NATURALISTIC OBSERVATIONS OF EATING PATTERNS IN HUMANS: RELATIONSHIPS BETWEEN OBESITY AND EATING STYLE

by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

ABSTRACT

Eating behaviors of 96 obese, overweight, and normal weight men and women were observed in a field study to investigate possible differences in eating style. Trained observers unobtrusively recorded the first five minutes of the following eating behaviors: (1) total number of bites, (2) total number of chews per bite, (3) total time spent chewing, (4) total number of return trips to the food bars, (5) choice of food (pizza or pizza and salad), and (6) a demographic condition of number of people seated with the target person.

These eating behaviors were analyzed as comparative weight and sex group totals. Comparison of group totals revealed that:

1. There were no differences in total number of bites taken between the three weight groups.
2. There were no differences in total number of chews per bite between the three weight groups.
3. There were no differences in return trips to the food bars between the three weight groups.
4. Overweight people spent the most time chewing their food followed by obese people with normal weight people spending the least time chewing.

5. Normal weight people least often chose pizza with a salad with obese people the next most often and overweight people most often choosing both food items.
6. There were no differences in number of people seated with the target person between the three weight groups.
7. There were no differences in total number of bites taken between men and women.
8. There were no differences in total number of chews per bite between men and women.
9. There were no differences in total time spent chewing between men and women.
10. Women tended to eat with more people than did men.
11. Obese women, on the average, took more chews per bite than obese men.

CHAPTER 1

INTRODUCTION

Obesity is a serious problem in the United States today. The U.S. Public Health Service estimates there are between forty to eighty million obese individuals in this country and classifies obesity as one of the most prevalent health problems in the U.S. today (Stuart and Davis, 1972).

Obesity constitutes a major health problem because it contributes to acute and chronic medical consequences. The risk involved with being obese is due to the effects of excess fat on blood pressure, plasma levels of cholesterol and triglycerides, all of which contribute to cardiovascular disease (McAlister, Farquhar, Thorensen, and Maccoby, 1976). The fact is that when compared to normal weight people, the obese demonstrate one and a half times more heart disease (Mahoney and Mahoney, 1976a). Other physical anomalies associated with obesity include: renal disease, diabetes, liver ailments, gall bladder disease, appendicities, and arthritis (Harmatz and Lapuc, 1968; Stuart and Davis, 1972). Along with these serious medical consequences of obesity are the considerable social pressures to be slim and sleek. Because of these hyptertensive consequences of obesity and other hypotensive effects of weight reduction (Chiang,

Perlman, and Epstein, 1969) the control of body weight is a serious and challenging undertaking for many people.

The treatment of obesity remains an exasperating endeavor with no consistent body of knowledge accounting for either causes or treatment success. However, this state of affairs has begun to change over the past ten years with the application of behavioral procedures to control overeating. Of all the treatment strategies devised to enable weight loss, those incorporating behavior modification techniques have proven to be the most successful (Abramson, 1973; Stunkard and Mahoney, 1976). This success seems substantial when compared with traditional weight loss procedures which yield no more effectiveness today than the state of the art fifteen years ago (Leon, 1976). The success of behavioral treatments, however, relates primarily to short-term weight loss. Evaluation of long-term maintenance of weight loss appears to be a neglected research activity. When this has been done, the variable results tend to be less favorable (Abramson, 1973; Leon, 1976; Mahoney and Mahoney, 1976b; Stunkard and Mahoney, 1976; Jeffery and Coates, 1977). Thus, although the magnitude of weight loss is substantially greater with behavioral approaches than traditional treatments, problems with maintenance and variability among subjects has prevented complacency and directed research activity toward a finer analysis of treatment success.

Weight Reduction Strategies and Their Assumptions

While much research effort is now being spent assessing the efficacy of specific components of the behavioral weight reduction package, the assumptions from which they were derived have received minimal attention. These assumptions generally imply that people who have successfully lost weight have done so by exchanging maladaptive eating habits for more adaptive ones. A further inference involves the idea that obese and nonobese individuals exhibit distinctive eating styles and that obese individuals achieve weight loss by adopting the eating style that characterizes the nonobese individual (Mahoney, 1976).

Specifically, the eating styles that distinguish and characterize the obese individual from his or her nonobese counterpart are purported to consist of at least three different sets of behaviors. These include: speed of eating (rate and meal duration), consummatory behavior (bites and chews), and sensitivity to external stimuli (Ferster, Nurnberger, and Levitt, 1962; Mahoney, 1976; Nisbett, 1972; Schacter, 1968, 1971; Stuart and Davis, 1972). Although some variations exist in the descriptions of these three areas from various sources, it can be assumed that they all incorporate the notion that the eating style of the obese individual involves (1) few,

large bites; (2) rapid eating pace; (3) short meal duration; and (4) exaggerated sensitivity to external stimuli (Mahoney, 1976; Stunkard and Mahoney, 1976).

From the number of behavioral treatments that incorporate specific methods to alter the obese eating style, one would assume extensive empirical support substantiating this eating style phenomenon. What exists, in fact, is a sparse body of literature offering contradictory findings on this eating style difference. In fact, the literature pertaining to empirically establishing eating style behaviors postdates the treatment literature that incorporates the eating style assumptions in suggestions for behavior change to the obese. Concern has recently been expressed (Mahoney, 1975, 1976; Shisslak, 1976; Stunkard and Mahoney, 1976) regarding the validity of the claim that these basic dysfunctional patterns set the obese person apart from the nonobese person. A further concern involves what role, if any, these behaviors actually play in weight loss. From the literature on treatment, outcome success has been said to affirm that these assumptions underlying these behavior changes exist without any direct measurement that this is so (Mahoney, 1975, 1976). Treatment procedures and assumptions from which they were derived have not been treated independently with success in one implying verification of the other. Mahoney's (1976) point that behavioral procedures for weight reduction have been

derived from undemonstrable behavior is well taken and strongly suggests a scrutiny of the more "basic" issues of research on obese behavior components.

Literature Review

Two treatment packages setting precedence in the behavioral treatment literature on obesity that exemplify how treatment procedures are derived from this eating style distinction will precede the review of experimental attempts to verify this distinction.

Ferster et al. (1962) in their behavioral treatment strategies relate one of the earliest assumptions about eating style. Regarding rate of eating, they state that many people carry out the sequence of placing food in the mouth at a high rate. They relate that this is done by reaching for additional food as soon as food is placed in the mouth and "swallowed while the fork is in transit to the mouth" (Ferster et al., 1962, p. 106). They specify that this is a behavior characteristic of obese people by stating, "This analysis is confirmed by the high rate with which many obese people eat compared with nonobese" (p. 106). Regarding chewing, they infer that another component of this rapid eating pace is placing food in the mouth as soon as the mouth empties "without very much chewing" (p. 106). These assumptions about fast eating rate and reduced chewing in the obese individual were incorporated into

their treatment package by developing specific procedures to lengthen this chain of eating responses. Ferster et al. (1962) report no empirical, comparative data from which this eating rate differential was derived and thus it appears to be an unfounded premise.

Stuart and Davis (1972), in one of the most popularly used books in weight control programs, Slim Chance in a Fat World, concur with Ferster et al. (1962) concerning the eating rate distinction. They state,

> . . . undesirable aspects of problem eating center around the speed with which food is eaten since reduction in the pace of food consumption can significantly limit the amount eaten during the span of a normal mealtime and can slow the overeater to a pace compatable with the rate at which others eat so that he does not finish his portion well before others (Stuart and Davis, 1972, p. 89).

This assumption about fast eating rate in obese individuals is incorporated into the treatment strategy through at least four recommended steps to slow the pace of eating. Regarding biting behavior, Stuart and Davis recommend to the overeater methods to gradually reduce the number of mouthfuls per minute. No experimental evidence is cited from which comparative speeds of eating (mouthfuls per minute) between normal and obese people were derived and thus, these premises also appear to have no empirical support.

These ideas about obese eating styles have even made their way into the popular media. Glamour (1977, p.

70) magazine, in an article on dieting, include in their helpful hints, "researchers concluded that eating slowly and chewing more might be an effective diet measure." Thus, these treatment strategies reflect the extent of concern with speed of eating and consummatory behaviors as potent factors that contribute to obesity warranting change. What is missing however, are data demonstrating comparative norms or equations for this obese eating style. Thus, these treatment procedures reveal that the foundation on which treatment strategies to change eating styles is based is a nonempirical one.

The following group of studies represent experimental attempts to date to verify the eating style distinctions between normal and obese people. The results of these experimental attempts will be considered from the orientation of supportive evidence for the distinctive eating styles on the following measures: (1) bites, (2) chewing, and (3) meal duration.

The first study offering experimental support for a measure of eating rate is data Schacter (1971) reports from a study done earlier by Nisbett (1968). By calculating number of spoonfuls of ice cream subjects (Ss) ate per minute in a laboratory setting, he concluded that obese individuals ate at a faster rate than normals.

Meyer and Pudel (1972) offer data to suggest that obese Ss drink at a slower rate than normals, thus

challenging the assumption that the obese individual consumes faster, in particular with liquid ingestion rates. Drinking rate was determined by per cent of total fluid consumed within the first half of drinking time. For normals this was 80%, for obese this was 50%.

Mahoney (1976) in a series of three experiments failed to support the notion that normals differed significantly from obese on three measures of eating style. These measures included: (1) bite frequency, (2) eating rate, and (3) meal duration. Study I involved Ss eating a standardized meal in the laboratory, alone, on two consecutive days. Correlations on degree of obesity and the three measures of eating style were not significant. However, significant sex differences were reported for males who took significantly fewer bites and spent less time eating than females. Study II involved a naturalistic field study at a quick service restaurant. No significant differences were reported between normal and obese Ss who had a hamburger, french fries, and a soft drink. Study III involved Ss counting their bite frequency over a 24 hour period. No significant differences were reported between weight and bite frequency.

Hill and McCutcheon (1975) compared eating behaviors of obese and nonobese Ss during four dinner meals. Varying conditions of food preference (high and low) and hunger (high and low) from the results of six measures of

eating responses including: (1) amount eaten (grams), (2) meal time (second), (3) number of bites, (4) grams per bite, (5) seconds per bite, and (6) grams per second, they concluded the two groups' eating behaviors were essentially similar. Except for one significant interaction, in which obese Ss ate more high preference food and less low preference food than nonobese Ss, and a significant rate difference in which obese Ss ate more grams per second, the authors suggest that overall, the two groups were affected by hunger and preference conditions in much the same way and were very similar in eating style responses.

Warner and Balagura (1975) observed eating behaviors of obese and nonobese people in both the laboratory and natural environment. From results of seven parameters of eating including meal duration, number of bites, number of times new food entered the mouth, number of sips of water, bites of food per minute, duration of sips of water, and eating pattern (serial, discrete, or intermediate), they concluded that their data fail to substantiate the eating style distinction between normal and obese individuals. The only parameter that was statistically significant, in both experimental settings, was meal duration. This difference showed obese subjects took longer to eat than normal weight people with men eating longer than women. Not only did these data fail to support the eating style distinction but they offer at least one measure of

contradictory evidence that the obese do not have a shorter meal duration than the nonobese.

Dodd, Birky, and Stalling (1976) offer data to support the notion that eating styles of obese and nonobese persons differ. They observed women in a fast food restaurant and recorded total calories ordered, nutritional content, eating rate, bite size, and number of times the sandwich was replaced on the tray. When obese and nonobese Ss were matched on meal size and content no significant differences were obtained. When Ss were not matched obese women ordered larger meals, consumed less protein, ate at a faster rate, and took larger bites than nonobese women.

Marston, London, and Cooper (1976) observed eating patterns of children in obese and nonobese pairs in a school cafeteria. From measures of three areas of response, speed, extraneous movement, and gross ratings of mood, tension, and enjoyment of food the authors conclude that their data support the eating style distinction in children. They reported obese children ate faster than normal weight children from measures of bites per three minutes and chews per bite. Thin children reportedly left significantly more food on their plates than obese children and showed significantly more of what was described as "thin eating responses" (hesitates, toys with food, puts food or utensils down between bites).

Marston, London, Cooper, and Cohen (in press) observed obese and nonobese Ss in a restaurant setting and present data they suggest supports the eating style distinction. They report nonobese Ss, particularly women, had lower frequency of bites, smaller mouthfuls, and more extraneous responses (hesitation, putting down utensils, more food left on plate, and shorter stay at table after eating). This pattern was subsequently used in a training program to orient the obese to eat more like the nonobese on these eating measures (Marston et al., 1976).

Gaul, Craighead, and Mahoney (1975) report that their experimental data support the premise that obese people could be distinguished from nonobese people on four measures of eating style. These included: (1) number of bites taken in five minutes, (2) number of chews per bite, (3) total number of seconds spent chewing (300 possible), and (4) total sips of a soft drink. From observations in a quick service restaurant of Ss who had a hamburger, french fries, and a soft drink they reported (1) obese Ss took more bites, (2) fewer chews per bite, and (2) spent less time chewing than normal Ss. Thus, on one measure, number of bites, obese Ss contradicted the assumption.

Epstein, Parker, McCoy, and McGee (1976) recorded bite rate, sip rate, and concurrent activities of six children in a lunchroom cafeteria. Differences in bite

rate between obese and nonobese Ss were not significant but obese Ss drank more milk.

Wagner and Hewitt (1975) observed normal weight and obese Ss consume four consecutive lunch and dinner meals and reported that the obese meal was shorter in duration, obese spent less time chewing, but were similar to normal weight Ss in terms of total bites in the meal.

Adams, Ferguson, Stunkard, and Agras (1977) observed 61 obese, normal, and thin women for thirty minutes as they consumed a free-choice lunch in the laboratory. From measures of bites, chews, drinks, pauses, type and amount of food consumed, total active or drinking time they report no differences between the eating behaviors of normal weight and the obese but differences between obese and thin Ss. These differences involved thin Ss spending significantly more time actively eating than the obese, and spending more time chewing than the obese Ss.

Overall, these twelve experimental attempts to verify the assumptions that distinctive eating styles exist between different people relative to their weight are inconclusive and somewhat contradictory. Regarding meal duration, of the seven studies reporting this, six found no significant differences (Mahoney, 1976; Warner and Balagura, 1975; Marston et al., 1976; Marston et al., in press; Hill and McCutcheon, 1975; Adams et al., 1977) and one study (Wagner and Hewitt, 1975) reported obese having a

significantly shorter meal duration than the nonobese. Regarding eating rate, four studies support the premise that obese people eat faster than nonobese people (Marston et al., 1976; Gaul et al., 1975; Schacter, 1971; Hill and McCutcheon, 1975), one study (Meyer and Pudel, 1972) offers contradictory evidence stating obese people eat slower, and four studies (Mahoney, 1976; Warner and Balagura, 1975; Dodd et al., 1976; Adams et al., 1977) report no significant differences. Regarding consummatory behaviors, for bites, one study offers evidence contradictory to the assumption that obese people take fewer bites (Gaul et al., 1975) with the six other studies measuring this reporting no significant difference between weight groups (Hill and McCutcheon, 1975; Mahoney, 1976; Warner and Balagura, 1975; Wagner and Hewitt, 1975; Epstein et al., 1976; Adams et al., 1977). Regarding size of bites, of the four studies measuring this, two found no support for the notion that obese people take larger bites (Marston et al., 1976; Hill and McCutcheon, 1975) and the other two support the notion (Dodd et al., 1976; Marston et al., in press). Regarding chewing, four studies measured this with three studies supporting the assumption that obese people chew their food less (Gaul et al., 1975; Marston et al., 1976; Adams et al., 1977) and one study finding no significant differences (Marston et al., in press). Thus, these studies fail to render experimental support to the assumption that the

eating style of the normal weight individual is distinctively different from that of the overweight individual.

At this point it could be said, then, that these basic eating behaviors, which guide treatment techniques, lack empirical support and perhaps should be discarded as extraneous variables. However, a caution to the dismissal of the eating style distinction as a strategy in the treatment of obesity is warranted. The question is raised as to whether these experimental studies, taken as a package of empirical attempts to verify eating style assumptions are methodologically comparable and additive to permit conclusive statements. The variety of dependent and independent measures used from study to study weakens the generalizability and robustness of the results and fails to add clarity and understanding to the contradictory nature of the data. Specifically, these variables change unsystematically across studies: subjects, weight-category, weight criteria, independent measures, dependent measures, setting, food, and mode of data analysis. Thus, it is unknown whether the variable results can be attributed to any one of these methodological variations or to the validity or invalidity of eating style as behaviors associated with obesity. Because of the unsystematic nature in which these empirical studies have varied, the area has progressed little in verifying assumptions about eating style.

It is the purpose of the present study to assess whether people are distinguishable in eating patterns as a function of their weight. While the area of eating style has progressed steadily and the past two years have witnessed a plethora of research in the area, the present study was conceived and carried out when just a handful of other research was available. Had the full range of evidence just reviewed been available at the inception of the present study other tactics would have been incorporated. But given this was not the case what appears to be modest research questions were undertaken. What ensued was an effort to decrease variation across the few available studies by using similar dependent and independent measures as those used in the Gaul et al. (1975) experiment.

A few important issues that extend the design of the present study beyond a simple replication of the Gaul et al. (1975) study involve weight category and setting. Recent concern has surfaced in the literature on obesity regarding the limitations of a bipolar classification of people into weight categories. Schacter (1971) and Nisbett (1972) relate that an individual's "set point," representing a specific metabolic level and state of starvation, may be an accurate predictor of eating patterns. This idea suggests that because overweight people may be preoccupied with dieting and consequently maintaining a metabolic level below that of satiation, they might continually be in a

state of starvation and most likely to exhibit the obese eating style that has been shown to occur in hungry rats (Nisbett, 1972). Along these lines then, the normal weight person should appear similar to the most obese individual, who eats or overeats until satiety, with the overweight person the most dissimilar along the dimension of eating style. This idea has yet to be incorporated in eating style research and thus the present study will divide people into three weight categories suggested by the "set point" reasoning. Although the present study cannot directly measure this, the idea of extending bipolar weight classification as suggested by "set point" reasoning is worthy of study.

The other issue that extends the present research beyond an isomorphic replication concerns the potential constraints of the setting on eating. In the Gaul et al. (1975) study, the setting was a fast food hamburger restaurant in which fixed servings were the norm. To minimize constraints on eating via fixed portions, the present study chose an eating establishment that would not artificially restrain or impose these standards on the eater. Specifically, an "all you can eat" pizza parlor was chosen in which the individual him or herself would be responsible for the limits placed on eating.

Another area of research that has contributed criteria for distinguishing eating patterns among people of different weight categories is the data derived from

"the circumstances of eating" literature (Schacter, 1968, 1971; Schacter and Rodin, 1974). Simply, these studies suggest that eating is triggered and controlled by different sets of cues in obese and nonobese people. External cues are said to exert significantly different control over the selection, initiation, and termination of eating in obese vs. nonobese people. Internal, physiological correlates of hunger are also proposed to differentially control eating patterns between normal and obese people (Schacter and Rodin, 1974). One of the variables that has been suggested to operate in influencing different eating patterns between normal and obese people is called response cost. This involves the notion that obese people are willing to expend less effort to secure food than normals. This variability of work expenditure has been demonstrated in studies where obese people were less likely to use chopsticks in consuming oriental food (Schacter, Friedman, and Handler, 1974) and more likely to consume shelled vs. unshelled nuts (Schacter and Friedman, 1974). As the present study takes place in a natural setting with no further manipulations required to observe behaviors falling under the category of response cost, it was decided to obtain a different type of measure such as this that also purports to distinguish people according to weight. This was defined as a person's choice to purchase an additional food item (salad) that had to be self-prepared.

To further probe the idea that states of deprivation might differ among these three weight groups and elucidate the effects of unlimited food supply on them another measure was included. This involves the observation of the frequency of return trips to the food sites within a fixed time period.

The major hypotheses of this study are:

1. People will show distinctively different eating style behaviors as a function of their weight in terms of
   a. number of bites taken within a fixed interval
   b. chews per bite
   c. duration chewing.
2. It is proposed that both classes of overweight people, overweight and obese, will choose foods requiring less effort to procure; i.e., they will be less likely to pay extra for a salad which has to be self-prepared and obtained in a different part of the restaurant than normal weight people.
3. The effect of unlimited food supply will differentially affect these three weight classes in terms of the number of return trips that they make to the food counters.

The independent variables used in this study consist of sex (male vs. female) and weight categories

divided as normal, overweight, and obese. The dependent measures for eating style will be: number of bites taken in a five minute interval, number of chews per bite, and time spent chewing; and for "circumstances of eating": choice of foods (pizza or pizza and salad) and number of return trips to the food bars for pizza and salad.

CHAPTER 2

METHOD

Subjects

The subjects (N = 96) were selected on the basis of (1) procurement of a plate and going through the food line, (2) availability for observation by the two data gatherers, and (3) being between the ages of eighteen and sixty-four as judged by observers. Each subject was independently rated, by each of the two observers, on the basis of sex, age, and obesity (Appendix B). The first thirty-two in each of the three obesity groups (16 normal weight males, 16 normal weight females; 16 overweight males, 16 overweight females; 16 obese males, 16 obese females) that met joint agreement on these criteria were chosen for observation. All subjects were observed unobtrusively without their knowledge by observers who were also eating in the restaurant. Observations of any subject indicating awareness of being observed were immediately discontinued. Data from these subjects were eliminated from the study.

Setting

The experiment took place at a restaurant chain specializing in pizza. The observations were made on one evening per week when the restaurant offered their food at

unlimited quantities for a fixed price. Four branches of the same restaurant were used an equal number of times to record the measures. The four restaurants were similar in that the floorplan (food counter, cash register, tables, chairs, lighting, jukebox) were identical for each. Each restaurant was located in a different area of the city with the clientele ranging from college students to suburban families.

Procedure

All observations were recorded on 3 x 5 coded data cards designed for quick recording (cf. Appendix A). These cards resulted from a pilot study that tested a variety of data cards, recording maneuvers and coding techniques for maximal unobtrusive and efficient data collection. Stop watches were used to record timed eating behaviors. Only the consumption of pizza and salad were recorded; drinking or sipping behaviors were not included. Eight observers, who were student volunteers, collected the data. These observers met several times for training purposes before beginning the actual data collection. Two group meetings were held in one of the restaurants to familiarize the observers with the purpose of the project, techniques to be used, and ways to best permit unobtrusive recording in the actual setting; i.e., tables that would prevent accurate viewing, optimal lighting, etc. Four subsequent group

meetings were devoted to obtaining sufficient inter-observer reliability on the independent and dependent measures. Reliability training for the independent measures of obesity (normal weight, overweight, and obese) consisted of the following: (1) devising a standardized handout sheet that described weight proportions for each of the three groups and areas of the body to be considered for weight classification (Appendix B), (2) familiarizing all observers with these criteria, and (3) establishing a sufficiently high degree of inter-observer reliability by having all observers simultaneously but independently rate the individual weight classification of passersby in a student cafeteria. A frequency reliability formula was used to calculate the reliability of each observer by comparing that individual's rating with that of a trained anchor person among the observers. All observers were trained to a 92% agreement criterion with the anchor observer (range = 95% to 100%, $\bar{X}$ = 96%).

Observer training for reliability on the dependent measures consisted of the following: (1) construction of a standardized handout sheet that described each of the dependent measures in detail (see Appendix C) and (2) establishing a sufficiently high degree of interobserver reliability for consummatory and speed of eating behaviors by group viewing and rating of volunteer pizza and salad eaters. These tapes were shown in five-minute segments

after which reliability checks of these eating style behaviors were scored. During this time difficulties with observations and recording were discussed and rectified. Three sessions of approximately six hours of viewing and recording took place until interobserver reliability was stabilized and established at a 92% agreement level (bites, range = 84% to 100%, $\bar{X}$ = 92%; chews, range = 81% to 98%, $\bar{X}$ = 88%; duration chewing, range 94% to 100%, $\bar{X}$ = 95%). Following this, two meetings took place in the natural setting for pilot runs of data collection to insure generalization of the interobserver reliability. With this being achieved and all observers agreeing to feeling comfortable with the procedures the project data collection began.

Working in pairs, the eight observers rotated pairings and stations every tuesday night for three months among the four chain restaurant locations. This rotation decreased the possibility of arousing suspicion on the part of restaurant employees and regular customers. Observations were made one subject at a time on the basis of availability to the observers. The two observers observed one subject at a time with observer I recording half of the measures and observer II the other half. Observers sat at different tables in the restaurant and alternated recording tasks with each new subject. With both observers independently agreeing to a subject's weight and sex

classification recording began. Starting with the subject's first bite, frequency counts on the eating style measures were recorded continuously for five minutes. The circumstances of eating measures were also recorded during this time. The following dependent measures were recorded: consummatory behaviors--total number of bites in five minutes, total number of chews per bite; speed of eating--total seconds spent chewing (300 possible); circumstances of eating--number of return trips to the food bars and choice of food (pizza or pizza and salad); demographic measure--number of people seated with the target person.

Data Reduction

The data used in this project resulted from three months of consistent, weekly observations from October to January, 1976. The statistical procedure used for obtaining interobserver reliability ratings was a frequency formula. This was calculated by dividing the number of ratings for which both observers agreed by the number of agreements plus disagreements and multiplying this quotient by one hundred. Separate mixed analysis of variance statistics were used for the following conditions: (1) total number of bites taken in the first five minutes of eating, (2) total number of chews per bite in the first five minutes of eating, (3) total time spent chewing in the first five minutes, (4) total number of return trips to the

food bars in the first five minutes, and (5) number of people seated with the target person. A chi square test of independence was used for the nominal data from the condition of choice of food.

CHAPTER 3

RESULTS

Interobserver Ratings

Interobserver agreement for weight category with all three weight groups was 96% and for eating style measures 92%.

Eating Style Measures

The means and standard deviations for eating style measures for the three weight groups are presented in Table 1. The main effect for obesity was significant for total time spent chewing in the first five minutes of eating ($F = 4.61$, $dF = 2/30$, $p < .05$). The mean chewing times (Table 1) for each weight group show overweight Ss spending the most time chewing ($M = 246.53$ secs) followed by obese Ss ($M = 224.93$ secs) with normal weight Ss spending the least time chewing ($M = 210.53$ secs).

The main effect for obesity was not significant for the other measures of eating style; total number of bites taken in the first five minutes ($F = 1.55$, $dF = 2/30$, p = n.s.), or total number of chews per bite in the first five minutes of eating ($F = .55$, $dF = 2/30$, p = n.s.).

The main effect for sex was not significant for any of the measures of eating style; total number of bites

Table 1. Means and Standard Deviations for Six Dependent Measures for Three Weight Groups

	Normal Weight		Overweight		Obese	
Condition	Males	Females	Males	Females	Males	Females
No. bites						
M	25.12	32.56	27.25	24.06	30.50	24.56
SD	1.24	1.87	3.29	2.62	3.14	2.19
No. chews per bite						
M	10.22	9.09	8.92	9.12	7.11	10.51
SD	3.12	3.23	3.61	2.18	2.72	4.11
Time spent chewing (in secs.)						
M	212.25	208.93	252.00	241.06	211.62	238.25
SD	24.82	29.54	31.20	26.01	33.22	35.20
Return trips--pizza						
M	1.25	1.06	1.12	1.00	1.25	1.12
SD	.33	.28	.04	.00	.32	.05
Return trips--salad						
M	.50	.43	.50	.81	.68	.43
SD	.12	.10	.11	.13	.16	.10
No. of people						
M	1.81	2.18	1.70	2.43	1.81	2.25
SD	.12	.10	.09	.14	.10	.16

taken in the first five minutes of eating (F = 2.81, dF = 1/15, p = n.s.), total number of chews per bite taken in the first five minutes of eating (F = 1.45, dF = 1/15, p = n.s.), or total time spent chewing in the first five minutes of eating (F = .18, dF = 1/15, p = n.s.).

There was a significant sex x obesity interaction for total chews per bite in the first five minutes of eating (F = 3.73, dF = 15/30, p = .05). Figure 1 illustrates that obese women, on the average, took more chews per bite (M = 10.51) than obese men (M = 7.11).

The Tukey multiple comparison method was used for post hoc comparison of the means from the significant conditions on eating style variable (Table 2). A significant difference was obtained for the main effect of obesity for total time spent chewing in the first five minutes of eating (F = 4.45, dF = 2/32, p = .01) between the means from the normal and overweight groups. All other comparisons of means for the eating style conditions were not significant.

Circumstances of Eating

For the condition of return trips to the food bars (both pizza and salad) no significant differences were obtained for either the main effect of obesity--return trips pizza (F = .84, dF = 2/15, p = n.s.)--return trips salad (F = 1.84, dF = 2/15, p = n.s.); or the main effect

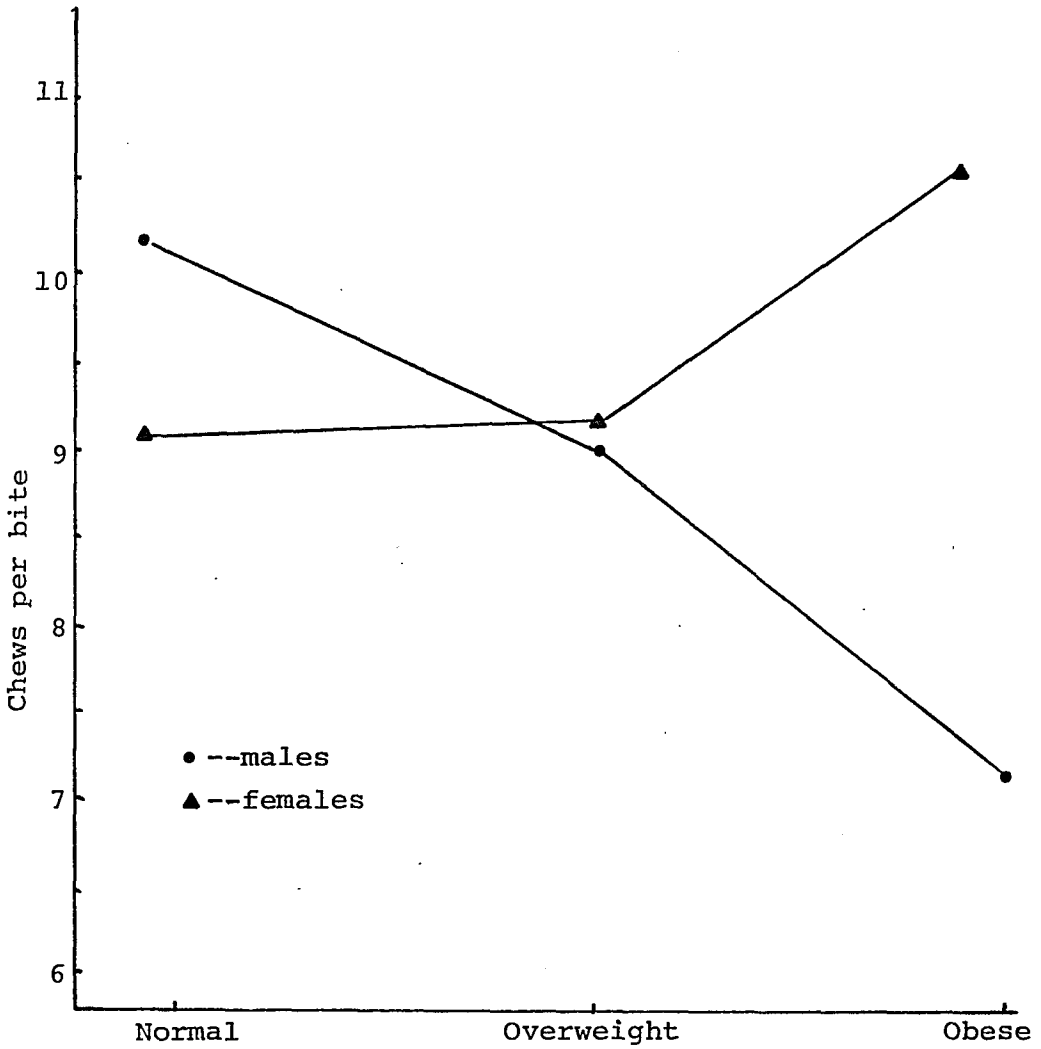

Figure 1. Sex x Weight Interaction for the Dependent Measure Chews per Bite

Table 2. Tukey Post-hoc Comparisons of Means from Significant Conditions on Eating with Three Weight Groups

Dep. Measure	Source	MSE	N	Means	q.05	Means		
						M		F
							Normal	
Chews per bite	sex x wt.	11.60	16	6	4.56	10.12		9.09
					N.S.		OW	
						8.92		9.12
							Obese	
						7.11		10.51
						Normal	OW	Obese
Duration chewing	weight	2266.81	32	3	3.49	210.59	246.53	224.00
						M		F
No. in party	sex	1.45	48	2	2.86	1.39		2.29

of sex--return trips pizza (F = 3.18, dF = 1/15, p = n.s.)--return trips salad (F = .15, dF = 1/15, p = n.s.).

For the condition of choice of food (pizza or pizza and salad), the chi square analysis, using weight, was significant (X = 17.3, dF = 2/32, p < .002). Choice of food is not independent of weight and as Table 3 indicates, normal weight people least often choose pizza with a salad (N = 12) with obese people the next most often (N = 15) and overweight people most often choosing pizza and salad (N = 16).

Table 3. Chi Square for Choice of Food (Pizza or Pizza and Salad) with Three Weight Groups

	Pizza	Pizza and Salad
Normal	20	12
Overweight	16	16
Obese	17	15

For the demographic condition of number of people seated with the target person there was a significant main effect for sex (F = 4.11, dF = 1/15, p < .05). Table 1 shows the means for this condition and indicates women tended to eat with more people (M = 2.18) than men (M = 1.81). The Tukey post hoc analysis of means for this condition was significant (F = 3.82, dF = 2/32, p < .01).

Additional Analysis

The majority of studies to date have compared eating styles and patterns in humans according to two weight categories, normal and obese. In order to render the present data in a more comparable form to these other studies, the same analysis for all conditions were performed but this time on only two weight groups, normal and obese (the obese weight group resulted from pooling subjects from the overweight and obese groups). Table 4 shows the comparison of results from eating behaviors with the change in the weight category from three to two classes. With the two weight categories the results are different than with the three weight categories. Among the eating style conditions with the two weight groups, the main effect for obesity was also significant for total time spent chewing in five minutes ($F = 5.16$, $dF = 1/92$, $p < .02$). The mean chewing time for normals was 330.54 secs, and for the obese, 370.73. As is the case when normal weight Ss are compared with two classes of overweight Ss, they spend the least time chewing. The main effect for obesity was not significant for the other measures of eating style in the two weight group analysis.

The main effect for sex was not signifiant for any of the measures of eating style similar to the case in the three weight group analysis.

Table 4. Comparison of Results of Eating Behaviors Between 3 and 2 Classes of Weight

	Independent Measures of Weight								
	Normal, Overweight, Obese					Normal, Obese			
Conditions:	Sign	Source	Means			Sign	Source	Means	
No. bites	N.S.					N.S.			
			m	f					
No. chews per bite	.05	sex x wt.	10.22	9.09	N	N.S.			
			8.92	9.12	OW				
			7.11	10.51	OB				
			n	ow	ob				
Time spent chewing (in secs.)	02.5	wt.	210.59	246.53	224.43	.02	wt.	n 330.54	ob 370.73
Return trips-- pizza	N.S.					.03	sex	m 1.2	f 1.0
Return trips-- salad	N.S.					N.S.			
			m	f				m	f
No. of people	.05	sex	1.79	2.29		.04	sex	1.79	2.29

For the circumstances of eating conditions the results are also different. For the condition of return trips to the pizza bar there was a significant effect for sex ($F = 4.39$, $dF = 1/92$, $p < .03$) with males returning slightly more often ($M = 1.2$) than females ($M = 1.0$). Return trips for salad was not significant.

For the condition of choice of food, the chi square analysis was not significant ($F = 1.05$, $dF = 1/32$, $p = n.s.$) contrary to the case in the three weight class analysis.

For the demographic condition of number of people seated with the target person there was a significant main effect for sex ($F = 4.19$, $dF = 1/92$, $p < .04$) with females eating in the company of more people ($M = 2.29$) than males ($M = 1.79$). This was exactly the case in the three weight category analysis.

Post hoc Tukey analyses were performed on all the means from significant conditions from the two weight group analysis but no significant differences were attained.

CHAPTER 4

DISCUSSION

Eating Style Differences

These results have several implications for basic research. Overall, these data fail to support the notion that there are differences in eating styles of individuals, as predicted, as a function of their weight. Specifically, the only significant difference in eating behaviors worth mention was the sex x weight interaction for chews per bite. These data suggest contradictory evidence in that obese individuals, particularly women, masticated their food the most. However, in the same weight class, males masticated their food the least. This implies that unique eating patterns existed in this population in terms of chews per bite and presents data that are not in the expected direction according to eating style assumptions. This finding is in direct opposition to the results of this same condition in the study by Gaul et al. (1975). Their study reported obese individuals took significantly less chews per bite than nonobese people. As their project involved two weight groups, normal and obese, the second analysis in the present study of normal and obese weight groups might be a more relevant comparison.

However, this analysis failed to show any significant differences for chews per bite and thus offers no support for this distinction.

Although there was a significant main effect for weight on the condition of total time spent chewing, with overweight people spending the most time chewing, these results are of limited value in terms of speed of eating. The reason for this is that the dependent measure of total number of bites was not significantly different and therefore cannot be used as a comparative measure of speed. This limitation also holds true for this same condition in the two weight group analysis.

Circumstances of Eating

Overall, the data from these conditions fail to offer support in the expected direction. For the condition of return trips to the food bars, in the three weight category analysis, no significant differences were found for either main effects. Thus, with this population, faced with unlimited amounts of food, all weight groups responded without notable differences. Although there was a significant effect for sex in the two weight group analysis, with males appearing to return more often than females, there are no data to qualify this in terms of their weight in accord with the predicted direction.

For the condition of choice of food, as a measure of response cost, the data from the three weight group analysis contradicts predictions according to weight. Particularly, ideas from the response cost area would suggest that obese people would expend less effort to secure food than normals. However, the present results show overweight people being the most likely to expend more effort to secure food as evidenced by their greater proclivity to spend twenty-five cents more to purchase a salad that had to be self-prepared. Nonobese people were the least likely to do this. This same behavior could also be considered to reflect the notion that overweight people tended to be more sucsceptible to the variety of external food cues, consequently purchasing both available food choices. This difficulty in interpretation reflects some of the problems encountered with research that takes place in the natural environment where controls are limited.

The data from the two weight group analysis failed to contribute any significant differences and information on this condition.

For the demographic condition of number of people seated with the target, both weight group analyses found significant sex differences with women tending to eat in the company of more people than men. This finding does not suggest any weight qualifications or support for this phenomenon in terms of differences in eating patterns but

does suggest that by qualifying a person by sex different behavioral considerations could be warranted.

Weight Group Analysis

Evaluating the data with two separate analyses according to different numbers of weight groups reveals two different sets of data. What can be said about the different sets of results are that neither separately nor together do these data offer potent support to the idea that eating patterns among humans are distinctively different according to their weight. It can also be concluded that the analysis of eating patterns using three weight groups failed to clearly support Nisbett's (1972) notions that the normal weight person might more closely resemble the obese more than the overweight person. The post hoc analysis of the means for the significant conditions involving differences according to weight failed to support this. However, as individuals were not weighed, their exact weight category is not known, which may be critical in validating this theory.

The specifics of the data with the weight group changes may be less important than more broad considerations raised. One consideration involves the utility of categorizing people into homogeneous groups according to biological weight. Particularly, the use of weight as a causal factor for behaviors related to eating deserves

attention. Herman and Polivy (1975) used the dimension of "restraint" in eating and were able to classify individuals within normal weight limits into two distinctive groups, restrained and unrestrained. Type of restraint reflected attitudinal and behavioral concern with diet and weight and suggests differential deprivational states and adipose tissue demand. According to the dependent measures of anxiety and amount of food eaten the restrained normals appeared highly similar to overweight people and highly dissimilar to unrestrained normals. The authors conclude that relative deprivation as indicated by type of restraint accounted for more variance in eating patterns than weight category.

This suggests that other factors such as "restraint" may be a more accurate predictor of behaviors accompanying weight and that behaviors comprising eating style may be more a consequence of dieting than a cause. Dimensions related to weight that account for greater variance than that accounted for by biological weight groups need to be considered as possibly more valid and useful predictors of individual eating behavior.

Including the results of the present study, it appears that the experimental attempts, to date, to validate eating style differences as a function of weight have fallen short of this goal. However, the inconclusiveness of the overall results needs to be considered as a

function of the unsystematic and variable use of dependent and independent measures (Shisslak, 1976). What is imperative at this stage is a careful matching of variables with alternation of one factor at a time to control for unknown sources of variance and insure attribution of cause to the appropriate variable. From the ambiguity that surfaces when scrutinizing the overall results of these experimental studies, it appears that eating style is not a robust phenomenon that can withstand uncontrolled variation along assorted dimensions.

At this stage, eating style assumptions reserve a major focus of the behavioral treatment of obesity and popular media (Glamour, 1977). However, treatment strategies based on this assumption may be too narrow or even irrelevant. Treatment plans that generally recommend changes in speed of eating, chewing, and biting may be unnecessary if not effective. Some studies suggest that taking smaller bites, for some people, may actually increase the amount of food they consume (Nisbett and Storms, 1976; Pliner, 1974; Wooley, 1972).

A salient feature in treatment outcome data is the inconsistent nature of the results across subjects. This may reflect the fact that obesity stems from many factors which may vary from person to person. This suggests that different approaches to weight loss and behavior change may be more efficacious to fit the variety of problems obesity

presents to many people. If designers of behavioral treatment packages blanketly recommend focusing on eating styles in designing treatment procedures, the probability of effecting weight change across people with diverse weight problems decreases. This decrease in effectiveness is exacerbated if eating styles are irrelevant to weight management.

Thus, neither through direct observation from research on eating styles nor inferences from treatment outcome measures have we been able to substantiate that behavioral treatments are effective due to changes in behavior which are the basis of treatment. From this state of affairs it is suggested that research strategies focus specifically on the relationship between treatments, eating behaviors, and outcome success. To insure scrutiny of the process of change, over time, single subject designs should be employed to allow simultaneous assessment of changes on a variety of measures (Jeffery and Coates, 1977). By identifying those behaviors directly related to successful weight loss and maintenance, treatment can be tailored to individual needs. If an individual empirically demonstrates excessively rapid rates of eating this behavior could be manipulaed, measured, and assessed to see how this contributes to that individual's weight loss. But from the variability of results from the eating style data it can be inferred that not all obese people eat fast and consequently

do not warrant strategies that target this behavior. From the ambiguous findings from eating style research it seems highly probable that other variables, besides eating style, contribute to obesity. It seems time that behavioral treatments become truly behavioral by measuring behavior change directly and systematically through individualized behavior analysis.

Mahoney and Mahoney (1976a, 1976b) have suggested that factors such as cognitive skills and social support may be untapped sources of effective weight reduction and urge a move in the direction of personalization of treatment strategies for individual eating problems. Their suggestions of instruction in problem solving skills related to behavior and situational components of obesity also permits adoption of a personalized plan for a broad range of problems. These are potentially fruitful lines to follow. However, to insure that our progression in varying the behavioral treatment package is a sound one, let us not lose sight of what has been done in the area so far and change systematically with new parameters based on valid rejection of the old.

APPENDIX A

DATA SHEETS

Data Sheets Used by Observer I in the Collecting of Information on Bites and Chews of the Individual Subject

Page 1:

OBSERVER I

CHEWS	BITES	CHEWS	BITES	CHEWS	BITES	CHEWS	BITES	CHEWS	BITES

Page 2:

OBSERVER I

Target Subject

Sex: M F

Weight: N OW O

Choice of Food

Pizza	Salad

Data Sheet Used by Observer II in the Recording of Information on Chewing Time of the Individual Subject

OBSERVER II

	Weight:		Position	Return Trips
Began Chewing: _____	1. N OW O	Pizza	P F A	
		Salad	P F A	
	2. N OW O	Pizza	P F A	
		Salad	P F A	
Ended Recording: _____	3. N OW O	Pizza	P F A	
		Salad	P F A	
	4. N OW O	Pizza	P F A	
		Salad	P F A	
Duration Chewing: _____	5. N OW O	Pizza	P F A	

NOTE: Information on other people accompanying the subject (i.e., weight category, choice of food, sitting position in relation to pizza and salad bars, and number of return trips to either bar) was also collected by Observer II on this data sheet.

APPENDIX B

CRITERIA FOR WEIGHT ESTIMATION

In estimating a person's weight, the following areas of the body are to be considered: (1) upper arms, (2) wrists, (3) stomach, (4) buttocks, (5) back and (6) thighs.

Normal weight consists of either 15% under or over a person's weight category as determined by their bone structure, size, and height. Subjectively, we shall classify someone's weight by determining the degree of excess fat in all of the above areas of the body or any combination thereof.

Normal--Weight distribution consisting of no more than about 1 inch of excess fat beyond the skeletal structure on 1 or more areas of the body.

Overweight--Weight distribution consisting of from 1-2 inches of excess fat in any 1 or more areas of the body.

Obese--Weight distribution consisting of from 2-infinity inches of excess fat in any 1 or more areas of the body.

APPENDIX C

DESCRIPTION OF THE OBSERVATION VARIABLES

1. Number of bites taken within a 5-minute interval.
   a. Bite: An observable hand and/or utensil to mouth contact with a food item in which some amount of food is secured in the mouth prior to the chewing sequence. It is possible for a bite to occur a number of times before the chewing sequence begins. The number of bites occurring prior to the chewing sequence should be recorded in the bites column. Only enter a number in this column if you observe more than one bite prior to chewing. When a bite is initiated with a utensil, this will be indicated by a checkmark in the bite column. (This checkmark also simultaneously records salad procurement.)
   b. 5-minute interval: This begins with the first bite of the meal, indicating the beginning of the meal, and ends at the limit of the 5-minute interval. Concommitant with the first bite is the recording of the time on the data sheet from wrist watch time.

2. Number of chews per bite.
   a. Chews: The up and down movement of jaws and mouth immediately following a bite or bite sequence. A chew is defined as the completion of one up and down movement of the jaws.
   b. Number of chews per bite: The frequency of chews within the interval between bites. Note: other extraneous mouth behaviors may occur within this interval; i.e., talking and/or sipping. These are not to be recorded as chews.
3. Time spent chewing. The duration of chewing is to be recorded from a stop watch which should assess the time spent chewing within the 5-minute recording interval. Depression of the stop watch button should occur at the beginning of each chewing sequence and stop at the end of the sequence. Make sure that the time spent chewing as recorded on the stop watch reflects the actual time that the person is engaged in chewing and not the intervals between chewing.
4. Number of trips to the food bar. This category represents the total number of trips, after the initial plates, back to either the pizza and/or salad bar within the 5-minute interval.

5. Choice of foods (pizza or pizza and salad). This category involves specifying whether the observed subjects choose either pizza or pizza and salad as their meal composition.
6. Number of people seated with the target person. This number represents the total number of people accompanying the target person to dinner and sitting at the same table as the target person throughout the meal.
7. Weight of the target person. This category represents the estimated weight of the target person as being either normal, overweight, or obese.
8. Sex of the target person. This category specifies the target person as being either male or female.
9. Age of the target person. In order for a person to qualify as a target subject they must be between the ages of 18-64.

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