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Fluency versus Conscious Recollection in Category-Production Performance: The Performance of Schizophrenic Patients

Chrystel Besche-Richard

Laboratoire de Psychologie clinique et sociale (LPCS), Université de Bourgogne, Dijon, France

Christine Passerieux and Marie-Christine Hardy-Baylé

Service de psychiatrie, Hôpital Richaud, Versailles, France

Serge Nicolas

Laboratoire de Psychologie Expérimentale URA CNRS 316, Université René Descartes et EPHE, Paris, France

and

Jean-Paul Laurent

Equipe de recherche en psychologie clinique et cognitive (ERPC), Université Paris 8, Saint-Denis, France

The purpose of this study was to investigate the relative contribution in schizophrenics of automatic processes (fluency) and conscious processes (conscious recollection) for the control of preencoded material in category production tasks. In one condition (Exclusion condition), subjects were told specifically not to produce previously presented words during the category-production task. This condition was compared with a standard category-production task in which subjects were told to produce the six first words that came to mind for a semantic category (Inclusion condition). In the inclusion condition, the effects of conscious control and automatic processes operated in the same direction, whereas in the exclusion condition automatic influences and conscious control were opposed. A recognition task followed the category-production tasks. Since the exclusion condition required conscious control of encoded items, we hypothesized that schizophrenic patients would be less able than control subjects to avoid producing study list items. These results indicated

Address correspondence and reprint requests to Chrystel Besche-Richard, Centre hospitalier de Versailles, Service du Pr. Chevalier, 1, rue Richaud, 78000 Versailles, France. E-mail: Chrystel.Besche@u-bourgogne.fr.

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that schizophrenics' performance differed from these of control subjects in the exclusion condition but not in inclusion condition. Recognition performance was similar in both the schizophrenic and the control groups. These results suggest a defective conscious control in schizophrenic patients and confirm the data from the literature on explicit memory in these patients.

For the past 20 years, the opposition between implicit and explicit memory tasks has played an important role within cognitive memory models. The study of memory is dependent on the study of the level of awareness (Tulving, 1985). Implicit measurements of memory assess memory in the absence of any conscious recollection: performance in memory tasks is facilitated without there being any conscious recollection of the influence of a prior event (encoding) on this performance. In contrast, performance in explicit tasks demands the conscious recollection of prior events (encoding and its context). Classically, it has been assumed that implicit memory tasks are based on an automatic processing mode which is performed unconsciously and without any intention on the part of the subject, whereas explicit memory tasks depend on a processing mode which is performed under conscious control (Graf & Schachter, 1985). It is now accepted that memory tasks do not exclusively involve one or the other of these processes (Jacoby, 1991; Jacoby, Toth & Yonelinas, 1993) and, instead, mobilize multiple memory processes. We shall return to this distinction later in this article.

Cognitive studies conducted using schizophrenic patients frequently conclude that there is an opposition between the preservation of automatic modes of information processing and the anomalous controlled processes (Callaway & Naghdi, 1982; Nuechterlein & Dawson, 1984). Memory studies should thus furnish a theoretical framework within which it is possible to examine the anomalies which affect schizophrenics. A number of studies have already attempted to assess memory in schizophrenic patients. The first studies to examine long-term memory in schizophrenic patients revealed that performance in recall tasks was impaired, irrespective of whether these tasks were free, indexed, or serial (Bauman & Murray, 1968; Traupmann, 1975). Performance in recognition tasks, however, should be preserved (Bauman & Murray, 1968; Koh, Kayton & Berry, 1973; Russell, Bannatyne & Smith, 1975, Traupmann, 1975; Truscott, 1970). These anomalies are explained in terms of encoding problems. In schizophrenics, the presence of category cues does not facilitate the retention of the items which are to be memorised (Culver, Kunen & Zinkgraf, 1986; MacClain, 1983; Russell & Beekhuis, 1976; Traupmann, Berzofsky & Kesselman, 1976). In consequence, the origin of these encoding problems lies in a deficit in the ability to organize the material which is to be learned. This capability is not mobilized spontaneously. Instead, when the ''context'' is largely favorable to the implementation of these categorization strategies, the performances achieved by schizophrenics nor-

malize (Koh & Petterson, 1978). This correction is a function of the degree of seriousness of the schizophrenia and appears to be effective in patients with a mild or average form of the illness (Calev & Monk, 1982; Calev, Venables & Monk, 1983). These authors consider that memory disorders are the result of the deficit in the ability to implement strategies for the organization of the material which is to be learned rather than of a structural anomaly in semantic memory. With the appearance in the field of cognitive psychology of studies involving implicit and explicit memory tasks, new research which makes use of this dichotomy has been performed among schizophrenic subjects. Generally speaking, the implicit tasks which correspond to the automatic, implicit, unconscious use of the learning material should produce normal performances in schizophrenics whereas they should fail in explicit tasks which require the mobilisation of conscious, controlled processes (Bazin & Perruchet, 1996; Clare, MacKenna, Mortimer & Baddeley, 1993; Gras-Vincendon et al., 1994; Schmand, Kop, Kuipers & Bosveld, 1992; Schwartz, Rosse & Deutsch, 1993). More particularly, in memory priming tasks, schizophrenics' performances are normal irrespective of whether the task is perceptual or conceptual (Schwartz et al., 1993). The normality of the priming effect observed in schizophrenics cannot be due to the activation of pre-existing representations in memory since a priming effect is observed in these patients following the encoding of new associations (Bazin & Perruchet, 1996). In addition, the acquisition of cognitive routines is globally preserved (Gras-Vincendon et al., 1994; Schwartz et al., 1992). A number of different interpretations help explain the observed results. First, we can state that when a controlled processing mode is required, schizophrenics' performances in memory tasks differ from those obtained by normal subjects. It is therefore not surprising that schizophrenics' performances in recognition tasks should be identical to those of normal subjects since the processes involved in these tasks are less controlled than those called on by recall tasks (Mandler, 1980). Second, as we have seen above, the processing of material encoded during a explicit memory task requires the conscious retrieval of the material in question and the context in which it was encoded: the difficulties encountered by schizophrenics therefore appear to be due to their inability to consciously retrieve the information associated with the encoding context (Gras-Vincendon et al., 1994). Third, success in implicit and explicit memory tasks demands different levels of awareness. Schizophrenics' performances should be unimpaired when the required level of awareness is low or zero, while their performance should suffer when a high level of awareness is required (Huron et al., 1995). Nevertheless, as we have already stated, tasks cannot be thought of as involving only one type of cognitive process. We cannot, for example, exclude the possibility that more conscious, explicit processes are involved in implicit memory tasks (Jacoby, 1991; Jacoby, Toth & Yonelinas, 1993) and vice versa. In consequence, when evaluating memory activity

in either normal or schizophrenic subjects, it is necessary to use procedures which make it possible to improve the way in which we control the nature of the processes involved in the presented tasks. That is why, in this article, we intend to use Jacoby's (1991) process dissociation procedure to assess the implicit, unconscious processes, on the one hand, and the controlled, conscious processes, on the other.

The inspiration for this study is taken from the experimental paradigm used by Cermak, Verfaellie, Swenney, and Jacoby (1992) with a population of amnesic patients. To assess the role of implicit and explicit processing during memory tasks more directly, our study used a conceptual memory task (category production task), i.e., a task which required the use of conceptual and organizational processes. For Schwartz et al. (1993), schizophrenics do not, strictly speaking, suffer from anomalies in their conceptual processes but instead experience difficulties when using these processes in tasks which require the conscious retrieval of contextual information. In one of the experimental conditions used in this task (exclusion condition), the correct response required the use of controlled, conscious procedures. In this condition, the subjects were presented with a number of semantic categories and were explicitly asked not to produce the words which had previously been presented in the learning list. In this first condition, the influence of automatic processes (fluency) and that of processes of conscious control (recollection) work in opposite directions. The exclusion of words which are familiar after encoding requires the ability to oppose a familiarity-based judgement on the basis of conscious recollection (Jacoby, 1991). Unlike classic recall tasks, this procedure makes it possible to exclude the intervention of automatic processes during an explicit memory task. The performance pattern obtained in this condition can be compared with that obtained in a classic priming condition (inclusion condition) which also focuses on the mobilization of implicit, automatic, unconscious processes although we cannot exclude the possibility that explicit processes are involved: following the encoding of category items, we asked the subjects to say the first words which came to mind on the basis of the semantic categories. In this condition, the automatic processes and conscious control processes work in the same direction. We believe that the performance of schizophrenics in the inclusion condition should be comparable with that of the control subjects, that is to say that all the subjects should find it easier to produce examples of the previously encoded categories even though they have no memory of them and that they should do so implicitly. In consequence, we should observe the same priming effect in control subjects and schizophrenics. In contrast, in the exclusion condition, only the schizophrenics should produce examples of the category previously presented during the learning phase despite the instructions which they have received. In the exclusion condition, the priming effect should therefore be weaker for the schizophrenics than for the control subjects.

These hypotheses were tested using the proportions of words produced and response time as a function of category type.

METHOD

Subjects

Two groups of subjects participated in these experiments. The first group consisted of 48 normal controls (36 men and 12 women, i.e., 75% men) and the second group consisted of 24 schizophrenic patients (20 men and 4 women, i.e., 83% of men). Schizophrenic patients were recruited from several psychiatric departments. Schizophrenia was diagnosed in accordance with the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*, 1994). The schizophrenic group consisted of 9 schizophrenics of paranoid type, 7 of undifferentiated type, 5 of residual type, and 3 of disorganized type. None of these patients had a history of neurological disease or alcohol or drug abuse. All the schizophrenic patients were on neuroleptic treatment and 5 of them were on anticholinergic treatment. None had had ECT within the previous 6 months. Informed consent was obtained from all subjects.

The schizophrenic subjects were assessed clinically by an independent psychiatrist using the PANSS scale (positive and negative symptoms scale, Kay et al., 1987) ($m = 85.8$, SD = 16.4) and the TLC scale (thought language and communication scale, Andreasen, 1979a,b) for evaluating thought disorders in schizophrenic patients ($m = 13.3$, SD = 9.5). The mean age of the control group was 26.8 years (SD = 6.8) and that of the schizophrenic group was 31 years (SD = 5.9). There was thus a significant difference between the two groups ($F(1, 70) = 6.8$, $p < .01$). The average number of years of education was 13.6 (SD = 3.1) for the control group and 11.4 (SD = 2.5) for the schizophrenic subjects. This difference was significant ($F(1, 70) = 9.4$, $p < .003$). All subjects had a normal vocabulary level (*Binois & Pichot's Vocabulary Test*, 1959). The average vocabulary test score was 25.8 (SD = 4.7) for the control group and 24.3 (SD = 6.6) for the schizophrenic group. There was no significant difference between these two scores.

Material

The material was selected on the basis of a French category table (Charles & Tardieu, 1977). From each of the 16 categories (a fruit, a kitchen utensil, a four-footed animal, a color, a bird, an article of clothing, a tree, a part of the human body, a vegetable, a fish, a flower, an insect, a drink, a profession, a piece of furniture, a tool), 5 common instances (e.g., bilberry, lemon, grapes, fig, mango) were selected. These items were not ranked among the 10 most frequent instances. Four lists were constructed and each contained 4 of the 16 categories resulting in four lists of 25 items (4 categories of five items each and five buffer items). Subjects learned one of the lists (study list), while the other lists served as new lists during the test phase. Across subjects, each list served equally often as a study list and as a new list and was used with equal frequency in the inclusion condition and exclusion condition.

Procedure

During the learning phase, the subjects in the inclusion condition had to read and correct aloud 25 syntactically incorrect sentences containing the category exemplars (20 target sentences and 5 buffer sentences). To correct the syntactic errors, the subjects had to process the target word. For the inclusion condition, we opted for a nonsemantic encoding mode in order to prevent a high level of contribution from strategic processes during the retrieval of the encoded material in the test phase. The encoding phase in the exclusion condition was different

and consisted of generating sentences on the basis of a list of 25 words (20 target words and 5 buffer words). In this condition, semantic type encoding would appear to be necessary to ensure the quality of recollection of the encoded items. The items in each learning phase were presented in random order. The two encoding tasks therefore differed in the inclusion and exclusion conditions since it should be remembered that the same subjects took part in the trials. By modifying the encoding modes used for the two learning phases, we wanted to avoid a repetition effect in the exclusion condition in order to prevent the implementation of strategic processes. This difference between learning modes causes no disruption given that we did not intend to compare the performances in the inclusion and exclusion conditions directly but, instead, the performances of each of the groups of subjects as a function of these two conditions.

Following these presentations, subjects were given a category-production task to perform. This consisted of the presentation of eight category titles with four category titles presented in the study list. In the first condition (inclusion condition), the subjects were told, as in a standard procedure, to produce six instances for each of the eight category titles presented in a random order. Thirty seconds was the time limit. In the second condition (exclusion condition), the subjects were presented with another target list of eight category titles presented in a random order and were told to produce six instances but not to produce those presented in the study list. Thirty seconds was the time limit. Each encoding phase was followed by the production phase. Subjects rarely had difficulty generating six instances. To familiarize the subjects with the procedure, they were given a sample category title (family) and examples of that title (sister, father, mother, brother, uncle, aunt).

Subjects completed the tasks in a fixed order: the inclusion condition followed by the exclusion condition. This order was preferred to the reverse in order to prevent the mobilization of explicit strategies in the inclusion task if this followed the exclusion condition. After the inclusion condition, the vocabulary test was presented to the subjects. After the exclusion condition, a recognition task was administered in which patients were required to say which of the 32 words presented came from the study lists (words presented in the inclusion and exclusion conditions) (16 old words, 8 for inclusion condition and 8 for exclusion condition, and 16 new words).

For each subject, we computed the proportion (as a percentage) and required production times (in seconds) of study list words (targets) produced for category titles and for nonpresented list words (fillers) they correctly produced by chance. The proportion of category instances produced from the list not presented to the subject at study provides the baseline score. These data were collected for the inclusion and exclusion tasks.

RESULTS

The data, which are presented in Tables 1 and 2, were analyzed by means of a repeated measures ANOVA with Group (Control, Schizophrenic) as the between-subjects factor and Instruction Set (Inclusion, Exclusion) and Item Type (Target, Filler) as the within-subjects factors. For post hoc analysis, we used the Newman–Keuls' test.

Word Proportions

Results of analyses of the category-production proportions revealed a significant main effect of Instruction Set ($F(1, 70) = 60.25$, $p < .0001$) which indicated that across groups more items were produced in the inclusion condition than in the exclusion condition. This effect was undoubtedly due to

TABLE 1
Percentage of Study List Words (Targets) and Nonpresented List Words (Fillers) Produced for List Items in Inclusion and Exclusion Condition

	Target	Filler
Controls		
Inclusion (syntactic correction)	16 (±8.4)	7.9 (±6.3)
Exclusion (sentence generation)	0.4 (±1.2)	7.7 (±5.3)
Schizophrenics		
Inclusion (syntactic correction)	14.4 (±8.9)	8.4 (±5.9)
Exclusion (sentence generation)	5.2 (±7.2)	7.5 (±4.6)

the difference in encoding depth in the inclusion and exclusion conditions. This latter effect was confirmed by a significant Instruction Set × Item interaction ($F(1, 70) = 64.58$, $p < .0001$). Post hoc analysis revealed that there was a significant difference between the proportion of target items production for the inclusion and exclusion conditions ($p < .0001$, 15.2 vs 2.8) but not for filler items (8.2 vs 7.6). This latter effect was modified by a significant Group × Item × Instruction Set interaction ($F(1, 70) = 5.97$, $p < .02$). Post hoc analysis revealed that controls and schizophrenics did not differ in the proportion of target items produced in the inclusion condition (Fig. 1) or in the proportion of filler targets produced in the inclusion and exclusion conditions but only in the proportion of target items obtained in the exclusion condition ($p < .002$). Furthermore, priming for the inclusion condition was significant for controls ($p < .0001$) and schizophrenic patients ($p < .0004$), while priming for the exclusion condition was only significant for controls ($p < .0002$) (Fig. 2). This result suggests that only the control subjects were able to modify their response to comply with the instruction set unlike the schizophrenic patients. Correlations (Bravais–Pearson) were observed between the priming effect in the exclusion condition and educational and vocabulary levels (respectively, $r = .37$, $p < .001$ and $r = .39$, $p < .002$). An

TABLE 2
Production Times (in Seconds) of Study List Words (Targets) and Nonpresented List Words (Fillers) in Inclusion and Exclusion Conditions

	Target	Filler
Controls		
Inclusion (syntactic correction)	23.3 (±7)	24.1 (±7.5)
Exclusion (sentence generation)	31.7 (±7.2)	23.9 (±5.8)
Schizophrenics		
Inclusion (syntactic correction)	27.2 (±12.4)	24.7 (±7.6)
Exclusion (sentence generation)	37.3 (±8.1)	29 (±7.5)

analysis of covariance (ANCOVA) was conducted on the priming effect in this condition with educational and vocabulary levels as covariants. No changes were observed. No correlations were observed between results (priming effect in inclusion and exclusion conditions) and clinical variables (TLC and PANSS scores, time course of illness, neuroleptic and anticholinergic treatment) in schizophrenic patients.

Production Times

The results of the analyses of production times revealed a significant main Group effect ($F(1, 70) = 7.06$, $p < .01$) indicating slower production times in schizophrenic patients than in control subjects (29.5 vs 25.7 s) (Figs. 1 and 2). There was a Instruction Set effect ($F(1, 70) = 58.8$, $p < .0001$) which indicated that, across groups, production times were longer in the exclusion condition than in the inclusion condition (30.5 vs 24.8 s). Moreover, there was a significant main Item effect ($F(1, 70) = 34.4$, $p < .0001$) which indicated that production times were longer for target items than for fillers items and a significant Instruction Set $\times$ Items interaction ($F(1, 70) = 24.9$, $p < .0001$). Post hoc analysis showed that this effect was due to production times for target items which differed between the inclusion and exclusion conditions ($p < .0001$) but not for filler items. Finally, there was a significant Group $\times$ Instruction Set interaction ($F(1, 70) = 4.3$, $p < .04$) indicating that there is a difference in production times between controls and schizophrenic subjects in the exclusion condition ($p < .0001$) (Fig. 2). There was no significant Instruction Set $\times$ Group $\times$ Item interaction, indicating that the pattern of response in schizophrenic patients was the same as in control subjects. No correlations were observed between priming effect in the exclusion condition and sociodemographic variables (sex, age, educational and vocabulary levels).

Recognition Task

Recognition memory scores for schizophrenic patients and control subjects as a function of Instruction Set are presented in Table 3.

The data from the recognition memory tasks were analyzed by means of an ANOVA with Group as a between-subjects factor and Instruction Set as the within-subjects factor. This analysis revealed an Instruction Set effect ($F(1, 70) = 126.8$, $p < .0001$) suggesting that, across groups, subjects recognized fewer words present in the inclusion condition than in the exclusion condition (51.7 vs 94.1%) because these words were presented at the beginning of the task and were superficially encoded. However, there was no significant difference between the schizophrenic patients and control subjects. We performed the same analysis with corrected recognition memory scores for the inclusion and exclusion conditions (correct recognition level–incorrect recognition level). This second ANOVA gave the same results indicating

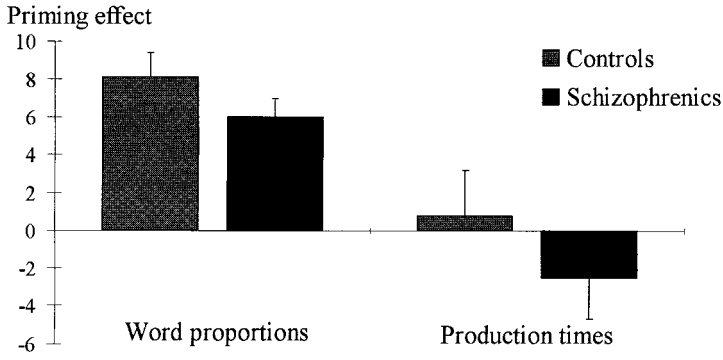

FIG. 1. Priming effect on word proportions and production times in control and schizophrenic groups in the inclusion condition. The priming effect for word proportions corresponds to the difference between the percentage category-production for list items and percentage category-production for filler items in the inclusion condition. Errors bars correspond to standard deviation error. The priming effect for production times corresponds to the difference between production times for filler items and production times for list items in the inclusion condition. Errors bars correspond to standard deviation error.

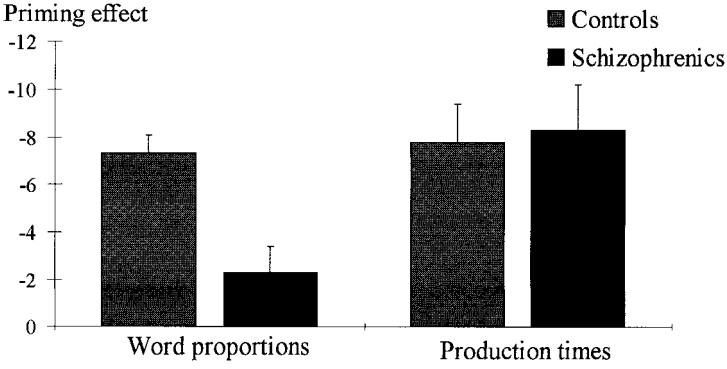

FIG. 2. Priming effect on word proportions and production times in control and schizophrenic groups in the exclusion condition. The priming effect for word proportions corresponds to the difference between the percentage category-production for list items and percentage category-production for filler items in the exclusion condition. Errors bars correspond to standard deviation error. The priming effect for production times corresponds to the difference between production times for filler items and production times for list items in the exclusion condition. Errors bars correspond to standard deviation error.

TABLE 3
Percentage of Study List Words Recognized in the Inclusion and Exclusion Condition

	Inclusion (syntactic correction)	Exclusion (sentence generation)	False recognition
Controls	53.8 (±27.4)	96.2 (±7.9)	2.8 (±5.8)
Schizophrenics	49.7 (±33.1)	92 (±12.2)	5.3 (±9.1)

an absence of differences in recognition memory scores between schizophrenic patients and control subjects.

No correlation was observed between recognition memory scores and priming effects obtained in inclusion and exclusion conditions.

DISCUSSION

The first main result of this research relates to the demonstration of an identically size priming effect among schizophrenics and control subjects in the inclusion condition. In the inclusion condition, the control and schizophrenic subjects used words from the learning list more frequently when responding to the presented semantic categories. No difference in production times resulting from the presence or absence of the words in a learning list was observed. The times required to produce words for the learned categories and the filler categories were identical. This might have been due to the low contribution of conscious processes for the recovery of encoded material in this task. In any case, this result supports the data reported in the literature concerning the observation of normal performances in schizophrenic subjects during implicit memory tasks (Clare et al., 1993; Gras-Vincendon et al., 1994; Schmand, Kop, Kuipers & Bosveld, 1992; Schwartz et al., 1993). Explicit memory, which requires awareness, is impaired, whereas implicit memory, which does not require awareness is spared.

The second main result relates to the difficulty which schizophrenic subjects experience in following the instructions in the exclusion condition whereas increased production times among both control and schizophrenic subjects indicate the mobilization of a control mechanism and/or longer decision-making times. We shall return to this interpretation later. In the exclusion condition, only the schizophrenic subjects, unlike the control subjects, produced the words from the encoding list. Nevertheless, in both groups, we observed longer production times for the learned categories than for the filler categories.

The third major result relates to the observation of similar recognition rates for control and schizophrenic subjects. In the recognition task, there was no difference between the performance of control subjects and that of schizophrenic subjects.

Finally, we demonstrated the absence of any correlation between the re-

sults obtained by our patients in the two experimental conditions and a number of clinical variables, including the reception of anticholinergic treatment. It has been claimed that anticholinergics affect recall and recognition performance (Calev, 1984; Goldberg et al., 1993), in particular, when this performance demands the organization of the material which is to be encoded (Calev, 1983). The absence of any anticholergenic effect on the memory performances of our patients may be due to the small number of subjects receiving anticholinergic treatment ($n = 5$).

In summary, the schizophrenics' performances on a standard category-production task in which automatic influences and conscious control produced effects in the same direction were identical to controls' performances thus indicating the preservation of implicit processes in a memory task. On the other hand, the schizophrenics' performances in an exclusion task in which automatic influences and conscious control were opposed differed from controls' performances. In the exclusion condition, schizophrenic patients produced a lower proportion of target items than in the inclusion condition, thus indicating a limited ability to consciously retrieve list items. The results obtained for the proportions of words produced and the production times seem to indicate that the conscious control processes are attenuated in schizophrenic subjects. Moreover, the observation of similar performances among control and schizophrenic subjects in a recognition task—a result which replicates other results from the literature (Bauman & Murray, 1968; Huron et al., 1995; Koh, Kayton, & Berry, 1973; Russell, Bannatyne, & Smith, 1975; Traupmann, 1975; Truscott, 1970)—can be explained in terms of the fact that in this task, schizophrenics base their responses on a feeling of familiarity rather than on a real search process (Kintsch, 1970). According to Kintsch's model (two-process theory), the processes involved in recall and recognition tasks are different: judgment of familiarity in the recognition task and search activity in the recall task. Despite this, so-called ''monist'' theories place the recall and recognition tasks within the same continuum. According to these theories, both tasks require a search process but these processes take place at different levels. These theories hold that two processes are involved in recognition: a predecision process which is based solely on the familiarity of the target item and a search process (''retrieval check'' or ''conditional search'') which is only mobilized if the result of the predecision process is insufficiently reliable (Mandler, 1980; Tiberghien, Cauzinille & Mathieu, 1979). The search process would therefore be optional in recognition tasks and would depend on the conditions of the situation in question. We can assume that this search process was minimal in the recognition task which we used.

Why, however, do schizophrenic subjects not experience this feeling of familiarity in connection with the items in the exclusion condition? In light of the generate/recognize model postulated by Jacoby and Hollingshead (1990), we can suppose that in the test phase of the exclusion condition, the

subjects generated the items which they had previously encoded, i.e., the items which were familiar to them. However, depending on the instructions they receive, they may be required to inhibit the familiar words which they have generated. In this case, the generation process would be opposed to the recognition processes since the generated items are normally recognized as familiar items which therefore have to be inhibited. In this condition, this second phase in the recognition of viewed items which form part of the encoding context would be absent in schizophrenics who, in consequence, would produce the words which they have already seen, basing their responses on the feeling of familiarity felt for these items during the response generation phase.

Despite this, we observe an increase in production times in the exclusion condition which, as we have said above, might reflect the presence of two processes: on the one hand, the control process itself which would consist of the specific inhibition of the encoded items and, on the other, a general decision-making process which would be more extended than in the inclusion condition because of the special nature of the instructions in the exclusion condition. In effect, the increased production times for the target categories in the exclusion condition in the control subjects may, to a large extent, reflect the mobilization of a control process and, to a lesser extent, a decision-making process. It is conceivable that the increased production times observed in the schizophrenic subjects for the target categories in the exclusion condition are due more to their uncertainty when it comes to making decisions than to the control process which would consist of inhibiting the encoded words even if, as we have said above, the presence of this control process is severely restricted in these subjects. Our interpretation that decision-making processes predominate during the period required by schizophrenic subjects when producing target category responses in the exclusion condition is supported by the fact that the production times of these patients for filler categories are longer in the exclusion condition than in the inclusion condition (29 vs 24.7 s), whereas these times are unchanged in the control subjects (23.9 vs 24.1 s). A Newman–Keul's test showed that the difference between production times for the filler items of the exclusion condition was significant in the schizophrenic group ($p < .009$) but not in the control group.

The results obtained by our schizophrenic subjects in the exclusion condition argue in favor of a reduction and disruption of the conscious control process, which is partially present and which translates into an increase in production times for the encoded categories. In our opinion, this increased production time would reflect a lengthening of the decision-making processes in schizophrenic subjects in the exclusion condition. Nevertheless, as we have already shown, this lengthening of production times in schizophrenics in the exclusion condition also applies to filler categories. This seems to point to a certain degree of caution regarding the words which are to be

produced which is caused by the requirements of the instruction (''Do not say words which you have already seen''). In consequence, given the production times in the exclusion conditions, the schizophrenic subjects do appear to retain the instruction in memory.

The results obtained by our schizophrenic subjects in the exclusion condition contrast with their performances in the recognition task. However, the latter does not involve as pure a task as that used in the exclusion condition since the recognition task simultaneously involves memory search processes and a feeling of familiarity (Mandler, 1980; Tiberghien et al., 1979). The schizophrenic subjects undoubtedly recognize items as a result of their familiarity with the encoded items and not because they retrieve the context in which they were encoded (Huron et al., 1995). However, for its part, the exclusion condition explicitly requires the conscious retrieval of the encoding context. It should be emphasized that in classic recognition tasks, unlike recall tasks, there is a high degree of compatibility between the recognition cues and the memory trace as encoded (Tulving, 1984). The difference in the performances achieved by our schizophrenic subjects in the exclusion condition and the recognition task highlights the methodological purity of our experimental design and the value of using it to reveal the type of conscious process that seems to be disturbed in schizophrenics.

It should be remembered that, as Jacoby (1991) argues, in the process dissociation procedure which we employed, the feelings of familiarity and of conscious control are opposed in the exclusion condition: the exclusion of familiar words because they have previously been encoded requires subjects to attribute the source of a feeling of familiarity to that feeling and this attribution may be accompanied by a greater or lesser feeling of certainty (Jacoby & Hollingshead, 1990). The failure of this attribution process in schizophrenics would indicate the difficulty which these patients experience in mobilizing strategic processes for the evocation of context and recovery of the encoding context, i.e., the source of the feeling of familiarity.

Our results are in agreement with those obtained by Huron et al. (1995). These authors used recognition tasks to demonstrate a selective impairment of conscious recollection of the original learning episode, whereas recognition memory based on feelings of familiarity was normal. In other words, performances in explicit memory tasks are impaired in schizophrenic subjects when a certain level of awareness is required: since conscious recall requires the use of the encoding context rather than a feeling of familiarity, only the first process is impaired in schizophrenic patients.

Our own experimental results, together with those taken from the literature, thus suggest that schizophrenics have difficulty in the explicit recall of contextual information. This hypothesis is supported by certain other studies which have revealed the difficulty experienced by schizophrenic subjects when asked to consciously recall the spatiotemporal context of encoding (Rizzo, Danion, Van der Linden & Grangé, 1996; Rizzo et al., 1996;

Schwartz et al., 1991) or to remember the origin of information which has already been encoded (Harvey, 1985). For example, schizophrenics have difficulty remembering the order in which events occurred, thus suggesting a deficit in the contextual memory of temporal information due to difficulties in organizing the information during encoding (Schwartz et al., 1991).

To conclude, we return to the article by Cermak et al. (1992) in which these authors identified a response pattern among amnesic patients which was similar to that observed among our schizophrenic subjects: an identical priming effect among amnesic and control subjects in the inclusion condition but not in the exclusion condition. In the latter condition, the amnesic subjects tended to produce the words which they had encoded. Nevertheless, it is necessary to point out two differences. First, the performances of our schizophrenic subjects differed from those of the amnesics in the recognition task: whereas the schizophrenic did not differ from the control subjects, the amnesic subjects did not perform as well as the control subjects in the recognition task. Second, in Cermak et al.'s study (1992), there was no measurement of response time which is, as we have demonstrated, an extremely valuable indicator in the exclusion condition. Context and awareness seem to be the two key terms in the analysis of the schizophrenic subjects since these are the two concepts which make it possible to distinguish between implicit and explicit memory tasks: explicit performances require the conscious recall of the encoding context. This is not possible without strategic, organizational processes which subsequently guide the memory search.

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