Field dependent eating and perception as a function of weight and sex

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Considerable research evidence indicates that internal and external cues differentially affect the eating behavior of obese and normal-weight individuals Compared with a normal-weight person, the obese individual is relatively insensitive to internal, visceral cues such as gastric motility or an empty stomach (Cabanac & Duclaux, 1970, Nisbett & Kanouse, 1969, Stunkard & Koch, 1964, Schachter, 1971, Schachter, Goldman & Gordon, 1968) What does seem to affect the eating behavior of the obese more than that of normals are external cues such as the taste, accessibility, and visibility of the food or the time of day (Goldman, Jaffa, & Schachter, 1968, Hashim & van Itallie, 1965, Johnson, 1970, Mayer, Monello, & Selzer, 1965, Nisbett, 1968, Nisbett & Gurwitz, 1970, Ross, 1969, Schachter, 1971, Schachter & Friedman, 1974, Schachter & Gross, 1968) The cause of the differential sensitivity of normals and obese to internal and external cues is as yet uncertain One kind of information which may shed some light on this question is evidence regarding the specificity of this differential sensitivity is it limited to eating behavior or does it generalize to other behaviors as well?

There have been documented individual differences in responsivity to external and internal cues for behaviors which are unrelated to food consumption For example, Witkin and his associates (1954, 1962) devised a number of measures to assess the influence on subjects' judgments of verticality of internal, kinesthetic cues to verticality vs external, visual cues, which are deliberately manipulated to provide misleading information regarding the true vertical position Reliable individual differences in the utilization of these two sets of cues have been observed some individuals' judgments of verticality are more influenced

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by the external cues in their visual field than are others', whose judgments seem to rely more on internal, kinesthetic cues The former group of persons have been labeled "field dependent" by Witkin and his associates, the latter are called "field independent" Some evidence that obese individuals manifest more reliance on external cues on these tasks than normals do is provided in a study by Karp and Pardes (1965), which employed Witkin's body-adjustment test (BAT) Witkin's embedded figures test (EFT) and Witkin's rod-and-frame test (RFT) as measures of field dependence These investigators found that a group of women who were attending a nutrition clinic for treatment of obesity problems manifested significantly more field dependence on the RFT and EFT than did a control group of women matched for age and education

While Karp and Pardes' (1965) findings are suggestive of a general tendency for obese individuals to be more influenced by external cues than normals are whether or not those cues are food-related, conflicting results are reported by Schachter (1971, p 136) Two separate studies compared the EFT field dependence of obese and normal male undergraduates and found no significant differences Schachter offers several possible explanations for his failure to replicate the Karp and Pardes effect, and concludes that Karp and Pardes' successful demonstration of obese-normal differences in field dependence probably resulted from differences between the experimental and control groups other than their degree of obesity However, it is possible that Schachter's failure to replicate resulted from his use of the embedded figures test Although this measure yielded the strongest weight differences in Karp and Pardes' research, it is not necessarily the best measure of field dependence

For one thing, EFT performance is significantly correlated with measures of intelligence (Bieri, Bradburn & Galinski, 1958, Elliot, 1961, Jackson, 1957) This correlation has led some researchers, such as Elliot (1961) to suggest that the RFT and other tests involving judgment of verticality are purer measures of field dependence than the EFT inasmuch as they are unrelated to intelligence measures Despite Karp and Pardes' attempt to match obese and normal-weight subjects for educational level, there may have been differences in the intelligence of these two groups of subjects which were absent in Schachter's more homogeneous college sample Such ability differences could have served to produce the differences in performance on the EFT between Karp and Pardes' two weight groups which Schachter failed to find On the other hand, ability differences could not have produced the weight differences in performance on the RFT observed by Karp and Pardes, and Schachter might have found similar weight differences in his undergraduate male population had he employed the RFT as a measure of field dependence Another argument against employing the EFT is that it has less face validity than the RFT as an index of the extent to which an individual's behavior is influenced by external vs internal cues Both the RFT and EFT provide the subject with misleading external, visual cues which can influence behavior But on the EFT these contextual cues are at odds with other external visual cues (the embedded figure), whereas on the RFT they conflict with internal, kinesthetic cues, a situation more analogous to the contest between external food-related cues and internal, visceral cues in the eating behavior research

The present study was designed to pursue the possibility that Schachter's failure to replicate Karp and Pardes resulted from his use of the EFT Thus, performance on the RFT was utilized as the measure of sensitivity to non-food-related cues. In addition, both male and female subjects were employed in order to pursue the possibility that the discrepant findings of Karp and Pardes (1965) and Schachter (1971) were due to their respective use of female and male subjects, as well as to investigate the possibility that there are sex differences in general sensitivity to external cues Finally, responsivity to both kinds of external cues was determined for each subject so that the correspondence between sensitivity to external, food-related cues and external, non-food-related cues could be assessed

The differential dependence on external cues of obese and normal subjects' eating behavior was determined in the present study by manipulating the accessibility of the food Replicating Schachter and Friedman's (1974) study, obese and normal subjects were given an opportunity to nibble either on unshelled almonds or shelled almonds It was expected that the eating behavior of obese subjects would be more field dependent than that of normals—i e, that their eating would be more influenced by the external properties of the food than would that of normals, whose food consumption should depend more on internal, visceral cues More specifically it was predicted that (1) The tendency to consume more shelled than unshelled almonds will be greater for obese than for normal-weight subjects [2]

The differential dependence of obese and normal subjects' behavior on non-food-related external cues was determined in the present study by means of Witkin's rod-and-frame-test For this test, subjects are seated in a completely darkened room where they view a luminous tilted rod within a luminous frame, which is also tilted Their task is to set the rod to gravitational vertical It was expected that obese subjects would be more field dependent than normals—i e , that their judgments of verticality would be more influenced by the external visual cues from the tilted frame than would those of normals whose judgments would rely more on internal, kinesthetic cues More specifically, it was predicted that (2) The average deviation of subjects' rod setting from the gravitational vertical will be greater for obese than for normal-weight subjects

In addition to predicting differences in sensitivity to external cues as a function of subjects' weight, sex differences were also anticipated Several studies have reported that the external visual field exerts a greater influence on females' than males' judgments of verticality on the RFT (Andrieux, 1955, Bennet, 1956, Sandstrom, 1953, 1956, Witkin, Dyk, Faterson, Goodenough, & Karp, 1962), and others have reported greater influence of external, food-related cues on the eating behavior of females than males (Nisbett & Gurwitz, 1970, Smith, Powell, & Ross, 1955a, b, Wallen, 1943) In view of these findings it was predicted that (3) The tendency to consume more shelled than unshelled almonds will be greater for females than for males, and (4) The average deviation of the rod from the gravitational vertical on the RFT will be greater for females than for males

If individual differences in the influence of the shell on subjects' eating behavior and the influence of the tilted frame on subjects' judgments of verticality are both manifestations of a

2 Schachter and Friedman noted that this effect may be due to either of two properties of unshelled nuts the lesser prominence of their edibility or the greater hindrance to their consumption This distinction is immaterial for purposes of the present investigation which seeks only to demonstrate that external food-related cues—be they "prominence" or "hindrance"—exert a greater influence on the eating behavior of obese than normal-weight subjects

generalized sensitivity to external vs internal cues, then one would expect a significant correlation between subjects' field dependence on the two tasks It was thus predicted that (5) The more a subject's eating is inhibited by the presence of the shell, the greater will be the deviation from gravitational vertical of his setting of the rod

METHOD

Subjects

To provide a pool of subjects, data on the weight, height, and age of volunteer subjects were obtained from university records and classroom surveys From these data, the percentage of weight deviation for each subject was computed from Metropolitan Life Insurance Company norms (1959) Earlier research by Schachter and his associates had generally defined a pool of obese subjects as those who were 15 percent overweight or more, while normal subjects have generally been defined as those 10 percent overweight or less Unfortunately, the difficulty of finding enough subjects who were 15 percent overweight or more made it impossible to use these specific criteria in the present investigation However, Schachter, Goldman, and Gordon's (1968) criterion that there be a 5 percent weight differential between the lightest obese and the heaviest normal subject was met The present investigation employed a total of 29 obese subjects whose weights ranged from 10 2 to 77 7 percent overweight, with a mean overweight of 17 9 percent Twenty-nine normal subjects ranged in weight from 4 5 percent underweight to 4 6 percent overweight with a mean overweight of 0 0 percent Obese subjects included 15 males and 14 females, normals included 13 males and 16 females [3] All subjects were paid $2 00 for their participation in the hour long experiment The experimentally relevant characteristics of each group of subjects are presented in Table 1

Materials

A rod-and-frame (Witkin & Asch, 1948) was employed as the measure of perceptual field dependence It consisted of four 40-inch fluorescent light bulbs covered by opaque plastic and mounted on a wooden frame 42 inches square within which was centered a 38-inch

3 Six additional subjects were discarded from the final analyses because their inclusion would not allow a 5 percent weight differential between the lightest obese and heaviest normal subject (All were approximately 6 percent overweight) Preliminary analyses of variance including these individuals with the group of normal-weight subjects yielded the same significant effects as the analyses which are reported

Table 1 Physical characteristics of the subjects in each of the eight experimental conditions

Weight	Sex	Type of nut	N	Age	Height in inches	Weight in lbs	Percent weight deviation from norm
Obese	Male	Shells on	7	18 9	68 9	176 4	+15 7
Obese	Male	Shells off	8	19 1	69 6	178 0	+14 4
Obese	Female	Shells on	7	18 3	63 1	146 6	+24 2
Obese	Female	Shells off	7	18 5	64 4	144 3	+17 2
Normal	Male	Shells on	6	19 7	67 9	147 8	−00 4
Normal	Male	Shells off	7	18 9	67 8	148 1	−00 8
Normal	Female	Shells on	8	19 0	64 6	125 4	+01 6
Normal	Female	Shells off	8	18 5	64 5	122.5	−00 2

rod with a fluorescent bulb in the center The rod and frame were mounted on a drum which allowed each to be tilted independently of the other The degree of tilt could be controlled manually by the experimenter or by means of an electrically operated dial mounted on the chair in which subjects were seated A large protractor was attached to the stationary support behind the drum and separate pointers from the rod and the frame permitted direct readings of degrees of deviation from the vertical The luminescence of the bulbs was fixed at a constant level by means of rheostats When viewed in a dark room, the effect was that of an illuminated 40 inch outline square in which was centered a 38-inch rod Nothing else could be seen [4]

A modified form of the 16 PF (Cattell & Eber, 1964) was employed as a filler task in the present experiment [5] Also employed were 464 grams of shelled or unshelled almonds, a Hanson dietetic scale for weighing the almonds, an ashtray, and a nutcracker, where appropriate

Procedure

Brandeis University undergraduates enrolled in psychology classes were asked to complete a research participation information sheet if they were interested in participating in an investigation of personality and perception This information sheet requested, among other

4 The authors would like to thank Ricardo B Morant for the use of his RFT apparatus

5 The data from this filler task were analyzed to see if there were weight or sex differences in responses on an Extraversion scale and an Independence scale The only significant effect was a tendency for normal-weight subjects to score higher on the extraversion scale than the obese did Correlations between these paper and pencil personality scales and behavior on the RFT and the eating behavior task were all nonsignificant

things, subjects' height, weight, and age. From this pool of subjects, obese and normal-weight males and females were selected according to the criteria outlined above. These subjects were contacted by telephone and again invited to participate in a psychology experiment studying personality and perception and told that they would be paid $2.00 for their time. Each subject was scheduled to participate individually sometime between 1:30 and 5:00 p.m.

Subjects were greeted by a female experimenter who was seated at a desk upon which there were papers, folders, a partially empty cup of coffee, a nutcracker (in the unshelled nut condition), an ashtray (containing the broken shells of three almonds in the unshelled nut condition), and a clear plastic bag of shelled or unshelled almonds. Subjects sat in a chair opposite the experimenter while she explained the experimental procedure to them. During this time, the experimenter casually ate two almonds. When the instructions were completed, the subject was invited to sit at the experimenter's desk so as to be more comfortable while completing the personality inventory. (The actual purpose of this was to situate subjects near the bag of almonds.) The experimenter then left the room munching a nut and saying, "Take your time, there's no time limit. Use pen or pencil, help yourself to some nuts, and I'll return shortly." Fifteen minutes later the experimenter returned, picked up the bag of nuts, and entered an adjoining room where she waited until the subject finished the personality questionnaire. Thus, each subject had the same amount of time in which to consume nuts regardless of how long they spent on the questionnaire.

After completing the personality questionnaire, subjects were blindfolded, taken into a completely darkened room, and seated in a chair 7 feet in front of the RFT apparatus. Following a short period of dark adaptation, the subject's blindfold was removed and he was told that he would be asked to make eight judgments on the RFT. Specifically, subjects were told that "the task is to set the rod to vertical, as in parallel to the walls of a building." They were instructed that they could manipulate the tilt of the rod by means of the dial mounted on the arm of the chair in which they were seated. On half of the trials, the frame was tilted 28 degrees to the right and on half it was tilted 28 degrees to the left. For each frame position, the rod was tilted either 28 degrees to the right or 28 degrees to the left, thus generating four combinations of rod and frame tilt. Each combination was presented twice in random order. After each trial, subjects were instructed to close their eyes, while the experimenter recorded the degrees of deviation of their rod setting from the vertical and set the rod and frame at the appropriate tilt for the next trial.

RESULTS

Eating Behavior

The grams of nuts consumed by subjects in the unshelled nut condition were multiplied by 6 to render their actual nut consumption comparable to that of subjects in the shelled nut condition (One gram of unshelled nuts equals 6 grams of nuts when the shells are removed) Since the means and variances of these gram consumption scores were highly correlated, logarithmic transformations were performed on the grams consumed by each subject to equalize the variances Table 2 presents the mean log grams of nuts consumed by subjects in each group A $2 \times 2 \times 2$ (Weight $\times$ Sex $\times$ Nut) analysis of variance performed on these log gram scores (See Table 3) revealed no significant main effect for sex, and although the means were all in the expected direction, the predicted Sex $\times$ Nut interaction did not reach an acceptable level of statistical significance ($F = 1\,46$, $df = 1{,}50$, $p = \,23$) However, the predicted interaction between weight and type of nut was significant ($F = 5\,70$, $df = 1{,}50$, $p = \,02$) As can be seen in Figure 1, obese subjects' consumption of nuts was more inhibited by the presence of a shell than was that of normals Indeed, while obese subjects consumed slightly more shelled almonds than normals did ($t < 1$), they consumed substantially fewer unshelled almonds than did normals ($t = 2\,72$, $df = 26$, $p < \,01$) This effect is responsible for the marginally significant weight main effect which revealed greater total nut consumption by normal subjects than by obese subjects ($F = 2\,78$, $df = 1{,}50$, $p = \,10$)

It should be noted that the obese–normal differences for the log grams consumed measure may reflect one of a number of

Table 2 Log grams of nuts consumed by subjects in each experimental condition

Type of nut	Subject group: Males		Females	
	Normal	Obese	Normal	Obese
Shells off	1 259 ($N = 7$)	1 102 ($N = 8$)	1 148 ($N = 8$)	1 450 ($N = 7$)
Shells on	1 008 ($N = 6$)	472 ($N = 7$)	755 ($N = 8$)	477 ($N = 7$)

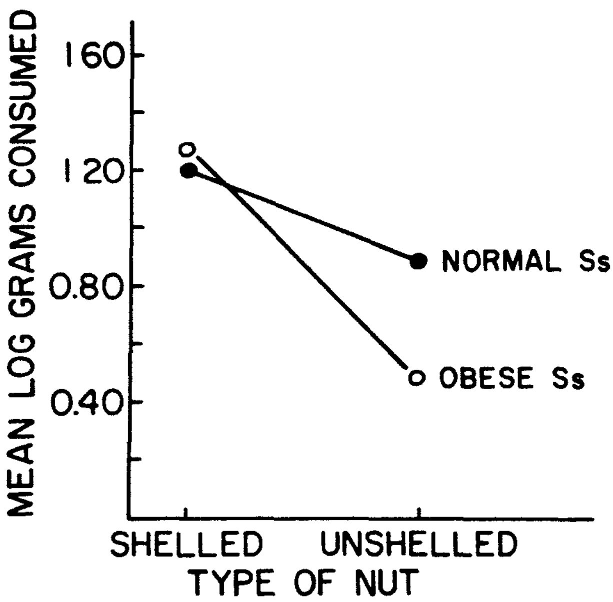

Figure 1 Mean log grams of shelled and unshelled nuts consumed by obese and normal-weight subjects

possible differences in the eating behavior of these weight groups (1) the likelihood of consuming any nuts at all may be reduced more by the presence of a shell for obese than for normal-weight individuals, and/or (2) the quantity of nuts consumed by those subjects who do eat may be reduced more by the shell for obese than for normal-weight individuals, or (3) the quantity of nuts consumed by those subjects who do eat may be greater for obese than for normal weight individuals, even though the shell reduces

Table 3 Analysis of variance of the log grams consumed scores

Source	*df*	*MS*	*F*
Weight (W)	1	403	2 78
Sex (S)	1	000	< 1
Nuts (N)	1	4 533	31 25***
W × S	1	463	3 19
W × N	1	827	5 70*
S × N	1	211	1 46
W × S × N	1	036	< 1
Error	50	145	

* $p < 05$
*** $p < 001$

Table 4 The proportion of obese and normal-weight subjects who ate

Type of nut	Weight group	
	Normal	Obese
Shells off	93	1 00
Shells on	93	64

Note—The nut × weight interaction pattern for all subjects also holds within each sex

the likelihood of consuming any nuts more for the obese than for the normals This last possibility would be consistent with Singh's (1973) suggestion that obese individuals have a response inhibition deficit which causes them to continue eating longer than normals do, and to thus consume more food

In an attempt to clarify the nature of the obese–normal differences in eating behavior, two additional analyses were performed The first was a 2 × 2 (Weight × Nut) analysis of variance performed on arcsin transformations of the proportion of obese and normal weight subjects who ate any shelled or unshelled nuts at all (See Tables 4 and 5) This analysis revealed a significant main effect for nuts which reflected the tendency for more subjects to eat shelled than unshelled nuts ($p <$ 05, one tailed) and a significant Weight × Nut interaction which revealed that the nut effect was greater for obese than for normal weight subjects ($p <$ 05, one-tailed) The main effect for weight was not significant ($p >$ 25) [6] These findings indicate that the Weight × Nut interaction for the log grams consumed measure is at least partly due to the fact that the presence of a shell reduces the likelihood of eating any nuts more for obese individuals than for normals The next question was whether obese subjects who did eat consumed fewer nuts than normals or more nuts than normals, as Singh's (1973) hypothesis might predict In an attempt to answer this question, a 2 × 2 × 2 analysis of variance was performed on the log grams of nuts consumed by subjects who ate some nuts Eliminating non-eaters from the log grams analysis rendered both the weight effect and the Weight × Nut in-

6 A parallel analysis of variance on the arcsin transformed proportions of male and female subjects who consumed any shelled and unshelled nuts revealed no significant sex or sex × nut interaction effects, which is consistent with the findings from the analysis of the log grams consumed measure

Table 5 Analysis of variance on arcsin transformations of the proportion of obese and normal-weight subjects who ate

Source	*df*	*MS*	*F*
Weight (W)	1	0855	1 24
Nuts (N)	1	2177	3 16*
W × N	1	2112	2 90*
Baseline variance	∞	069	

* $p < 05$, one-tailed

teraction nonsignificant ($Fs = 2\ 17$ and $1\ 30$, $dfs = 1{,}43$, both $ps < 10$) However, the pattern of means was similar to that obtained for all subjects (See Table 6) obese eaters consumed approximately the same amount of shelled nuts as normal eaters, and they consumed somewhat fewer unshelled nuts ($t = 1\ 70$, $df = 20$, $p \simeq 10$) [7] Thus this internal analysis revealed a tendency for the shell to reduce the quantity of nuts consumed by obese eaters more than it reduced the quantity consumed by normal-weight eaters, and it provided no evidence that obese individuals consumed more food than normals did once eating had begun [8]

Table 6 Log grams of nuts consumed by subjects in each experimental condition who ate

Type of nut	Subject group			
	Males		Females	
	Normal	Obese	Normal	Obese
Shells off	1 469 (N = 6)	1 102 (N = 8)	1 148 (N = 8)	1 450 (N = 7)
Shells on	1 008 (N = 6)	661 (N = 5)	863 (N = 7)	834 (N = 4)

7 It should be noted that although this effect is largely due to the female subjects, neither the Sex × Nut interaction ($F < 1$) nor the Sex × Weight × Nut interaction was significant ($F = 1\ 38$, $df = 1{,}43$, $p > 10$)

8 The results for unshelled nuts are not really problematic for Singh, since he argues that obese individuals may not eat so much as normals do when effort is required due to an inability to suppress incompatible emotional responses However, his theory would predict greater consumption of shelled nuts by obese than normal eaters, and this did not occur Although these data thus seem to contradict Singh's (1973) hypothesis, they should be interpreted with caution, since those subjects who were retained in the internal analysis self-selected themselves to be eaters, and they may have differed in some important way from a random sample of obese and normal-weight individuals

Additional evidence that subjects' obesity determines the influence of external cues on their eating behavior is found in the correlations between subjects' percent overweight and the influence of the shell on their nut consumption Inasmuch as nuts comprised a between-subjects variable in the present experiment, a direct assessment of the influence of the shell could not be made—i e , a comparison of the consumption of shelled vs unshelled nuts was not possible for individual subjects In lieu of this, correlations between percent overweight and nut consumption were computed within each nut condition In calculating these correlations, the assumption is made that the fewer unshelled nuts an individual consumes, the more field dependence he manifests, since such consumption suggests that his eating behavior is relatively inhibited by (dependent upon) the presence of the shell On the other hand, it is assumed that consumption of shelled nuts is unrelated to field dependence [9] As would be expected, the more overweight the subject, the fewer log grams consumed when the nuts were unshelled ($r = - 45$, $df = 26$, $p <$ 02), and the less likely the subject was to eat any unshelled nuts at all ($r = - 46$, $df = 26$, $p <$ 02) This negative relationship between percent overweight and food consumption did not obtain when the nuts had no shells the correlation between overweight and eating was + 09 for the log grams measure and + 22 for the eat vs no-eat measure ($df = 28$, both $ps >$ 10) An inspection of the within-cell correlations between percent overweight and consumption of shelled and unshelled nuts revealed a very inconsistent pattern of results, which may indicate that the overall correlations were largely a product of between group differences On the other hand, unreliability due to the small sample sizes ($n = 6$ to 8) may be responsible for the inconsistency of the within-cell correlations

Judgments of Verticality

As predicted, a 2 × 2 × 2 (Weight × Sex × Nut) analysis of variance performed on subjects' mean degrees of deviation from

9 If any relationship were to be expected, it would be a positive one—the fewer shelled nuts consumed the less field dependence a subject would seem to manifest inasmuch as his eating behavior is relatively unaugmented by the easy accessibility of the nuts

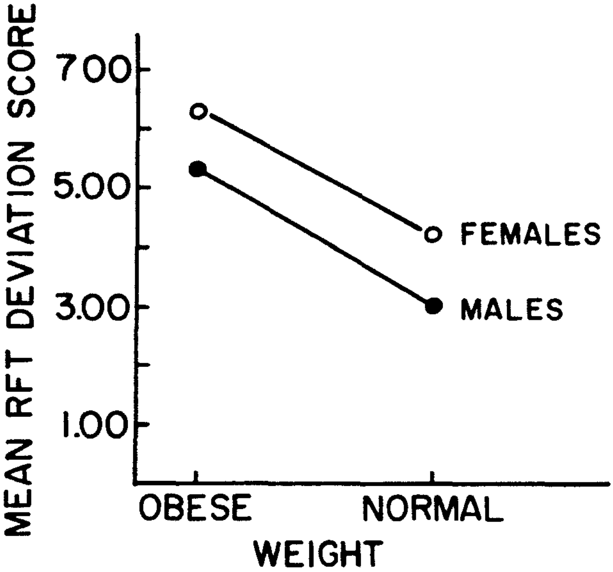

Figure 2 Mean RFT deviation scores as a function of subjects' sex and weight

the vertical on the RFT yielded significant main effects for weight ($F = 49\ 65$, $df = 1{,}50$, $p <\ 001$) and for sex ($F = 12\ 34$; $df = 1{,}50$, $p <\ 001$) which reflected greater influence of the visual field on judgments made by obese and by female subjects than on those made by normals and males (See Table 7) As would be expected, the nut effect was not significant and neither were any of the interaction effects Figure 2 depicts the mean RFT deviation scores for obese and normal males and females, collapsing across the nut condition to which they were assigned

Table 7 Analysis of variance of the RFT deviation scores

Source	df	MS	F
Weight (W)	1	69 487	49 65***
Sex (S)	1	17 266	12 34***
Nuts (N)	1	660	<1
W × S	1	152	<1
W × N	1	001	<1
S × N	1	2 193	1 57
W × S × N	1	3 219	2 30
Error	50	1 399	

*** $p <\ 001$

Further evidence that subjects' obesity determines the influence of external visual cues on their judgments of verticality is found in the correlations between subjects percent overweight and their mean RFT deviation scores The more overweight the subject, the greater the influence of the visual field on his judgments of verticality ($r = + 62$, $df = 56$, $p < 001$) This relationship held true for obese females ($r = + 60$, $df = 12$, $p < 05$) and for normal females ($r = + 41$, $df = 14$, $p \simeq 10$), but not for obese or normal males ($rs = - 06$ and $+ 04$, respectively), thus indicating that only for females does degree of obesity determine degree of field dependence on the RFT

Relationship between Eating Behavior and Judgments of Verticality

If an individual's reliance on external vs internal cues to govern his eating behavior and his judgments of verticality are both manifestations of a generalized sensitivity to such cues, then one would expect to observe a positive correlation between subjects' field dependence on the RFT and the field dependence of their nut-eating behavior As mentioned above, the present experiment did not allow computation of an absolute measure of the influence of the shell on each subject's eating behavior inasmuch as nuts comprised a between-subjects variable Hence, as was done for correlations of percent overweight with nut consumption, correlations between RFT deviation scores and almond consumption were computed within each nut condition As predicted, a significant negative correlation obtained between field dependence on the RFT and log grams of unshelled nuts consumed ($r = - 58$, $df = 26$, $p < 01$) Similarly there was a significant negative correlation between subjects' field dependence on the RFT and whether or not they ate any unshelled nuts at all ($r = - 47$, $df = 26$, $p < 05$). These correlations cannot be attributed to smaller appetites among subjects manifesting more error on the RFT inasmuch as there were nonsignificant positive correlations between RFT field dependence and log grams of shelled nuts consumed ($r = +25$, $df = 28$, $p = 18$) and consumption of any shelled nuts at all ($r = + 30$, $df = 28$, $p = 10$) Thus, the more subjects' judgments of verticality were influenced by their visual field, the more their eating behavior was de-

Table 8 Within group correlations between RFT field dependence and eating behavior

Subject group	Nut condition Shells On	Shells Off
Obese male	−59 (N = 7)	+18 (N = 8)
Normal male	−35 (N = 6)	+56 (N = 7)
Obese female	+07[a] (N = 7)	−05 (N = 7)
Normal female	−57 (N = 8)	−32 (N = 8)
All subjects	−58 (N = 28)[a]*	+25 (N = 30)

[a] The absence of a negative correlation for this group is largely due to one aberrant obese female subject who consumed twice as many unshelled nuts as any other obese subject With her data omitted, the correlation between RFT field dependence and log grams consumption for obese female subjects is −27, and the correlation for all subjects is −68

* $p < 05$

pressed by the presence of a shell This general pattern of relationships held true for all groups of subjects, although the strongest effects were obtained for the males The negative correlation between RFT field dependence and consumption of unshelled nuts obtained for obese females only when the data for one aberrant obese female subject were omitted, and the correlation between RFT field dependence and consumption of shelled nuts was negative for normal females—albeit less negative than the correlation between RFT field dependence and their consumption of unshelled nuts (See Table 8)

Discussion

The present investigation has clearly demonstrated that the differential responsivity of obese and normal-weight individuals to internal and external cues is not specific to their eating behavior Not only did external, food-related cues exert a greater influence on the eating behavior of obese than normal subjects, but also, external cues in the visual field exerted a greater influence on obese subjects' judgments of verticality on the RFT than on the judgments of normals This effect obtained even though the obese and normal subjects were drawn from the same subject population, thus indicating that Karp and Pardes' (1965) RFT findings cannot be attributed to differences between their experimental groups other than their degree of obesity Moreover, the obese-normal differences in responsivity to non-food related cues held true for both male and female subjects, thus indicating that Schachter's (1971) failure to replicate Karp and Pardes was not due to their respective use of male and female subjects

The effects of sex on responsivity to external cues in the present study were not so uniformly significant as were those of weight As predicted, judgments of verticality were significantly more influenced by external cues for females than for males, but the differential influence of external cues on the eating behavior of males and females was not significant Nevertheless, further research investigating sex differences in eating behavior does seem warranted, since the present study did at least reveal the expected pattern of means—the difference in consumption of shelled and unshelled nuts was greater for females than for males Perhaps a significant Sex × Food-cue interaction requires utilization of a more subtle external cue, one which does not inhibit the eating behavior of males so strongly as the shells on the nuts did Alternatively, the presence of stronger internal cues, ones which could maintain male subjects' eating behavior despite deterrent external cues, may suffice to produce a significant effect [10] In any event, the present data do indicate that the utilization of exclusively male or female subjects, which is so prevalent in the obesity research of Schachter and his associates, should be avoided This practice precludes the rather likely discovery of sex differences which, aside from their intrinsic interest, could conceivably shed some light on the etiology of the obese–normal differences

The finding that the greater responsivity of obese subjects to external cues is not specific to their eating behavior is consistent with research findings published by Schachter and Rodin (1974) While neither Schachter and Rodin's research nor the present study was designed to pinpoint the processes which mediate obese–normal differences in responsivity to external cues, the present investigation does provide some information relevant to causal explanations for these individual differ-

10 It is worthy of note in this regard that the one experimental study demonstrating the expected sex differences in eating behavior was conducted on infants who had not eaten for four hours—i e, hungry infants (Nisbett & Gurwitz, 1970)

ences This is the significant correlation which obtained between the dependence on external cues of subjects' eating behavior and their judgments of verticality This relationship was surprisingly strong considering the diversity of the behaviors involved, and it suggests that a single cause may generate responsivity to external cues in the two situations studied What this cause might be remains to be discovered, but the data do reveal that explanations for individual differences in eating behavior which cannot explain differences in performance on the RFT and explanations for individual differences in performance on the RFT which cannot explain eating behavior differences suffer from lack of parsimony In this category of explanations is the attribution of differences in the eating behavior of obese and normal-weight individuals to the obese person's greater hunger (Nisbett, 1972) Such an etiology cannot explain obese individuals' greater sensitivity to the visual field on the RFT without some added assumptions about the behavioral effects of hunger Similarly, Sherman's (1967) attribution of individual differences in judgments of verticality on the RFT to lesser spatial ability on the part of field dependent persons (e g , females) fails to explain the greater responsivity to external cues of field dependent persons' eating behavior

A final point which should be mentioned is that the present findings are based on a sample of obese subjects who were much less overweight than the clinical population employed in Karp and Pardes' (1965) research, they are even somewhat less overweight than the undergraduate subjects employed in the research of Schachter and his colleagues The observation of obese–normal differences in this sample suggests that weight differences in responsivity to external cues represent a rather robust effect, not only do they obtain for a variety of external cues and for both male and female subjects, but they also obtain over a wide range of weights

Summary

It was hypothesized that the greater influence of external cues on obese than on normal individuals' eating behavior is a manifestation of a generalized sensitivity to external cues Responsivity of nut consumption to the external cue of shells on the nuts and responsivity of judgment of verticality to the ex-

ternal cue of a tilted visual field were assessed for male and female, obese and normal-weight subjects As predicted, both obese subjects' nut consumption and their judgments of verticality were more influenced by external cues than were those of normals Females' judgments of verticality were more influenced by external cues than males' were, but the sex differences in eating behavior were not statistically significant A significant correlation between the field dependence of subjects' eating behavior and their judgments of verticality suggests that a single cause may generate sensitivity to external cues in these two diverse situations

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