

## Original article

**Mood congruence effect in explicit and implicit memory tasks:  
a comparison between depressed patients,  
schizophrenic patients and controls**N Bazin<sup>1\*</sup>, P Perruchet<sup>2</sup>, A Féline<sup>3</sup><sup>1</sup> CHG, Lagny-sur-Marne; <sup>2</sup> CNRS, Université de Bourgogne, Bourgogne; <sup>3</sup> CHU Bicêtre, Le Kremlin-Bicêtre, France

(Received 26 April 1993; accepted 30 April 1996)

**Summary** – This study investigates mood congruence effect in explicit and implicit memory tasks in 23 inpatients fulfilling DSM-III-R criteria for major depressive disorder. Performances were compared to those of 15 in- or outpatients fulfilling DSM-III-R criteria for schizophrenia, and 37 normal subjects serving as euthymic controls. All subjects were submitted to a standard cued recall test and to a word stem completion test devised to assess the effect of the initial presentation without the explicit retrieval of the words being necessary. The material used for these two tasks consisted of emotionally negative and positive words. The results show a mood congruence effect in the *implicit* memory task (and not in the *explicit* memory task) only in patients who had recovered from their major depressive episode (and not in depressed patients, schizophrenic patients, or controls). These results suggest that implicit and explicit emotional information processing differ from one another in certain respects.

implicit/explicit memory / mood congruence effect / affective valence / depression / schizophrenia

**INTRODUCTION**

The term ‘implicit memory’ was coined by Graf and Schacter in 1985. In contrast to explicit memory, which involves conscious recall of previous events, implicit memory manifests itself indirectly through improved task performance, without conscious remembering. Several studies have shown a dissociation between these two forms of memory (Perruchet and Baveux, 1989).

Implicit memory effects can be observed through different tasks, such as the word completion task, which is the most commonly used. Subjects are shown a list of three-letter word stems (eg, LIB...) and asked to complete them with the first word that comes to mind. Under these conditions, the prior presentation of a word to be completed (eg, LIBERTY) greatly enhances or “primes” performance on this completion task, and

the probability of producing the studied words is increased. Other similar tests include lexical decision (eg, Carroll and Kirsner, 1982), perceptual clarification (eg, Perruchet and Baveux, 1989), tachistoscopic identification (eg, Jacoby and Dallas, 1981), homophone spelling (eg, Jacoby and Witherspoon, 1982) and anagram solving (Perruchet and Baveux, 1989). In none of these tasks are subjects told that they are being administered a memory task, nor is a directed search for specific episodic representation of the initial words required to perform the task. Nevertheless, changes in performance due to the earlier presentation of words provide implicit evidence of some encoding in memory.

The role played by the materials’ emotional value (eg, positive or negative affective words) during memory processes remains unclear. According to the mood congruence effect, a subject mem-

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orizes mood congruent information more easily than information which is not mood congruent (Bower, 1981). Thus, a depressed subject would exhibit preferential recall of negative affective words as compared to positive affective words.

In explicit memory using free recall or recognition task, the mood congruence effect has been well-documented. Studies using a mood induction procedure (Velten Mood Induction Procedure, hypnosis, etc) on healthy volunteers (Martins, 1985) as well as studies on clinically depressed subjects (Breslow et al, 1981; Dunbar and Lishman, 1984; Dowal, 1984) have lent support to this effect (for review see Bazin, 1991).

More recently, the mood congruence effect has been explored in implicit memory. In depressed patients, Denny and Hunt (1992) did not observe the mood congruence effect in a word fragment completion task, whereas the effect was observed in an explicit free recall task. The choice of tests used in this study has been criticised and the results questioned by Roediger and Mc Dermott (1992). However, Watkins et al (1992) obtained the same results – mood congruence effect in an explicit memory task but not in a implicit memory task – with a group of depressed subjects, in a study using more adequate tests (cued recall and word-stem completion).

The present study investigated mood congruence effect in explicit and implicit memory tasks. The implicit memory test was a word-stem completion task, and the explicit memory test a cued recall task. According to Roediger and McDermott (1992), these two tasks are well-suited to comparing explicit and implicit memory. Three groups of subjects (depressed, schizophrenic and normal) participated in the study. We hypothesized that depressed patients would show preferential recall of negative affective words as compared to positive ones. We expected this effect to appear in explicit memory only and to disappear when depressed patients recovered from their depressive episode. Schizophrenic patients and normal subjects were used as euthymic controls. We expected these control groups to show no preferential recall, and to memorize as many negative as positive affective words.

## METHOD

### Subjects

A total of 75 subjects comprising depressed, schizophrenic and normal subjects participated in the experiment:

- twenty-three depressed inpatients (16 females and 7 males; mean age  $43.2 \pm 13$  years), all native French

speakers, fulfilling DSM-III-R criteria for major depressive disorders. The severity of the depressive mood was assessed using a depression rating scale (Montgomery and Asberg Depression Rating Scale 21-item version; MADRS scores ranged from 46 to 27 with a mean of  $35.26 \pm 4.92$ ) and a depression inventory (Beck Depression Inventory 13-item version; BDI scores ranged from 34 to 13 with a mean of  $21.30 \pm 6.30$ ). All subjects were being treated with antidepressive drugs often taken in combination with benzodiazepines;

- fifteen schizophrenic in- or outpatients (6 females and 9 males; mean age  $32 \pm 7.3$  years) all native French speakers, fulfilling DSM-III-R criteria for schizophrenia. All of these subjects were undergoing treatment with neuroleptic drugs and were clinically stable (BPRS scores ranged from 76 to 35 with a mean of  $55 \pm 13.3$ ) and not depressed (MADRS scores from 23 to 1 with a mean of  $12 \pm 7.6$ );

- thirty-seven control subjects (25 females and 12 males; mean age  $44.2 \pm 14$  years), all native French speakers, with no history of illness, free of somatic or psychiatric symptoms, and taking no drugs.

All subjects were evaluated a first time (session 1). Depressed patients were tested a second time (session 2) approximately 4 weeks later ( $29.90 \pm 21.41$  days) just before leaving the hospital. At this time, depressed patients had recovered or at least greatly improved both clinically and according to evaluating scales (average Score MADRS =  $8.6 \pm 5.1$ ; average score BDI =  $7.4 \pm 4.1$ ). All were undergoing the same treatment as in session 1. Control subjects were also evaluated at this time ( $30.50 \pm 22.39$  days after session 1). Schizophrenic patients could not be evaluated in session 2.

### Material

The material was composed of 120 common words of more than five letters in length, typed on  $125 \times 75$  mm cards. In order to fulfill the requirement for the word-stem completion and cued recall tasks, the stems (ie, the initial three letters) of each word were unique to the whole set of words, without diacritical marks, and could be completed to generate at least ten common words. In no case were the selected words the most frequent of the possible words (according to the *Trésor de la langue Française du CNRS*, Nancy, 1977).

The words were selected for their affective value, as evaluated by the “semantic differentiator” of Boucher and Osgood (1969). We used three analogical seven-point scales with adjectives GOOD/ BAD for the first, HAPPY/SAD for the second, and POSITIVE/NEGATIVE for the third scale (fig 1).

Two hundred words were evaluated by ten independent judges. One hundred and twenty words were then selected for the study: 60 positive, good, and happy

GOOD           |---|---|---|---|---|       BAD  
 HAPPY          |---|---|---|---|---|       SAD  
 POSITIVE      |---|---|---|---|---|     NEGATIVE

**Fig 1.** The three analogic scales used to evaluate the affective valence of the words.

words (eg, holiday, happiness) and 60 negative, bad, and sad words (eg, terror, murder).

These 120 words were randomly divided into 6 sets of 20 words. Within each set of words, positive words were equivalent to negative words with respect to the mean number of letters, mean frequency of occurrence, proportion of nouns, verbs, and adjectives, and intensity of affective value (positive words being as intensely positive as negative words are intensely negative). Two sets of words, one for session 1 and the other for session 2, were used for the explicit memory task (cued recall). The other word sets were used for the implicit memory task (word-stem completion). The same material was used for the two or three compared groups of subjects for each testing session.

### Procedure

In the initial (study) phase, the subjects were shown a list of 40 words. The words were successively displayed, one time each, for a duration of 3 to 4 seconds for each word. The subjects were instructed to read the words aloud, and were informed that the task would be followed by an unspecified memory task. The 40 words consisted of two sets of 20 words randomly intermixed for each subject; each set was assigned to a memory task. One set was used for the subsequent cued-recall task, and was the same for all subjects. For the other set, some of the subjects studied the words whose stems were presented as controls to the remaining subjects in the subsequent word-completion task, and vice-versa. Subjects were assigned to groups on a random basis.

As soon as the entire list had been read, all subjects were engaged in distractor tasks for approximately half an hour in order to prevent them from rehearsing the study list items.

Subjects then performed the implicit and explicit memory tests in immediate succession. Following common practice, all subjects performed the implicit memory task first. Thus, the implicit memory test was presented as a "filler", a distractor task, which minimised the potential influence of deliberate retrieval strategy on implicit memory performance. For the implicit memory test, the subjects were successively shown 40-word stems in random order. They were instructed to "provide the first word that

**Table I.** Explicit and implicit memory performances in session 1.

	<i>Depressed patients</i>	<i>Schizophrenic patients</i>	<i>Control subjects</i>
Cued recall	4.04 ± 2.36	4.93 ± 2.12	5.29 ± 2.17
Word completion	4.56 ± 2.89	5.26 ± 2.43	4.81 ± 2.50

comes to mind". The 20-word stems which could be completed with a word from the study list and the 20-word stems which could not be completed with a word from the study list were randomly intermixed.

For the explicit memory task, subjects were shown 20-word stems, and instructed to "complete each stem with one of the words previously presented".

The procedure was identical for session 1 and 2, although different word sets were used.

Performance was assessed according to the number of words completed in line with the study list.

## RESULTS

### Session 1

Separate ANOVAS were performed for the explicit and implicit memory tests. In both cases, the subject groups (depressed, schizophrenic and control subjects) were introduced as a between-subject factor.

#### *Explicit and implicit memory performance (table I)*

*Cued recall test:* in comparison with control scores, schizophrenic scores in explicit memory were similar (5.29 vs 4.93;  $F < 1$ ), whereas depressed patients scored significantly lower (5.29 vs 4.04;  $F(1.58) = 4.70$   $P < 0.034$ ). Nevertheless, the main effect of groups was not significant ( $F(2.72) = 2.27$   $P = 0.11$ ).

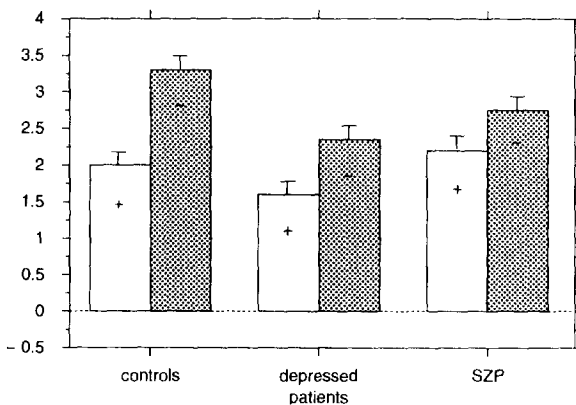
*Word-stem completion task:* as a whole, subjects completed significantly more old words than new words ( $P < 0.001$ ). Implicit memory scores did not differ for the three groups (4.56, 5.26 and 4.81, respectively for depressed, schizophrenic and control subjects). The groups of subjects (depressed/schizophrenic/control subjects)  $\times$  status of words (old/new words) interaction was not significant ( $F < 1$ ).

#### *Mood congruence effect in explicit and implicit memory (table II)*

*Cued recall test:* as shown in figure 2, the three groups of subjects showed preferential recall of

**Table II.** Mood congruence effect in explicit and implicit memory in session 1.

	<i>Depressed patients</i>	<i>Schizophrenic patients</i>	<i>Control subjects</i>
<b>Cued recall</b>			
Positive words	1.65 ± 1.07	2.20 ± 1.20	2.00 ± 1.33
Negative words	2.39 ± 1.69	2.73 ± 1.79	3.29 ± 1.68
<b>Word completion</b>			
Positive words	2.17 ± 1.43	2.93 ± 1.38	2.37 ± 1.53
Negative words	2.39 ± 1.72	2.33 ± 1.75	2.43 ± 1.77

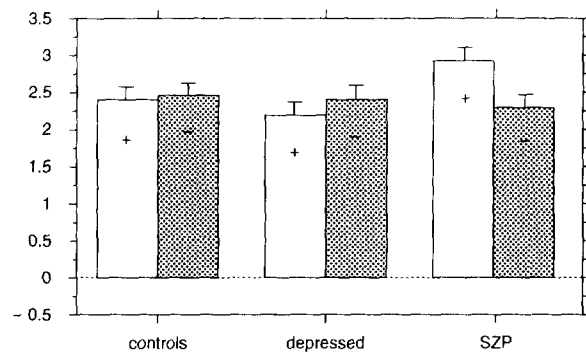
**Fig 2.** Cued recall scores in session 1. SZP: schizophrenics; □: positive affective words; ▨: negative affective words.

negative affective words as compared to positive affective words. This tendency is statistically significant for control subjects ( $F(1.36) = 13.86$   $P < 0.0007$ ) and depressed subjects ( $F(1.22) = 5.08$   $P < 0.034$ ), but not for schizophrenic patients ( $F < 1$ ). However, the groups of subjects (depressed/ schizophrenic/ control subjects)  $\times$  affective valences (positive/negative words) interaction did not reach significance ( $F(2.72) = 1.00$ ).

**Word-stem completion:** as shown in figure 3, results showed no reliable differences and all subjects completed as many positive as negative words ( $F_s < 1$  in all cases). The groups of subjects  $\times$  affective valences interaction was not significant ( $F < 1$ ).

### Session 2

Data scoring and analyses were performed as for session 1. However, this time the ANOVAs included only two groups of subjects: the depressed inpatients at the end of their hospitalisation (there-

**Fig 3.** Word completion scores in session 1. SZP: schizophrenics; □: positive affective words; ▨: negative affective words.**Table III.** Explicit and implicit memory performances in session 2.

	<i>Recovered patients</i>	<i>Control subjects</i>
Cued recall	7.60 ± 2.74	8.30 ± 2.53
Word completion	3.50 ± 1.96	3.13 ± 1.36

fore recovered or at least well-improved), and the control subjects, who were also tested again after the same delay.

### Implicit and explicit memory performance (table III)

Performances of the two groups of subjects did not differ significantly either in the cued recall task (7.60 vs 8.30 respectively for depressed recovered patients and control subjects;  $F < 1$ ) nor in the word-stem completion task (3.50 and 3.13 respectively;  $F < 1$ ).

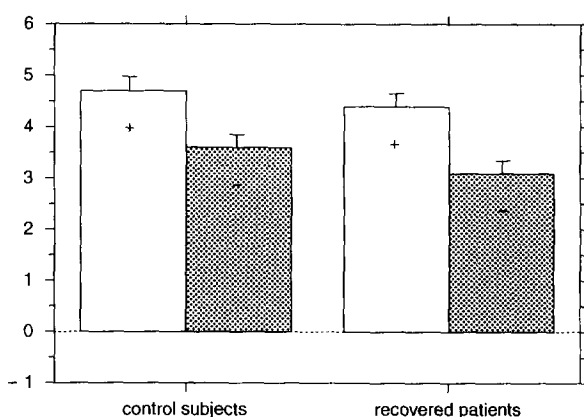
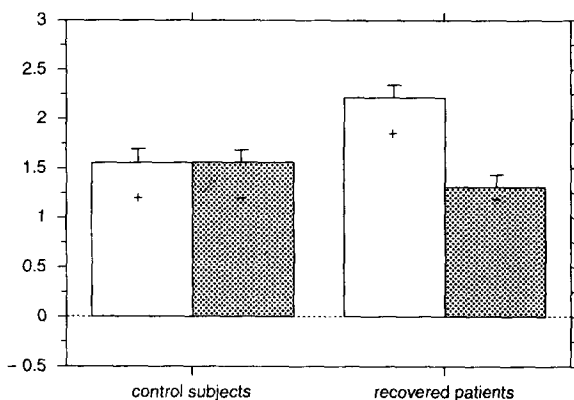
### Mood congruence effect in explicit and implicit memory (table IV)

**Cued recall (fig 4):** the two groups of subjects showed preferential recall of positive affective words as compared to negative affective words ( $F(1.19) = 9.41$   $P < 0.006$  for patients and  $F(1.29) = 6.78$   $P < 0.014$  for controls). The subject groups  $\times$  valence interaction was not significant ( $F < 1$ ).

**Word-stem completion (fig 5):** as in session 1, the control subjects showed no preferential remembering and completed as many positive as negative words (1.56 vs 1.56;  $F < 1$ ). On the other hand, depressed recovered patients exhibited a significant preferential remembering of positive

**Table IV.** Mood congruence effect in explicit and implicit memory in session 2.

	<i>Recovered patients</i>	<i>Control subjects</i>
Cued recall		
Positive words	4.45 ± 1.79	4.66 ± 1.82
Negative words	3.15 ± 1.53	3.63 ± 1.49
Word completion		
Positive words	2.20 ± 1.24	1.56 ± 1.16
Negative words	1.30 ± 1.23	1.56 ± 0.93

**Fig 4.** Cued recall scores in session 2. □: positive affective words; ▨: negative affective words.**Fig 5.** Word completion scores in session 2. □: positive affective words; ▨: negative affective words.

affective words as compared to negative ones (2.20 vs 1.30;  $F(1.19) = 7.69$   $P < 0.021$ ). This difference elicited a reliable subject groups × valence interaction ( $F(1.48) = 4.25$   $P < 0.05$ ).

## DISCUSSION AND CONCLUSION

### Implicit and explicit memory performance in depressed and schizophrenic patients

In line with the prior literature, depressed patients are significantly impaired in a cued recall task (see review in Burt et al, 1995) whereas they are not impaired in a word-stem completion task (Bazin et al, 1994; Danion et al, 1991).

In schizophrenic patients, explicit memory is usually explored through free recall tasks, and their performance is often found to be altered. This study shows that schizophrenic patients do not perform differently from controls in a cued recall task.

Few studies have explored implicit memory performance in schizophrenic patients, and these that have been done report conflicting results. Some studies show impaired performances (Randolph et al, 1993; Heinrichs, 1991) while others show normal performance (Schmand et al, 1992; Clare et al, 1993; Goldberg et al, 1993). The results of this investigation are consonant with those of the latter studies, insofar as they report normal performances in a word-stem completion task. These results support the hypothesis of spared automatic processes in schizophrenia.

### Mood congruence effect in implicit and explicit memory tasks

For explicit memory (cued recall task), control subjects memorised more negative than positive words in session 1 and more positive than negative words in session 2, with no mood change occurring between these two sessions. This result could be interpreted in terms of the "list effect". In fact, in the set of words used in session 1, the negative words were more easily retrieved than the positive ones, whereas the opposite was true for the set of words used in session 2. In depressed patients, this "list effect" interfered with an eventual mood congruence effect. Thus, for this part of the study, no conclusion can be drawn with regard to this effect.

For implicit memory (word completion task), control subject results were stable at both times of evaluation, despite the use of different sets of words. The mood congruence effect in depressed patients can thus be explored.

In session 1, the three groups of subjects showed no preferential remembering, and all subjects produced as many positive as negative words in the word completion task. This result runs counter to the hypothesis of mood congruence effect in implicit

memory, and is in accordance with the results of two previous studies (Denny and Hunt, 1992; Watkins et al, 1992). Nevertheless, according to Roediger and Mc Dermott (1992), mood congruence effect probably exists, but would appear only with *conceptual* tests (as opposed to frequently used *perceptual* tests like word-stem completion).

In session 2, recovered depressed patients differed from control subjects: while this latter group memorised as many positive affective words as negative ones, recovered depressed patients exhibited significant preferential implicit remembering of positive affective words as compared to negative affective words. This result could be related to the mood congruence effect: the mental state of the recovered patients can be characterized as elation, and congruent words are positive ones.

Future studies should further these results through the investigation of a mood congruence effect occurring in implicit memory alone, and only in patients who have recovered from their major depressive episode (not including depressed patients). More data are needed in order to determine, for example, whether this effect is specific to depressed patients or could be revealed in any patient leaving the hospital after several weeks of the favourable evolution of any severe pathological episode.

However, these results do suggest that implicit and explicit emotional information processing differ in certain respects from one another.

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