Bulletin of the Psychonomic Society
1975, Vol. 6 (6), 641-644

The nature of thinking behavior in obese humans

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The thinking behavior of obese subjects was investigated using a divergent thinking task. Results showed that obese subjects spent less time and gave fewer responses than nonobese subjects. Furthermore, qualitative differences in responses were observed between obese and nonobese subjects. These findings suggest that obese subjects have a more limited cognitive repertoire than nonobese subjects.

In a series of experiments, Singh and his associates (Singh, 1973; Singh, Swanson, Letz, & Sanders, 1973; Singh & Sikes, 1974) have shown that the obese have an impaired ability to suppress habitual responses. Obese subjects, when compared to nonobese subjects, seem to encounter greater difficulty in changing an established response and exhibit a greater tendency to keep responding in habitual ways, even when the habitual response is not the most effective or rewarding. This failure to change responses when the situational demands are altered has been demonstrated for eating behavior, a motor learning task, and time-estimation behavior (Singh, 1973). This behavioral characteristic of obese people is not restricted to overt motor responses. It is also reflected in their mental sets. For example, obese people persist in solving mathematical problems using a method to which they are accustomed, even when easier methods of solving the problems are available. In the same test, nonobese people readily abandon the practiced problem-solving method and discover an easier one (Singh, 1973).

This failure to overcome mental sets suggests that obese subjects may exhibit a similar problem in their thinking behavior. It could be that obese subjects have a more limited cognitive repertoire than nonobese subjects which would affect their thinking behavior under certain conditions. To investigate this issue, the divergent thinking test developed by Guilford (1967) was used. The test involves presenting the subject with a picture of a familiar common object (such as a brick) and asking the subject to write as many different and novel uses for that object as possible. This test also provides an objective measure of the duration of thinking, because the amount of time the subject takes to write responses can be recorded. Written responses can then be analyzed to detect differences in the nature of the associations between subjects.

This research was supported in part by a grant from the Weight Watchers Foundation. The authors are grateful to Arnold Buss and David Krantz for critical reading of the article. Requests for reprints should be sent to Devendra Singh, Department of Psychology, University of Texas at Austin, Austin, Texas 78712.

It was argued that the presentation of a familiar common object should evoke very few, but highly potent, associations. To think of novel uses for the object, the subject would have to suppress or ignore these associations. Since obese subjects have difficulty suppressing potent response habits and, if such difficulty is encountered in their thinking behavior as well, obese subjects should think of fewer novel uses for the object than nonobese subjects.

METHOD

Subjects

The subjects were paid volunteers, 19-21 years old, enrolled at the University of Texas. Height, weight, and triceps skinfold measurements were recorded for all subjects. Triceps skinfold thickness was used to classify subjects as either obese or nonobese since this measure has been shown to be a reliable indicator of obesity which is not affected by the height and body frame of the subject (Seltzer & Mayer, 1965). The mean triceps skinfold thickness for obese males was 34.0 mm; for nonobese males, 12.0 mm; for obese females, 42.0 mm; and for nonobese females, 20.0 mm. The mean percent overweight, determined from the Metropolitan Life Insurance Table (1959) for the obese groups was 63% and 6% for the nonobese groups.

All subjects were administered an intelligence test (the vocabulary subscale of the Wechsler Adult Intelligence) and a fluency of association test (i.e., the number of words given beginning with "b" in 1 min). Data analysis showed no significant differences between obese and nonobese groups on either of these tests.

Materials

Testing materials consisted of line drawings of 12 different objects, each drawn on a separate legal-size paper. There were four drawings from each of three functional groups: food items (cake, soda, steak, apple), food-related items (bottle, fork, cup, table), and non-food-related items (suitcase, hat, hammer, hanger). The rationale for using three different types of items was to rule out the possibility that obese subjects might be reluctant to give many responses to food items, thereby confounding the measure. But if our theoretical position is correct and the inflexibility of these obese is a *general* rather than a food specific phenomenon, obese subjects should give fewer novel responses than nonobese subjects not only on food items, but on nonfood items as well.

Procedure

Each subject was tested individually and was given a stack of the twelve drawings. The order of presentation of the drawings was random and was identical for all subjects. The subjects were informed that this was a test of their imagination and that they

should write down as many uses for each object as they could think of, regardless of whether the uses were feasible. They were required to work on the drawings in the order handed to them and to place each page face down when finished and then begin the next page. This procedure made it possible to record the time spent on each drawing. Subjects were told to work as long as they wanted and to give as many uses as they could. The subjects were then left alone for the duration of the task.

The experimenter observed the subjects through a peephole, timing them for each drawing. The following measures were obtained for each subject: (a) total time taken to finish the 12 drawings, (b) total response frequency for the 12 drawings, (c) time taken for each drawing, and (d) response frequency for each drawing.

Finally, after the divergent thinking test, all subjects were tested for self-esteem, emotional reactivity, and the strength of the need to comply with the experimenter. These methods and findings are reported in detail elsewhere (Sikes & Singh, 1974). It should be pointed out here, however, that no significant difference between obese and nonobese subjects was evident on any of the above measures.

RESULTS

The data were analyzed for time taken to complete the task, response frequency, and the nature of the responses for the three types of items, i.e., food (F), food-related (FR), and non-food (NF).

Time and Response Frequency

The obese subjects took significantly less time to complete the task for all three types of items ($F = 15.48$, $df = 1/48$, $p < .01$). The obese group spent, on the average, 28 min 51 sec to complete the task; the nonobese group spent 46 min 35 sec. Obese subjects also gave significantly fewer responses than nonobese subjects for all three items ($F = 6.83$, $df = 1/84$, $p < .05$). To determine whether less amount of time spent and fewer responses given by obese subjects reflected a differential response rate, speed (seconds/word) was calculated for obese and nonobese subjects. There were no significant differences in speed for any type of items, suggesting that obese and nonobese subjects had a similar rate of responding. The time and frequency analyses indicate that both obese and nonobese subjects reacted in an identical manner to the three types of items. This inference is further strengthened by considering the mean percent of responses given by the two groups to the three types of items. Both groups gave approximately similar percentages to food (obese 29.3 vs. nonobese 28.6), food-related (obese 37.3 vs. 36.8 nonobese) and nonfood (obese 33.4 vs. 34.6 nonobese) items.

Nature of Responses

Qualitative analysis of responses was essential because the main purpose of this study was to determine whether obese subjects would give fewer novel uses for the different items than nonobese subjects. Three independent judges, unaware of whether the subject was obese or not, decided whether responses were novel or conventional. In the process of classifying responses, it was discovered that virtually all subjects gave a few nonusage responses to many items. These nonusage responses were mere descriptions of the item or what the item reminded them of. Hence, responses were classified into four response categories: (1) conventional—responses referring to the most common and frequent uses, (2) novel—unconventional uses, regardless of whether feasible or not, (3) descriptive—merely describing the object, and (4) associative—responses related to associations, rather than uses. For example, responses given to Item 8 (cake) would be classified in the following manner: Responses such as "to eat" or "to reduce hunger" would be classified as conventional; responses such as "to light a cigarette" or "to use as a door stopper" would be assigned to the novel category; responses such as "cake" or "food" would be considered descriptive; while responses such as "birthday party" or "to have a good time" would be classified as associative. A coefficient of concordance showed a significant agreement among judges ($W = .89$) classifying the various responses by category. The mean number of responses given by obese and nonobese subjects under the four response categories are shown in Figure 1. Two trends are evident in Figure 1. First, both groups gave fewer responses to food items compared to food-relaed and nonfood items in all categories except the associative. Second, the obese group gave fewer responses than the nonobese group in all categories except the descriptive. In the descriptive category, the obese group gave more responses than the nonobese group.

Separate analyses (2 by 3 analysis of variance) of each response category revealed several interesting differences between the obese and nonobese groups: (1) In conventional responses, a significant main effect for groups ($F = 5.3$, $df = 1/84$, $p < .05$) and type of items ($F = 7.37$, $df = 2/84$, $p < .05$) was obtained. Thus, although both obese and nonobese groups gave significantly fewer responses to food items compared to the two other items, the obese group gave significantly fewer conventional responses than the nonobese group to all three types of items. (2) Analysis of the novel response category indicated that only the group main effect was significant ($F = 8.31$, $df = 1/84$, $p < .01$); the obese subjects gave fewer novel responses than the nonobese subjects. (3) No significant differences were found in the associative category except that both the obese and nonobese groups gave significantly more responses to food items than to the other two types of items ($F = 11.98$, $df = 2/84$, $p < .01$). (4) Surprisingly, analysis of the descriptive response category revealed a significant main effect for groups ($F = 18.84$, $df = 1/84$, $p < .01$); the obese group gave significantly *more* descriptive responses than the nonobese group.

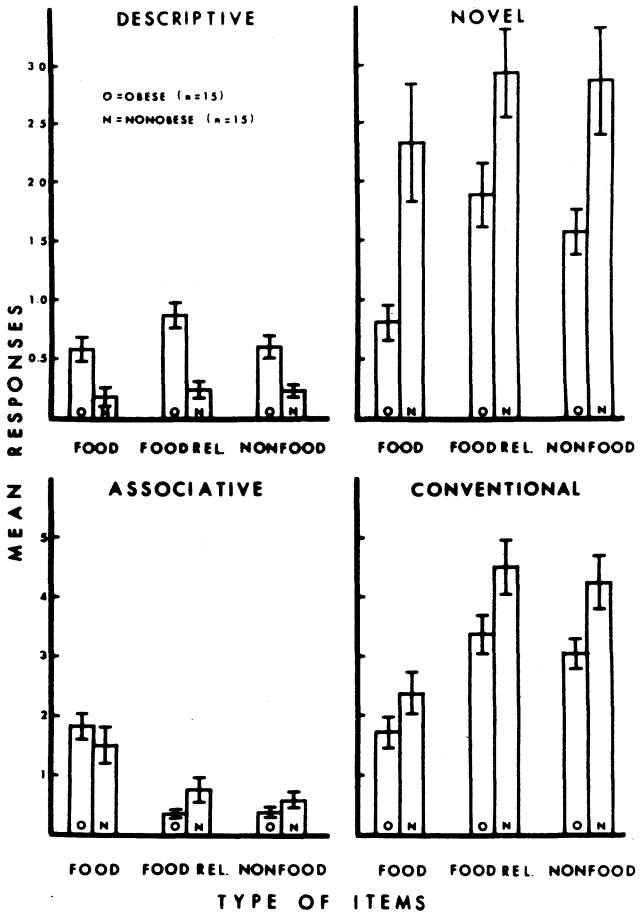

Figure 1. Mean number of responses given by obese and nonobese subjects under the four functional categories of responses for the three types of items. Vertical bars indicate the standard error of the mean.

In summary, the obese group gave *fewer* conventional and novel responses and gave *more* descriptive responses than the nonobese group. No difference between the groups was evident for the associative response category. Such a *pattern* of differences cannot be attributed to the fact that obese subjects gave fewer responses overall than nonobese subjects. Nevertheless, the data were analyzed for each response category using proportions, i.e., the number of responses by each subject in each category was converted to a percentage of his total number of responses. The percent data exhibited an identical trend for differences between the two groups as that shown by analyses of variances performed on the raw data.

DISCUSSION

The main findings of the present study are that obese subjects spent less time thinking about the stimuli and gave fewer responses than nonobese subjects. Qualitative analysis of the responses showed that obese subjects gave fewer conventional and novel responses than nonobese subjects. Only in the descriptive category did obese subjects give more responses than nonobese subjects.

Recently, Pliner (1973) has also demonstrated differences in thinking behavior of obese and nonobese subjects. However, Pliner recorded only the duration of thinking and made no attempt to investigate whether there are any qualitative differences between the thoughts of obese and nonobese subjects. Furthermore, the duration of thinking was calculated on the basis of the subject's self-report. There is some evidence suggesting that obese and nonobese subjects differ in the time-estimation (Singh, 1973) and, hence, self-report of the time spent thinking may not be a reliable measure for thinking behavior. These methodological differences between Pliner's study and the present study make any comparison difficult.

Before attempting an explanation of these findings, it is important to rule out the possibility that the observed differences were caused by lowered motivation or decreased word fluency on the part of obese subjects. Consider the following: (a) Although both of these factors might explain why the obese subjects spent less time and gave fewer responses than nonobese subjects, neither can explain the observed qualitative differences. (b) All subjects were given an intelligence test and a word fluency test prior to this task, and no differences were observed between groups. (c) When the same obese subjects in another study were required to perform a dull task (drawing triangles and circles), they spent as much time and drew as many figures as nonobese subjects (Sikes, 1974). (d) Furthermore, obese subjects were as compliant as nonobese subjects in volunteering for an experiment employing shock (Sikes & Singh, 1974). Thus, neither motivational nor word fluency differences provide an adequate explanation of the obtained results.

It appears instead that the obese subjects had difficulty suppressing habitual responses. Because each object evoked a few highly potent associations in obese subjects, they gave fewer responses overall; after giving the few potent responses, they merely described the object in front of them. The obese more rapidly exhausted their available associations for each object and moved to the next object more quickly. Because food objects are rarely used for anything besides eating, both obese and nonobese subjects gave fewer responses to food objects than nonfood objects. This effect was more pronounced in the obese subjects than in the nonobese subjects.

It should be pointed out that the fact that obese subjects gave fewer conventional responses than nonobese subjects was unexpected. Such a finding is indeed puzzling and cannot be explained without additional speculation. Perhaps obese subjects tend to be less imaginative in their thoughts and exhibit a rigidity of thinking that parallels their behavior at motor tasks (Singh, 1973).

As obese subjects gave fewer responses to food-related and nonfood items also, their cognitive rigidity seems nonspecific, and it should be evident in a variety of situations. Additional experimental evidence supports this expectation. Obese subjects, compared to nonobese ones, have been shown to be more resistant to changing a strongly held attitude when confronted with a persuasive argument against their position (Sikes, 1974).

Together, these findings suggest that obese subjects have a more limited cognitive and behavioral repertoire than nonobese subjects. Situations which require abandoning established behavior and developing new responses put obese subjects at a particular disadvantage. Since this behavioral rigidity appears to be a general characteristic, these findings further imply that effective clinical approaches to weight reduction must not be confined to modifying eating behavior alone. Instead, obese persons must be actively taught that there are other possibilities for dealing with their boredom. Therapeutic techniques such as role playing or behavioral rehearsal may be useful in achieving this goal. By considering obesity as part of a larger psychological problem, namely an inability to suppress potent response tendencies, perhaps we can better cope with the problem.

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(Received for publication September 12, 1975.)

ERRATUM

Marshall, P. H., Chatfield, D. C., & Janek, E. J. The effects of natural language mediation on response recognition following paired-associate learning, Bulletin of the Psychonomic Society, 1975, 5, 411-412.–Page 412, Column 2, Paragraph 2, second sentence should read as follows: "The same was found in this experiment, with the conditional probabilities of response correct given NLM correct being .57 and response correct given NLM incorrect being $.06^{1}$."