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Effect of Effort on Meal Selection and Meal Acceptability in a Student Cafeteria

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Past laboratory and field studies show that the effort necessary to obtain food acts as a determinant of food selection and consumption. Two studies examined the impact of increasing the effort needed to obtain candy or potato chips on selection in a normal lunch setting. In the first study, food selection, acceptance and intake were obtained during the first week baseline and under the effort manipulation during the second week. With increased effort, candy selection dropped dramatically in week 2. Subjects substituted items from the dessert, fruit and accessory food groups. In the second study, food selection and acceptance were measured during a 2-week baseline, a 3-week effort period, and a 3-week recovery period. With increased effort, potato chip selection dropped dramatically and only partially recovered in the last phase. Subjects substituted items from the starch food group. These results demonstrate that changes in the effort needed to obtain food can have a nutritional impact in an actual eating situation and could be an important part of a healthy eating strategy.

Introduction

A number of lines of evidence are combining to suggest that effort is a major influence on people's food selections and nutrient intakes. Hirsch and Kramer (1993) recently noted in their review that earlier studies of effort were conducted in the

The first study was carried out while the senior author was a Secretary of the Army Research Fellow at the Institute of Food Research, Reading.

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context of contemporary theories of obesity, while more recent studies of effort were conducted in the context of understanding consumption of military rations in field exercises.

Two early laboratory studies compared intakes of both natural and wrapped products, with the wrapped product requiring more effort to eat it. Schachter and Freedman (1974) found that subjects who were not and had never been obese showed no difference in intake of shelled or unshelled almonds. Singh and Sikes (1972), in another laboratory study, used chocolates in their regular commercial foil wrap and unwrapped, and cashew nuts wrapped and unwrapped. Wrapping had no effect on consumption of chocolates or cashews for normal-weight subjects.

Nisbett's laboratory study of sandwich eating can also be reinterpreted in the present context (Nisbett, 1967). Normal-weight subjects did not eat more sandwiches when presented with either one or three sandwiches in front of them and more sandwiches in the refrigerator in the room. In other words, the added effort to get up and get more sandwiches did not produce changes in intake.

Of greater relevance to the studies to be reported below, Meyers *et al.* (1980) studied food selections of staff, students and visitors at a hospital cafeteria over 6 days. On two control days high energy desserts (pies, cakes) were equally as accessible as low energy desserts (fresh fruit, gelatin). On two other days, high energy desserts were placed more accessibly in the front row; on the remaining two days low energy desserts were placed more accessibly. Overall, about 70% of respondents did not select dessert. Of those who did, about 60% chose a high energy dessert, and about 55% chose the closest dessert in the front of the display. Making desserts less accessible affected selection of low energy desserts but not high energy desserts. A number of people opted for no dessert rather than select a less accessible low energy dessert; however, those selecting a high energy dessert were more likely to persevere and reach it when it was placed further away.

Levitz (1976) also reported dessert selection in a hospital cafeteria. Comparing ice-cream selection with the cooler lid open and closed, Levitz found ice-cream selection by normal-weight individuals to be 16% and 5% respectively. Neither Meyers *et al.* (1980) nor Levitz (1976) reported significant differences between obese and normal-weight individuals in these effects.

Effort was not a major focus of human research again until recently when it was raised as a key factor in soldiers' willingness to eat their field rations. Meiselman *et al.* (1988) reported that "... situational factors ... the numerous variables in our eating environments which make it easier or harder for us to begin, continue, or complete a meal ..." (p. 78) are key factors in controlling food intake. Hirsch and Kramer (1993) have reviewed the situational variables studied thus far.

Engell *et al.* (1990) manipulated effort to obtain water for subjects being fed a laboratory lunch meal. Water was on the table, or 20 feet from the table in the same room, or 40 feet from the table in another room. Subjects drank approximately twice as much water when it was on the table in front of them than they did in either of the other conditions which did not differ significantly.

The present studies were undertaken to test effort as a factor in controlling food selection, intake and meal acceptability ratings in a natural eating situation, a college cafeteria. The studies were designed to examine whether increased effort affected intake of a specific meal constituent and whether this change in turn led to other meal changes.

Study 1

Methods

Subjects

Subjects were students at Bournemouth University who normally ate in the large student cafeteria which provides several thousand meals per day. Sixty-three students were solicited through various advertisements posted on campus to participate in rating the canteen for two weeks in exchange for £5. Students were told that their task was to “rate the canteen”. At no time were students told that we were interested in what they ate or how much they ate. Out of the 63 who started the study, 43 students provided at least 3 days data from each week.

Student characteristics were distributed as follows for the 43 subjects: year of college (first, 18; second, 22; third, 3), age (18 years, 4; 19 years, 15; 20 years, 12; 21 years, 7; over 21 years, 5). Student majors were distributed across many fields with only business studies ($n = 14$) and tourism ($n = 8$) showing more than five participants. Of the 43, 16 lived in hotels or other accommodations which provided food, while 27 lived in accommodations at college in which students did their own meal preparation or purchased food.

Setting and Procedure

The study took place in the large student cafeteria at Bournemouth University. Students enter at one end of a long room, select their food at several points (two hot food lines, sandwich case, beverage line, etc.), pay at one of four cash points, and find a seat. In this cafeteria, each item is individually priced. About 20 m down the large room is a smaller snack bar with some food items and drinks and one cash point. During the baseline week, candy was available at large displays at the four cash points at the end of the cafeteria line. During the effort week, the candy was moved to the smaller snack bar, requiring walking to another line and paying at another cash point. Cashiers at the four cash points told the students where to get candy if the students asked. The cafeteria was normally busy at each hour from 1100 to 1400 hrs with lines subsiding from 20 past the hour until the next hour.

Survey forms for the study were handed out each day at a small table on the side of the cafeteria. Student participants reported at the table, obtained their rating form, and, after eating, returned their food tray and completed form to the same table. Students used a standard rating form which asked students to list each food selected and provide a rating on a seven-point hedonic scale as well as an overall meal rating, and provided a space for other comments.

All weighing of food on trays was carried out in the kitchens, out of sight. Neither the cafeteria staff nor the students were aware of the food weighing. Weighing was carried out according to conventional practice. Items which could be separated were separated for weighing on balances. Information was copied from all packaged items. The only obvious problem was separating liquids from foods (gravy from meat, potato, rice or vegetable; custard or cream from desserts, etc.). One advantage was that students tended to eat their entire meal, leaving little or no waste to weigh. Portion sizes of all foods consumed were calculated by weighing a series of portions prior to and during the study. The students’ food intakes were calculated by subtracting the weight of any plate waste from the average portion size.

Food intake data were analysed by the Microdiet System, version 7 (Salford University, U.K.) which is based on nutrient data from the 4th edition of McCance and Widdowson's *The Composition of Foods*. This program has the facility for additional foods and made-up dishes to be added to the database. All recipes used in the cafeteria were added to improve accuracy (e.g. pizza, chili con carne). Similarly, a number of previously manufactured items such as potato chips, chocolate bars, and low fat dairy products were added using the manufacturers' published data. Data from five nutritional variables (energy, protein, fat, carbohydrate and fiber) were analysed statistically to determine whether there were any significant differences between the two experimental conditions studied.

RESULTS

Selection Rates

Selection rates were calculated for different types of items. Most item types will be familiar to readers. The category of desserts included warm baked items often served with warm custard as well as puddings, etc. Fruit was fresh fruit. Accessory foods were potato chips, various packaged cakes, cookies, short bread, etc. Candy or confectionery was chocolate, chocolate-containing bars and muesli bars.

In order to assess whether there was any difference between the types of food chosen in week 1 and week 2, selection rates across all subjects were compared using a binomial model. Because many subjects were observed for different numbers of days in each week, the proportion of observations they contribute to the total differs between the 2 weeks. This means that differences in the consumption totals or simple proportions between the 2 weeks may simply be due to the different proportion of observations from each subject, rather than any underlying change in behavior. In order to compare the 2 weeks, "directly standardized" rates (Fleiss, 1973) were considered, rather than simple proportions. The consumption rates were standardized to the number of meals each subject ate in week 1. Thus, for week 1 the standardized rate is the same as the simple proportion; while for week 2, the standardized rate for an item is calculated by taking the proportion of meals containing that item in week 2 for each subject individually and then multiplying this by the number of meals that subject ate in week 1. These numbers are then totaled across all subjects and divided by the total number of meals eaten in week 1 to arrive at a standardized rate. So, for instance, a subject who ate four meals in week 1, two of which included a starch item, contributes "2" to the sum of starch items used in calculating the rate for week 1. If they ate three meals in week 2, two of which contained a starch item, then the proportion of meals containing starch is 2/3; if the subject had eaten this proportion of meals containing starch during week 1, they would have eaten $4 \times (2/3) = 8/3$ meals with starch items, so they contribute "8/3" (i.e. 2·667) to the total number of starch items used in calculating the standardized rate for week 2 (see Fleiss, 1973 for an explanation at greater length).

A binomial model was then used to check for significant differences in the proportions of meals which included items for each food category. This was done by comparing the difference between the rates to that which would be expected due to sampling variation if the "true" rate was the same in both weeks (Fleiss, 1973, equation 2·5). This produces a z^2 statistic which, under the assumption that there is no difference between the "true" rates, should have a chi-squared distribution with 1 d.f.

A total of 141 meals was recorded in week 1 and 193 in week 2. For the samples as a whole, the only food category which had a significant difference in its selection rate between week 1 (rate: 0·142) and week 2 (rate: 0·021) was candy (χ^2, $p<0{\cdot}001$). For subjects who did not buy candy in week 1, their 90 meals in week 1 and 122 meals in week 2 showed no significant differences in selection rates of various food categories.

For the subjects who did eat candy in week 1, before the candy was moved, a different picture emerges (Table 1). Although the samples for each food category are small, there is a highly significant reduction in selection of candy. Further, there is a non-significant increase in selection rate for the categories of dessert, fruit and accessory foods. When these three categories are grouped, this increase in selection rate approaches significance.

Hedonic Ratings

The statistical significance of the differences between the hedonic scores given to items from each category in the 2 weeks was tested using the Mann–Whitney–Wilcoxon *U* statistic. The summary of hedonic scores for the entire sample shows no differences between week 1 and week 2 for any food category, although accessory foods approached significance. For those who did not select candy during week 1 there were no significant differences in hedonic scores between weeks 1 and 2 for different food categories, although in some categories there were too few observations to calculate a test.

For those who selected candy in week 1 a pattern emerged similar to that for food category selection rates. There were no significant differences in hedonic scores for any food class, but the reduction in hedonic score approached significance for accessory foods (hedonic score: 6·22 and 5·35, $p<0{\cdot}08$) and for the total grouping of desserts, fruit and accessory foods. For the latter group the mean hedonic value dropped from 5·97 to 5·32 ($p<0{\cdot}06$).

Nutritional Intake

For the nutritional variables of energy, protein, fat, carbohydrate, and fiber, *t*-tests yielded no significant differences between week 1 and week 2 when all the students were considered (Table 2). However, the increase in protein from week 1 to week 2 approached significance. When the intakes of candy-consuming students were considered separately, and compared with the same students' intakes on a corresponding day in week 2, some significant differences were noted (Table 3). Carbohydrate consumption was significantly lower in week 2. Unfortunately, it was not possible to analyse for sucrose intake separately. There was a trend to lower fat consumption in week 2. Fiber intake increased significantly in week 2. The decrease in carbohydrate consumption in week 2 and the trend toward decreased fat consumption in week 2 were reflected in a trend to reduced energy consumption in week 2.

TABLE 1

Summary of selection rates for subjects who chose candy in the baseline period

Condition	Main Dishes	Pizza	Alter-natives	Salads	Sand-wiches	Dessert	Fruit	Accessory Foods	Candy	Total Dessert Fruit Accessory Foods Candy	Total Dessert Fruit Accessory Foods
Week 1 No. Person–Days Observed (out of 51)	0·471	0·157	0·020	0·059	0·294	0·078	0·098	0·177	0·392	0·608	0·353
Week 2 No. Person–Days Observed (out of 71)	0·380	0·085	0·051	0·098	0·366	0·192	0·216	0·255	0·031	0·580	0·549
Z Squared (Chi-squared) (1 df)	0·520	0·647	0·104	0·136	0·311	1·932	1·852	0·522	17·783	0·007	3·208
Significance	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	$p<0{\cdot}001$	N.S.	$p<0{\cdot}10$

TABLE 2
Average energy and nutrient intakes of students in week 1 and week 2 (all cases)

	Number of meals	Energy (kcals)	Energy (kj)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)
Week 1	139	691·4	2905·4	23·4	31·2	84·4	4·2
Week 2	191	722·5	3034·8	26·1	33·2	84·9	4·9
$p=$		0·407	0·412	0·057	0·316	0·930	0·124

TABLE 3
Comparison of average energy and nutrient intakes of confectionery-eating students in week 1 with intakes week 2

	Number of people	Energy (kcals)	Energy (kj)	Protein (g)	Fat (g)	CHO* (g)	Fibre* (g)
Week 1	20	871·9	3660·9	24·5	43·0	103·2	2·5
Week 2	20	686·3	2880·9	21·7	34·1	77·9	4·7
$p=$		0·066	0·066	0·349	0·123	0·036	0·028

* Difference between means significant $p<0{\cdot}05$.

DISCUSSION

The results show that increasing the effort to obtain candy resulted in a significant selective reduction in candy consumption. The only significant reduction of selection rate when candy was removed to a distance was for candy. There also appears to be a concomitant increase of consumption of cooked desserts, fresh fruit and a group of accessory foods when candy consumption drops. While this study provides support for the dietary impact of effort, especially when taken with earlier studies (Meyers *et al.*, 1980; Levitz, 1975; Engell *et al.*, 1990), further work was needed to fully describe the effort effect itself and to understand how it functions. It was necessary to explore further the effects of effort to obtain food as follows:

1. determine whether the effort effect could be demonstrated again in the same situation;
2. extend the duration of the effort manipulation to determine if the effect is transitory or persistent;
3. determine whether eating behavior recovers to its previous level after the effort treatment or whether effort exerts some residual effect;
4. determine whether the immediate effect of the effort manipulation and any residual effects are specific to the one treatment food.

STUDY 2

INTRODUCTION

A second study was undertaken to improve the methods used in the first study and to explore the questions raised above. The method was improved as follows:

most importantly, subjects were preselected and recruited who were more likely to use the student cafeteria regularly and to select the target food (potato chips, or crisps, as they are called in the U.K.). In the first study the baseline selection rate for candy was only 0·142 (20 selections out of 141 meals). Thus, candy was not even moderately selected to begin with. In the second study we chose subjects who used the cafeteria and were observed to select potato chips and indicated, on a brief questionnaire, that they did frequently select potato chips.

In the first study, candy was moved from the four cash points during the effort manipulation. The cashiers told students, if they asked, that candy could be obtained at the snack bar. We improved on this in several ways in the second study. Prior to the baseline period and in the baseline condition, potato chips were only available in one location on the food line. In the effort condition the potato chips were moved to the snack bar (as the candy had been) and a sign was placed where the potato chips had been, stating that "crisps" were available in the snack bar. Also, the baseline period now extended over 2 weeks, allowing more time for students to adjust to the change.

Readers familiar with laboratory approaches to behavioral topics would probably recommend or expect a counterbalanced design in study 1 or study 2. Such a design would ensure that all subjects did not receive the same order of conditions. However, in field research it can be impractical or even impossible to counterbalance. In the student cafeteria, students are not isolated from each other. Any experimental treatment presented to some students would be observed by all students. Also, manipulations such as moving food apply to all students. Counterbalancing was not a practical possibility.

Subjects

Subjects were 60 students at Bournemouth University who frequently ate in the student cafeteria. The subjects comprised 36 males and 24 females between the ages of 18 and 42. Student majors were widely varied, with the exception of 14 subjects taking Food and Hospitality and nine subjects taking Business Studies. Of the 60 subjects, seven lived in hotels which provided food, 47 lived in student houses where they made their own meals, and six lived on campus in the student village where they also made their own meals.

Subjects were recruited by distributing posters and leaflets in the student cafeteria. Both the posters and leaflets informed potential subjects that they would be "rating the food" of the cafeteria for 2 days per week for 8 weeks. Students were not told that we were interested in what or how much they ate. The leaflet explained that they would be required to spend approximately 1 min to fill in a questionnaire each Tuesday and Thursday during the 8 weeks and that they would receive a token of £10 at the end of the study.

Students who wished to take part were asked to fill in a brief questionnaire attached to the leaflets which requested information on how often they ate in the cafeteria, what type of meal or food items they usually selected from the menu offered, and basic information about themselves such as name, age, sex, course of study and type of living accommodation.

Setting and Procedure

The study took place in the student cafeteria at Bournemouth University which is described above. Everything was the same as in Study 1, except for the addition of a set meal as well as individually priced food. The set meal consisted of meat, potato, vegetable, dessert and drink, all for one reduced price. Also, vending machines were now situated at the bottom end of the cafeteria, opposite the meal area. There, students could obtain drinks and packaged food.

The survey for the second study asked subjects where they purchased their food within the cafeteria. They were asked to list and rate the acceptability of each individual food item taken, as well as the acceptability of the whole meal, using a nine-point hedonic scale ranging from "dislike extremely" to "like extremely", with a neutral point of "neither dislike nor like". As in the first study, at the bottom of the questionnaire subjects could make comments about any aspect of the cafeteria. This was compatible with the stated aim of the study, which was to rate the canteen.

The 8 weeks of the study period were divided into three parts: baseline (2 weeks), experimental manipulation period (3 weeks) and recovery (3 weeks). The study ran every Tuesday and Thursday over a period of 8 weeks, with the same subjects taking part throughout the study. Student participation was very high, and nearly all subjects turned up every Tuesday and Thursday. In the first 2 weeks, the study was conducted under normal conditions. In the following 3 weeks, all potato chips were moved away from the main food line to the snack bar, and a notice was put up stating that crisps were now available in the snack bar. Thus, subjects were required to make increased effort to walk to and wait in a second queue if they wanted potato chips with their meal. Finally, for the last 3 weeks the study was conducted under normal conditions, as in the first 2 weeks. Each subject's consumption of food was assessed by visually recording the waste of each food item. The data analysis was carried out using the GENSTAT statistical package (Numerical Algorithms Group, Oxford, U.K.).

Results

Selection Rates

The subjects ate a total of 214 times in the baseline period, 333 in the manipulation period, and 317 times in the recovery period. If all 60 subjects were present at each meal, then there would be 240 meals in baseline and 360 each in experimental manipulation and recovery.

Selection rates for all subjects were calculated for the 11 different food categories for each of the three time periods. Simple rates were used rather than the standardized rates, because subjects were generally observed on the same number of days. For all subjects, there were no significant differences in selection rates of main dish, pizza, sandwich, dessert, fruit and candy. Vegetable selection showed a slight reduction in selection rate ($p<0.05$) and a slight but incomplete return to baseline ($p<0.05$). Selection of potato chips showed a highly significant reduction from baseline to experimental treatment ($p<0.001$), and a significant reduction remained in the recovery period ($p<0.001$). Whereas selection of potato chips dropped, selection of starch increased in the treatment period ($p<0.05$) and recovery was not complete ($p<0.01$). Selection of sweets/cakes increased slightly from baseline ($p<0.10$) and recovery was not statistically different from baseline.

Table 4 presents selection rates for those subjects who chose potato chips in the baseline period. This table is analogous to Table 1 above for the candy study. Two food categories showed statistically significant selection rate changes across the three periods. Selection rate of potato chips dropped significantly during treatment ($p<0.001$) and increased during recovery but remained significantly lower than baseline ($p<0.001$). Selection rate of starch foods increased significantly during treatment ($p<0.05$) and decreased during recovery but remained significantly higher than baseline ($p<0.05$). Although sample sizes were much smaller, recovery selection rates also differed significantly from baseline for fruit and candy ($p<0.05$).

Weeks 3, 4 and 5 were compared to determine whether the effect of the effort treatment varied over its 3-week duration. There was no significant variation for potato chips or starch. Salad consumption did drop in week 5 compared to weeks 3 and 4. Also, the selection rates in the baseline period were compared to the selection rate for week 8 only, the end of recovery. The only significant difference was for potato chips, which was significantly lower in week 8 of recovery than in baseline.

Hedonic Ratings

Average acceptability ratings were calculated for the overall meal and for each food category for the three time periods. Several food categories showed statistically significant increases in rated acceptance over the three time periods (overall meal, starch, sandwiches), while the candy category declined. Ratings of potato chips showed no difference between baseline (7·10) and treatment (7·06), with a non-significant increase to recovery (7·34).

Estimation of Intake

In study 1 we noted that most students ate all of their meal. In this study we used visual estimation to determine the percentage of meals with food remaining for the three study periods. Under 20% of meals showed food waste.

Discussion

The importance of situational variables in controlling intake was observed in a series of studies on soldiers' underconsumption of military rations in the field (Hirsch & Kramer, 1993). Meiselman *et al.* (1988) argued that situational factors as well as food factors controlled intake. The power of situational effects was made clearer when Meiselman *et al.* examined the increased food consumption by college students in an environment which prompted maximum ease of eating. Since that time, a number of reviews have begun to place more emphasis on contextual factors (Meiselman, 1992, 1993; Rozin & Tuorila, 1993). The present study, also with college students, confirms the effect of effort in a "normal" eating situation with a "normal" population.

One feature of the effort effects observed in these studies is the specificity of the effect. In study 1, when candy was moved and required more effort, only candy selection dropped significantly. In study 2, when potato chips were moved and required more effort, only potato chips selection dropped significantly. Not only was there an observed specificity of the impact on the item moved, but also on the other

TABLE 4

Summary of consumption rates for subjects who chose crisps in the baseline period (page 1)

Condition	Number of meals	Main meal	Pizzas	Starch items	Vegetables	Salads	Bread	Sandwiches	Desserts	Fruit	Crisps	Sweets/ Cakes	Sauces	Candy	Drinks
Baseline	117	0·385	0·111	0·274	0·154	0·000	0·000	0·299	0·137	0·222	0·718	0·051	0·017	0·060	0·607
Effort	184	0·408	0·125	0·462	0·092	0·000	0·005	0·304	0·120	0·130	0·092	0·065	0·022	0·103	0·560
Recovery	171	0·398	0·088	0·398	0·123	0·003	0·006	0·333	0·152	0·135	0·322	0·070	0·029	0·140	0·515
Difference between the three periods*		0·158 N.S.	1·229 N.S.	10·695 $p<0·01$	2·628 N.S.	5·315 $p<0·10$	0·666 N.S.	0·496 N.S.	0·800 N.S.	5·442 $p<0·10$	126·582 $p<<0·001$	0·431 N.S.	0·483 N.S.	4·778 $p<0·10$	2·419 N.S.
Contrast between baseline and manipulation†		0·109 N.S.	0·899 N.S.	6·201 $p<0·05$	1·988 N.S.	1·929 N.S.	0·103 N.S.	0·119 N.S.	0·661 N.S.	1·354 N.S.	77·272 $p<<0·001$	0·014 N.S.	0·032 N.S.	0·023 N.S.	0·027 N.S.
Contrast between the two baselines		0·066 N.S.	0·580 N.S.	6·331 $p<0·05$	0·766 N.S.	2·780 N.S.	0·920 N.S.	0·500 N.S.	0·175 N.S.	5·073 $p<0·05$	58·554 $p<<0·001$	0·567 N.S.	0·579 N.S.	6·284 $p<0·05$	3·201 $p<0·10$

* Using Fleiss's formula 9·4 and simple rates (compare to a chi-squared with a 2 df).
† (compare to a chi-squared with a 1 df).
‡ (compare to a chi-squared with a 1 df).

items affected by the effort manipulation. In the first study, movement of candy, hence reduction in candy selection, was accompanied by an increase in fruit, baked desserts and a group of accessory items. Note that none of these items (including candy) are basic meal components. Substitutions took place within items not part of the basic meal (meat, potato, vegetable). In the second study, movement of potato chips, hence reduction in potato chip selection, was accompanied by an increase in starch selection.

The effort manipulation and the resulting apparent substitution of items by the students also provides an operational definition of which meal items naturally group together. Traditional meal planning is being replaced by non-traditional meals and snacks. Food substitution data can provide insight into what meal components function in a similar way in a meal. By experimentally developing a meal structure through addition or subtraction of a meal component and observing any changes, one can develop a meal matrix of what can substitute for what.

Both the research and non-scientific literature are filled with results on success and failures of many programs and approaches to control diet. Many approaches involve costly programs and costly diet aids. The present results strongly suggest that the simple technique of varying effort can increase or decrease consumption of foods through manipulation of the effort required to obtain them.

Interestingly, the current view of obesity (Rodin *et al.*, 1989) and the current behavioral approaches to managing obesity (Brownell & Kramer, 1989) do not stress situational variables such as effort to obtain food. Rodin *et al.* consider aspects of the food (variety, palatability) and aspects of the individual (hyper-responsiveness, etc.) but not of the eating situation. Clearly, some of the variables mentioned by Rodin *et al.* could involve greater effort.

Similarly, Brownell and Kramer (1989) present Brownell's 1986 "techniques in a comprehensive program for weight control". These are divided into lifestyle, exercise, attitude, relationship and nutrition. Although the authors state that "treatment is geared toward modifying the situations that promote eating" (p. 189), and several techniques presented might involve effort to obtain food (e.g. "prevent automatic eating", "alter the antecedents to eating", "keep problem foods out of sight"), there is no direct mention of how to design the eating situation. The eating situation is also not dealt with directly in *Progress in Obesity Research* (Oomura, Tarui, Inoue, & Shimazu, 1990). On the more conceptual level, Blundell includes environmental or situational factors in some of his diagrams of eating (e.g. Blundell, 1983; 1979) but not in others (Blundell & Hill, 1986); and it is not clear whether environment includes factors such as effort.

One factor which has been mentioned in the obesity literature is salience, or cue prominence. In the context of the present studies, one could argue that the food which was removed from view had less salience, or cue prominence. However, studies by Johnson (1974) and Ross (1974), in Schachter and Rodin's classic book *Obese Humans and Rats*, both conclude that salience is a factor for obese and not for normals. Therefore, there is no reason to believe that reduced consumption of food in the present studies resulted from reduced salience when the food was removed. Although we did not collect or report height/weight data on the subjects, they were definitely not obese.

Thus, effort is an important variable in understanding the control of human eating and is also an important tool in studying the dynamics of the eating process and situation.

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