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IMPLICIT AND EXPLICIT MEMORY BIAS FOR WORDS RELATED TO FOOD, SHAPE AND BODY PARTS IN OBESE AND NORMAL WEIGHT FEMALES

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Résumé

Nous présentons une expérimentation qui vise, en utilisant des tâches de mémoire implicite et explicite, à étudier le processus de sélection en mémoire de stimuli chez des patientes obèses, obèses morbides et des femmes contrôles normopondérées. Les participantes ($n=60$) effectuent une tâche de complèvement de trigrammes puis une tâche de rappel libre de 32 mots relatifs aux aliments, au corps, ou à l'apparence, ainsi que des mots neutres. Les résultats montrent un biais dans la tâche de mémoire implicite spécifique aux noms d'aliments chez les patientes obèses morbides, et spécifique aux noms d'aliments et aux mots liés à l'apparence chez les patientes obèses. Les femmes contrôles normopondérées ne présentent aucun biais mnésique dans la tâche de mémoire implicite. Contrairement aux résultats de la tâche de mémoire implicite, ces biais ne persistent pas dans la tâche de mémoire explicite chez les patientes obèses.

Mots clés : obésité, mémoire explicite, mémoire implicite, aliments, corpulence.

Abstract

The aim of this study was to explore the information processing of words related to food, shape and body parts in women of obese and normal weights. Twenty severely obese patients, 20 obese patients and 20 normal weight individuals, all of whom were female, were assessed using implicit and explicit memory tasks. The memory tasks involved words related to food, shape and body parts. Results showed biases in implicit memory measures. Severely obese women completed significantly more food-related words than other words. Obese patients completed significantly more food- and shape-related words than did the other groups. Normal weight females did not show any bias on the implicit memory measures. No explicit memory biases were found in any groups.

Key words: obesity, implicit memory, explicit memory, food, shape.

INTRODUCTION

In general, memory refers to the ability to encode, store and retrieve a stimulus representation. Some memory tasks do not tap into specific memories but are more general, highlighting the information process itself. For example, implicit and explicit memory tasks (Graf & Schacter, 1985; Schacter & Graf, 1986) measure both global thoughts or involuntary activity and then specific detailed thoughts. Implicit memory refers to the strengthening of one's representation of a stimulus; this strengthening occurs when the stimulus is mentally processed and consequently renders it more accessible for future retrieval (Williams, Watts, MacLeod, & Mathews, 1988). For example, higher accessibility or integration makes a word come to mind more easily when only some of its components or features (e.g., the three initial letters of a word) are presented. As such, an implicit memory task (e.g., word completion stem) is an ideal procedure to examine how information is integrated into memory. Explicit memory tasks tap into a more strategic process that activates a representation in relation to other associated representations. The recovery of an event is made in connection with the previous experiences stored in memory, to form new associations. Such representations aid in the formation of new relationships (elaboration) between new concepts and old ones (Williams, Watts, MacLeod, & Mathews, 1988). Stronger elaboration makes a memory concept more retrievable (e.g., in a free recall task). Therefore, an explicit memory task is an ideal procedure for examining how the information is elaborated in memory. Based on Graf and Mandler's (1984) distinction between integration and elaboration, implicit and explicit memory tasks are often used to investigate selective memory process, notably for material with emotional salience.

A large body of literature suggests that emotional processing can influence memory, with individuals often showing heightened memories of emotional or affective items relative to neutral material (Bradley, Greenwald, Petry, & Lang, 1992; Christianson, 1992; Christianson, Loftus, Hoffman, & Loftus, 1991; Hamann, Cahill, & McGaugh, 1997). Individuals often exhibit better recollection for this material relative to neutral items (Bradley, Greenwald, Petry, & Lang, 1992). Research on depression using explicit memory tasks (Bradley, Mogg, & Williams, 1995; Rinck & Becker, 2005; Ruiz-Caballero & Gonzalez, 1997; Taylor & John, 2004), based on Beck's schema theory (1979) and Bower's network theory (1981), showed specific biases for negative information in depressed individuals, suggesting that negative information was more retrievable for these individuals. In this way, an individual in a sad mood state will recall information congruent with his emotional state and current preoccupations and, consequently, will remember unpleasant information.

In eating disorders (e.g. anorexia or bulimia nervosa) and obesity, the presence of a memory bias for items related to shape and weight has been postulated by researchers (Vitousek & Hollon, 1990). In this hypothesis, patients with eating disorders are excessively concerned with weight, show distressing preoccupation with food and shape (Adami, 2001), and experience ruminations that render information relative to food and shape more retrievable. During the last two decades, this hypothesis has been well investigated, showing a memory bias for food and shape related information, both in implicit and explicit memory tasks (Ben-Tovim & Walker, 1991; Cooper & Fairburn, 1992; Hermans, Eelen, & Pieters, 1998; King, Polivy, & Herman, 1991; Sebastian, Williamson, & Blouin, 1996).

In contrast, this kind of memory bias research is scarce within the context of obesity (Soetens & Braet, 2007). However, individuals with either eating disorders or obesity share many common features, including food preoccupations (Adami, Gandolfo, Campostano, Bauer, Cocchi, & Scopinaro, 1994) and dietary restraint attitudes (Braet & Wydhooge, 2000). Within the context of obesity, only information retrievability has been investigated (King, Polivy, & Herman, 1991; Soetens & Braet,

2007). Using a free recall task with weight-, food- and shape-related words, King, Polivy and Herman (1991) showed that obese persons recall more weight- and food-related words compared to shape-related or neutral words. More recently, Soetens and Braet (2007) replicated these results in the child population (age between 8 and 12 years) using a free recall task with high caloric and low caloric food words; overweight adolescents recalled more food names (notably high caloric food names) as compared to normal weight adolescents. It seems that information related to food and weight is more easily activated in obese persons. Moreover, some studies did not show specific bias in obesity using explicit measures (Conforto & Gershman, 1985). In 2003, Braet and Crombez suggested that it could be more difficult for obese individuals to inhibit food and shape relevant information when the process is automatic (e.g. implicit memory).

Thus, the purpose of this study was to investigate the information processing of words related to food, shape and body parts in obese women and to compare their potential biases with those of normal weight women using both implicit and explicit memory tasks.

We hypothesized that the use of implicit measure will highlight more specific bias in obese persons.

METHODS

PARTICIPANTS

A total of 60 French females participated in this experiment. There were 20 normal weight females and 40 obese female patients (20 severely obese patients and 20 obese patients). The three groups were age-matched ($F(2,57) = 1.543$; $p = .22$). The Body Mass Index (BMI) of the severely obese (mean = 49.67) and obese (mean = 34.69) patients ranged from 32 to 59, and the BMI of the normal weight females ranged from 20 to 24 (average = 22.25). BMI values were significantly different between all three groups ($F(2,57) = 99.19$; $p < .001$).

STIMULI

In order to construct the experimental material, 50 judges assessed a total of 120 words: 30 food, 30 shape, 30 body parts and 30 neutral words on a five-point scale (Bonin, Meot, Aubert, Malardier, Niedenthal, & Cappelle-Toczek, 2003) with responses ranging from “very difficult to imagine a scene with this word” (1) to “very easy to imagine a scene with this word” (5). The 64 words (16 food-related words, 16 shape-related words, 16 body part-related words and 16 neutral words) that were evaluated as most conducive to producing a mental image were selected. The four groups of 16 words were matched for frequency of occurrence ($F(3,60) = 0.010$; $p = .99$) and length ($F(3,60) = 1.64$; $p = .18$).

APPARATUS

Based on Hermans and Al’s protocol (1998), all stimuli were presented in white uppercase letters in the center of a black background. Letters were of a consistent height and width. Two

parallel word sets (A and B), each with 32 words, were used to prepare two versions of both memory tests, each including 8 food-related words, 8 shape-related words, 8 body parts-related words and 8 neutral words. In the encoding task, the participant read a list of one word set (A or B). For the words completion task, all 3 first letters from both word sets (A and B) were used. Every version of the free recall task consists in a set of one of both word sets (A or B).

PROCEDURE

The procedure was composed of three stages: an encoding task with self-referent encoding, an implicit memory task (e.g., word completion stem), and an explicit memory task (e.g., free recall task).

During the encoding task, participants were presented with one set of stimulus words (A or B). Participants were seen individually and were informed that they were taking part in a study on imagination. They were told that words would be presented on a computer screen and that they were to imagine a scene involving themselves and the presented words (self-referent encoding task). The instructions were as follows: *"You are going to be presented with a list of words. Your task is to imagine a scene involving yourself and the presented words. This task is limited to 10 seconds for each word"*.

They were told to engage in and elaborate the imaginary scene during the 10-second presentation of the words. Four practice trials preceded the presentation of one set of 32 stimulus words (for example list. A). Words were presented in a randomized order that was different for each participant.

The second task consisted of word stems from the two word sets. Word stems in the word completion task comprised both the previously presented (primed) word set and words from the set that was not presented earlier (unprimed words), for example List. B. For the word completion task, participants were handed the appropriate response sheet and were instructed to complete the three-letter stems with the first word that came to mind, beginning with the letters printed on the response form. The instructions were as follows: *"You are going to be presented with sets of letters. Your task is to complete each stem with the first word that comes into your mind"*.

Participants were told to work through the stems in the order in which the items were listed. There was a 10-second presentation for each item.

Four practice trials preceded this task. For the free recall task, participants were asked to recall as many words as they could from the first task (e.g. encoding task) and write them on a sheet of white paper. The instructions were as follows: *"You have read at the beginning a set of 32 words. Now please write here, as quickly as possible, as many words as you can remember"*. This task is limited to three minutes".

DATA ANALYSIS

Analysis of variance (ANOVA) with repeated measures was used to examine potential differences between ability of the weight groups to complete and recall food-, shape- and body-related words. Follow-up analyses were conducted using Tukey's test in order to identify differences between word type responses in each group. All statistical analyses were performed using SPSS version 15 (SPSS copyright C SPSS, inc 1989-2000). All results were considered to be significant at the 5% critical level ($p < 0.05$).

RESULTS

IMPLICIT MEMORY TASK

Completions were scored as correct if they perfectly matched a word from the set. Mean primed and unprimed word completion scores for each of the four word types were computed for the three groups. The number of words correctly completed was calculated for each word type, and scores were subjected to ANOVA. The ANOVA contrasted completion of the four types of words. Results show a significant interaction between groups and word type; the recall patterns for groups differed as a function of word type. Group means are presented in figure 1. Tukey comparisons on the weight group factor by word type revealed that obese and severely obese patients completed significantly more food names than words related to body parts, those related to shape or neutral words. Tukey comparisons revealed that obese patients completed significantly more shape-related words than body parts-related words or neutral words. These specific differences did not appear for normal weight females, who instead exhibited a general bias for body parts, food and shape related words.

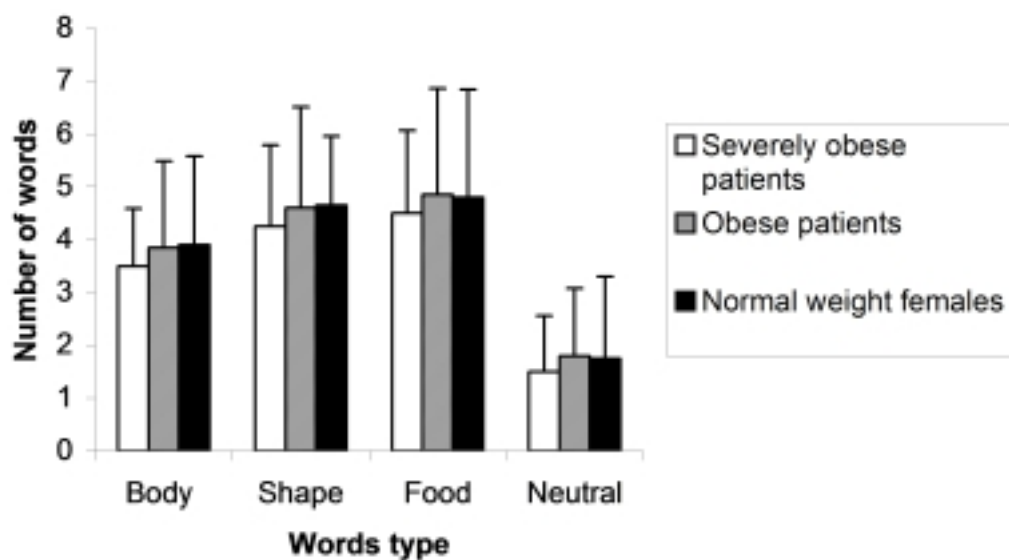


Figure 1: Number of words completed (means and standard deviations) in implicit memory by category in obese patients and normal weight females.

In summary, severely obese patients showed a bias in the implicit memory task specific for food-related words, obese patients for food- and shape-related words and normal weight females for body parts, food and shape related words.

EXPLICIT MEMORY TASK

The number of words correctly recalled was calculated for each word type, and scores were subjected to ANOVA. The ANOVA contrasted recall for four types of words. Results show no effect of group on the ability to recall food, shape, body part or neutral words. Group means are presented in figure 2. Tukey comparisons on the weight group factor by word type revealed significant differences between on the one hand the recall of body parts, food and shape related words and on the other hand neutral words in severely obese patients, obese patients and normal weight females.

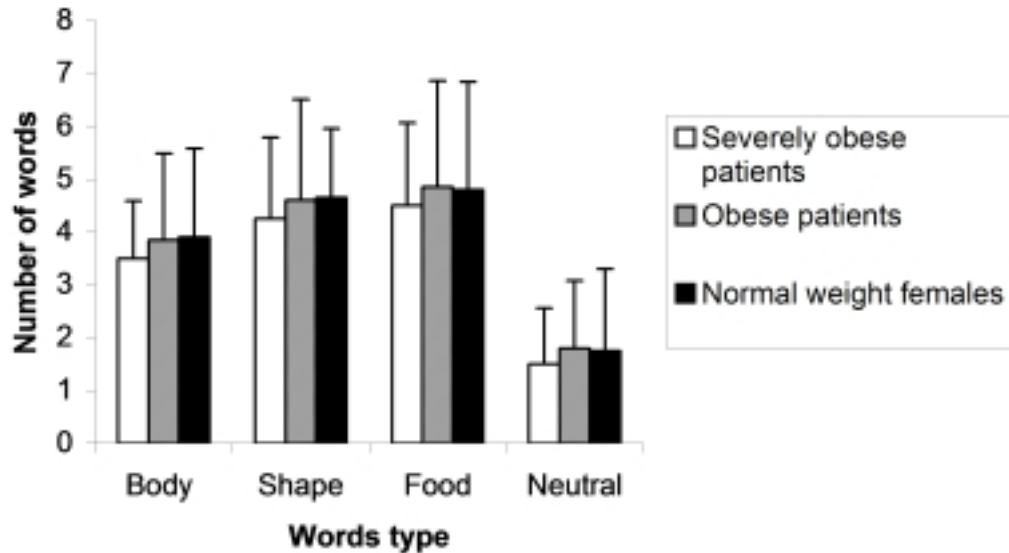


Figure 2: Number of words recalled (means and standard deviations) in explicit memory by category in obese patients and normal weight females.

There is no evidence for a specific bias in obese patients using an explicit memory task.

CONCLUSION

In this study, implicit and explicit memory for words related to food, shape and body parts were assessed in obese patients and normal weight females. As expected, patients with obesity demonstrated a bias for those words related to food and shape as compared with other kinds of material, but this bias appeared only in the implicit memory task. According to Adami (2001), individuals with obesity and, consequently, with weight problems are excessively preoccupied with food and shape; these features are very similar to those observed in eating disorder pathologies. These preoccupations have been investigated with several methodologies, including questionnaires and verbalizations (Volery, Carrard, Rouget, Archinard, & Golay, 2006), the Stroop test (Long, Hinton & Gillespie, 1994; Braet & Crombez, 2003) and explicit memory tasks (Conforto & Gershman, 1985; King, Polivy, & Herman, 1991; Soetens & Braet, 2007). The major problem (Tucker & Schlundt, 1995; Vitousek, Daly, & Heiser, 1991) of using methods such as these is that they rely on information that is stored “consciously” and can therefore increase denial and distortions in these persons. In accordance with this hypothesis, some studies do not display specific bias in individuals with obesity. On the other

hand, studies using methodologies involving more automatic processes could better highlight any specific biases in obese persons. Using a Stroop test, Braet and Crombez (2003) showed that obese children are slower in naming the colour of food words versus control words. Using an implicit memory task in adults, our results seem to confirm the fact that it is more difficult for obese individuals to inhibit food and shape relevant information when the process is automatic. Using the Braet and Crombez (2003) hypothesis, we suggest that this bias in information processing reflects hypersensitivity for food and shape material, which can contribute to initiating or maintaining dysfunctional eating behaviours. An interesting result is that obese patients show a specific bias in implicit memory for shape relevant information that is not found for severe obese patients. We suggest that, contrary to obese patients, severely obese females have renounced their preoccupations with food and shape, probably because the difference between actual body size and expectations are too large to reconcile.

This study highlights bias in information processing for food- and shape-related information in obese patients. The difficulty with these kinds of results in clinical practice concerns the fact that selection process in memory for specific informations is largely unknown to the individual and cannot easily be put into words. Our perspective in future studies is to determine if the attitudes of food restriction (as for example fact to be on a diet), could play a role in this implicit memory bias for food relevant information. Is it because a person is corpulent that she activates more the food relevant information, or is it because she is in diet at the time of assessment?

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APPENDIX

The list of stimuli words in french (english translation)

	List A	List B
	Paume (palm) Nombril (navel) Ventre (stomach)	Cuisse (thigh) Genou (knee) Hanche (hip)
Body parts-related words	Coude (bend) Orteil (toe) Paupière (eyelid) Cheville (peg) Jambe (leg)	Poitrine (breast) Taille (cuts) Fesse (buttock) Mollet (calf) Nuque (nape of the neck)
Shape-relate words	Potelée (plump) Obèse (obese) dodue corpulente (corpulent) grosse (big) énorme (enormous) ronde (slim) menue (round)	mince (slender) maigre (thin) athlétique (athletic) svelte (slim) forte (strong) enrobée (coated) fine (fine) surpoids (overweight)
Food-related words	Glace (freeze) beurre (butter) chocolat (chocolate-brown) gâteau (cake) tomate (tomato) madeleine (madeleine) crème (cremates) croissant (growing)	pomme (apple) soupe (supper) salade (salad) huile (oils) vinaigre (vinegar) poulet (chicken) Fromage (cheese) Sucre (sweetens)
Neutral words	Placard (cupboard) Poche (poaches) Horloge (clock) Tronc (trunk) Fourmi (ant) Masque (mask) Boussole (compass) Tabouret (stool)	Escalier (staircase) Fourchette (fork) Mèche (drill) Trompette (trumpet) Cercle (encircle) Marmite (pot) Batterie (battery) Robinet (faucet)