Control of Eating Behavior: An Evaluation of the Effects of Serving Less Preferred Foods Prior to the Meal on Preschoolers' Eating

Knight

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CONTROL OF EATING BEHAVIOR: AN EVALUATION OF THE EFFECTS OF SERVING LESS PREFERRED FOODS PRIOR TO THE MEAL ON PRESCHOOLERS' EATING

Paul Joseph Smith Knight, II, Ed.S.
Western Michigan University, 1981

This study investigated the effects of serving less preferred foods (vegetables) prior to the noon meal on: (1) The amount of vegetables eaten. (2) The variety of different vegetables eaten. (3) The number of servings of vegetables requested by the children. A plate containing 10 grams each of six different vegetables was served under one of two conditions: (1) Alone, 10 minutes prior to the main meal. (2) With the main meal for the first 10 minutes. A third condition allowed for the children to request any one of the six vegetables as an addition to their main meal. The results indicated that more of the vegetables were eaten, in greater variety, when served prior to the meal. No carryover effect was observed when the vegetables were again served with the main meal. These results were discussed in terms of deprivation versus opportunity to eat other foods, nutrition education, and food preference research.
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PRIOR TO THE MEAL ON PRESCHOOLERS' EATING.

WESTERN MICHIGAN UNIVERSITY, ED.S., 1981
TABLE OF CONTENTS

LIST OF TABLES ................................................................. iv
LIST OF FIGURES ............................................................... v

Chapter

I. INTRODUCTION ............................................................... 1

II. METHOD ................................................................. 7
Subjects ................................................................. 7
Setting and Material ................................................... 7
Lunch Meal .............................................................. 8
Food Measures .......................................................... 9
Conditions ............................................................. 10
Condition Ordering ................................................... 12
Experimental Design .................................................. 14

III. RESULTS ............................................................................ 16

IV. DISCUSSION ........................................................................... 25

REFERENCE NOTE ............................................................ 28
REFERENCES ................................................................. 29
BIBLIOGRAPHY ................................................................. 32
LIST OF TABLES

I. Order of experimental conditions to which each subject was assigned.............................................................. 13

II. Mean amount, variety, and choice of vegetables eaten in each condition for each regrouping............................. 17

III. Mean amount, variety, and choice of vegetables eaten for each phase for subjects moving from a premeal to an at- meal grouping, or an at-meal to a premeal grouping.............. 23

IV. Average daily amount, choice, and variety for P-23 and M-25 across conditions.............................................. 24
LIST OF FIGURES

1 Total amount of test vegetables eaten (grams), number of different vegetables sampled (variety), and number of ten gram portions requested (choice) each day for Subject J-3.  ................................................. 19

2 Total amount of test vegetables eaten per day for Subjects M-21 and S-7. .................................................. 20

3 Total amount of test vegetables eaten per day for Subjects P-23 and S-17. .................................................. 21

4 The number of different vegetables (variety) and the number of ten gram portions requested (choice) per day for Subjects P-23 and S-17 (upper portion), and M-21 and S-7 (lower portion) ........................................... 22

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CHAPTER I

Introduction

It is generally accepted that the patterns of food consumption established during the toddler and preschool years (ages 18 to 60 months) affect an individual's nutritional lifestyle and therefore health status in later life (e.g., Beyer & Morris, 1974). A method advocated to affect food consumption patterns is through early nutrition education programs, (Gassie & Jones, 1972; Harrill, Smith & Gangever, 1972) that emphasize both information about good nutritional practices and the establishment of good eating behaviors (e.g., Robinson, 1972; Burgess & Dean, 1962). Although there is much information available about good nutritional practices, getting people to engage in them has been a problem (Stunkard & Mahoney, 1976). This may be a function of how much information is currently available on the variables that control eating behavior, a necessary first step in establishing good eating behavior (Ferster, Nurnberger & Levitt, 1962).

At first glance it may seem that there is much information about the controlling variables of young children's eating but most of this information has been tangential or not well researched. A number of studies report foods that children tend to eat and/or ignore, by actually measuring food consumption (Lamme & Lamme, 1980; Lamb & Ling, 1948; McCay, Waring & Kruse, 1940; Beyer & Morris, 1974; and Twardosz, Cataldo & Risley, 1975). Other related research involves

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the verbal report of children about food likes and dislikes (Birch, 1979(a), 1979(b); Birch, Zimmerman & Hind, 1980; Birch, 1980(a); Philips & Kolasa, 1980; and Beyer & Morris, 1974). Yet another line of research has looked at factors which are correlated with food habits, but have not been tested for any causal relationships (Yperman & Vermeersch, 1979; Burt & Herzler, 1978; Methany, Hunt, Patton & Heye, 1962(a), 1962(b); Harper & Sanders, 1975; Glaser, 1964; Herbert-Jackson, Cross & Risley, 1977; and Herbert-Jackson & Risley, 1977). None of these studies report on variables that could be used to reliably predict and control eating behavior.

Research into the variables controlling young children's eating behavior has been sparse. Duncker (1938) reported temporary shifts in food consumption toward a "bad" tasting food following stories in which the hero chose that food. In a second study, Duncker reports that a large majority of children switched food choices after observing other children making food choices that differed from their own. Birch (1980b) reports similar results. Having targeted children select and eat foods in the presence of peers who selected and ate the target children's nonpreferred foods was sufficient to cause a change in consumption patterns. Harrill et al. (1972) obtained increases in vegetable consumption at lunch when information on the vegetables was presented just prior to the meal. An early study by Lovaas (1964) of the relationship between verbal and nonverbal behavior demonstrated that reinforcement of verbal behavior denoting a targeted food can function to increase the consumption of that food. Ireton and Guthrie (1972) compared the effects of varying the method of food
preparation (e.g., adding a cheese sauce) and a token economy on food consumption. The token economy was successful: varying the food preparation was not. Madsen, Madsen and Thompson (1974) successfully increased the proportion of meals consumed by presenting small candies and sugar-coated cereals, paired with adult praise, contingent upon eating behavior and portion completion. Although these studies give the educator some basis from which to work, research on the factors controlling eating behavior are indeed sparse.

Methods to effect eating behavior have been suggested by nutrition authors. For example, Davis (1959) suggested that preschoolers refused many nutritious foods as a means of obtaining attention. To counter this, Davis suggested giving plenty of attention at times other than the meal, as well as giving attention at the meal for things done correctly. Further, if there is a problem that comes up, wait until the meal is over and then discuss the performance, suggesting corrections for the next meal. Smith (1979) in suggesting how to get children to eat new or less preferred foods states: "touch everything with honey. Trap [the child] into nutritious foods by utilizing the craving for sweets, then over a period of weeks or months, reduce the honey until [the child] prefers the wholesome taste of good food." Robinson (1972) has suggested that fewer difficulties are likely to be encountered if new foods are served at the beginning of the meal when the child is hungry. However, these authors do not report empirical validation substantiating these recommendations.

The objective of the present research was to investigate Robinson's (1972) suggestion. Using single subject methodology of the behavioral
sciences (Bailey, 1977) answers to the following questions were sought.
(1) If less preferred foods (e.g., vegetables) are served prior to the
presentation of other foods at a meal, will consumption of those foods
increase? Two other questions arise if the answer to this question is
yes. (2) From a scientific standpoint, is the effect due to hunger
variables or could some other explanation be possible, such as the op-
portunity to eat other foods. (3) From an educational standpoint,
does this increase in consumption, should it occur, affect consump-
tion of the vegetables when they are reintroduced during the meal
time? If merely serving new or less preferred foods for a brief per-
iod prior to a meal does increase consumption, both during the premeal
period and when served again with the meal, the teaching task of the
educator or parent would be greatly reduced.

Vegetables are repeatedly cited as having low consumption rates
or being disliked by preschoolers (e.g. Harrill et al., 1972; Ireton
& Guthrie, 1972; Philips & Kolasa, 1980; Birch, 1980(b)). Harrill
et al. were able to obtain measures of the individual amounts of each
food consumed at lunch by 17 preschool children. These amounts were
then converted to measures of the nutritional content. When compared
to those recommended for the preschool age group, the authors noted
deficits in specific nutrients (e.g., iron). A comparison of foods
containing these nutrients to the consumption rates of those foods led
the authors to conclude that a deficit in vegetable eating was the pri-
mary factor. Continued deficits in vegetable consumption have been
noted at the elementary and high school levels (e.g., Jansen & Harper,
1980). In the present study, vegetables were used as the target food.
Six vegetables (corn, carrots, peas, green beans, broccoli and spinach) were presented to the children.

Previous researchers interested in eating behavior have used the amount of food consumed as the primary measure (McKay, 1940; Lovaas, 1962; Ireton & Gutherie, 1972; Twardosz et al., 1975; Herbert-Jackson & Risley, 1977; Herbert-Jackson et al., 1977; Harrill et al., 1972; and Madsen et al., 1974). Within the nutrition field, Pekkarinen (1970) has identified the amount of food consumed to be the most accurate data on food consumption. One measure used in the present study was the number of grams of six targeted vegetables eaten at each lunch meal. Using procedures similar to Twardosz et al. (1975) and Harrill et al. (1972) the vegetables of interest were weighed out at the beginning of the lunch meal and each child's leftovers were weighed back in to determine the amount consumed.

The Committee on Dietary Allowances of the Food and Nutrition Board (1980) has set Recommended Dietary Allowances (RDA) to meet the known nutritional needs of each age group. The Committee has strongly recommended eating a variety of foods in order to meet the RDA standards. In the present research, a measure of variety was obtained. The number of different targeted vegetables consumed each day was recorded.

A third measure obtained in the present study was choice. Catania (1979) has defined a choice situation as involving the ability to commit to a particular delayed alternative action. In the present study a choice condition was included. In addition to serving targeted vegetables prior to the lunch meal, a condition was included
in which each child could "commit" to the vegetables by requesting them added to their regular lunch plate. The number of requests was treated as a measure of choice.
CHAPTER II

Method

Subjects

Fifteen preschool children attending the Western Michigan University Child Development Center participated in this study. The children ranged in age from 3 - 5 years and were all from the same classroom. Data were not included for five of the subjects due to high rates of absenteeism. Data were included on the ten students having at least 75% attendance. This included 6 boys and 4 girls.

Setting and materials

The children were served lunch every day in their classroom. The classroom was approximately 6 M x 10 M. Each of three tables was set up in the room with natural barriers (e.g., storage cabinets) between them. The tables were standard for a preschool, measuring about .75 M in height, and the chairs were of proportionate height. Central serving and weighing tables were used.

Lunch was served on 23 cm diameter paper plates and plastic utensils were provided. Milk was served in 170 ml cups. Two Hanson dietetic scales having a 500 gram capacity were used to weigh vegetables when served and whenever a subject returned vegetable leftovers. The experimental vegetables were served on 12.7 cm diameter paper plates during two of the three conditions. Serving spoons and bowls were
used in the process of weighing and serving the vegetables. Three undergraduate students, the classroom teacher and one graduate student carried out various aspects of the study.

The experimental vegetables included fresh-frozen corn, carrots, green beans, peas, spinach, and broccoli. Vegetables were heated in a microwave oven prior to serving and kept warm on a food warmer in the classroom.

Lunch meal

Measures of vegetables eaten were obtained at each lunch meal (12:00 - 12:45 p.m.) throughout all conditions. The classroom teacher was instructed to serve a required snack prior to 10:30 a.m. to insure a constant deprivation interval. The amount of snack eaten daily for all subjects was not ascertained.

Meals were prepared in the kitchen at the preschool. Daily lunches consisted of food from five groups: (1) dairy; (2) meat or meat substitutes; (3) grain; (4) fruit; and (5) vegetables. Food from each of these categories was required to be served due to State and Federal licensing requirements. Previous observations of several of the subjects had indicated a low consumption of vegetables in proportion to foods in the other four food groups (Stroh, Note 1). In addition to the usual meal served at lunch, six different vegetables were made available: (1) corn, (2) green beans, (3) carrots, (4) peas, (5) broccoli, and (6) spinach. The method of serving was the independent variable and is described in the "Conditions" section.

The meals were served at a central serving station. All weighing
was completed at the station. Depending on which condition a child was in, he/she either went to the station and obtained a plate of lunch foods, or was seated at a table with a prepared plate of food for each child in that condition.

No more than five children were assigned to any one table. Each child at a table was in the same condition. Monitors were assigned to each table. They were instructed to consequate good table manners with social approval and the privilege of being first to get second helpings. They were also instructed not to encourage eating by directing conversation at the meal away from "food" talk and toward favorite television shows, preschool activities they had done that morning, or by participating with the children in any other non-food talk. The table monitors also kept track of what vegetables were observed to be eaten in the first ten minutes during two of the experimental conditions.

**Food measures**

The amount of vegetables eaten (in grams) by each child was determined by giving standard ten-gram servings of any vegetable and marking who was served which vegetable. When plates were returned to the serving station, they were again weighed and recorded. Each individual vegetable type was weighed. Each post-weight was subtracted from the pre-weight to determine the weight of the consumed vegetables. Average weights were determined by adding each child's vegetable consumption and dividing by the number of children at the meal.

Variety and choice measures were obtained from the weight record.
Variety was defined as the number of different vegetables consumed. So, for instance, if the record showed 10 grams each of corn and carrots as the only vegetables eaten, then a measure of 2 was recorded for variety. Choice was defined as the child approaching the serving area and requesting specific vegetables. When a child did this, 10 grams were served, and a hatch mark was made on the record form. These marks were added together to determine the number of choices per day. Individual measures of variety or choice were added together and divided by the number of children to determine averages for each of these food measures. To insure reliability, weighers were required to practice weighing using five weights varying from 9.5 to 11.5 grams in weight. They were then tested on weighing abilities by the experimenter placing different weights on the scale one at a time and the research aide recording the weights. The aide was considered accurate when he/she was within plus or minus 2.5 grams of the total on three consecutive random sequence weighings of the five weights. Twice during each condition, weighing of outgoing food, or incoming food, was completed by two observers. Reliability was calculated by dividing the smallest total by the largest total. Data were considered reliable because individual weights were within 1.5 grams of each other and the total reliability was at least 85%.

Conditions

Pre-meal (P): The pre-meal condition involved 10 grams each of the six vegetables being placed on a 12.7 cm paper plate. The
children in this condition were called from the activity area and seated at the table. Plates of vegetables with a plastic utensil and napkin were placed in front of the child. The table monitor started timing when the plates were set on the table. The plates were removed at the end of 10 minutes and children were released one at a time to the serving table to obtain the rest of their lunch. At the serving table, a 23 cm paper plate containing other foods was handed to them. The child was then asked by the aide serving, "Would you like any of these with your lunch?" while the aide pointed at the hot plate with six bowls of vegetables. If the child responded "yes", he/she was then asked to indicate which vegetable by naming or pointing. A 10 gram portion of each one named or pointed to was served on the plate with the rest of the lunch.

Whenever children returned to the serving table for second helpings, this procedure was repeated. Children were then requested to take their plates to the serving area when they were finished. Names were written on the plates and passed to the weighing station.

At-meal (A): The At-meal condition was the same as the Pre-meal condition in that the same 12.7 cm paper plate was served to the children for the first 10 minutes of lunch. It differed in that the vegetable plate was served with the 23 cm plate containing the rest of the meal. The plates were placed on the table, the children called to the table, the ten minute timing, and the second helpings were all handled in the same manner. Second helpings of the six vegetables were not available until the 10 minutes had elapsed. When the 10 minutes elapsed, research aides collected the 12.7 cm plates, told
the children that if they wanted more vegetables they should go to
the serving area to get them, and then the plates were taken to the
serving area. Names were written on the plates and transferred to
the weighing station.

Choice (C): The Choice condition consisted of the children being
called from the activity area one at a time following the start of
the Pre- and At-meal groups. They were handed a 23 cm paper plate
with the lunch serving and asked if they wanted any of the six veget-
ables in the same fashion as described for the Pre-meal group. Serv-
ing, weighing, and recording were then completed in the same way if
the child indicated that he/she did not want any of the vegetables.

Pre-experimental (P-E): Semester break at the University and the
training of new research staff created a four-week break in data
collection at the preschool. During the four-week period, the child-
ren returned to the usual classroom routine that existed prior to the
present study. At the end of this break, some of the subjects were
again exposed to the Pre-meal experimental condition (reliability
measures were not taken) as part of another research project.

Condition ordering

Subjects were exposed to each of the experimental conditions with
the exception of J-3. This provided counterbalancing of condition
orders. Each subject was exposed to the conditions for either 5, 10,
or 15 days. At the end of Phase I (5 days) subjects were either
reassigned to a different condition or continued in the same condition
(see Table I). At the end of Phases II, III, and IV (15, 10, and 10
days, respectively), the subjects were regrouped by assignment to a
# TABLE I

ORDER OF EXPERIMENTAL CONDITIONS TO WHICH EACH SUBJECT WAS ASSIGNED

<table>
<thead>
<tr>
<th>Subjects</th>
<th>I 5 days</th>
<th>II 15 days</th>
<th>III 10 days</th>
<th>IV 10 days</th>
<th>20</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-3</td>
<td>PRE</td>
<td>PRE</td>
<td>CHC</td>
<td>PRE</td>
<td>P-E</td>
<td>PRE</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M-21</td>
<td>PRE</td>
<td>AT</td>
<td>PRE</td>
<td>CHC</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>c, ca, gb, p, s</td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-23</td>
<td>CHC</td>
<td>AT</td>
<td>PRE</td>
<td>CHC</td>
<td>P-E</td>
<td>PRE</td>
</tr>
<tr>
<td></td>
<td>ca, p, s</td>
<td>c, b</td>
<td>gb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M-25</td>
<td>CHC</td>
<td>AT</td>
<td>PRE</td>
<td>CHC</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td>s</td>
<td>c, ca, gb, b</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-7</td>
<td>PRE</td>
<td>PRE</td>
<td>AT</td>
<td>CHC</td>
<td>P-E</td>
<td>PRE</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-5</td>
<td>PRE</td>
<td>PRE</td>
<td>AT</td>
<td>CHC</td>
<td>P-E</td>
<td>PRE</td>
</tr>
<tr>
<td></td>
<td>c, ca, gb, s, p</td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M-15</td>
<td>CHC</td>
<td>CHC</td>
<td>PRE</td>
<td>AT</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>c, ca</td>
<td>p</td>
<td>s, b</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-19</td>
<td>CHC</td>
<td>CHC</td>
<td>PRE</td>
<td>AT</td>
<td>P-E</td>
<td>PRE</td>
</tr>
<tr>
<td></td>
<td>c, ca, gb</td>
<td>p, b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J-1</td>
<td>PRE</td>
<td>PRE</td>
<td>CHC</td>
<td>AT</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>c, ca</td>
<td>b, p, s, gb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-17</td>
<td>CHC</td>
<td>CHC</td>
<td>AT</td>
<td>PRE</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td>b</td>
<td>s, p</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*PRE-MEAL (PRE); AT-MEAL (AT); CHOICE (CHC); PRE-EXPERIMENTAL (P-E)

The letters under some of the conditions indicate that that vegetable was eaten in that condition for the first time during this experiment: Corn (ca), Carrots (ca), Green Beans (gb), Peas (p), Spinach (s), and Broccoli (b).
different condition. This form of regrouping controlled for effects that might have been peculiar to one group had the experimenter just used three groups always containing the same subjects. This also allowed for more flexibility in the order of conditions to which subjects could be assigned. Seven different condition orders were used overall to control for any possible ordering effects.

Experimental design

Table I indicates the order in which each of ten subjects was exposed to the experimental conditions. A number of direct replication designs were used to answer the research questions (Bailey, 1977). To indicate an increase in vegetable consumption, a reversal design with multiple baseline comparison across subjects was used. These included Subjects J-3 and M-21 in a reversal design (P, P, C, P, P-E, P, and P, A, P, respectively). A multiple baseline design was applied across two sets of Subjects, S-7 and M-21, (P, P, A, C, P-E, P and P, A, P, C) and Subjects P-23 and S-17 (C, A, P and C, C, A, P).

The above comparisons shed some data on Pre-meal increases being a function of deprivation or hunger variables versus the lack of alternative food consumatory responses. A series of simple comparison designs (P, A and A, P) are also available (Subjects S-5, S-7, M-15, K-19, S-17, P-23 and M-25). Time and the counterbalancing of the condition orders prevented further direct replication analysis. However, simple comparisons replicated across subjects and showing consistent increases when moving from an A to a P condition, and consistent
decreases across each subject when moving from a P to an A condition would further indicate that lack of alternative foods to compete with the vegetables was the critical variable rather than hunger variables.

To compare the effects of the Pre-meal condition on Choice, a reversal design using Subjects P-23 and M-25 was included (C, A, P, C). Changes in the number of choice responses or amount consumed across the C condition would indicate that presenting the Pre-meal vegetables was perhaps a viable, educational alternative. (Attrition especially weakened the comparisons possible for this variable with the loss of subjects in C, P, C conditions.)

Group data in the form of means are presented to further substantiate the findings of the single subject designs. Group means of amount consumed, choice, and variety are presented to indicate consistent measures in any of the conditions, regardless of the groupings. Means were computed by adding the amount, choice, or variety measures obtained daily for each subject across a condition and dividing by the number of measures added.

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CHAPTER III

Results

The results of this experiment indicate a very clear difference between the Pre-meal and At-meal or Choice conditions in the amount of the vegetables consumed and the variety of vegetables eaten on any one day. Serving the vegetables for the 10-minute period prior to the rest of the meal resulted in a low of 21.6 to a high of 33 grams of the vegetables eaten, across the four groups (see Table II). The greatest amount eaten for either Choice or At-meal was 13.4 grams.

The variety of vegetables eaten was also consistently higher for the Pre-meal groups, ranging from 3.2 to 3.9 grams chosen. Ranges for the Choice and At-meal variety of vegetables eaten were .5 to .9 and .6 to 2.1, respectively. The number of times per lunch a subject chose one of the vegetables was highest for the Choice condition, ranging from 1.0 to 2.2. Ranges for Pre-meal and At-meal were .4 to 1.2 and 0 to .7, respectively.

These group results were verified through individual subject data as can be seen in Figure 1. The data for Subject J-3 illustrate the reversibility of the effect for the amount of vegetables eaten, the number of different types of vegetables eaten and the number of 10-gram portions requested. Subject J-3 (Figure 1) averaged 44.5 g consumed in the Pre-meal condition, 9.4 g in the Choice condition and 34.5 g when returned to the Pre-meal condition. The number of different vegetables sampled averaged 5.6 g during the Pre-meal condition, 1.1 g
<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Phase IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-meal</td>
<td>28</td>
<td>25.6</td>
<td>21.6</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Choice</td>
<td>13.4</td>
<td>10.5</td>
<td>9.3</td>
<td>10.3</td>
<td></td>
</tr>
<tr>
<td>At-meal</td>
<td>--</td>
<td>2.7</td>
<td>12.9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Variety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-meal</td>
<td>3.4</td>
<td>3.5</td>
<td>3.2</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>Choice</td>
<td>0.5</td>
<td>0.6</td>
<td>0.9</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>At-meal</td>
<td>--</td>
<td>0.6</td>
<td>1.1</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Choices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-meal</td>
<td>0.5</td>
<td>0.4</td>
<td>0.8</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Choice</td>
<td>1.6</td>
<td>1.4</td>
<td>2.2</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>At-meal</td>
<td>--</td>
<td>0.0</td>
<td>0.7</td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>
during the Choice condition, and 5.9 g when returned to the Pre-meal condition. The number of 10-gram portions requested averaged .2 during Pre-meal, 1.1 during Choice, and .3 when returned to the Pre-meal condition. Data for Subject M-21 (Figure 2, top and Figure 4, bottom) and Subject P-23 (Figure 3, top and Figure 4, top) further illustrate this reversibility.

More specific comparisons of the Pre-meal and At-meal groups clearly indicate that subjects ate more vegetables of a greater variety under the Pre-meal rather than the At-meal condition. This occurred for Subject M-21 (Figure 2, top and Figure 4 bottom) when conditions were reversed from Pre-meal to At-meal and back again to Pre-meal; when Subject M-21 was compared to Subject S-7 using a multiple baseline design (Figure 2 and Figure 4, bottom); and again when Subject P-23 was compared to S-17 using a multiple baseline design (Figure 3 and Figure 4, top). In addition, Table III summarizes the mean amount, variety, and choice in a series of four Pre-meal to At-meal condition juxtapositions (Subjects S-5, S-7, M-15 and K-19); three At-meal to Pre-meal condition juxtapositions (Subjects S-17, P-23 and M-25); and the Pre-meal to At-meal to Pre-meal condition juxtapositions (Subject M-21); Subjects going from a Pre-meal to an At-meal condition showed an 11.6 gram average decrease in the amount of vegetables consumed, a decrease of 1.1 in the average number of different types of vegetables consumed, and a decrease of only .2 in the average number of choices made per day. When going from an At-meal to a Pre-meal condition, subjects averaged an increase of 21.4 grams of vegetables consumed, an increase of 2.4 different types of
Total amount of test vegetables eaten (grams), number of different vegetables sampled (variety), and number of ten gram portions requested (choice) each day for Subject J-3. Horizontal broken lines indicate the mean amount eaten for that condition.
Figure 2
Total amount of test vegetables eaten per day for Subjects M-21 and S-7. A multiple baseline for the Pre and At-meal conditions are presented across subjects. Horizontal broken lines indicate the mean amount eaten for that condition.
Total amount of test vegetables eaten per day for Subjects P-23 and S-17. A multiple baseline for the Choice, At and Pre meal conditions are presented across subjects. For Subject P-23 data for the last Premeal condition occurred after a four week break. Horizontal broken lines indicate the mean amount eaten for that condition.
Figure 4

The number of different vegetables (variety) and the number of ten gram portions requested (choice) per day for Subjects P-23 and S-17, (upper graphs) and M-21 and S-7, (lower graphs).
TABLE III

MEAN AMOUNT, VARIETY AND CHOICE OF VEGETABLES EATEN FOR EACH CONDITION ACROSS EACH PHASE FOR SUBJECTS MOVING FROM A PRE-MEAL TO AN AT-MEAL GROUPING OR AN AT-MEAL TO A PRE-MEAL GROUPING

<table>
<thead>
<tr>
<th>Subject</th>
<th>Amount</th>
<th>Variety</th>
<th>Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRE</td>
<td>AT</td>
<td>PRE</td>
</tr>
<tr>
<td>S-5</td>
<td>18.0</td>
<td>7.5</td>
<td>---</td>
</tr>
<tr>
<td>S-7</td>
<td>25.5</td>
<td>19.6</td>
<td>---</td>
</tr>
<tr>
<td>M-15</td>
<td>16.2</td>
<td>6.5</td>
<td>---</td>
</tr>
<tr>
<td>K-19</td>
<td>21.7</td>
<td>10.5</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>20.6</td>
<td>9.0</td>
<td>---</td>
</tr>
<tr>
<td>M-21*</td>
<td>21.8</td>
<td>1.1</td>
<td>31.5</td>
</tr>
<tr>
<td>S-17</td>
<td>---</td>
<td>9.5</td>
<td>30.5</td>
</tr>
<tr>
<td>P-23</td>
<td>---</td>
<td>4.0</td>
<td>16.0</td>
</tr>
<tr>
<td>M-25</td>
<td>---</td>
<td>0.5</td>
<td>22.7</td>
</tr>
<tr>
<td></td>
<td>3.8</td>
<td>25.2</td>
<td>0.6</td>
</tr>
</tbody>
</table>

*Subject M-21 was used in the computation of both P to A and A to P comparisons.
vegetables consumed and an increase of .75 in the number of choices made each day. Examination of the individual measures for each subject shows that no one violated these trends.

Table IV summarizes the data on amount, variety and choice for Subjects P-23 and S-25, the two subjects exposed to the Choice condition before and after the Pre-meal condition. Comparisons of the average amount of vegetables eaten, the number of different vegetables eaten at each meal (Variety), and the number of times vegetables were requested (Choice) show consistent decreases in amount, variety and choice between the two Choice conditions. The amount decreased from 11 to 6 grams, the variety from 1.2 to .4 different vegetables eaten per day, and the choice decreased from 1.8 to .6 vegetable portions requested per day.

TABLE IV

AVERAGE DAILY AMOUNT, CHOICE, AND VARIETY FOR P-23 AND M-25 ACROSS CONDITIONS

<table>
<thead>
<tr>
<th>Day and Condition</th>
<th>5</th>
<th>10</th>
<th>10</th>
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</thead>
<tbody>
<tr>
<td>Measure</td>
<td>CHC</td>
<td>AT</td>
<td>PRE</td>
</tr>
<tr>
<td>Amount (grams)</td>
<td>11.0</td>
<td>2.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Variety</td>
<td>1.2</td>
<td>0.5</td>
<td>2.9</td>
</tr>
<tr>
<td>Choice</td>
<td>1.8</td>
<td>0.1</td>
<td>0.5</td>
</tr>
</tbody>
</table>
CHAPTER IV

Discussion

The present study was directed toward evaluating the effects of serving less preferred foods prior to lunch on the consumption of those foods. This objective was achieved using single subject research designs across three measures of eating behavior: the amount eaten, the variety eaten, and the number of vegetable portions requested. The results indicated that: (1) serving a less preferred food, such as vegetables, prior to the meal would increase the amount and variety of vegetables consumed; (2) increases in the amount and variety were more a function of a lack of alternative foods rather than the degree of deprivation; and (3) although not as strongly, the results also indicated that increases in the amount eaten and the number of vegetable portions requested by children were not affected in a choice situation following increases in these two measures produced via serving the vegetables 10 minutes prior to the meal for 10 days. Further research in this area is necessary in order to draw a firm conclusion about this lack of carryover.

A final result of interest is the phase and condition in which each subject consumed one of the six vegetables for the first time. As can be seen in Table I, subjects tried more vegetables for the first time in the Pre-meal condition. Of the possible 60 first tries that could be made by the 10 subjects, 39 vegetables were first eaten in the Pre-meal condition compared to 4 in the At-meal
and 12 in the Choice conditions. The Pre-meal condition clearly had the greatest effect on getting subjects to try vegetables for the first time, at least in the context of this experiment.

As can be observed in any of the graphs, the subjects' consumption was often quite variable. Anecdotal information collected throughout the study indicated several possible reasons. Even though the adults at the tables tried to direct the children's conversation away from the food in front of them, the children periodically engaged in "competitive games" of who could eat the most of one food or another. One subject, S-17, showed a strong preference for corn. On day 34, an amount of only 17 grams of corn was eaten, compared to the 20 to 50 gram amounts eaten the preceding three days. Canned corn, with sugar and salt added in processing had been served as part of the regular lunch that day, and S-17 consumed 60 grams of the canned corn, in addition to the 17 grams of the fresh-frozen corn used in the study. Another factor was health-related. On a couple of occasions, a subject who normally ate a major portion of his/her lunch, would skip it in part or whole, requesting to lie down for a nap (a request rarely made), complaining that he/she felt sick.

These results should be useful to both the preschool teacher and the nutrition researcher. To the teacher, the results should suggest one method of teaching children to eat more of new or less preferred foods and a larger variety of foods. By introducing these foods just prior to lunch, perhaps naming and/or classifying them and then letting the children sample them is one lesson set-up that could be used.
In addition, as preference can be influenced via density of reinforcement as derived from the experimental analysis of behavior (e.g., Herrnstein & Loveland, 1975); applied behavior analysis (e.g., Betancourt & Zeiler, 1971); and nutrition research (e.g., Birch 1980), the addition to the pre-meal lesson of generalized conditioned reinforceers for food consumption may indeed serve to affect food preference.

These results are of interest to researchers of human food preference because of the dramatic effect that the introduction of alternative foods had on food consumption measures. It is the relative strengths of the available operants that is important to describe in preference research (e.g., Lockart, 1979). In nutrition the operant is the consumatory response followed by food ingestion, generally measured as the amount of food consumed. It is the relative amount of food consumption that is important, and depending on the foods that are available, differing amounts may be consumed. Caution in reporting or interpreting general preference trends should be taken.
REFERENCE NOTE

Note 1. Stroh, G. _Assessment of food consumption patterns in preschoolers._ Senior Honors Paper, Western Michigan University, Winter, 1981.
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