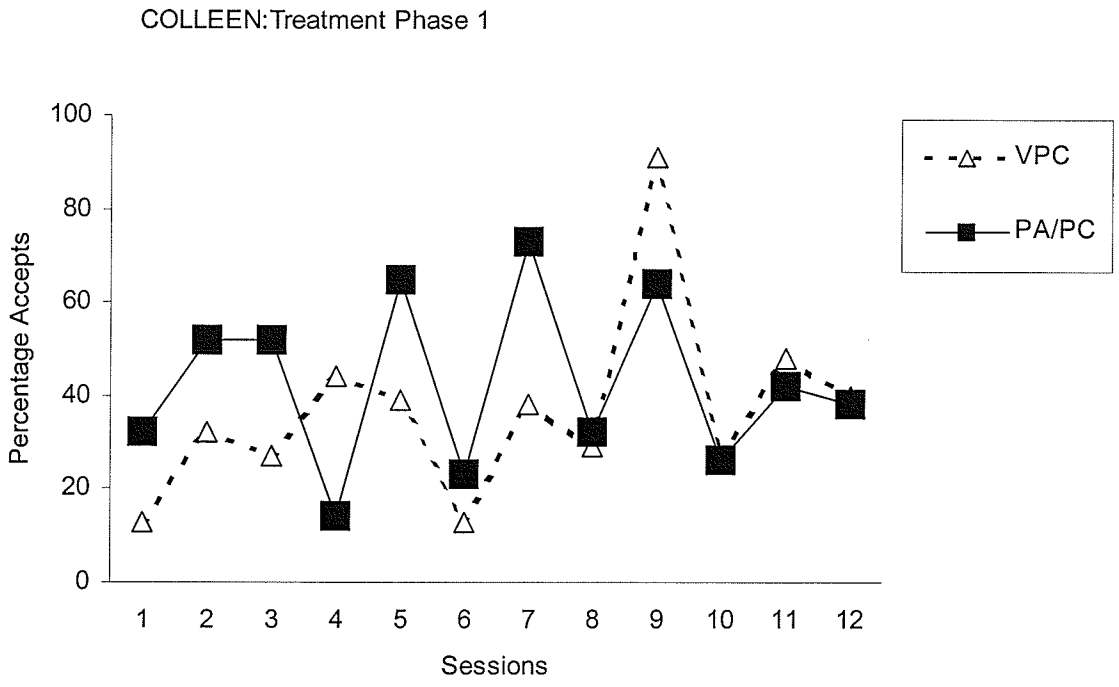

Figure 12. The percentages of accepts for treatments based on the descriptive analysis and functional analysis for Colleen are depicted (top). The treatment based on the descriptive analysis, as chosen by the experts, was PA/PC; the treatment based on the functional analysis was VPC.

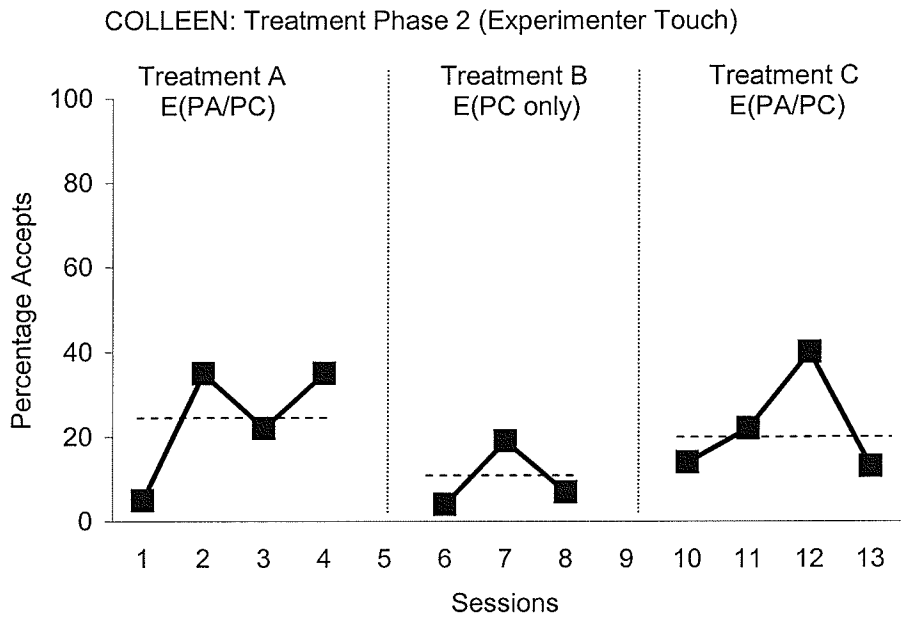

Figure 13. The percentages of accepts for treatments for the Phase 2 (experimenter touch) are depicted. Treatment A depicts treatment with experimenter touch included as an antecedent and consequence [E(PA/PC)]. Treatment B depicts the treatment where experimenter touch was included as a consequence only [E(PC only)].

when it was present along with physical stimuli as a consequence, as in the original treatment condition in Treatment Phase 1.

Treatment Phase 3. Consequently, in order to experimentally determine the importance of a verbal stimulus as a variable, a third treatment phase was conducted. These sessions consisted of presenting the original VPC treatment and the original PC condition as the second treatment in an ABA design. Results are presented in Figure 14. In the first Phase A when both verbal and physical social stimuli were presented as a consequence (VPC) acceptance was high and close to 80% in the first session, gradually dropping over the next two sessions to nearly 0% but then increasing again with continued variation across the last three sessions (M = 37%). In Phase B when physical stimuli only was presented as a consequence (PC), there was a higher percentage of acceptance in the first session which dropped to nearly 0% in the second, and then increased and remained stable over the last three sessions (M = 27%). In the second Phase A when both verbal and physical social stimuli again were presented as a consequence (VPC), the percentage acceptance in the first session increased slightly followed by an increasing trend in acceptance across sessions (M = 44%).

The VPC treatment (M = 41% across both A Phases) replicated the original results of this treatment (M = 37%) in Treatment Phase 1 and also resulted in a higher percentage of accepts (M = 41%) than the PC only treatment (M = 27%) in the current Treatment Phase (2). In addition, this increasing trend in acceptance for VPC in Phase 3 offers further support for the effectiveness of verbal stimuli as important controlling variables

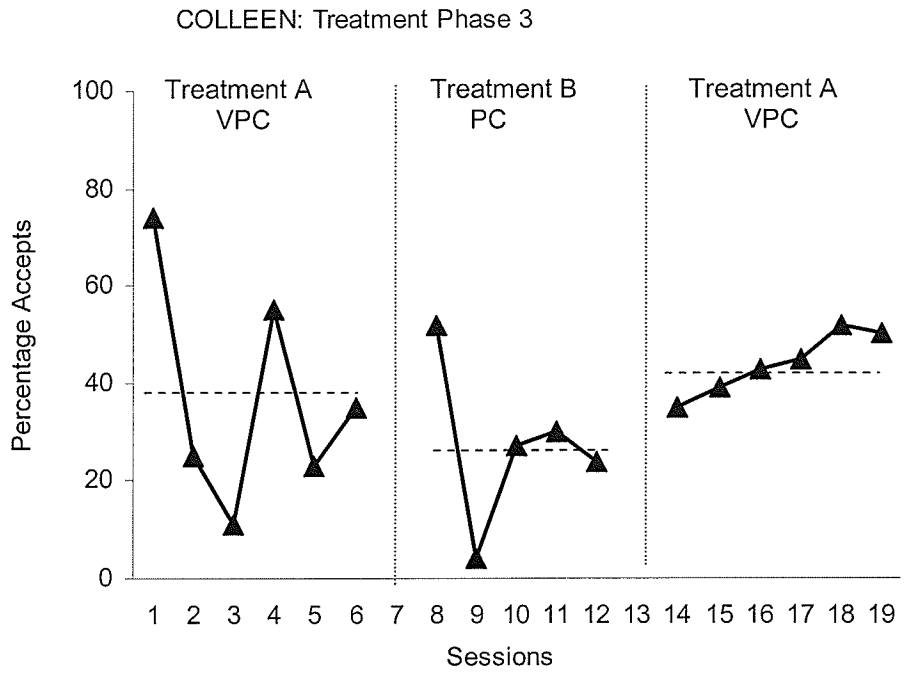

Figure 14. The percentage of accepts for Phase 3 treatments are depicted. Treatment A depicts treatment which included both verbal and physical stimuli as a consequence (VPC). Treatment B indicates treatment in which physical stimuli alone as a consequence was implemented (PC).

for acceptance for Colleen. At this point the sessions were discontinued, since there was an upward trend in the data indicating an increase in food acceptance, at least to levels obtained during the original treatment phase.

Cost Effectiveness

Three types of calculations were conducted; first, to obtain the cost of each assessment (Appendix L, Table L1), second to obtain the cost of treatment (Appendix L, Table L2), and third to obtain the cost per unit outcome based on the assessment and treatment information (Table 1). This information is presented in order.

The total cost to conduct each assessment for each participant is depicted in Appendix L (Table L1). The range for the descriptive analysis across participants was between $92.25 and $101.25 while the range for the functional analysis was between $30.75 and $33.75. However, given that the functional analysis was driven by the descriptive analysis these two sets of costs should be cumulated. Adding the cost of the descriptive analysis to the functional analysis increased the cumulative cost of the functional analysis (Range $123.00 - $135.00) over that for descriptive analysis alone (Range $92.25 - 101.25).

Next, the cost for treatment alone was calculated for each individual. This information is depicted in Appendix L (Table L2) and indicates that the cost to conduct treatments ranged from $15.00 to $33.00. Cost for treatment based on the descriptive analysis was the same as cost for treatment based on the functional analysis, since the number of sessions and session duration was equal for each treatment.

Next, the cost per unit of outcome (e.g., cost per increase in bites accepted) for each assessment/treatment, for each individual was calculated (Yates, 1985). This

Table 1

Cost Per Accept ($)

	Treatment (DA)				
Participant	Cost of Assessment	Cost of Treatment	Total Cost	Total Accepts During DA Treatment	Cost Per Accept
Carrie	101.25	22.00	123.25	69	1.79
Dana	92.25	15.00	107.25	92	1.17
Franie	93.75	19.25	113.00	78	1.45
Colleen	100.50	33.00	133.50	113	1.18

	Treatment (FA)				
Participant	Cost of Assessment	Cost of Treatment	Total Cost	Total Accepts During FA Treatment	Cost Per Accept FA
Carrie	33.75	22.00	55.75	63	0.88
Dana	30.75	15.00	45.75	96	0.48
Franie	31.50	19.25	50.75	59	0.86
Colleen	33.50	33.00	66.50	107	0.62

Cost Per Accept for Functional Analysis Treatment When Including Cost of Descriptive Assessment

Participant	Total Cost of Assessment (DA Plus FA)	Cost of Treatment	Total Cost	Total Accepts in FA Treatment	Cost Per Accept Using DA Plus FA Assessment
Carrie	135.00	22.00	157.00	63	2.49
Dana	123.00	15.00	138.00	96	1.44
Franie	125.25	19.25	144.50	59	2.45
Colleen	134.00	33.00	167.00	107	1.56

information is depicted in Table 1 and indicates that for the descriptive analysis cost per accept ranged from $1.17 to $1.79 while for the functional analysis the range was .48 cents to .88 cents. If, however, the cost of the descriptive analysis is again taken into consideration when conducting the functional analysis (Table L3), then the total cost of the functional analysis/treatment increases (Range $138.00 - $167.00) versus the descriptive analysis/treatment (Range $107.25 - 133.50); as does the cost per accepts for the functional analysis; as indicated in Table 1 (Range $1.44 - $2.49) versus the cost per accepts in the descriptive analysis (Range $1.17 - $1.79).

Discussion

My research followed Cone's (1997) model which outlines three phases in the behavioral assessment process: (a) information gathering (description); (b) hypothesis formulation (interpretation); and (c) hypothesis testing (verification). For Cone, functional analysis, the experimental manipulation of potential controlling variables of behavior (conducted in Phase 3), occurs to verify hypotheses formulated (in Phase 2) from information gathered in Phase 1 of the assessment. He also suggests that investigating treatment utility (Phase 4 of my research), based on this functional analysis, allows a further step forward in establishing functional analysis and the model, as being an effective method for identifying controlling variables to include during treatment.

In my research, data were analyzed in order to address five research questions: (a) was brief behavioral assessment useful in identifying controlling variables for problematic eating; (b) did descriptive and functional analysis yield the same information in terms of variables that may be maintaining eating behavior; (c) if not, would utilizing different assessment information derived from descriptive versus functional analysis to

design treatment strategies, be differentially effective in increasing food acceptance; (d) was there a difference in cost effectiveness of each assessment procedure based on related treatment results; and (e) was Cone's (1997) model useful in determining controlling variables for eating during assessment to include in treatment? These five questions now will be addressed in order.

The first question was: "Was a brief behavioral assessment useful in identifying controlling variables for eating?". The data allowed controlling variables to be identified for all participants in that different conditions had lower or higher percentages of food acceptance associated with them, reflecting differential control. In addition, variables were sufficiently identified that three experts could agree completely, both on which conditions were implicated in affecting eating, as well as on their ratings of effectiveness of these variables. This high degree of inter-judge reliability occurred for both the descriptive and functional analyses. Thus, brief behavioral assessment appeared to be an efficacious assessment strategy.

The second question was: "Did descriptive and functional analysis yield the same information in terms of variables that may be maintaining eating behavior?". Both assessment methods identified 2 out of 3 of the same conditions, although the order of effectiveness of conditions varied across assessment methods. This result was consistent for all 4 participants. To illustrate, for Carrie, similar controlling conditions for eating were identified by the two different assessment methods. The descriptive analysis identified VPC, VPA, PC as most effective and VC as least effective while the functional analysis identified VPA, VC, VPC as most effective and PC as least effective; however, the degree of control across conditions varied as evidenced by different percentages of

associated food acceptance. This finding also occurred for all other participants. That the two methods identified similar conditions, in this manner, for all four participants may not be surprising given that the functional analysis was driven by the results from the descriptive analysis.

However, the change in order of conditions from the descriptive analysis to the functional analysis also was important. That is, conditions showing lower effectiveness in the descriptive analysis moved up in order of effectiveness in the functional analysis. For example, for Carrie the condition with the lowest effectiveness, VC, moved up to become second in order of effectiveness in the functional analysis. The same pattern also occurred for Dana. In addition, for Franie and Colleen, the lower conditions in the descriptive analysis actually moved up to become the most effective conditions in the functional analysis. For example, for Franie VPC, the least effective descriptive analysis condition, moved up to become the most effective functional analysis condition. These patterns could lead one to believe that the functional analysis identified more important variables for treatment since the functional analysis appeared to more specifically define the most effective conditions. This could reinforce the concept of functional analysis as the "gold standard".

An interesting result also occurred when generating hypotheses based on the results. The two assessment methods led to different treatment hypotheses for all participants. Thus, in spite of the overlap of conditions, different treatments were generated from the different assessments by the behavioral experts.

The third question was: "If assessments yielded different information regarding controlling variables, would utilizing different assessment information (descriptive versus

functional analysis) to design treatment strategies be differentially effective in increasing food acceptance?". The results were similar and clear for all 4 participants when comparing the effects of the two treatments. Although different treatments were generated from the two assessment methods, essentially there was no difference in food acceptance between the two treatments. It would appear, then, that the two assessment methods were equally effective in identifying controlling variables to include in treatment.

An important point to note, however, is that if the process had stopped at assessment only (Phase 3), descriptive analysis would have been viewed as inferior to functional analysis due to the lack of complete correspondence of the former with the latter, and the fact that conditions moved up in importance from the DA to the FA assessment results. However, adding the treatment phase clarified the fact that there was actually no apparent difference in treatment effects; a point which would not have been evident if assessment alone had been conducted. Thus, Cone's (1997) advice to incorporate treatment utility (a "functional analysis of functional analysis") was well founded.

The fourth question was: "Was there a difference in cost effectiveness of each assessment procedure based on related treatment results?". The results of the cost effectiveness analysis suggest that for assessment alone, the descriptive analysis cost approximately three times as much as the functional analysis when taken separately. However, given that the functional analysis was based on the descriptive analysis, the cost of the descriptive analysis should be added to that of the functional analysis in order to accurately represent the cost of completing functional analysis using Cone's (1997) model. In this case, completing a functional analysis based on the descriptive analysis

added to the cost of the functional analysis and put it at a higher cost than the descriptive analysis.

It is important to note that this cumulative cost was specific to this research but would not be necessary if the descriptive analysis and functional analysis were conducted independently. That is, if the functional analysis conditions were chosen as based on the literature and not specifically driven from the descriptive analysis, as in Cone's model and this research, then the cost of the functional analysis would be calculated independently and potentially may be less costly than the descriptive analysis. Certainly, in this research the descriptive analysis was more costly than the functional analysis when considered separately (see Table 1). This was due to the difficulty to observe, score, and obtain acceptable interobserver agreement given the complexity of the observations of antecedent, behavior, and consequence in the descriptive analysis, in contrast to the controlled presentation of conditions in the functional analysis. Thus, it was necessary to repeatedly review tapes of descriptive analysis sessions, which increased the cost of the descriptive analysis over the functional analysis in this research.

The fifth and last question was: "Was Cone's (1997) model useful in determining controlling variables for eating during assessment to include in treatment?". My research contained a modification to Cone's model in that it depended solely on the descriptive analysis in the information gathering phase to drive the functional analysis rather than including a variety of less objectively gathered information from the information gathering phase to drive the functional analysis. Thus, phase 2 was restricted in terms of the experts using less information (objective data only) from which to make their decisions regarding conditions to include in the functional analysis. In addition,

instructions were provided to the experts with which to evaluate the descriptive analysis data when choosing conditions, rather than allowing them to determine their own individual criteria for choosing importance of conditions in the descriptive analysis. If these changes affected which conditions the experts would have chosen to include in the functional analysis, then the results of the functional analysis may have been different. These modifications were made in my research in the interests of achieving more objective data, greater experimental control, and improved replicability of procedures. However, due to these modifications, some caution is warranted in generalizing from my research to Cone's model.

Nevertheless, Cone's model was supported by my research in terms of the efficacy of completing a functional analysis after a descriptive analysis and progressing to treatment to further establish control of behavior based on the assessment information. Thus, Cone's model of progressing through this assessment/treatment sequence was supported in spite of the fact that the equality of effects between treatments seemed to suggest that either assessment method would be effective to design treatment. More specifically, support for his model is offered from three aspects of the results: (a) through the efficacy of the functional analysis to simplify treatment (e.g., for 3 participants Carrie, Dana, and Colleen), (b) through the efficacy of the functional analysis to clarify effective or additional components (e.g., for Colleen and Franie); and (c) through the demonstrated advantage of adding the treatment utility phase after the assessment phase to verify assessment information and guide treatment decisions.

For Carrie, for example, the treatment from the descriptive analysis was VPA/VPC while that from the functional analysis was VPA. However, treatment effects

were essentially similar. Thus, completing the functional analysis led to the design of a simpler treatment by isolating one of the two conditions from the descriptive analysis; and this treatment was as effective as the more complex treatment based on the descriptive analysis. A similar result occurred, as well, for Dana and Colleen. For example, for Dana the functional analysis again, appeared to lead to a simpler treatment (NA/NC) than that based upon the descriptive analysis (NA/PC). For Colleen the functional analysis also led to a simpler treatment of focusing only on consequences (VPC) from that based upon the descriptive analysis treatment which focused on antecedents and consequences (PA/PC). The results for these 3 participants support those from previous literature in which descriptive analysis suggested multiple variables and functional analysis narrowed the focus to fewer variables (e.g., Mace & Lalli, 1991; Lerman & Iwata, 1993).

In addition, for Colleen, the assessment methods led to the design of different treatments. The treatment from the descriptive analysis was PA/PC while that from the functional analysis was VPC. Based on this information further treatment phases were implemented which helped define the verbal variable as an important treatment component. However, this variable initially had only been revealed by virtue of completing the functional analysis. Again, it appeared that completing the functional analysis was beneficial in that it helped define important treatment components that would have been missed by conducting only a descriptive analysis.

Franie's results were similar to those of the other 3 participants in that similar conditions were identified from both assessments and different treatments were derived from the different assessments. Although completing the functional analysis did not assist in adding any further clarification or simplification to her data or treatments; it did reveal

additional potential controlling variables (VPC) to consider for treatment. In contrast, if descriptive analysis only had been completed, NA/NC, that is, food alone as a controlling stimulus would have been chosen as treatment.

Thus, for all participants, completing the functional analysis added useful information for choosing treatment options or in designing simpler treatments. For example, adding the functional analysis would suggest instructing Carrie's caregivers to just add verbal/physical stimuli prior to offering a bite versus adding verbal/physical stimuli prior to offering a bite and verbal/physical stimuli after, if the bite were accepted. For Dana, instructions would be to just quietly offer the meal without additional stimulation versus to provide a physical stimulus after offering a bite, if the bite were accepted. For Colleen instructions would be to just add verbal/physical stimuli after the bite if it were accepted, versus instructions to offer physical stimuli prior to offering a bite and then after as well, if the bite were accepted. Therefore, completing a functional analysis may be particularly important in a practical setting given the relationship of parental stress to feeding disorders (e.g., Budd et al., 1992; Drotar, 1988), which might be augmented with complex treatment packages.

For Franie, however, it was actually the descriptive analysis that yielded a simpler treatment. Although the descriptive analysis yielded a simpler treatment, the fact that it was equally effective only was revealed when conducting the treatment phases. Again, this supports Cone's (1997) contention that you cannot just rely on a functional analysis, but that a functional analysis of functional analysis is necessary.

Cone's (1997) model also is supported by my research in that variables identified during assessment demonstrated control over acceptance in additional treatment phases

for Colleen. That is, in treatment Phase 2 it was clear that physical stimuli (as both antecedent and consequence), as identified by assessment, were effective in controlling acceptance. Acceptance was, however, lower than during the original treatment. Further manipulations to identify the role of the verbal stimulus indicated that it, too, was a controlling variable for eating, since when the verbal stimulus was re-introduced percentage of accepts increased.

In addition, if assessments only had been conducted, it may have appeared that the functional analysis would have produced a more effective treatment. While there were definite benefits to conducting the functional analysis (e.g., simpler treatments), it did not specifically produce a more effective treatment. However, this was evident only after conducting the treatment utility phase.

In spite of the support for Cone's (1997) model, the methodology or focus of the present study requires examination particularly in regard to the information gathering phase and how the methodology there may have affected the functional analysis and treatment results. Feeding is a complex behavior controlled by organic and non-organic variables. Firstly, my research considered only immediately occurring social antecedents and consequences. Thus, it may be beneficial to include, or at least more precisely control, more remote antecedents or setting events (e.g., time since the last meal) and physical characteristics or limitations of the participants. Secondly, eating may be under the control of multiple variables not just the conditions with the highest related percentages of accepts, as in my research. Some support for this view is suggested in the literature (e.g., Heffer & Kelly, 1994; Luiselli, 1989; O'Brien et al., 1991) and by the fact that percentage of accepts in the descriptive analysis, when results were not separated by

condition, was higher than in treatment. That is, when we look at percentage of acceptance not related to any particular condition, but to naturally presented conditions in the descriptive analysis, acceptance is higher than in treatment. Of course, it should be noted that the efficacy of conducting the functional analysis is not necessarily to immediately impact relative performance level, but rather to demonstrate experimental control of specific variables. Thus, conducting a functional analysis may ultimately allow the identification of the important, multiple variables that control eating and therefore which may be useful to include in treatment.

Further support for the idea of multiple controlling variables occurs when considering Dana's descriptive analysis results, the change in caregivers during that phase, and the drastic change across the descriptive analysis sessions for the VPA condition that may have occurred by virtue of the different caregivers naturally presenting the stimuli differently with the resulting impact on the target behavior. Thus, it may be expected that eating is under the control of multiple variables which begs for a functional analysis, the purpose of which is, in fact, to determine controlling relations of a variety of variables with the target behavior.

In addition, more information as to controlling variables also may have been revealed had all descriptive analysis conditions been implemented in the functional analysis. In the current research this was not possible given the need to drive the functional analysis from hypotheses drawn from the descriptive analysis; and the need for the functional analysis to be brief.

Furthermore, the range of activities occurring in a descriptive analysis and opportunities for behavior to occur are critical considerations. While an examination

based on naturally occurring contingencies may suggest naturally occurring controlling variables, it may not reveal additional important variables that could exert improved control over eating behavior resulting in a larger increase in eating. In my study, for example, if more diverse caregiver activities had occurred during meals such as offering toys or preferred foods, which are both noted in the literature as potentially potent reinforcers for acceptance of food, they may have been identified as important controlling variables. Cone's (1997) model does not appear to suggest that the researcher draw on information from the literature to add to the descriptive analysis information. Thus, strictly adhering to an assessment based solely on the information available from the natural environment may be a limitation of the current model.

Further research may investigate the importance of expanding the questionnaire by adding more choices of potential controlling variables, such as setting or time since the last meal. In addition, it may be useful to include an assessment of general reinforcers for participants, not just the reinforcers that are occurring during the meal. This may be particularly important when investigating behavior which is occurring in austere or restricted environments.

Another consideration in this vein is that some contingencies that are revealed may not be ethically acceptable to implement, or even identified during the information gathering phase. For example, caregivers did not always specify restraint as a technique that they had implemented; however, it was clear when conducting the descriptive analysis that it did, indeed, occur in some form for 3 of the 4 participants. Whether it was effective is not clear, since these contingencies were not included in my research for ethical reasons. Further to the need to pay special attention to the information gathering

phase, some researchers have investigated contingencies which maintain the unacceptable behavior and then have used those contingencies to increase the desired behavior (e.g., Northup et al., 1991) which may be a useful inclusion in future research.

Methodological factors that may be implicated in the relatively low acceptance percentages also must be considered. During treatment, accepts may have been higher if each meal, each day, had received treatment so that there were no opportunities for other behavioral contingencies to affect accepts at the other two meals per day. That is, contingencies occurring at other meals may have generalized to the targeted meal.

In addition, it may be that there sometimes was nondifferentiated responding across conditions because the conditions themselves were not easy to distinguish due to stimuli not being different enough to make the conditions clearly different to the participants. Including additional discriminative stimuli (e.g., conducting sessions for each condition in a distinctly different room) to each condition may have made the conditions sufficiently different for participants. In the case where conditions are not clearly different, an alternating treatment design may not have been the best choice of designs. Given that in this research assessments were brief, it was necessary to use an alternating treatment research design, however, an ABA design may have aided the participants to come in contact with the contingencies in the different conditions by virtue of the sequential repeated contingencies. Certainly when an ABA design was implemented there was a clear difference in responding to treatments presented (i.e., for Colleen). Perhaps had the ABA design been used throughout the study, participants would have differentiated conditions and responding would have been different.

Notwithstanding the previously noted limitations, the current research extended the literature in several ways. Firstly, it extended the work of Iwata et al. (1982a) in that functional analysis methodology was applied directly to food acceptance behavior. Secondly, it extended the work of Cooper et al. (1995) in that the analysis was conducted pre-rather than post-treatment thereby identifying subsequent treatment variables. Thirdly, it extended the work of Munk and Repp (1994) in that, in addition to antecedents, assessment strategies investigated consequences for food acceptance. Fourthly, it extended the work of Northup et al. (1991) in that a brief functional analysis was implemented which specifically targeted food acceptance behavior. Lastly, it extended the work of Lerman and Iwata (1993) by comparing descriptive and functional analyses specifically in the area of food acceptance; and also by adding a treatment phase consisting of treatments derived from the separate assessment methods. This addition allowed an investigation of relative treatment utility of the two assessment methods.

Refusal of food remains a serious risk factor for many individuals with developmental disabilities. Functional analysis procedures in general, and Cone's (1997) model of them in particular, hold much promise for uncovering the multiplicity of controlling variables of the relevant behaviors. Demonstration of control over eating by multiple variables suggests that in the clinical setting it may be beneficial to offer a treatment package comprised of the most effective combinations of variables for each individual (cf., Azrin, 1977). Challenging as it may be, intensive behavioral assessment research of this nature must be undertaken to improve the health and quality of life of individuals afflicted with eating disorders.

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Appendix A

Informed Consent

Date

Mr. & Mrs.
Address
City, Province, Postal Code

Dear Mr. & Mrs.

RE: Participant's Name

We are writing to ask you to review the following information and then to decide if you will consent to your daughter participating in this project. The main purpose of the project is to help residents at xxxxxxxxxxx eat more of their food offered at mealtimes. Eating more of the food offered at every meal may help the individual be healthier and may make mealtimes more pleasant. As you know, your son/daughter is not in any danger due to not eating but may not be eating all of the meals presented and may benefit from doing so.

The project will compare two different ways of assessing how much and why the individuals in this project may be refusing some of their meal. During the first type of assessment we will be asking the regular careprovider if they know of any reason why any of the food refusal may be occurring. Also, we will observe the individual at meals over about a week time period to see what types of situations occur during meals that may affect acceptance of the offered food. The next type of assessment will involve systematically changing the situations that seemed to be affecting food refusal so that we can try to ensure that those situations are, indeed, affecting food refusal.

Next, we will work individually with your daughter at least three times a week at meals to see whether we can increase food acceptance. During this time we will use the information we found in the assessments to make a couple of types of different treatment situations so that we can see which treatment helps increase food acceptance the most. Once we find this out, we will train the person who assists your daughter to do the same things during their regular mealtimes. We will also check back a couple of months later to make sure the treatment is still being done and that your son/daughter is still accepting more of his/her meals.

Mr. & Mrs.
Date
Page 2

My name is Valdine Scott-Huyghebaert. I am the Coordinator of Psychology at xxxxxxxxxxxxx and I am also finishing my Ph.D. in Psychology and will be working on this project. Dr. Stephen Holborn, Professor of Psychology at the University of Manitoba is the academic advisor for this project. I will also have two helpers who are undergraduate students in Psychology working on the project with me. Their names are student 1 and student 2.

We would very much like to include your son/daughter in this project and are therefore writing to request your permission to do so. We have attached a consent form to this letter and would ask you to fill it out indicating your decision as to whether your daughter can participate in the assessments and treatment described above. Once you have filled it out please place it in the attached stamped envelope and return it to me at xxxxxx by date.

Thank you for your time. If you have any questions about the project you may contact myself or Dr. Holborn at the following numbers:

- Valdine Scott-Huyghebaert: xxxxx Phone: xxxxxxxxxx) /Home: xxxxxxxx
- Dr. Stephen Holborn, Department of Psychology, University of Manitoba, 474-8245

Sincerely,

Valdine Scott-Huyghebaert, M.A., P.A.	Dr. Stephen Holborn
Title	Professor of Psychology
Workplace	University of Manitoba

Attachment

PARENT/ GUARDIAN CONSENT FORM

Title of Research: Treatment Utility of Brief Descriptive and Functional Analyses for Individuals Chronically Refusing Food.

Researchers: Valdine Scott-Huyghebaert, Title, Workplace
Dr. Stephen Holborn, Professor of Psychology, University of Manitoba

I understand that:

1. Participation in the study is voluntary and my decision will not affect any services that my son/daughter is or will receive from xxxxxxxxxxxx.

2. This consent can be canceled at any time and for any reason.

3. My son/daughter may be videotaped during the study. The videotapes will be erased after data analyses are completed.

4. The study will last approximately four to six months.

5. All information collected about my son/daughter will be confidential.

6. My son/daughter's name or other identifying information will not be used in any subsequent reports, presentations, or publications.

7. I can contact the researchers if I have any questions about the study.

8. The researchers will access the unit charts at xxxxxxx to obtain general information regarding weight, height, degree of developmental delay and physical difficulties, and food consumption.

This study has been explained to me to my satisfaction. (please check one of the boxes below indicating your decision for participation).

❒ I give consent for Participant's name to participate in the project.

❒ I do not give consent for Participant's name to participate in the project.

Name of Parent/Guardian (to be inserted)

Signature of Parent/Guardian:_____Date:_____

Relation to Participant:_____

Appendix B

Caregiver Assessment Questionnaire

Resident's Name: Living Unit:	Respondent:	Date:

Thank you for agreeing to help us investigate the feeding behavior of this individual. We are attempting to determine if this individual has a feeding problem, what behaviors they engage in that interfere with eating, and, why you think the individual engages in these behaviors. We have asked you to respond to this questionnaire, since you are the primary person that assists this individual with feeding and thus, likely know the individual's eating habits well. We would appreciate your best estimate in answering the questions below. If you have any questions please feel free to call me at any time.

Thank you for your assistance.

Valdine Scott-Huyghebaert: Coordinator of Psychology Ext. 292

1. How long have you been assisting this individual at mealtimes?					
2. Does this individual refuse to accept food during mealtimes?					
3. What meals do you usually assist this individual with?	❒ Breakfast	❒ Lunch		❒ Dinner	
4. What percentage of meals does this individual usually eat?	❒ 100%	❒75%	❒ 50%	❒ 25%	❒ 0%

A. BEHAVIORS

- Please indicate whether the individual engages in any of the following behaviors during each meal.
- Rate each behavior on a scale of **1 (occurs very little)** to **5 (occurs alot).** Please do this for each meal by placing a letter (B, L, D) in the appropriate box to indicate which meal you are rating.

B. WHY DO THEY OCCUR?

- Why do you think each of the behaviors occurs? Please explain **for each behavior:** give your best estimate based on the current information that you have.

	1	2	3	4	5	
Cry						
Push food away						

Continued on next page

A. BEHAVIORS "CONTINUED" • Rate each behavior on a scale of **1 (occurs very little)** to **5 (occurs alot)** by placing a letter (B,L,D) in the appropriate box below.						**B.** WHY DO THEY OCCUR "CONTINUED" • Why do you think each of the behaviors occurs? Please explain **for each behavior**, your best estimation based on the current information you have.
	1	2	3	4	5	
Spit food out						
Finger feed						
Vomit or gag						
Attempt to leave						
Turn away from spoon						
Throw food						
Drool						
Refuse to open mouth						
Other (list)						

Please provide any other comments that you believe are important about why the behaviors occur?

A. TECHNIQUES USED TO HELP INDIVIDUAL EAT What techniques have you used during meals to try to decrease the behaviors listed above or to try to get the individual to eat. Please note below any techniques you have used for particular behaviors.	**B. DID THEY HELP?** For each technique please describe whether it worked or not. That is, did the individual stop engaging in the behavior and eat after? What happened? If the technique was not successful, please explain why, if you can.

Please provide any other comments you believe are important about why the behaviors occur?

A. TECHNIQUES USED TO HELP INDIVIDUAL EAT What techniques have you used during meals to try to decrease the behaviors listed above or to try to get the individual to eat. Please note below.	**B. DID THEY HELP?** Did these techniques work? That is, did the individual stop engaging in the behavior and eat after? What happened?
□ Coaxing	
□ Offers of rewards (e.g., favorite foods or special privileges	
□ Ignoring	
□ Holding arms, hands, or head so that you can place food in their mouth	
□ Telling the individual that they will have a preferred food or activity removed	
□ Ending the meal	
□ Modeling	
□ Gently stroking or touching the individual	
□ Softly talking to the individual	
□ Other	

Appendix C

Questionnaire for Experts to Determine Functional Analysis Conditions from Descriptive Analysis Information

PARTICIPANT: RESPONDER:

Thank you for agreeing to participate in Phase I of this research entitled Treatment Utility of Brief Descriptive and Functional Analyses for Individuals Chronically Refusing Food. The general task required will be to review the data for this phase of the research (descriptive assessment) for each participant in order to determine what conditions would be most appropriate to include in the next phase. The next phase consists of implementing a functional analysis based on information obtained in phase I.

The target behavior is acceptance of offerings. During the descriptive assessment antecedents to acceptance such as interaction of the caregiver and participant were recorded. This included antecedents such as verbal interaction, physical interaction, restraint, and combinations of these. Similarly, consequences related to acceptance were recorded.

These data were gathered through a process by which the participants were video taped during meal times and the video taped sessions were then observed. The target behaviour and each antecedent and consequence was recorded in sequence during each 10 second interval using a partial interval continuous 10 sec recording method.

Percentages of the occurrence of acceptance related to the occurrence of each antecedent and consequence were calculated. Thus, the bar graph depicts the average percentage of accepts related to each condition (as noted above). These data were obtained by summing all intervals for which the antecedent / consequence occurred and then dividing by the sum of all intervals that accept had occurred for each antecedent / consequence to obtain an average percentage. In addition, the line graphs depict the data as percentages of accepts during sessions. Thus, each data point represents a percentage of accepts related to the specific antecedent /consequence.

1. Please review the information obtained from the descriptive assessment (graphs provided). Up to four conditions will be implemented in the next phase (Functional Analysis) based on this information. A comparison will then be made between the two types of assessments to determine the consistency of the information from both as to which conditions impact food acceptance the most.

2. Please refer to Part A below and consider the 8 Variables and then refer to Part B. Rank the four conditions most related to food acceptance. Next, indicate the one least related to food acceptance. This condition will be implemented during the functional analysis as a control condition.

PART A.		PART B.
VARIABLES		1. RANK THE 4 CONDITIONS MOST RELATED TO FOOD ACCEPTANCE. 2. NEXT, WRITE "LEAST" NEXT TO THE CONDITION LEAST RELATED TO FOOD ACCEPTANCE .
ANTECEDENTS	1. Physical	
	2. Verbal	
	3. Physical/Verbal Combined	
	4. No Antecedent	
CONSEQUENCES	5. Physical	
	6. Verbal	
	7. Physical/Verbal Combined	
	8. No Consequence	

*All restraint conditions have been excluded for ethical purposes.

Appendix D

Questionnaire for Experts to Determine Treatment Conditions from the Descriptive Analysis and Functional Analysis

Assessor	Date

Thank you for agreeing to participate in my research. You are being asked to participate because of your expertise in designing behavioral assessments and treatments. Please answer the following questions before going on:

1. What is your current employment position?	
2. How many years have you provided behavioral assessment and treatment?	
3. What degree do you currently hold in Psychology?	

Thank you.

The general task is to review the assessment data (graphs and table attached) in order to determine which conditions should be implemented during treatment. The goal of treatment will be to increase acceptance of food or drink offered at mealtimes.

The target behavior is acceptance of food offered. The assessment data provided below depict the percentage of acceptance of food for each condition. Conditions may include interactions of the caregiver and participant, such as verbal interaction, physical interaction, or combinations of these conditions. These conditions may occur as either an antecedent to the offering or as a consequence to the acceptance of the offering. The percentage of acceptances of the offerings during each session (frequency of accepts /frequency of offerings x 100) is the dependent measure.

1. Please review the graphs depicting the percentage of accepts for each session for all conditions and the Table indicating the average percentage of accepts per condition.

2. Based on this assessment information, please indicate which condition(s) you would include in treatment in order to increase acceptance of offerings during mealtimes. To indicate your treatment choice(s), make a check in the column to the extreme right of the condition of your choice. Feel free to choose more than one condition to include in treatment, if that would be your treatment recommendations. If you choose more than one condition, then rank them in the column to the right of the chosen conditions.

Participant	Assessor	Date

Insert Figure of Descriptive Assessment for Participant

PART A.		PART B.
CONDITIONS		1. Place a ✓ beside the condition chosen for treatment 2. If 2 conditions are chosen then rank them in descending order.

Participant	Assessor	Date

Insert Figure of Functional Analysis for Participant

PART A.		PART B.
CONDITIONS		1. Place a check mark beside the condition chosen for treatment 2. If 2 conditions are chosen then rank them in descending order.

Appendix E

Point to Point Percentage Agreement for Each Interval for Accepts for the Descriptive Assessment, Functional Analysis, and Treatment

Participant	Descriptive Assessment			Functional Analysis			Treatment		
	Sessions Viewed	Mean Percentage Agreement	Range	Sessions Viewed	Mean Percentage Agreement	Range	Sessions Viewed	Mean Percentage Agreement	Range
Carrie	40	98.5	98 - 99	25	97.7	95.1 - 100	25.0	96.1	87.5 - 100
Dana	55	100	100	33	90.5	86.0 – 94.0	66.6	90.8	83.0 – 97.0
Franie	50	99	94.3 - 100	67	96.0	92.0 - 100	73.0	91.0	79.0 – 99.0
Colleen	89	99	96-100	92	93.0	86.0 – 93.0	60.0	90.0	81.0 – 99.0

Appendix F

Percentage Agreement for the Descriptive Analysis and Agreement for Antecedents and Acceptance and Acceptance and Consequences

Percentage Agreement for Each Antecedent and Acceptance

Participant	Percent Sessions Viewed	Complete Interval		Verbal		Physical		Verbal Physical		Restraint	
		Percent Agreement	Range	Agreement	Range	Agreement	Range	Agreement	Range	Agreement	Range
Carrie	40	89.5	88 -91	98.3	97.5 - 99	99.5	99 - 100	100	100	100	100
Dana	55	93.8	85-100	99.0	95-100	99.5	97.6-100	100	100	95.8	80-100
Franie	50	98.0	94-98	99.0	96.4-100	99.0	94.4-100	100	100	100	100
Colleen	89	97.0	91-99	99.9	99-100	100	100	100	100	100	100

Percentage Agreement for Each Antecedent and Acceptance

Participant	Verbal Restraint		Physical Restraint		Verbal Physical Restraint		No Antecedent		Food Type	
	Agreement	Range	Agreement	Range	Agreement	Range	Agreement	Range	Agreement	Range
Carrie	100	100	100	100	100	100	100	100	100	100
Dana	97	91-100	100	100	100	100	96.2	77-100	100	100
Franie	100	100	100	100	100	100	97.9	95.2 - 100	100	100
Colleen	100	100	100	100	100	100	96.8	87.5 - 100	99.5	98-100

Appendix F continued

Percentage Agreement for the Descriptive Analysis and

Agreement for Antecedents and Acceptance and Acceptance and Consequences

	Agreement for Each Acceptance and Consequence							
	Verbal		Physical		Verbal Physical		Restraint	
Participant	Agreement	Range	Agreement	Range	Agreement	Range	Agreement	Range
Carrie	98.2	97.5 - 99	98.2	97.5 - 99	100	100	100	100
Dana	100	100	98.1	94-100	97	91-100	100	100
Franie	100	100	100	100	100	100	100	100
Colleen	100	100	99.8	99-100	99.7	98-100	99.8	99-100

	Agreement for Each Acceptance and Consequence							
	Verbal Restraint		Physical Restraint		Verbal Physical Restraint		No Consequence	
Participant	Agreement	Range	Agreement	Range	Agreement	Range	Agreement	Range
Carrie	100	100	100	100	100	100	99.5	99 - 100
Dana	100	100	100	100	100	100	90.2	55-100
Franie	100	100	100	100	100	100	97.8	95.1 - 100
Colleen	100	100	100	100	100	100	98.8	94.1 - 100

	Agreement for Each Acceptance and Consequence							
	Food Change		Physical Removed		Restraint Removed		Physical Restraint Removed	
Participant	Agreement	Range	Agreement	Range	Agreement	Range	Agreement	Range
Carrie	100	100	100	100	100	100	100	100
Dana	100	100	100	100	100	100	100	100
Franie	100	100	100	100	100	100	100	100
Colleen	100	100	100	100	100	100	100	100

Appendix G

Treatment Integrity Measures for Functional Analysis and Treatment

Table 1

Treatment Integrity for Functional Analysis

		Antecedent	Food Type	Consequence	Intertrial Interval	Total Interval	
Participant	Percent of Sessions Viewed	Mean Percent Agree	Mean Percent Agree	Mean Percent Agree	Mean Percent Agree	Mean Percent Agree	Range
Carrie	25	99.4	99.7	97.7	100	97.7	95.1 - 100
Dana	42	98.1	97.3	99.4	100	90.9	87 - 95
Franie	67	100	87.0	99.7	99.5	96	92 - 100
Colleen	33	100	99.4	99.4	100	98.7	95 - 100

Table 2

Treatment Integrity for Treatment

		Antecedent	Food Type	Consequence	Intertrial Interval	Total Interval	
Participant	Percent of Sessions Viewed	Mean Percent Agree	Mean Percent Agree	Mean Percent Agree	Mean Percent Agree	Mean Percent Agree	Range
Carrie	25	99.4	99.7	97.7	100	97.7	95.1 - 100
Dana	25	86.6	98.8	98.6	100	85.2	75.0 - 93.1
Franie	26	98.2	100	97.9	100	96.0	87.5 - 100
Colleen	27	100	100	92.1	100	92.1	92.5 - 100

Appendix H

Duration of Descriptive Analysis Sessions

Participant	Number Of Sessions	Total Assessment Time	Mean Session Duration	Range
Carrie	5	134 min 50 s	27 min	23 min 30 s - 33 min 10 s [a] (26 min 30 s)
Dana	11	122 min 30 s	11 min	6 min 30 s - 17 min 30 s
Franie	12	125 min	10 min	3 min 30 s - 13 min 20 s
Colleen	9	134 min	15 min	10 min - 25 min [b] (17min)

Note. [a] There was only one session that extended to 33 min 10 s. Because the range was generally between 23 min 30 s and 26 min 30 s the longest duration of the DA meal was considered to be 26 min 30 s. [b] There was only one session that extended to 25 min. Because the range was generally between 10 and 17 min the longest duration of the DA meal was considered to be 17 min.

Appendix I

Duration of Functional Analysis Sessions

Participant	FA Conditions				Number of Sessions	Session Duration	Total FA time
Carrie	VPC	PC	VC	VPA	12	11 min 20 s	136 min
Dana	NC	PC	NA	VPA	12	10 min 20 s	124 min
Franie	VPC	VA	NA	NC	12	10 min 30 s	126 min
Colleen	PC	VPC	VC	PA	12	11min 20 s	136 min

Appendix J

Mean Percentages of Acceptance for Each Antecedent and Consequence Condition and Overall During the Descriptive Analysis

Antecedents

Participant	Verbal	Physical	Verbal Physical	Restraint	Verbal Restraint	Physical Restraint	Verbal Physical Restraint	No Antecedent
Carrie	60	78	82	28	[a]0*	0*	0*	70
Dana	60	87	35	78	48	71*	25	96
Franie	54	49	42	0*	0*	0*	0*	60
Colleen	45	64	53	57	100*	100*	0	35

Consequences

Participant	Verbal	Physical	Verbal Physical	Restraint
Carrie	49	82	91	0*
Dana	58	90	67	66.6*
Franie	43	48	38	0*
Colleen	29	75	58	33.0*

Consequences

Participant	Verbal Restraint	Physical Restraint	Verbal Physical Restraint	No Consequence
Carrie	0*	0*	0*	74
Dana	50*	100*	100*	89
Franie	0*	0*	0*	69
Colleen	0*	0*	0*	42

Consequences

Participant	Food Change	Physical Removed	Restraint Removed	Physical Restraint Removed
Carrie	0*	0*	0*	0*
Dana	60.0*	100*	87.5*	0*
Franie	10.0*	0*	0*	0*
Colleen	37.5*	0*	50*	0*

Note. [a] The asterisk indicates fewer than 10 occurrences across all sessions.

Appendix J continued

Mean Percentage of Acceptance Overall and for Each Condition

During the Descriptive Analysis

Participant	Mean Percent Accept Out of Total Intervals Food or Drink Offered	Range
Carrie	68	63-77
Dana	75	43-94
Franie	54	22-82
Colleen	48	24-67

Appendix K

Summary of Means and Order of Conditions Chosen From Each Assessment and the Derived Treatments

Participant	Assessments									Treatments	
		Condition 1	Mean % Accept	Condition 2	Mean % Accept	Condition 3	Mean % Accept	Condition 4	Mean % Accept		Mean % Accept
Carrie	DA	VPC	91	VPA	82	PC	82	VC	49	VPA/VPC	39
	FA	VPA	72	VC	57	VPC	57	PC	49	VPA	34
Dana	DA	NA	96	PC	90	NC	89	VPA	35	NA/PC	87
	FA	NA/NC	89	VPA	80	PC	78	*	*	NA/NC	85
Franie	DA	NC	69	NA	60	VA	54	VPC	38	NA/NC	46
	FA	VPC	63	VA	56	NA	52	NC	45	VPC	42
										NO ITI NA/NC	56
										NO ITI VPC	39
Colleen	DA	PC	75	PA	64	VPC	58	VC	29	PA/PC	43
	FA	VPC	58	PC	42	PA	37	VC	36	VPC	37
										(E) PA/PC	24
										(E) PC	10
										(E) PA/PC	22
										VPC	37
										PC	27
										VPC	44

* Only 3 conditions were implemented during the functional analysis for Dana due to self injurious behavior beginning on the living unit.

Appendix L

Cost of Assessment and Treatment

Table 1

Cost of Assessment

	Descriptive Assessment			Functional Analysis			
Participant	Total Assessment Minutes	Total Minutes to Review Tapes	Total Cost $	Total Assessment Minutes	Total Minutes to Review Tapes	Total Cost $	Total Cost of DA Plus FA $
Carrie	[a]135	405	[b]101.25	135	135	33.75	135.00
Dana	123	369	92.25	123	123	30.75	123.00
Franie	125	375	93.75	126	126	31.50	125.25
Colleen	134	402	100.50	134	134	33.50	134.00

Note. [a] numbers were rounded up 134:50 = 135 x 3 =405. [b] 405 min x.25/min = $101.25 since $15.00/hr = .25 cents/min

Table 2

Cost of Treatment (Descriptive Analysis and Functional Analysis Treatments) [b]

					Treatment (DA)		Treatment (FA)	
Participant	Number of Minutes Per Meal	Total Number of Treatment Sessions	Total Number of Minutes for Treatment	Total Cost in Dollars for Treatment	Total Accepts In DA Treatment	Cost per Accept (DA) $	Total Accepts In FA Treatment	Cost per Accept (FA) $
Carrie	[a]11	8	88	22.00	69	0.32	63	0.35
Dana	10	6	60	15.00	92	0.16	96	0.16
Franie	11	7	77	19.25	78	0.25	59	0.33
Colleen	11	12	132	33.00	113	0.29	107	0.31

Note. [a] Numbers are rounded up to minutes. [b] DA and FA treatment costs are the same since meal duration and number of sessions per treatment were equal.

Appendix L continued

Table 3

Cost Per Accept for Functional Analysis Treatment When Including Cost of Descriptive Assessment

Participant	Total Cost of Assessment (DA Plus FA) $	Cost of Treatment $	Total Cost $	Total Accepts in FA Treatment	Cost Per Accept Using DA Plus FA Assessment $
Carrie	135.00	22.00	157.00	63	2.49
Dana	123.00	15.00	138.00	96	1.44
Franie	125.25	19.25	144.50	59	2.45
Colleen	134.00	33.00	167.00	107	1.56