



The effect of contracted reinforcers on targeted nutrition-related dental behaviors in six Bozeman pediatric subjects
by Karen Pal Lilly

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE
in Home Economics
Montana State University
© Copyright by Karen Pal Lilly (1980)

Abstract:

The purpose of this research was to establish and evaluate a nutrition-for-dental-health program for use in the dental office which demonstrated that rewards for targeted dietary behaviors increased those nutrition-related behaviors towards the ultimate aim of reduced dental caries. Six Bozeman children, 7 to 10 years old, were subjects in a multiple phase reversal design program. Baselines of the four target behaviors were used to establish criteria for compliance. Nutrition instruction increased knowledge of dental dietary practices but had negligible effect on actual performances. Positive reinforcement techniques were highly effective in attaining and maintaining the predetermined criteria levels in all six subjects across all four target behaviors. Recording of target behaviors was by five-day diet diaries. Appropriate levels of performance were reinforced with contracted rewards based on the subject's reinforcement hierarchy.

Control from the dentists' offices was demonstrated.

STATEMENT OF PERMISSION TO COPY

In presenting this thesis in partial fulfillment of the requirements for an advanced degree at Montana State University, I agree that the Library shall make it freely available for inspection. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by my major professor, or, in her absence, by the Director of Libraries. It is understood that any copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Signature

Karen Dale Lilly

Date

June 18, 1980

THE EFFECT OF CONTRACTED REINFORCERS ON TARGETED NUTRITION-RELATED
DENTAL BEHAVIORS IN SIX BOZEMAN PEDIATRIC SUBJECTS

by

KAREN PAL LILLY

A thesis submitted in partial fulfillment
of the requirements for the degree

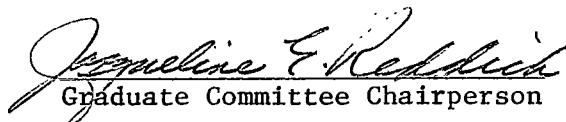
of

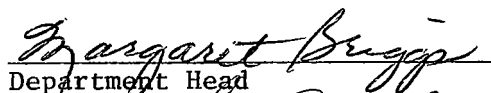
MASTER OF SCIENCE

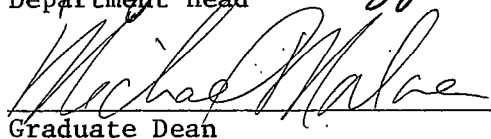
in

Home Economics

Approved:


Graduate Committee Chairperson


Department Head


Graduate Dean

MONTANA STATE UNIVERSITY
Bozeman, Montana

June, 1980

ACKNOWLEDGMENTS

Sincere thanks are extended to the many persons in my personal and professional life not mentioned herein who have unknowingly contributed to the completion of this thesis.

Gratefully acknowledged is Dr. Jaqueline Reddick's experience, professional competency and confidence in me which was freely given during these past two school years. Deep appreciation is felt for Dr. Robert Morasky who spent many long hours helping me during my pilot and thesis studies. I am indebted to his patience and efforts to help my growth. For her helpful assistance on my Graduate Committee and her moral support, sincere thanks goes to Dr. Ramona Marotz-Baden.

I would also like to express appreciation to Lawrence Pendleton, D.M.D. and William Frasier, D.M.D. and their dental teams for their assistance and cooperation with the study.

Enough gratitude cannot be extended to my family. My parents' pride and husband Michael's support and understanding helped bring this thesis to completion.

TABLE OF CONTENTS

	Page
VITA	ii
ACKNOWLEDGMENTS	iii
LIST OF TABLES	vi
LIST OF FIGURES	vii
ABSTRACT	viii
CHAPTER	
I. INTRODUCTION	1
Purpose of the Study	2
Need for the Study	4
Assumptions	6
Limitations	7
Definitions of Terms	8
II. LITERATURE REVIEW	11
III. PROCEDURES	17
Subjects	17
Design	18
Procedure	22
Phase A: Baseline	25
Phase B ₁ : Nutrition Instruction	25
Phase C ₁ : Positive Reinforcement	26
Phase B ₂ : Reversal	27
Phase C ₂ : Positive Reinforcement	27
Phase C ₃ : Maintenance	28
Analysis of Data	28
IV. RESULTS AND DISCUSSION	31
V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	45

TABLE OF CONTENTS
(Continued)

	Page
Summary	45
Conclusions	47
Recommendations	49
CITED REFERENCES	52
APPENDICES	58
A. Letters and Release Forms in Regards to Human Subjects Committee	59
B. Case History Outline	64
C. Letters to Subject's Family	66
D. Time Line and Program Format	69
E. Diet Diary Form	73
F. Behavior Contract	77
G. Pre- and Post-Test	79
H. Questionnaire for Reinforcement Heirarchy	83
I. Sucrose Content of Selected Breakfast Cereals	85
J. Check-List Diet Diary Analysis Form	88
K. Comparisons of Two Treatments: Instruction With Baseline and Reinforcement ("Sugar Foods")	90
L. Comparisons of Two Treatments: Instruction With Baseline and Reinforcement ("Sugar Foods" Between Meals)	92
M. Comparisons of Two Treatments: Instruction With Baseline and Reinforcement ("Protective Foods")	94
N. Comparisons of Two Treatments: Instruction With Baseline and Reinforcement ("Cleaning Foods")	96

LIST OF TABLES

Table	Page
1. SUMMARY OF PHASES, THE TREATMENT DURING EACH PHASE AND ADDITIONAL PROCEDURES ADMINISTERED TO EACH SUBJECT DURING THE DENTAL-NUTRITION PROGRAM	21
2. PRE- AND POST-TEST AND DIFFERENCE SCORES FOR EACH OF THE SIX SUBJECTS BEFORE BASELINE DATA COLLECTION AND AFTER NUTRITION INSTRUCTION	32

LIST OF FIGURES

Figure	Page
1. TOTAL "SUGAR FOODS" EXPOSURES PER DAY FOR EACH PHASE	33
2. "SUGAR FOODS" EXPOSURES BETWEEN MEALS PER DAY FOR EACH PHASE	35
3. TOTAL "PROTECTIVE FOODS" EXPOSURES PER DAY FOR EACH PHASE	36
4. TOTAL "CLEANING FOODS" EXPOSURES PER DAY FOR EACH PHASE	38

ABSTRACT

The purpose of this research was to establish and evaluate a nutrition-for-dental-health program for use in the dental office which demonstrated that rewards for targeted dietary behaviors increased those nutrition-related behaviors towards the ultimate aim of reduced dental caries. Six Bozeman children, 7 to 10 years old, were subjects in a multiple phase reversal design program. Baselines of the four target behaviors were used to establish criteria for compliance. Nutrition instruction increased knowledge of dental dietary practices but had negligible effect on actual performances. Positive reinforcement techniques were highly effective in attaining and maintaining the predetermined criteria levels in all six subjects across all four target behaviors. Recording of target behaviors was by five-day diet diaries. Appropriate levels of performance were reinforced with contracted rewards based on the subject's reinforcement hierarchy. Control from the dentists' offices was demonstrated.

CHAPTER I

INTRODUCTION

In accord with current scientific knowledge, nutrition is one component of sound dental health: (1) Clean your teeth, (2) Visit your dentist, (3) Choose food wisely (National Dairy Council, 1977). Therefore, for a total dental health care plan, each of these components needs to be integrated formally into an active cost-effective and practical program (Mercer, 1975; Legler, 1978). This research involved the nutritional component of this kind of program.

The inclusion of the nutritional component in dental care requires individualized nutrition education and the necessary behavior changes (Mercer, 1975; Mager, 1962; Nizel, 1972; Legler, 1978). Good in-office administration of this kind of program requires a person competent in multi-modal instruction and who is trained in behavior management techniques. Both of these traits are infrequently found in dental office personnel, but that does not mean the program described is impossible to establish. It was the objective of the investigator to establish and evaluate a nutrition-for-dental health program for use in the dental office.

Considering that nutrition towards the aim of decreased dental caries has been preached at school and at home as well as from the dentist's office for so long (Nizel, 1972), what can the investigator

add to shed new light on a relatively old topic? Since the batting record for the "Do-as-I-say" method to achieve eating-behavior change has been poor at best (Nizel, 1972; Evans, 1978), this study sought to show that the addition of positive reinforcement for appropriate eating behaviors in a modified "Do-as-I-say" schooling produced desirable behavior changes. The problem that the investigator actually posed was "Do rewards for target eating behaviors gain compliance while 'talking until you are blue in the face' has failed?"

Purpose of the Study

One of the most prevalent diseases affecting mankind today is dental caries (Finn and Glass, 1975; Bernier and Muhler, 1975; Rowe, 1978; Nizel, 1977). In some areas of the country the incidence of caries may be on the increase (Finn and Glass, 1975; Mandel, 1979). In research as well as in practice, the overall problem remains how to reduce the incidence of dental caries.

One explanation given for the increased incidence of dental caries is modern dietary habits (Nizel, 1972; Rowe, 1978; Finn and Glass, 1975; Mandel, 1979; Bernier and Muhler, 1975). It is acknowledged (Navia, 1973; Shaw, 1975; Rowe, 1978) that good nutrition can foster dental health and poor nutrition can contribute to the decay process. Given this nutritional correlation to dental health, the overall problem in this thesis became: what dietary measures need to

be taken to reduce the incidence of dental caries?

Nizel (1972) and others (Navia, 1973; Shannon and Edmonds, 1976; Finn and Glass, 1975; Bibby, 1975; Legler, 1978) have documented that nutrition instruction should be available to patients for good dental health. According to Evans and Hall (1978), Ferguson (1978), Mahoney and Caggiula (1978) and Legler (1978), the nutrition education at the dentist's office must do much more than impart information. The focus must be on changing specific dietary behaviors involved in dental health. This study addressed the more specific problem: how can poor nutrition-related behaviors be changed?

The operant conditioning paradigm provided an approach to behavior change (Evans, 1978; Kazdin, 1975). According to this theory, operant conditioning focuses on the consequences of behavior (Skinner, 1974). When something good immediately follows a behavior, that behavior increases (Zifferblatt, 1975). An example in dental health is the yummy taste of a gooey candy bar as a positive consequence to candy-bar-eating behavior. The candy-bar-eating behavior will continue and likely increase. What is the equivalent consequence to eating a raw carrot? There is none. These two consequences are really not comparable to most individuals. Then, how can some positive consequence to good dental-nutrition behaviors be established? The objective of this study was to establish and evaluate a nutrition-for-dental-health program for use in the dental office which

demonstrated that rewards for targeted dietary behaviors increased those nutrition-related behaviors towards the ultimate aim of reduced dental caries.

Need for the Study

Because dental practice has been technique or process oriented (Bernier and Muhler, 1975), successful behavior management of preventive dentistry is almost non-existent. In fact, according to Albridge (1974), less than 1% of dental students' time is spent in behavioral-social sciences. Only recently has systematic behavioral analysis been applied to preventive dentistry. Absent from the annals of dental research is a cumulative body of empirical knowledge concerning the behavior demanded in preventive dental health care (Chambers, 1977; Douglas and Stacy, 1973; Albridge, 1974; Navia, 1973).

In order to achieve successful behavior management of preventive dentistry, the patient's dental health outcomes and then the subsequent behaviors need to be defined (Cordes, 1978; Crowder and Bennette, 1976). For example, when the terminal goal is defined as decreased dental plaque, the appropriate terminal behaviors are next clarified as brushing, flossing and proper dietary intake. The patient's terminal outcome and behaviors have been now outlined for a successful, systematic approach to behavior management (Zifferblatt, 1975).

Looking back, one reason why patient outcomes have not materialized is because dentists and educators have relied on imparting pertinent facts with the idea that knowledge alone would cause a change in oral health concepts or attitudes and then ultimately behavior change would occur (Douglas and Stacy, 1973; Chambers, 1977; Ferguson, 1978; Albridge, 1974). According to Douglas and Stacy (1973) and Evans and Hall (1978), change at the emotional level does not ensure the behavioral change. Therefore, the instructional strategy is most successful when directed at obtaining those predefined appropriate behaviors necessary for the patient's dental health outcome (Douglas and Stacy, 1973).

For this investigator, the question that followed was what ought to be done? Most agree that preventive dentistry behavior changes are desirable through the dentist's office (Navia, 1973; White, 1977; Chambers, 1977; Albridge, 1974; Legler, 1978). The dental office staff is knowledgeable in dental health concepts since they are the professionals/specialists in the field. Also, the clout the dentist and dental auxiliaries possess due to their status, white attire and being a respected authority figure outside the family can be used to advantage. Dental health information at school is at best only supportive of the education at the dental office since only general facts are provided on a non-individualized basis. The family acts as an extension of the education from the dental office while the dentist's

office remains the focal point of information and behavior management.

Having established that the dentist and the dental auxiliaries are the best qualified to manage dental behavior changes, a look at what was instrumental in behavior management was also necessary. Behavior modification has the tools for change (Ferguson, 1978) and dental students, dentists and dental auxiliaries can be taught behavior modification techniques (Rosenberg, 1974; Albridge, 1974; Shaw, 1975). Possible, then, is behavior modification woven into all factors of preventive dentistry: care of the oral cavity, microbial factors and nutrition (Navia, 1973; Legler, 1978).

The changes in nutrition-related preventive dentistry behaviors were of particular interest to the investigator. Desirable was nutrition education (in the true sense when change is included in its definition) offered directly to the dental patient by the dentist and his auxiliary staff so that the appropriate behavior changes were incorporated into the patient's living pattern (Navia, 1973; Becker and Jones, 1975). This study contributed to the needed research in behavior management of nutrition-related preventive dentistry through the dentist's office.

Assumptions

Dental research has shown that eating habits influenced the incidence of dental caries (Nizel, 1972; Bernier and Muhler, 1975;

Rowe, 1978; Mandel, 1979) and this relationship was not re-examined in the study.

A change in dental home care (brushing and flossing) may influence the incidence of dental caries.

Recording one's own eating behaviors may have an effect on those dietary behaviors.

Limitations

The two dentists cooperating in the study were given subject screening guidelines but the process was left to their interpretation.

As in a true clinical situation the private environment was only partially controllable because of previously established food purchasing or eating habits and other family-imposed limitations; problems in finding appointment times, keeping appointments, being on time, food record keeping and unpredictable human factors (i.e. illness); as well as physical limitations such as weather conducive to illness, poor weather for travel and accommodating location for the office appointments.

The study relied heavily on self-reporting; honesty and accuracy were variables.

Because there was an imposed time limit to conduct the experiment, a dental caries measure was not feasible except as a followup study because caries development requires six months to one year to detect.

Diet was only one factor of preventive dentistry; and the other factors, control of microbial growth and the individual's disposition to decay also influenced the incidence of dental caries.

The participating dental hygienists volunteered limited time.

Since the subjects and their families were being invited to participate in a program to improve their dental nutrition, their expectations may influence their behaviors during the study. The target dietary behaviors may change prior to or during baseline due to previously gained knowledge which had not been put into practice until now.

Definitions of Terms

The following is a list of briefly defined terms the reader will encounter in following sections or will have encountered in the preceding material. These terms were chosen because the average reader will be unfamiliar with them and because the reader needs to understand the definition of these terms relative to their use in this thesis.

1. ABAB or Reversal Design: An experimental design which provided for two occasions, B to A and then A to B, for demonstrating the positive effects of the treatment variable.
2. Behavior: Any observable and measurable response or act of an individual seen as a function of the environment.
3. Behavior Change: The exerted influence over others by altering the environmental contingencies.
4. Cleaning Foods: Those foods which aided oral clearance and stimulated salivary flow such as raw apples, oranges, pears, carrots, celery and cucumbers.

5. Compliance: The extent to which an individual's behavior was in harmony with the requirements of the treatment as demonstrated by the degree he/she met criteria levels for the target behaviors.
6. Contingency: The "if-then" relationship between a behavior and the consequences which followed behavior.
7. Criteria/Criterion Level: The predetermined level of performance that was reached in a target behavior to be considered clinically acceptable.
8. Dental Health Care: The application of techniques to improve and maintain the welfare of the teeth and soft tissues of the oral cavity through dental medicine, diagnosis of disease manifested in the oral cavity and preventive dentistry which included nutrition and nutrition education.
9. Diet Diary: A written record of food and beverage recorded as it was consumed.
10. Operant Learning: A type of learning in which behaviors were altered primarily by regulating the consequences which followed them.
11. Positive Reinforcer: A highly valued event or material good which, when presented, increased the probability of a response it followed.
12. Protective Foods: Those foods which were rich in protein and phosphates such as meats, cheese, eggs, milk and nuts.
13. Reinforcement Hierarchy: A ranked order of events and/or material goods which, when presented, increased the probability of a behavior occurring. The highest in the series was the strongest reinforcer.
14. Secondary Reinforcer: An event which became reinforcing through learning. The event became a secondary reinforcer by being paired with other events which were already reinforcing.
15. Single-subject Design Research: The study of one individual's behavior as a function of his environment which was in some way controlled. When the behavior(s) of more than

one subject was (were) observed, it was considered duplication of the treatment while still recognizing individuality of an organism.

16. Sub-criteria Measures: Situations to test if the material first presented was understood and how well it was understood.
17. Sugar Foods: Those foods which were composed largely of simple carbohydrate such as sugar, honey, syrup, frosting and candy. Also, those sugar-rich foods which were adhesive to tooth surfaces such as dried fruit, cake and other confections.

CHAPTER II

LITERATURE REVIEW

An individual's dental health prognosis is determined by the interaction of host, microbial factors and diet (Rowe, 1978; Legler, 1978; Bernier and Muhler, 1975; Mandel, 1979; Nizel, 1972). Although the approach to preventive dentistry considers all those factors not just one (Navia, 1973; Legler, 1978; Bernier and Muhler, 1975; Mandel, 1979; Rowe, 1978), this study focused on diet. Good nutrition can foster dental health while poor nutrition can contribute to the dental decay process (Navia, 1973; Shaw, 1975, Sweeney, 1977). Additionally, the dentist should understand the application nutritional science has to dentistry (Shaw, 1975; Sweeney, 1977). The dental decay process is dependent on the topical adhesion of simple dietary saccharides making the physical nature of the sugar exceedingly important. The greater the retention quality (i.e. stickiness) of the sugar-rich food, the longer the contact of the bacterially produced acid with the enamel surface, and therefore, the greater the caries potential. Another important factor contributing to dental decay is frequent snacking of sugar-rich food even though only small amounts of sugar may be consumed each time. Therefore, the influence of food on dental caries comes from the type and frequency of sugar-rich foods (Nizel, 1977; Navia, 1973; Legler, 1978; Shannon and Edmonds, 1976;

Finn and Glass, 1975; Bibby and Mundorff, 1975; Mandel, 1979; Sweeney, 1977).

A few nutrients have been shown to have some anticaries properties. Those pertinent to this study are foods high in protein and phosphates (Nizel, 1977). Other foods which may not be anticariogenic but contribute little to the dental decay process due to their maximal oral clearance and stimulation of salivary flow are certain raw fruits and raw vegetables (Nizel, 1972).

Dental health educators, including the dentist, the dental hygienist and the nutritionist, can play an important role in determining how their patients will behave in terms of preventive dentistry. In the past focus was on decreasing caries from the dental chair. The burden of dental health had fallen on the dentist and his ability to control caries at the patients' annual dental appointments. The dentist had become the exclusive agent for obtaining dental health — the patients had not assumed any part of the burden of maintaining their own dental health (Douglas and Stacy, 1973).

History has shown that one of the reasons that has inhibited the development of long term oral health behavior in dental patients was the failure of dental health educators to monitor and reinforce any desired behavior change in their patients which has been carried out in his/her living patterns (Douglas and Stacy, 1973; Zifferblatt, 1975). More recently however, preventive dentistry has seen behavior

modification as a method of teaching desirable behaviors to dental patients through operant learning and positive reinforcement (Albridge, 1974; Fitch, 1972; White, 1974; White, 1977). According to Albridge (1974), a mediator must possess the patients' reinforcers and must be able to dispense them on a contingency and in this way manage an effective program. The dentist and his team, then, are the significant candidates for such a program if trained in communication and educational skills and behavior modification.

There should be acknowledgment by both the dental health professionals and their patients of the important role behavior plays in determining the patients' dental health (Rosenberg, 1974; Legler, 1978). The effectiveness of behavior management techniques applied to nutrition have been fostered (Barlow and Tillotson, 1978; Mahoney and Caggiula, 1978; Evans and Hall, 1978; Ferguson, 1978). Studies in various areas of dental health give support that behavior modification offers some principles for modifying dental patients' behaviors that are routinely successful and acceptable to the patients and staff (White, 1977; Evans, 1978; Albridge, 1974; Legler, 1978).

Behavioral science cannot offer a panacea, but rather it offers additional tools with which to approach the problems of dental health. Behavior modification can be an ally to the health sciences (Evans and Hall, 1978; Mahoney and Caggiula, 1978; Evans, 1978), especially since the success of preventive dentistry depends on behavioral change.

Interestingly, dentistry has been employing behavior modification, albeit incorrectly, for some time now (Rosenberg, 1974). In other words the unconditionally giving of a sucker or toy to the pediatric dental patient as he leaves the office is reinforcement, a behavior modification technique. No matter whether home care, dietary habits or behavior in the dental office was good or poor, the patient gets his reward reinforcing whatever behaviors had been taking place. What the dentist may have unwittingly reinforced are all the inappropriate behaviors which led up to the dental appointment. If the patient is confused, it is no wonder. First he is nonspecifically reprimanded for inappropriate dental health behaviors, then is lastly rewarded for being a "good boy/girl"! Yet, the dentist queries "Why do I have to keep talking myself blue in the face?"

In a well planned behavior modification program patients quickly get the message of what their performance should be (White, 1977). Studies that have employed behavior modification tools in dental practice report that it is important to explain the specific behavior at hand and to select individualized and strong reinforcers for that particular behavior (Rosenberg, 1974; White, 1977). It is also vital to reinforce immediately and positively (White, 1977; Rosenberg, 1974; Fitch, 1972; Albridge, 1974; Kazdin, 1975). With children it has been advised to use material items (Fitch, 1972) even though praise will serve as the necessary secondary reinforcer (Kazdin, 1975). Children

need simplicity, repetition, frequent contact and some method of measuring their accomplishments (Fitch, 1972). The use of these measures strengthens behaviors and shapes new behaviors (Hersen and Barlow, 1976; Kazdin, 1975).

While new behaviors are being shaped, the child should be trained to eventually reinforce himself/herself for appropriate behaviors and learn to maintain those behaviors (Albridge, 1974). Kazdin (1975) recommends pairing social reinforcers, such as praise, with material reinforcers. Since praise is a generalized conditioned reinforcer, it is less subject to satiation than other types of reinforcers. Praise can continue to be a reinforcer to be used at home once the patient or subject is weaned from the contingencies (Kazdin, 1975; Schwitzgebel and Kolb, 1974).

Operant learning theory studies the relationships between observable, definable behavior and the environment. Every response produces some consequence and the behavior will be increased or decreased depending upon the nature of the consequences (Skinner, 1974; Zifferblatt, 1975). The relationships between a response and what follows that response is known as a contingency. Contingencies can be set up as reward-type consequences in response to appropriate behavior during a behavior modification program. Operant learning with positive consequences, then, can be an effective means of increasing the desirable eating behaviors in dental patients or research subjects.

Where individual behavior is of primary concern, single subject experimentation has been shown to be a valid and useful strategy for studying behavior change (Hersen and Barlow, 1976; Martin and Pear, 1978). The two basic issues to single case methodology are the same in any science: variability and generality of findings. According to Hersen and Barlow (1976), seeking sources of variability in individuals must take place in order to pursue an applied clinical science of human behavior change. Furthermore, he contends that even though establishing wide generality from results in single case research has its limits, there are also real problems when trying to establish generality from results of a large group study.

CHAPTER III

PROCEDURES

The components that made up the composite procedure for this research project are discussed in this section. The dental-nutrition program, the observation system and evaluation techniques are discussed. Throughout this chapter the investigator describes and substantiates details of the program and methodology.

Subjects

Whenever individuals are subjects of research, Montana State University requires approval of the Human Subjects Committee. Before the initiation of the dental-nutrition program, approval by the Human Subjects Committee was obtained (Appendix A). Additionally, the mother of each subject signed a release form acknowledging cooperation in the study (Appendix A).

The subjects were seven to ten year old children from the Bozeman community. Selection was made from an initial screening performed by two Bozeman dentists and their dental hygienists. The criteria that they used to determine who was selected for the study were presence of dental caries, poor home care, poor dietary habits and responsible families who have kept their dental appointments (Appendix B). Each dentist submitted eight selections that met the above criteria.

Also, each indicated four out of the eight who would be the best candidates for the study. A total of six children was enrolled in the study. This procedure is described below.

In order to obtain six subjects each of the sixteen selected families received one letter from the investigator describing the study and one letter from the dentist recommending participation (Appendix C). A followup phone call was made post-mailing to inquire whether the family and the intended subject agreed to participate. The eight indicated by the dentists as the "best candidates" were called first but only five of these agreed to participate in the dental-nutrition program. The other families were called until a sixth agreed to participate. The rest of the families were called in order to notify them that the program had been filled. Names of interested families were recorded in case of drop outs. During this initial phone call, questions were answered and an appointment scheduled with the mother and the subject for the first office visit with the investigator.

Design

Operant conditioning was fundamental to the single subject reversal design of this study. This particular design was used to demonstrate that the contingencies had greater influence than nutrition instruction. Also, the reversal design was selected in order to avoid

problems of generalization encountered in a previous study (Morasky and Lilly, 1980).

The reversal design is often called ABAB design because A (baseline) and B (experimental) phases are alternated in order to demonstrate a functional relationship between treatment and behavior change. In this study there were a total of six phases: A, B₁, C₁, B₂, C₂, C₃. Phase A served as the baseline prior to any kind of instruction or treatment. The data collected at this phase were used to establish criteria for the target eating behaviors. The B₁ phase was the nutrition instruction phase. Target behaviors were compared to criteria established in the A phase. The B₁ phase was also a "baseline" with which the C₁ phase was compared. The C₁ phase was the first behavior modification treatment phase. The reversal design requires that the experimental phase be temporarily withdrawn. Reinstatement of the B₁ or "reversal" phase was to determine whether the targeted behavior would have stayed the same if the program had not been introduced. The C₂ phase was reinstated when the behavior resembled baseline. If the behavioral changes in the first experimental phase (C₁) returned to baseline or near baseline levels during the second baseline (reversal), B₂ phase, and again changed in the final experimental phase (C₂), a clear demonstration of the effect of behavior modification techniques would be provided (Kazdin, 1975; Albridge, 1974). According to Hersen and Barlow (1976), the two occasions for demonstrating the positive effects

of the treatment variable further strengthen the conclusions that were derived as to its controlling effects over the target behaviors. The final phase, C_3 , was the maintenance phase of target behaviors at criterion levels. Table 1 summarizes these phases and treatments.

Predetermined criteria for the target behaviors were established as a measurement of compliance and basis for reward. Criteria for target dental health behaviors were individualized while still following Nizel's (1972) principles of diet therapy.

The time line for this study was established as for a clinical situation such that the length of the dental program was adjusted according to the individual subject's performance. This meant that even though it was conceivable that each office visit initiated a new phase (e.g. from C_1 to B_2), a subject did not change phases unless his/her target behaviors were stable at the predetermined criteria levels. In other words, he/she continued in that phase until his/her target behaviors increased (Appendix D).

The five-day diet diary was the vehicle for self-reporting eating behaviors for each subject. The subject's parent(s) recorded the child's eating behaviors or in some cases merely monitored closely the subject's recording. The diet diary keeping required an accurate description of foods eaten excluding specific amounts (Appendix E). Differentiation of foods eaten at and between meals was necessary. The diet diary was used since it is a more accurate account of actual

TABLE 1. SUMMARY OF PHASES, THE TREATMENT DURING EACH PHASE AND ADDITIONAL PROCEDURES ADMINISTERED TO EACH SUBJECT DURING THE DENTAL-NUTRITION PROGRAM.

Phase	Phase Title	Treatment	Additional Procedures
A	Baseline	None	Diet-diary-keeping instruction, pre-test, data used to establish target-behavior criteria, diet diary keeping.
B ₁	Nutrition Instruction	Dental-nutrition information given	Post-test, diet diary keeping.
C ₁	Positive Reinforcement	The contracted reinforcer was given if target behaviors met criteria*	Diet diary keeping.
B ₂	Reversal	No contingencies were in effect	Diet diary keeping.
C ₂	Positive Reinforcement	The contracted reinforcer was given if target behaviors met criteria*	Diet diary keeping.
C ₃	Maintenance	The contracted reinforcer was given if target behaviors met criteria*	Diet diary keeping.

* For criteria, the four target behaviors had to be performed at the specified levels for four out of five consecutive days. Progression to this and the next phase was not made unless all target behaviors were at criteria.

food intake than a 24-hour recall or a diet history which rely on memory and interviewing techniques. The duration of recording was five days since three days has been shown to be an unreliable picture; and when more than seven days are recorded, there is decreased accuracy (Pike and Brown, 1975). Self-reporting has been shown to be a viable methodology if certain measures are taken prior to its initiation (Mahoney and Thoreson, 1974; Jeffrey, 1974; Kazdin, 1974). According to Broden (1974), the most promising feature of self-recording is as a monitoring device for the initiation of desired levels of the target behavior. Such is the case in the present study where the investigator reinforced the target behaviors after assessing the diet diary. Kazdin (1974) suggests that when self-monitoring is used for assessment purposes, independent corroborative data be used in order to validate the accuracy of the assessment. In light of this, the investigator discussed with the subject and his/her mother about taking precautions against the subject doing any false reporting and verbally contracted with the parents low profile "watch-dog" tactics. Also, during diet diary analysis, the mother was interviewed about the diary's content.

Procedure

Six phases were sequentially introduced to all participants (Table 1). During each phase, food consumed was recorded on the

standardized diet diary form for five consecutive days including one day of the weekend (Appendix E). Each phase required a fifteen minute appointment with the investigator at the dentist's office except for the first two appointments when 45 minutes were scheduled each time.

Since food habits are personal and intimate topics with most families, care was taken when approaching the subject regarding food choices and food habits. It was useful to talk with the subject's mother since she was the person who planned, purchased and prepared the food. Consequently, parental cooperation was important to the degree of compliance on the part of each subject. A lack of parental cooperation was indicated in a previous pilot study which was a hinderance to the subject's performance (Morasky and Lilly, 1980).

The reinforcers that were used during the study were visible to the subjects at the appointment during phases C_1 , C_2 and C_3 . The reinforcers were based on the information gathered regarding each child's reinforcement heirarchy yet met certain criteria for practicality: (1) easy to obtain/purchase; (2) easy to store in the dentist's office; (3) easy to display; (4) low in cost (approximately \$.50 to \$1.00 each). Reinforcers for meeting criteria for the target behaviors during phases C_1 , C_2 and C_3 were given to each subject immediately after his/her diet diary was analyzed. If the subject had not met criteria, a reinforcer for improving over baseline was given. A comic book was the reinforcer given for improvement in any

one, two or three of the target behaviors. When the reinforcers were presented to the subject, words of praise about his completion of the contract were also given.

A contingency contract was negotiated between the subject, his/her mother and the investigator during the treatment phases, C₁, C₂ and C₃. In attempt to reduce confusion and inconsistency, the contract specified the reinforcer desired by the subject and the behavior desired by the investigator. Only if the subject performed the agreed upon behaviors was he/she rewarded as recommended by Kazdin (1975) and Mahoney and Thoreson (1974).

Based on DeRisi and Butz' (1975) work, the items that were included in the contract were:

- (1) Time Line: the date agreement began and ended;
- (2) Behavior: the predetermined criterion levels for each of the four target behaviors;
- (3) Reinforcement: the amount and kind of reinforcer used including when the reinforcer was delivered;
- (4) Signatures: the subject, his/her mother and the investigator signed the contract (Appendix F). The subject and the investigator were each allowed a copy of the contract.

An additional contingency states that if the subject kept all of the appointments bringing along a completed diet diary each time, dental supplies would be given. The dental supplies consisted of a

toothbrush for each family member, a small spool of dental floss per every two family members, a dozen disclosing tablets and toothpaste.

Phase A: Baseline

The first office visit included a nutrition and dental health pretest (Appendix G) and instructions for keeping an accurate diet diary. Each participant was asked to keep a five-day diary while maintaining normal eating habits.

No contingencies were in effect for eating behaviors during this phase. However, as part of introductions and preliminary conversation, pertinent questions were asked in order to determine the subject's reinforcement hierarchy for future use when establishing contingencies and appropriate reinforcers (Appendix H).

Phase B₁: Nutrition Instruction

The second office visit included instruction by the dental hygienist concerning nutritional facts involved in dental health. The teaching tool designed and constructed by the investigator consisted of a colorful, pictorial and worded flip-chart and accompanying dialogue geared to the 3rd-5th grade level. Recommended foods and foods to avoid as well as sub-criteria measures to test learning of information presented were incorporated in the tool. The pertinent nutrition-instruction training of the two participating dental hygienists for this study was carried out by the investigator. Also, the

investigator provided a dialogue for the dental hygienist to follow which standardized the instruction content between hygienists and subjects.

The facts presented were based on Nizel's (1972), recommended dietary modifications for the prevention or control of caries: (1) a reduction in dietary carbohydrate which this investigator interpreted through reading his work and other literature to mean a significant reduction in simple carbohydrates; (2) elimination of "sticky" sweets such as candy, cake and dried fruits; (3) limiting the number of eating periods to three meals; (4) increased use of protective foods which are rich in protein and phosphates; and (5) increased use of cleaning foods which provide oral clearance of food debris and minimal accumulation of dental plaque. A post-test identical to the pre-test was administered after the nutrition instruction to test knowledge (Appendix G). If the test score was below 85% correct, the nutrition instruction and testing were repeated.

Phase C₁: Positive Reinforcement

Each subject was asked:

(1) to reduce the number of servings of sugar and sugar-added foods in his/her diet by at least 50% of his/her baseline mean on four out of five consecutive days;

(2) to eliminate sugar, sugar-added foods and "sticky" sweets

between meals on four out of the five consecutive days;

(3) to maintain his/her intake of protective foods four out of the five consecutive days above his/her baseline mean and;

(4) to have three servings of cleaning foods per day for four out of the five consecutive days. If the subject met the criteria for all four of the target behaviors, he/she received the predetermined reinforcer at the appointment when the diet diary was analyzed. If he/she improved over baseline target behaviors but did not meet the established criteria, he/she selected a comic book as reinforcement for improvement.

A contract as previously described was drawn up including the criteria for target behaviors and the contingency statement depicting the reinforcer. The subject and mother signed the contract and took it home, leaving a copy with the investigator.

Phase B₂: Reversal

All contingencies were removed. Each subject was told that no reinforcers were to be given for eating behaviors.

Phase C₂: Positive Reinforcement

Each subject was asked to perform the target dental-nutrition behaviors at the criteria levels explained in phase C₁. As previously described, another contract was drawn up including the criteria for target behaviors and the contingency statement depicting the reinforcer.

Again the subject and mother signed the contract and took it home, leaving a copy with the investigator.

Phase C₃: Maintenance

Essentially a continuation of phase C₂ took place during the maintenance phase. A contract was signed for earning a predetermined reinforcer contingent upon meeting the criteria for the target behaviors as in phase C₂.

Analysis of Data

The *Nutritive Value of American Foods*, USDA Handbook 456 (Adams, 1975), *Food Values of Portions Commonly Used* (Bowes and Church, 1975), the *Exchange Lists for Meal Planning* (American Diabetes Association, 1976) and the *Sucrose Content of Breakfast Cereals* (Appendix I) were used to formulate standardized analyses.

A check-list method of diary analysis was developed based on requirements necessary to meet target behaviors. This quick, in-office analysis was an improvement recommended in the pilot study (Morasky and Lilly, 1980). Foods recommended and not recommended were listed categorically according to whether it was a "sugar", "protective" or "cleaning" food (Appendix J). When the subject brought in the diet diary at each appointment, the check-list was used to transfer the pertinent information from the diary to the form. During each phase of the study, the subject's total number of exposures of specified

foods for each of the above four target behaviors was noted on a daily basis and plotted against the subject's predetermined criteria levels.

The pre- and post-tests taken by the subjects during the study had a dual purpose. First, the post-test disclosed whether the subjects knew the facts after the nutrition instruction. An 85% correct response was the level used in the pilot study (Morasky and Lilly, 1980) and was accepted as learned knowledge. Second, a paired t-test was calculated to determine significant differences ($p < .005$) between pre- and post-test scores (Table 2).

Since applied research affects meaningful, clinically germaine behavioral changes, the criteria against which the target behaviors were measured were set at predetermined clinically significant levels. These clinically significant criteria served as evaluation tools to determine whether behavioral change had occurred. As an analytical method, the number of subjects at criteria for the four target behaviors were quantified and graphically expressed which gave obvious, visible evidence of the success (or lack of success) of the study. As in other types of research analysis, the above method provided viable data for drawing conclusions and making recommendations.

Statistical significance was not meant to be a substitute for clinical significance yet often statistics are used as "proof" to others that treatment was influential (Hersen and Barlow, 1976).

Also, statistics are a concise descriptive language (Huntsberger, 1961). To add to the analysis of this study's intervention effects, the Wilcoxon Rank Sum Test for unpaired replicates ($p < .05$) was used. Researchers have demonstrated that the relative asymptotic efficiency compared to the t -test is 95.5% when the distribution is normal making the Wilcoxon test a useful test for the behavioral scientist (Siegel, 1956; Fruin and Davidson, 1978). This nonparametric, statistical method determined the significant differences intervention played on each subject's behavior. Comparisons were made between Baseline, Phase A, and Nutrition Instruction, Phase B₁, as well as between Nutrition Instruction, Phase B₁, and Positive Reinforcement, Phase C₁.

CHAPTER IV

RESULTS AND DISCUSSION

The objective of the nutrition knowledge testing was to establish that the subjects learned the nutrition information presented to them. The mean pre-test score was 74.2% with a range of 59.0 to 83.0 on a 100 point scale. The mean post-test score was 93.3% with a range of 86 to 97 on a 100 point scale. All subjects exceeded the 85% minimum knowledge score criterion. The differences between pre- and post-test scores ranged from 7 to 27 percentage points. Significant differences ($p < .005$) occurred between pre- and post-test means using the paired t-test (Table 2).

The objective of this study was to establish and evaluate a nutrition-for-dental-health program for use in the dental office which demonstrated that rewards for targeted dietary behaviors increased those nutrition-related behaviors toward the aim of reduced dental caries. Figures 1 through 4 graphically display the target behavior rates studied during the dental-nutrition program. Each figure depicts each subject's daily performance for the four target behaviors: Figure 1, total "sugar foods" exposures; Figure 2, exposures to "sugar foods" between meals; Figure 3, total "protective foods" exposures; and Figure 4, total "cleaning foods" exposures.

As described in Chapter III, the predetermined criteria for the

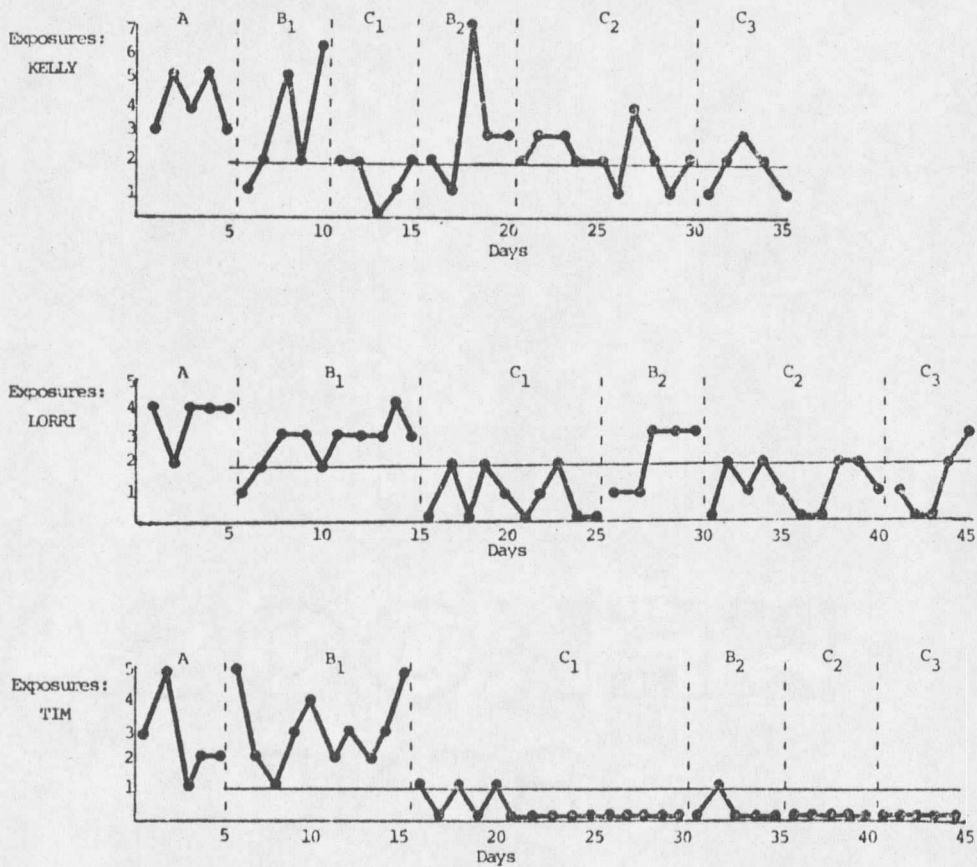
TABLE 2. PRE- AND POST-TEST AND DIFFERENCE SCORES FOR EACH OF THE SIX SUBJECTS BEFORE BASELINE DATA COLLECTION AND AFTER NUTRITION INSTRUCTION[†]

Subject	Test Scores		
	Pre	Post	Differences
Kelly	79	97	+ 18
Lorri	76	93	+ 7
Tim	76	97	+ 21
Karen	83	90	+ 7
Lisa	72	97	+ 25
Eric	59	86	+ 27
Means:	74.2	93.3	+ 17.5
			t=4.858*

[†]The paired t-test was used with degrees of freedom equaling N - 1.

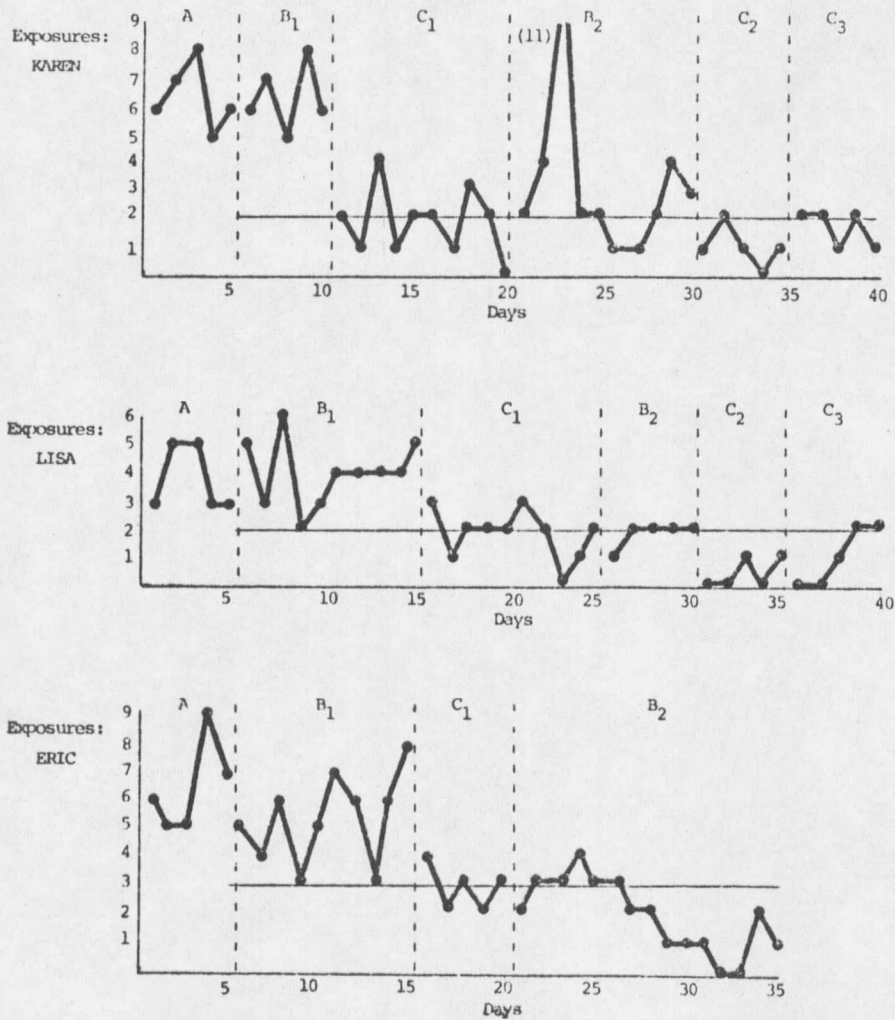
*Indicates significant difference ($p < .005$) between the pre- and post-tests.

FIGURE 1. TOTAL "SUGAR FOODS" EXPOSURES PER DAY FOR EACH PHASE.*
The horizontal criteria bar (CB) is at 50% of the baseline means.



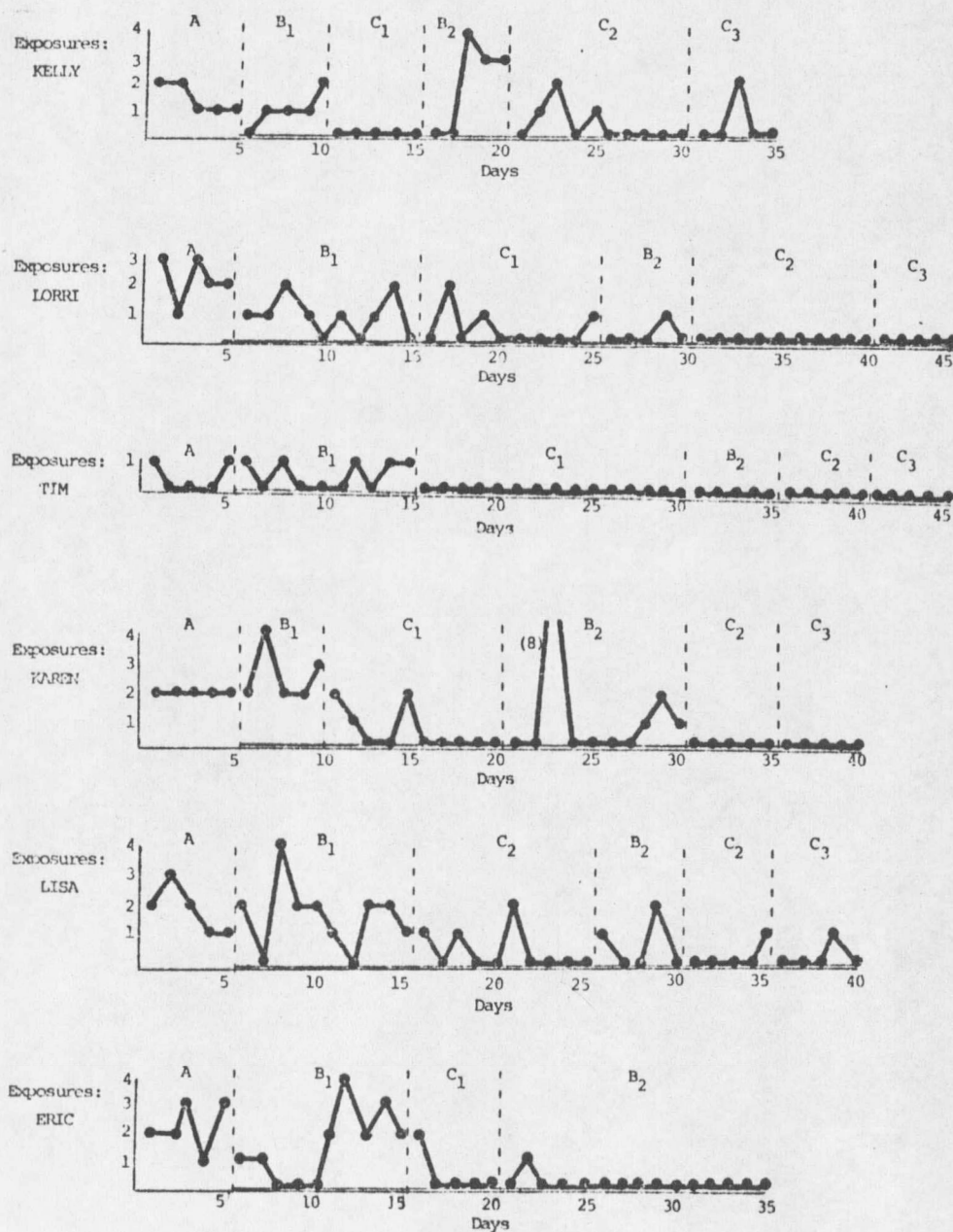
* See Table 1 for a description of phases.

FIGURE 1. (Continued) TOTAL "SUGAR FOODS" EXPOSURES PER DAY FOR EACH PHASE.* The horizontal criteria bar (CB) is at 50% of the baseline means.



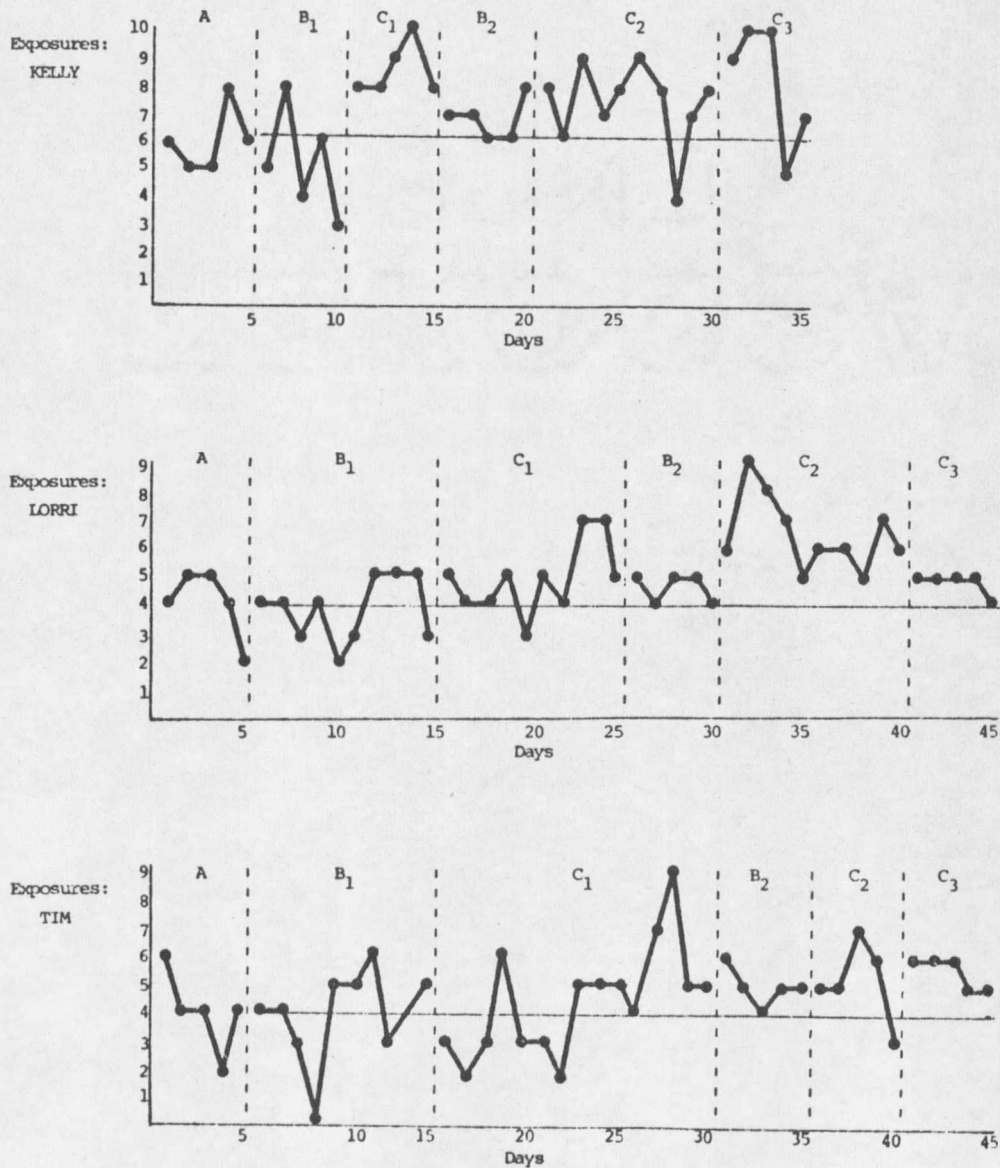
* See Table 1 for a description of phases.

FIGURE 2. "SUGAR FOODS" EXPOSURES BETWEEN MEALS PER DAY FOR EACH PHASE* The horizontal criteria bar (CB) is at zero exposures between meals.



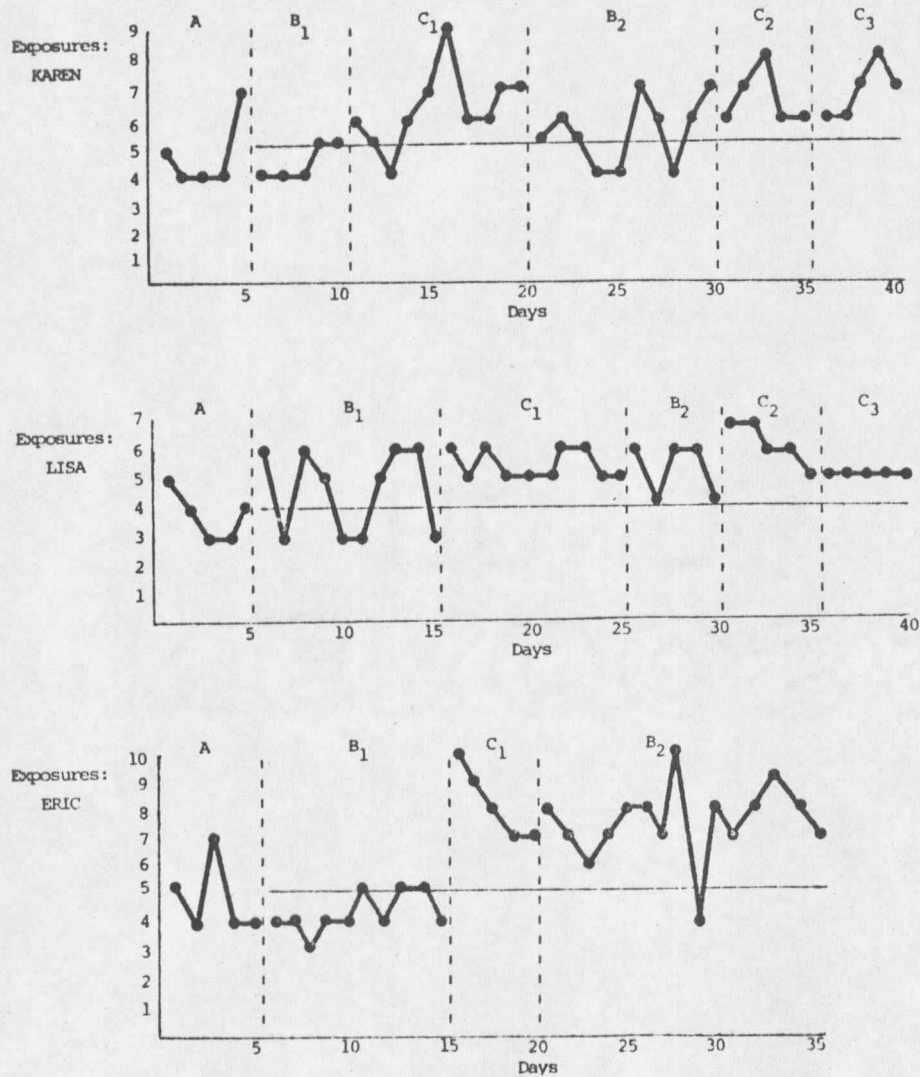
* See Table 1 for a description of phases.

FIGURE 3. TOTAL "PROTECTIVE FOODS" EXPOSURES PER DAY FOR EACH PHASE*
The horizontal criteria bar (CB) is at the baseline mean.



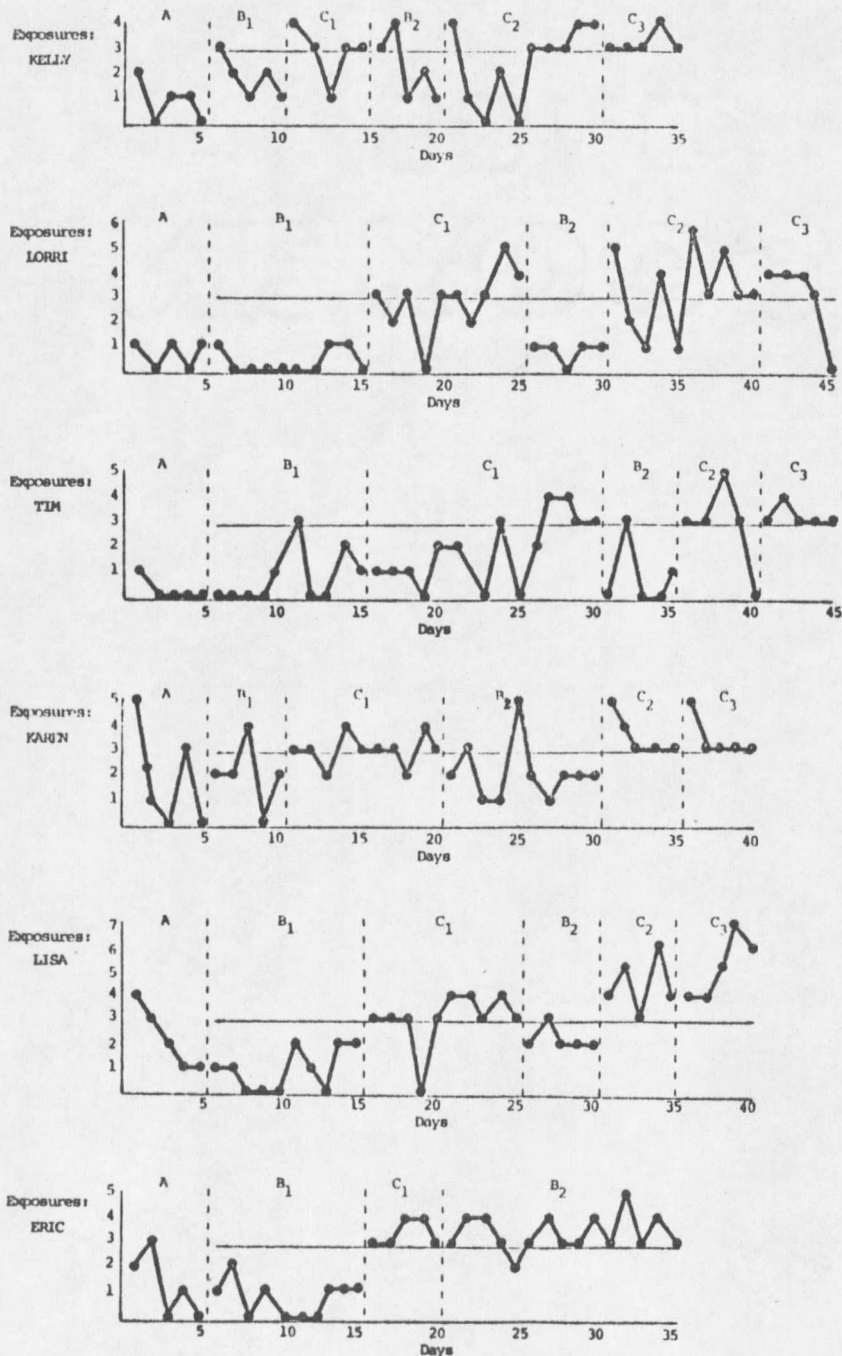
* See Table 1 for a description of phases.

FIGURE 3. (Continued) TOTAL "PROTECTIVE FOODS" EXPOSURES PER DAY FOR EACH PHASE* The horizontal criteria bar (CB) is at the baseline mean.



* See Table 1 for a description of phases.

FIGURE 4. TOTAL "CLEANING FOODS" EXPOSURES PER DAY FOR EACH PHASE*
The horizontal criteria bar (CB) is at 3 exposures.



* See Table 1 for a description of phases.

target behaviors were established as a measure of compliance and basis for reward during phases C_1 , C_2 and C_3 of the dental-nutrition program. The subjects were not encouraged to exceed criteria, just to meet them. The graphed criteria bars (CB) for each subject in Figure 1 was set at 50% of each individual's mean total exposures of "sugar foods" during Baseline, Phase A. Each subject needed to be on or below the CB four out of five consecutive days during phases C_1 , C_2 and C_3 in order to meet criteria.

The CB in Figure 2 was set at zero exposures of "sugar foods" between meals. For this behavior, each subject needed to be on the CB four out of the five consecutive days during phases C_1 , C_2 and C_3 in order to meet criteria. The CB in Figure 3 represented the mean "protective foods" exposures per day for each subject derived from his/her baseline data. Each subject needed to be above the CB four out of five consecutive days during phases C_1 , C_2 and C_3 in order to meet the criteria for "protective foods". The CB in Figure 4 was set at three servings of "cleaning foods" per day. Each subject needed to be on or above the CB four out of five consecutive days during phases C_1 , C_2 and C_3 in order to meet criteria.

Baselines, Phase A, showed varying degrees of stability across all four target behaviors and across all six subjects. It was the investigator's opinion that further baseline data collection would not result in overall increased stability. Previous research

(Morasky and Lilly, 1980) indicated that considerable variability should be expected during baseline. Also, instability during baseline can be compared with stability during treatment. None of the subjects stabilized at any of the CBs during baseline (Figures 1 through 4).

During Nutrition Instruction, Phase B₁, none of the subjects stabilized at criteria for any of the target behaviors. The number of days any of the subjects met criteria for any of the behaviors ranged from zero to three out of five consecutive days (Figures 1 through 4). There were several days when total "sugar foods" exposures and those between meals were as high or higher than during baseline. The subjects were on or below the CB for "protective foods" for 80% of the days during phase B₁. In other words, the subjects met criteria only 20% of the days. None of the subjects had three cleaning foods per day more than once (Figures 1 through 4).

From a clinical standpoint, nutrition instruction did not substantially decrease the number of exposures of "sugar foods" or "sugar foods" between meals. Nor did nutrition instruction substantially maintain or increase "protective foods" above the mean or "cleaning foods" at or above three exposures per day. Namely, nutrition instruction did not improve any target behaviors to criteria in any of the subjects (Figures 1 through 4).

During Reinforcement, Phase C₁, all behaviors for all subjects improved to criteria. That is, all subjects met the criteria for each

of the four target behaviors for four out of five consecutive days. Four of the six subjects required ten to fifteen days in phase C_1 while the other two subjects required only five days. For total "sugar foods" exposures, all of the subjects met criteria (Figure 1). For "sugar foods" between meals and total "protective foods", three of the subjects met criteria during the first five days of this phase while all the subjects had met criteria by day 25 and 30 respectively (Figure 2). For "cleaning foods", four of the subjects met criteria during the first five days of this phase while all the subjects had met criteria by day 30.

During phase B_2 when reinforcement was no longer in effect, the target behaviors deteriorated to above or below the CB across all subjects except Eric. Eric's behaviors remained stabilized at criteria throughout the remainder of the study (Figures 1 through 4).

Figures 1 and 2 show that during phase B_2 , three out of five subjects did not meet criteria for "sugar foods" and "sugar foods" between meals for two to four out of five consecutive days. Figure 3 shows that four out of five subjects did not meet criteria for "protective foods" during phase B_2 . Figure 4 shows that none of the five subjects met the criteria for "cleaning foods"; all of them were below the CB for three to five out of five consecutive days.

When reinforcement was reinstated during phase C_2 , all behaviors across all five subjects improved to at least criteria. Two of the

subjects required ten days in phase C_2 while the other three required only five days. All of the subjects except Kelly met criteria during the first five days of this phase for total "sugar foods" and "sugar foods" between meals. All of the subjects, except Lorri, met criteria during the first five days of phase C_2 for "protective foods". All of the subjects except Kelly and Lorri met criteria for the first five days of phase C_2 for "cleaning foods" (Figures 1 through 4).

During Maintenance, Phase C_3 , all subjects maintained at criteria across all target behaviors for at least four out of the five consecutive days:

Appendices K through N display the critical values (called sum T-values in the Wilcoxon Rank Sum Test) for the four target dental-nutrition behaviors: total "sugar foods" exposures; total exposures to "sugar foods" between meals; total exposures to "protective foods"; and total exposures to "cleaning foods". Using the Wilcoxon Rank Sum Test to determine the significant difference ($p < .05$) between the behaviors of the two treatments, Baseline, Phase A, was compared to Nutrition Instruction, Phase B_1 . Additionally, Nutrition Instruction, Phase B_1 , was compared to Reinforcement, Phase C_1 , on each of the tables. In each table the sum T-value for the smallest number of observations for each behavior was listed. An asterisk (*) notes significant differences ($p < .05$) between the performance levels of the two phases being compared.

As shown in Appendices K through N, there were no significant differences ($p < .05$) between the performance levels of the target behaviors during Baseline and Nutrition Instruction with one exception. Appendix K shows that Lorri's baseline exposures to "sugar foods" was significantly greater than during instruction. Interestingly, some subjects' behaviors were better during baseline than during instruction. For example, Tim, Karen, Lisa and Eric had greater "cleaning foods" exposures (within a single day) during baseline prior to the instruction.

As shown in Appendices K through N, four to six subjects show significant differences ($p < .05$) between Nutrition Instruction, Phase B_1 , and Reinforcement, Phase C_1 , across all target behaviors. Appendix K shows that the number of exposures to "sugar foods" was significantly less during phase C_1 than during B_1 for all six subjects. Five out of the six subjects had a significantly less number of exposures of "sugar foods" between meals during phase C_1 than during B_1 (Appendix L). Appendix M shows that there were significant differences in "protective foods" between phases B_1 and C_1 in four out of six subjects. All of the subjects except Tim and Lisa had significantly greater exposures to "protective foods" during Reinforcement, Phase C_1 than during Nutrition Instruction, Phase B_1 . Appendix N shows that there were significant differences in "cleaning foods" exposures between phases B_1 and C_1 in four subjects. All of the subjects except Kelly and Karen had significantly greater "cleaning foods" during Reinforcement, Phase C_1 than

during Nutrition Instruction, Phase B₁.

An observation by the investigator was that only after the reinforcement phase of the study did the subjects change their attitude towards appropriate dental-nutrition behavior. Comments made by the subjects prior to the initiation of the behavior modification techniques were to the effect that "sugar foods" were what they wanted and would like these foods at any and all times. By the end of the study when the targeted behaviors had stabilized at criteria, the subjects related that they like their new dental-nutrition behaviors and did not need their old ones any longer.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The present research focused on applying behavior modification techniques to dental-nutrition behavior in preventive dentistry. Positive reinforcement in the form of contracted rewards was the consequence to target behaviors performed at predetermined clinically significant levels. Six pediatric subjects were sequentially introduced to treatments in a reversal design methodology, the initial phase being baseline data collection. Nutrition instruction based on Nizel's (1972) principles was the second phase followed by a reinforcement-for-target-behaviors phase. Reinforcement was later removed, followed by a reinstatement of contingencies. A maintenance of target behaviors, including contracted reinforcers, was the last phase. Food intake was self and parentally recorded in 5-day diet diaries which were analyzed at the dental office. Progression to subsequent phases was made only after the subjects met criteria. When diary analyses determined that the subject met criteria during phases C_1 , C_2 and C_3 , the subject was immediately given his the contracted reward. All subjects went through the seven different phases of the study except one whose behaviors stabilized at criteria during reversal for 15 days. All subjects completed the dental-nutrition program.

The objective of the study was to establish and evaluate a nutrition-for-dental-health program for use in the dental office which demonstrated that rewards for targeted dietary behaviors increased those behaviors. The dental nutrition information was learned by the subjects but did not have any positive effect on behavior. The nutrition instruction did not significantly decrease the total number of exposures of "sugar foods" or "sugar foods" between meals. Also, nutrition instruction did not significantly increase or maintain an average amount (compared to baseline) of "protective foods". Lastly, nutrition instruction did not significantly increase the amount of "cleaning foods" in the subjects' diets.

To demonstrate that positive reinforcement increased behavior, the target behaviors across all subjects improved to at least the predetermined criteria when contracted rewards were introduced. Significant differences ($p < .05$) were noted between nutrition instruction and positive reinforcement. As a further demonstration of the influence behavior modification had on the dental-nutrition behaviors, the criteria were not met when the rewards were removed (except in one case); yet criteria were met once again when the contracted rewards were re-introduced. Behaviors continued to meet the criteria during a maintenance phase.

Also, part of the study's objective was the establishment of the dental-nutrition program in the dental office. All contact with the

subjects was made during regular weekday working hours. The office visits took 15 to 30 minutes except for the nutrition-instruction-and-testing which required 45 to 60 minutes. The dental hygienists gave satisfactory nutrition instruction using concise, portable teaching tools. The subjects showed that they were able to learn the nutrition facts within the clinical setting. Diet diaries were analyzed using a check-list analysis form requiring only 5-10 minutes. The rewards were contracted in the office and were given to the subject at the appropriate times.

Conclusions

Performance of targeted dental-nutrition behaviors was reached using behavior modification techniques meeting the primary objective, "to demonstrate that rewards for targeted dietary behaviors increase those behaviors". Positive reinforcement gained clinically and statistically significant differences ($p < .05$) in behavior by attaining and maintaining criteria-level performances of the four target behaviors. Furthermore, instruction had increased nutrition knowledge to criteria, but its effect on behavior change was not demonstrated. The targeted dental-nutrition behaviors did not improve with improved nutrition knowledge.

A closely associated objective, "to establish a . . . program for use in the dental office", was met. A multidisciplinary, dental

health team could provide nutrition counseling and manage the short-term dietary intake of pediatric patients. Post-study evaluations by the subjects and their mothers were also supportive of this conclusion.

Chapter II discusses the learning needs of an individual who is learning new behaviors. Those qualifications of a good learning situation were met during the behavior modification phases of the dental-nutrition program (phases C_1 , C_2 and C_3). During these positive-reinforcement phases, the specific dental-nutrition behaviors were explained and each subject's accomplishments were measured. The dental-nutrition instruction was simplified with the incorporation of the clear-cut contingency contract. Meeting once a week provided frequent contact and the necessary repetition of target-behavior performance. The positive reinforcement for meeting criteria was immediate since it came right after the diet diary analysis.

During the reversal phase of the study, except for Eric, all of the subjects' performance levels of some or all target behaviors declined towards baseline levels. One reason Eric's behavior did not depreciate after contingency removal was due to the carry over effects of positive reinforcement during phase C_1 . The contracted rewards were no longer necessary which showed that generalized reinforcement was in effect. Also, considered was the influence his mother exerted on his eating habits. Eric's performance was seen as clinically advantageous and positive.

Generalization to other subjects, therapists and settings can not be made from these research results. The investigator concluded that the treatment was effective for the six subjects discussed herein and that the dental-nutrition program was established in the dental offices used during the study (internal validity). However, the dental-nutrition program would have to be individualized and monitored regarding other subjects since no conclusive statement can be drawn from this study about the outcomes of other subjects, settings or adaptabilities to other therapists/dental health professionals (lack of external validity).

Although only short-term effects were studied, it was important to demonstrate the critical functional relationship between behavior and consequences within the preventive dentistry arena. Before long-term effects can be studied, the short-term or immediate behaviors need to be established. As for the individual, the targeted behaviors must be accomplished before a certain level of performance can be maintained.

Recommendations

The following are recommendations for future research in the area of nutrition-behavior modification in preventive dentistry:

- (1) Integrate the nutrition component of dental health into a comprehensive preventive dentistry program directed at the three

factors in caries development: diet, bacteria and the host.

(2) Research the long-term effects by followup study of targeted dietary behaviors.

(3) Incorporate secondary reinforcers and reinforcement schedules for use outside the dental office environment.

(4) Study developmental differences between subjects in relation to performance.

(5) Survey for attitude change before and after nutrition instruction and then after behavior change to further clarify when attitude change occurs.

(6) Study the effect of a "contract" enumerating target dental-nutrition behaviors without the reward contingency.

The following are recommendations for dental-nutrition program development:

(1) Properly train dental health professionals and auxiliaries in nutrition-behavior modification principles and techniques.

(2) Pre-test the patients for dental-nutrition knowledge and the program's terminology as a basis for instruction.

(3) Hand out lists of foods pertaining to the target dental-nutrition behaviors.

(4) Maintain a list of easily obtainable rewards based on individuals' reinforcement hierarchies.

(5) Work closely with parents since their behaviors influence

the patients' outcomes.

(6) Train parents and patients to continue positive reinforcement outside the dental office.

(7) Train the dental-health programmer to effectively wean the patients from the program.

In brief, the conclusions drawn from this research answer "yes" to the initial question, "Do rewards for target eating behaviors gain compliance . . .?" The above recommendations will further help the practitioner in preventive dentistry attain success in dental-nutrition behavior change towards the ultimate aim of improved oral health.

CITED REFERENCES

CITED REFERENCES

- Adams, C. *Nutritive Value of American Foods* (USDA Handbook #456). Washington, D. C.: United States Department of Agriculture, 1975.
- Albridge, U. Expanded functions and behavior modification. *Dental Hygiene*, 1974, 48, 349-353.
- American Diabetes Association. *Exchange Lists for Meal Planning*. New York: American Diabetes Association, Inc., 1976.
- Baer, D., Wolf, M., and Risley, T. Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis*, 1968, 1, 91-97.
- Barlow, D. and Tillotson, J. Behavioral science and nutrition: A new perspective. *Journal of the American Dietetic Association*, 1978, 72, 368-371.
- Becker, M. and Jones, R. Work session on behavior in nutrition programs. In J. Tillotson (conference coordinator), *Proceedings of the Nutrition-Behavioral Research Conference*. Sponsored by the National Heart and Lung Institute, National Institutes of Health in Bethesda Maryland, 1975. (Department of Health, Education and Welfare Publication No. NIH 76-978)
- Bernier, J. and Muhler, J., editors. *Improving Dental Practice Through Preventive Measures*, 3rd ed. St. Louis: C. V. Mosby Company, 1975.
- Bibby, B. and Mundorff. Enamel demineralization by snack foods. *Journal of Dental Research*, 1975, 54, 461-470.
- Bowes, A. and Church, C. *Food Values of Portions Commonly Used*, 12th ed. Philadelphia: J. B. Lippincott Company, 1975.
- Broden, M., Hall, R. and Mitts, B. The effect of self-recording on the classroom behavior of two eighth-grade students. In M. Mahoney and C. Thoresen (editors), *Self Control: Power to the Person*. Monterey, California: Brooks/Cole Publishing Company, 1974.

- Chambers, D. Behavior management techniques for pediatric dentists: an embarrassment of riches. *Journal of Dentistry for Children*, 1977, 44, 30-34.
- Cordes, S. Assessing health care needs: elements and processes. *Community Health Journal*, 1978, 1, 1-16.
- Crowder, D. and Bennett, A. Total commitment to goals is secret to hospital's success. *Journal of the American Hospital Association*, 1976, 50, 104-109.
- DeRisi, W. and Butz, G. *Writing Behavioral Contracts*. Chicago, Illinois: Research Press, 1975.
- Douglas, C. and Stacy, D. Establishment and maintenance of oral health behavior. *Journal of Public Health Dentistry*, 1973, 33, 123-125.
- Evans, R. Motivating changes in oral hygiene behavior: some social psychological perspectives. *Journal of Preventive Dentistry*, 1978, 5, 14-18.
- Evans, R. and Hall, T. Social-psychologic perspective in motivating changes in eating behavior. *Journal of the American Dietetic Association*, 1978, 72, 378-383.
- Ferguson, J. Dietitians as behavior-change agents. *Journal of the American Dietetic Association*, 1978, 73, 231-238.
- Finn, S. and Glass, R. Sugar and dental decay. In F. Stare (editor), *Sugar in the Diet of Man*. New York: S. Karger, 1975.
- Fitch, M., and Moxley, R., Jr. Preventive dentistry with behavior modification. *Journal of American Society of Preventive Dentistry*, 1972, 2, 45-46.
- Fruin, M. and Davison, M. Some considerations in the measurement of change. *Journal of the American Dietetic Association*, 1978, 73, 15-19.
- Hersen, M. and Barlow, D. *Single Case Experimental Designs: Strategies for Studying Behavior Change*. New York: Pergamon, 1976.
- Huntsberger, D. *Elements of Statistical Inference*. Boston, Massachusetts: Allyn and Bacon, Inc., 1961.

- Jeffrey, D. Self-control: Methodological issues and research trends. In M. Mahoney and C. Thoresen (editors), *Self Control: Power to the Person*. Monterey, California: Brooks/Cole Publishing Company, 1974.
- Kazdin, A. Self-monitoring and behavior change. In M. Mahoney and C. Thoresen (editors), *Self Control: Power to the Person*. Monterey, California: Brooks/Cole Publishing Company, 1974.
- Kazdin, A. *Behavior Modification in Applied Settings*. Homewood, Illinois: The Dorsey Press, 1975.
- Legler, D. Applications of nutritional principles to patient management. In Rowe (editor), *Proceedings of Symposium on Diet, Nutrition and Dental Caries*. Sponsored by the University of Michigan School of Dentistry and the Dental Research Institute in Ann Arbor, Michigan on November 17-18, 1978.
- Mager, R. *Preparing Instructional Objectives*. Belmont, California: Fearon Publishers, 1962.
- Mahoney, M. and Caggiula, A. Applying behavioral methods to nutritional counseling. *Journal of the American Dietetic Association*, 1978, 72, 372-377.
- Mahoney, M. and Thoresen, C. *Self Control: Power to the Person*. Monterey, California: Brooks/Cole Publishing Company, 1974.
- Mandel, I. Dental caries. *American Scientist*, 1979, 67, 680-688.
- Martin, G. and Pear, J. *Behavior Modification: What It Is And How To Do It*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1978.
- Mercer, V. Incorporation of preventive dentistry into office practice. In J. Bernier and J. Muhler (editors), *Improving Dental Practice Through Preventive Measures*. St. Louis: C. V. Mosby Company, 1975.
- Morasky, R. and Lilly, K. Nutrition management for dental health: a behavioral approach. *Journal of Clinical Preventive Dentistry*. Manuscript accepted for publication in 1980.

- National Dairy Council, *Have a Happy Healthy Smile* (leaflet number B029). Rosemont, Illinois: National Dairy Council, 1977.
- Navia, J. Prospects for prevention of dental caries: dietary factors. *Journal of the American Dental Association*, 1973, 87 (Special Issue), 1010-1012.
- Nizel, A. *Nutrition in Preventive Dentistry: Science and Practice*. Philadelphia: W. B. Saunders Company, 1972.
- Nizel, A. Oral problems. In H. Schneider, C. Andersen and D. Coursin (editors), *Nutritional Support of Medical Practice*. Hagerstown, Maryland: Harper & Row Publishers, 1977.
- Pike, R. and Brown, M. *Nutrition: An Integrated Approach*, 2nd. ed. New York: Wiley and Sons, 1975.
- Rosenberg, H. Behavior modification for the child dental patient. *Journal of Dentistry for Children*, 1974, 41, 31-34.
- Rowe, N., editor, *Proceedings of Symposium on Diet, Nutrition and Dental Caries*. Sponsored by the University of Michigan School of Dentistry and the Dental Research Institute in Ann Arbor, Michigan on November 17-18, 1978.
- Schwitzgebel, R. and Kolb, D. *Changing Human Behavior: Principles of Planned Intervention*. New York: McGraw-Hill Book Company, 1974.
- Shannon, I. and Edmonds, E. Substitutes for high sucrose snacks. *Journal of the Texas Dental Hygienists' Association*, 1976, 13, 5-10.
- Shaw, J. Preventive nutrition. In J. Bernier and J. Muhler (editors), *Improving Dental Practice Through Preventive Measures*. St. Louis: C. V. Mosby Company, 1975.
- Siegel, S. *Nonparametric Statistics for the Behavioral Sciences*. New York: McGraw-Hill Book Company, 1956.
- Skinner, B. *About Behaviorism*. New York: Alfred A. Knopf, 1974.
- Sweeney, E., editor. *The Food That Stays: An Update on Nutrition, Diet, Sugar and Caries*. New York: Medcom, Inc., 1977.

White, L. Behavior modification of orthodontic patients. *Journal of Clinical Orthodontics*, 1974, 8, 501-505.

White, L. A behavioristic approach to oral hygiene. *American Journal of Orthodontics*, 1977, 72, 406-413.

Zifferblatt, S. Increasing patient compliance through the applied analysis of behavior. *Preventive Medicine*, 1975, 4, 173-182.

APPENDICES

APPENDIX A

LETTERS AND RELEASE FORMS IN REGARDS TO
HUMAN SUBJECTS COMMITTEE

Letter in Regards to Human Subjects Committee

Chairman, Human Subjects Committee
Health and Physical Education Center
Montana State University
Bozeman, Montana 59717

Dear

Preventive dentistry is a major health concern of society and of interest to this investigator. It has been documented that diet plays a role in dental health. The specific problem under consideration is how to change dietary behaviors in compliance with the requirements conducive to good dental health.

The study's objective is to establish and evaluate a nutrition-for-dental-health program for use in the dental office that will demonstrate that rewards for targeted dietary behaviors will increase those nutrition-related behaviors towards the aim of reduced dental caries as partial fulfillment for a Master's degree in Home Economics at Montana State University. I will be conducting my investigation during winter quarter and would like to inform you and the committee of my plans and request your approval.

Two reputable dentists in Bozeman have agreed to screen their pediatric patients for a total of six subjects, ages 7-10, who would most benefit from the program. Two letters will be sent to the parents of the potential subjects: one from the investigator describing the program in some detail and one from the dentist encouraging their participation. A followup phone call will answer questions and arrange appointments with the investigator at the dentist's office. The major requirement of the subjects and their parents will be to keep diet diaries and weekly office appointments for approximately seven weeks. The subjects will be instructed how to keep diaries and what foods to avoid for good dental health. No nutritional deficiencies will result from compliance in the program. If the subject follows the nutrition instruction he will be rewarded. For example, he may be given a comic book for avoiding "sticky sweets" between meals. A written contract will be drawn up stating the desired behaviors and agreed upon rewards.

Precautions will be taken to assure confidentiality. The two cooperating dentists are familiar with the program — one dentist cooperated

in the pilot study. The investigator's graduate committee, including a member from the Psychology Department and two members from the Home Economics Department, have approved the research design.

The investigator would appreciate your written response to this letter and the proposed inclusion of human subjects in this research. Should you need any further clarification, please contact the investigator.

Thank you for your time and consideration.

Note: Only the pertinent parts of the letter to the committed have been included here.

Letter About Release Form to Human Subjects Committee

Chairman; Human Subjects Committee
Health and Physical Education Center
Montana State University
Bozeman, Montana 59717

Dear

Please find enclosed a copy of the release form that will be used during my study. Hopefully, it meets with your requirements.

The signed release forms will be forwarded to you once the subjects and their parents have been contacted and the program initiated.

Again, thank you for your consideration in this matter.

Note: Only pertinent parts of the letter have been included here.

Release Form

I, the parent or guardian of program participant,
_____, do hereby acknowledge
that cooperation in this study is given willingly.

Signature _____

Date _____

Signature _____
(Investigator)

Date _____

APPENDIX B
CASE HISTORY OUTLINE

Case History Outline

Name _____ Age _____

Address _____

General Appearance:

Chief Complaint:

Personal and Social History:

1. Grade in school _____
2. Number of hours per day watching TV _____
3. Other spare time activities _____
4. Psychological development _____

Family History:

1. Father's occupation _____ mother's _____
2. Number and ages of brothers _____ sisters _____
3. Child care other than parents _____
4. Dental status of family _____
5. Diets affecting patient's food intake _____

Diet History:

1. Appetite _____
2. Person responsible for food preparation _____
3. Eat with whom? _____
4. Balance of meals _____
5. Frequency of eating, including snacks _____
6. Is there a cookie jar, etc. always full? _____
7. Bedtime snacks _____
8. Plaque-forming foods _____
9. Non-plaque forming foods _____

Clinical Observations:

1. Periodontal health _____
2. Dental plaque _____
3. Teeth--caries _____

Other Comments:

Interviewer _____ Date _____

Based on Nizel's (1972) nutrition/dental health outline for patient history.

APPENDIX C .

LETTERS TO SUBJECT'S FAMILY

Letter to Subject's Family

Your child has been selected by our office to participate in the nutrition program described in the attached letter.

We know that the practice of good oral hygiene habits and proper nutrition are directly related to the prevention of dental decay.

Given your child's dental history, we recommend and encourage your participation in the program.

We will call you next week to set up your first appointment if you have decided to take advantage of this opportunity.

Note: Only the body of the letter from the dentist has been included here.

Letter to Subject's Family

The purpose of this letter is to request your participation in a research project concerning nutrition and dental health. Local dentists and the Departments of Home Economics and Psychology at Montana State University are cooperating in this endeavor. The purpose of the project is to look at the relationship nutrition plays in children's dental health. A program will be set up for your child to learn what he/she can do to nutritionally improve dental health.

There is no charge for the nutrition program. A minimum of your time will be requested even though the program will last approximately seven weeks. The date of completion will be in March depending on your child's progress. An appointment with the program director will be made each week. The first two appointments will include instruction regarding the components of the program. About 30 minutes will be allowed at each session. The subsequent appointments will be brief requiring about 15 minutes. Throughout the program you and your son or daughter will be asked to keep accurate diet diaries for five days. On the sixth day, there will be a brief appointment at the dentist's office so that the diet diary can be examined. Also, the next phase of the program will be instigated at this time. Any information obtained during the study will be treated with confidentiality.

For cooperating in the program your child can earn incentives in addition to the opportunity to learn what can be done with diet to improve dental health. I encourage and would greatly appreciate your participation in the program.

Note: Only the body of the letter from the investigator has been included here.

APPENDIX D

TIME LINE AND PROGRAM FORMAT

Time Line and Program Format

A. Baseline

1. Names/Introductions/Release Forms
2. Program description in greater detail/Answer questions/
Dental supply contingency
3. Establish reinforcement heirarchy. See questionnaire
4. Pre-test
5. Diary keeping instruction

Do not change present eating habits

Parents: cooperation, watch/monitor reporting, do not try to
deter/encourage eating, do not reinforce "good" be-
haviors

Review printed instructions

Order of eating if applicable (i.e. glass of milk before,
during, after meal, not 3 glasses of milk)

Between meals

Must bring with each appointment

HONESTY

B₁ Nutrition Instruction

1. Review diary for completeness and accuracy only
2. Nutrition instruction by dental hygienist
3. Post-test
4. Diary keeping instruction -- brief, a reminder

C₁ Positive Reinforcement

1. Diary analysis of B₁ with check-list analysis. PLOT ON GRAPH
2. Set up contingencies if eating behaviors are stable
3. Sign contract -- parent is not to give this reinforcer to
child at any time

4. Diary keeping instructions -- brief

B₂ Reversal

1. Diary analysis with check-list analysis for C₁. PLOT ON GRAPH
2. Give reinforcer as appropriate for C₁
3. No reinforcer for B₂. MOVE TO THIS PHASE IF APPROPRIATE
4. Diary keeping instruction -- brief

C₂ Positive Reinforcement

1. Diary analysis of B₂ with check-list analysis. PLOT ON GRAPH
2. No reinforcers given for B₂. MOVE TO C₂ IF APPROPRIATE
3. Re-establish contingencies if B₂ eating behaviors are stable
4. Sign contract -- parent is not to give this reinforcer to child at any time
5. Diary keeping instruction -- brief

C₃ Maintenance

1. Diary analysis of C₂ with check-list analysis. PLOT ON GRAPH
2. Give reinforcer as appropriate for C₂. MOVE TO C₃ IF APPROPRIATE
3. Re-establish contingencies for C₃
4. Sign contract -- parent is not to give this reinforcer to child at any time
5. Diary keeping instruction -- brief

Final Appointment

1. Diary analysis of C₃ with check-list analysis. PLOT ON GRAPH
2. Give reinforcer as appropriate for C₃. CONCLUDE STUDY IF APPROPRIATE

3. Give dental supplies if appropriate
4. Evaluation by parents and subjects

APPENDIX E

DIET DIARY FORM

Diet Diary Form

Name: _____

Instructions

1. To promote accurate recording, keep a *running account* of your meals and between meal snacking. Putting off the recording until the end of the day or even a short time will *not* be reliable. If you do not have this diary form with you, use a piece of scratch paper to jot down what you ate and then copy it over when you get home.
2. Please write down in DETAIL *everything* you eat or drink in the order in which it was eaten. Record in detail the kinds of food and drink as well as their preparation.
3. Record EACH TIME and WHEN you eat or drink something whether at mealtime or between meals. Include such items as candies, gum, "licking out the bowl", etc.
4. Consider:
 - a) *Measurements*: State in general terms the amounts eaten such as 1 whole sandwich, 2 glasses milk, 1 average meat patty, 3 bites apple, 1 medium slice cherry pie.
 - b) *Preparation*: Record how the food was prepared such as fried, baked, raw, plain, with mayonnaise, breaded, with lettuce, canned in syrup, frosted.
 - c) *Additions*: If you added anything to the food such as butter on vegetables, sugar on cereal, honey in tea, milk on cereal, include them in your diary.
5. Record your food and drink for five (5) days including one day of the weekend.

Examples:

NOT CORRECT

Juice

Juice

CORRECT

A small glass of orange juice

1 large cup orange drink

75

Sandwich

Roast beef sandwich with lots of
lettuce

Sandwich

Peanut butter and jelly sandwich

Dessert

1 medium chocolate brownie with icing

Chicken

2 fried chicken legs

76

Date _____

BREAKFAST:

MORNING SNACKS:

LUNCH:

AFTERNOON SNACKS:

DINNER:

EVENING SNACKS:

(Five copies of this page were included for each complete diet
diary form.)

APPENDIX F
BEHAVIOR CONTRACT

Behavior Contract^{*}

Effective Date: From _____ To _____

We, the undersigned parties, agree to perform the following behaviors:

If _____

- 1) reduces the number of servings of sugar and sugar added foods in his/her diet by at least 50% of his/her baseline mean 4 out of the 5 days (that is to _____ exposures);
- 2) eliminates sugar, sugar-added foods and "sticky sweets" between meals 4 out of the 5 days;
- 3) maintains his/her intake of the protective foods above his/her baseline mean 4 out of the 5 days (that is _____ exposures);
- 4) has 3 servings of cleaning foods per day for 4 out of the 5 days

Then Karen will reward _____ with _____

If only one, two or three of the four contingencies are met, then _____ will receive a comic book.

(Parent)

(Program Director)

This contract will be reviewed on _____.

^{*}Based on: DeRisi and Butz, *Writing Behavioral Contracts*, Champaign, Illinois, 1977, page 45.

APPENDIX G
PRE- AND POST-TEST

Pre- and Post-Test

1. If you were buying your lunch at school and you had a choice between a chocolate brownie or an orange for dessert, which would you take? Circle your choice.
2. After playing soccer really hard with your friend, his mom asks you what you should have to drink. Circle one from the list.

Hawaiian Punch

Ice Water

Coke

Sugar-free Seven Up

3. For breakfast choose the cereal you should have for better dental health. Circle one.

Sugar Smacks

Cherios

Apple Jacks

Rice Krispies

4. Should you add sugar or honey to your breakfast cereal?
5. After school you see some kids eating ice cream cones. Is this a cleaning food? Circle one. YES NO
6. The person next to you in the school cafeteria wanted to trade his jelly sandwich for your bowl of chili. In light of your dental health, should you do it? Circle one. YES NO
7. Let's say you are on a picnic and you could choose the foods you wanted. Your mom takes these foods out of the picnic basket. Circle the foods you should eat.

potato chips

chocolate candy bar

tuna sandwiches

gum

carrot sticks

cheese

apples

sugar-free pop

kool-aid

peanut butter and jelly sandwiches

cookies

nuts

8. You are at the movies and your friend buys himself gum drops to eat. If he offers you some, should you take any? Circle one.

YES NO

9. If you did have some extra money after buying the movie ticket, circle the foods below you should buy still keeping in mind good dental health.

candy or candy bar

chocolate

popcorn

pop

ice cream bar

sugar-free pop

nuts

nothing

10. Circle the lunch you think is better for dental health.

A. Soup

B. Sandwich

Saltine Crackers

Cola

Apple

Cake

Milk

11. You are going home after school and your friend offers you a candy bar or an apple. Which should you take? Circle your choice.

12. Your mom has made a grocery list and you need to check it to make sure she does not buy any foods with too much sugar in them. Cross out the foods she should *NOT* buy.

meat	canned fruit in syrup
sugar-coated cereal	nuts
cheese	chocolate-covered nuts or raisins
frosted cupcakes	jello
orange drink	eggs
fresh fruit	gum
noodles	bread
soup	vegetables

13. Let's say that after school you went into a grocery store and you had 50¢ to spend, what should you buy that would be good for your teeth?
14. Let's say that you have a good friend and every time you see her, she is eating something. Mostly she is munching on potato chips, cookies, candy, drinking a coke or milkshake; and if she is not eating she is chewing bubble gum. Do you think she is doing any harm to her teeth? Circle one. YES NO

APPENDIX H

QUESTIONNAIRE FOR REINFORCEMENT HEIRARCHY

Questionnaire for Reinforcement Hierarchy

A. *Activity Reinforcers*: What things does this person like to do?

1. Activities in the home:

- a) hobbies
- b) collectables
- c) crafts
- d) play
- e) work
- f) reading
- g) artistic
- h) scholastic
- i) TV
- j) radio/record player/tapes

2. Activities in the yard:

- a) sports
- b) play
- c) other outdoor interests

3. Activities you pay to do:

- a) movies
- b) sporting events

B. *Manipulative Reinforcers*: What kinds of games or toys does this person enjoy?

- a) cars/trucks
- b) wind-ups
- c) dolls
- d) books
- e) puzzles

C. *Possessional Reinforcers*: What kinds of things does this person like to possess?

- a) hair brush/comb
- b) hair clips
- c) jewelry
- d) lotion/perfume

APPENDIX I

SUCROSE CONTENT OF SELECTED
BREAKFAST CEREALS

Sucrose Content of Selected Breakfast Cereals

<u>Commercial Cereal</u>	<u>% Sucrose</u>	<u>Commercial Cereal</u>	<u>% Sucrose</u>
Shredded Wheat (large biscuit)*	1	Country Morning (raisins, dates)	21
Shredded Wheat (spoon size biscuit)*	1	Raisin Bran (Kellogg)*	21
Cheerios	2	Granola (with almonds and filberts)*	21
Puffed Rice	2	Fortified Oat Flakes	22
Uncle Sam Cereal*	2	Heartland*	23
Wheat Chex*	3	Super Sugar Chex	25
Grape Nut Flakes*	3	Bran Buds*	25
Puffed Wheat*	4	Country Morning	25
Alpen*	4	Frosted Mini Wheats*	28
Post Toasties	4	Sugar Sparkled Corn Flakes	32
Corn Total	4	Sugar Pops	39
Wheaties*	5	Frosted Rice	39
Peanut Butter	5	Alpha Bits	40
Grape Nuts*	7	Sir Grapefellow	41
Special K	7	Super Sugar Crisp	41
Crispy Rice	7	Sugar Frosted Flakes	42
Corn Flakes (Kellogg)	7	Cocoa Puffs	43
Corn Chex	8	Cap'n Crunch	43
Total	8	Crunch Berries	43
Rice Chex	9	Kaboom	44
Crisp Rice	9	Frankenberry	44
Concentrate	11	Count Chocula	44
Rice Krispies (Kellogg)	11	Orange Quangaroos	45
Product 19	11	Quisp	45
Heartland (with raisins)*	14	Boo Berry	46
Buck Wheat	14	Vanilly Crunch	46
All Bran*	14	Baron Von Redberry	46
Pep	14	Cocoa Krispies	46
Life	15	Trix	47
Granola (with dates)*	15	Body Buddies	48
Granola (with raisins)*	15	Honeycomb	49
Sugar Frosted Corn Flakes	16	Pink Panther	49
40% Bran Flakes (Post)*	16	Cinnamon Crunch	50
Team	16	Lucky Charms	50

<u>Commercial Cereal</u>	<u>% Sucrose</u>	<u>Commercial Cereal</u>	<u>% Sucrose</u>
Brown Sugar-Cinnamon			
Frosted Mini Wheats*	16	Froot Loops	53
Granola*	17	Cocoa Pebbles	54
40% Bran Flakes (Kellogg)*	18	Fruity Pebbles	55
100% Bran*	18	Cooky Crisps	56
		Apple Jacks	56
Cut off point		Sugar Smacks	56
		King Vitamin	59
		Super Orange Crisp	68

*Whole Grain

Based on: *Sucrose Content of Commercially-Available Breakfast Cereals.*
Cooperative Extension Service, Montana State University,
Bozeman, 1978.

APPENDIX J

CHECK-LIST DIET DIARY ANALYSIS FORM

"SUGAR FOODS"	MEAL	BETWEEN	"PROTECTIVE FOODS"	MEAL	BETWEEN	"CLEANING FOODS"	MEAL	BETWEEN
Cake			Bacon			Apples		
Candy/Candy Bar			Beans, Dried			Grapes		
Cereal, Sugared			Beef Jerkey			Grapefruit		
Choc.Milk/Cocoa			Cheese			Melon		
Coconut, Sweet.			Cottage Cheese			Orange		
Cookie			Egg			Peach		
Cough Drop			Fish			Pear		
Desserts			Game			Pineapple		
Donut/Sweet Roll			Hot Dogs/Franks			Plum		
Dried Fruit			Luncheon Meat			Pomegranate		
Frosting/Icing			Meat (bf. pk. lb.)			Prune (not dried)		
Fruit Drinks			Milk			Strawberries		
Fruit In Syrup			Nuts					
Fudge			Peanut Butter					
Gelatin			Poultry			Broccoli		
Graham Crackers			Sausage			Cabbage		
Gum			Sunflower Seeds			Carrot		
Honey			Yogurt, Plain			Cauliflower		
Ice Cream			TOTAL			Celery		
Jelly/Jam						Cucumber		
Juice, Sweet.						Lettuce		
Pie			50% of Mean "Sugar Foods" Exposures	GOAL	SUBJECT	Onion		
Pop				_____	_____	Peas		
Pop Cycles			Between Meal "Sugar Foods" Exposures	_____	_____	Peppers		
Pudding				_____	_____	Pickles, Dill		
Sherbet/Fro.Yog.			Mean "Protective Foods" Exposures	_____	_____	Potato		
Sugar				_____	_____	Radishes		
Sweet Breads			Three "Cleaning Foods" Exposures	_____	_____	Tomato		
Syrup/Toppings				_____	_____	Turnip		
Yogurt, Fruited				_____	_____	Zucchini		
TOTAL			NAME	PHASE	DATE	TOTAL		

APPENDIX K

COMPARISONS OF TWO TREATMENTS: INSTRUCTION WITH BASELINE
AND REINFORCEMENT ("SUGAR FOODS")

Comparisons of Two Treatments: Instruction With
Baseline and Reinforcement ("Sugar Foods")[†]

<u>Subjects</u>	<u>Phase Comparisons</u>	
	<u>Nutrition Instruction and Baseline</u>	<u>Nutrition Instruction and Reinforcement</u>
Kelly	23	15.5*
Lorri	60.5*	146*
Tim	31.5	202*
Karen	25.5	61*
Lisa	30	148*
Eric	45	19.5*

[†]Sum T values are expressed for total "sugar foods" exposures
(Wilcoxon Rank Sum Test).

*Indicates significant differences ($p < .05$) between the two phases.

APPENDIX L

COMPARISONS OF TWO TREATMENTS: INSTRUCTION WITH BASELINE
AND REINFORCEMENT ("SUGAR FOODS" BETWEEN MEALS)

Comparisons of Two Treatments: Instruction With Baseline
and Reinforcement ("Sugar Foods" Between Meals)[†]

<u>Subjects</u>	<u>Phase Comparisons</u>	
	<u>Nutrition Instruction and Baseline</u>	<u>Nutrition Instruction and Reinforcement</u>
Kelly	33	17.5*
Lorri	55	78*
Tim	36	70
Karen	22.5	62*
Lisa	44	74*
Eric	47	27

[†]Sum T-values expressed for "sugar foods" exposures between meals (Wilcoxon Rank Sum Test).

*Indicates significant differences ($p < .05$) between the two phases.

APPENDIX M

COMPARISONS OF TWO TREATMENTS: INSTRUCTION WITH BASELINE
AND REINFORCEMENT ("PROTECTIVE FOODS")

Comparisons of Two Treatments: Instruction With Baseline
and Reinforcement ("Protective Foods")[†]

<u>Subjects</u>	<u>Phase Comparisons</u>	
	<u>Nutrition Instruction and Baseline</u>	<u>Nutrition Instruction and Reinforcement</u>
Kelly	31.5	16.5*
Lorri	43.5	78*
Tim	39	95.5
Karen	28.5	19.5*
Lisa	32	89
Eric	47	65*

[†]Sum T-values are expressed for total "protective foods" exposures (Wilcoxon Rank Sum Test).

*Indicates significant differences ($p < .05$) between the two phases.

APPENDIX N

COMPARISONS OF TWO TREATMENTS: INSTRUCTION WITH BASELINE
AND REINFORCEMENT ("CLEANING FOODS")

Comparisons of Two Treatments: Instruction With Baseline
and Reinforcement ("Cleaning Foods")[†]

<u>Subjects</u>	<u>Phase Comparisons</u>	
	<u>Nutrition Instruction and Baseline</u>	<u>Nutrition Instruction and Reinforcement</u>
Kelly	22	20.5
Lorri	50.5	61.5*
Tim	34	93*
Karen	26	27
Lisa	54.5	63*
Eric	43.5	64*

[†] Sum T-values are expressed for total "cleaning foods" exposures (Wilcoxon Rank Sum Test).

* Indicates significant differences ($p < .05$) between the two phases.

MONTANA STATE UNIVERSITY LIBRARIES



3 1762 10014707 1

~~1~~
N378
L62.9
cap 2

+