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Susceptibility to misleading information under social pressure in schizophrenia

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Abstract

Research looking at specific memory aberrations in the schizophrenia has primarily focused on their phenomenology using standardized semantic laboratory tasks. However, no study has investigated to what extent such aberrations have consequences for everyday episodic memories using more realistic false memory paradigms. Using a false memory paradigm where participants are presented with misleading suggestive information (Gudjonsson Suggestibility Scale), we investigated the susceptibility of patients with schizophrenia (n = 21) and healthy controls (n = 18) to post hoc misleading information acceptance and compliance. Patients with schizophrenia exhibited an increased susceptibility to go along with misleading suggestive items. Furthermore, they showed an increased tendency to change answers under conditions of social pressure. Underscoring previous findings on memory aberrations in schizophrenia, patients with schizophrenia had reduced levels of correct recognition (ie, true memory) relative to healthy controls. The effects remained stable when controlling for specific mediating variables such as symptom severity and intelligence in patients with schizophrenia. These findings are a first indication that social pressure and misleading information may impair source memory for everyday episodic memories in schizophrenia, and such impairment has clear consequences for treatment issues and forensic practice.

1. Introduction

In recent years, laboratory studies have tried to pinpoint specific memory aberrations related to the pathogenesis of schizophrenia [1]. This research has now focused on memory binding and source monitoring deficits in schizophrenia (ie, false memories and source monitoring errors [1-6]). In particular, behavioural studies show that patients with schizophrenia exhibit deficits in binding multiple features into complex representations [7,8]. Regarding source monitoring [9], it has been found that patients with schizophrenia consistently show a severe deficiency in internal ("Did I do this or did I only imagine this?" [10-12]) and internal-external source attribution ("Did I do this or did someone else say this to me?" [4,13,14]). These deficits are thought to be a consequence of marked difficulties of patients with schizophrenia in encoding distinctive perceptual and contextual features [9] that serve as landmarks in classifying the correct source of information during memory retrieval ([15], but see [16,17]).

Ideally, during encoding and consolidation, perceptual and contextual features need to be bound together to form a "coherent" memory representation (ie, memory binding [18]). At retrieval, this activated information should then be monitored properly to differentiate between a veridical recollection of an experienced event and a fabricated one. A recent study by Waters et al [8] found that deficits in binding contextual cues together might explain commonality of these source attribution deficits in schizophrenia. It was found that patients with schizophrenia were less accurate in identifying the source and temporal context and were unable to combine contextual cues (source and temporal context) together to form an integrated representation of the event. These impairments of memory binding and monitoring are strongly associated with poor clinical and functional outcome in schizophrenia [19,20].

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Although these studies have clearly advanced our insights into memory binding and monitoring deficits of schizophrenia, they primarily relied on semantic memory laboratory tasks such as wordlists, picture paradigms [3,4,21,22], and simple sentence or action paradigms [23-25]. Performance on these tasks is then used to make inferences about patients' episodic autobiographical memory in the real world. Until now, no attempts have been made to investigate whether or not memory deficits of patients with schizophrenia also occur in more near-life (ie, autobiographical) settings. This is, however, an important issue because evaluation of information given by an advisor and the tendency to integrate this information into one's own memory are central in clinical practice. In a therapeutic context, memory deficits may heavily distort the way patients interpret reality, thereby undermining the efficacy of psychotherapeutic interventions. Furthermore, in forensic settings, memory aberrations of patients with schizophrenia may make them vulnerable to misleading information provided under social pressure (ie, during police interrogations). A potential consequence of memory aberrations in a social context is the tendency to accept misleading and suggestive information [26,27]. There is some evidence to support this relationship, at least within healthy and aging participants [28]. For example, a study conducted by Mitchell et al [27] compared the source attribution performance on a task of younger and older adults in which participants were exposed to misleading information [29]. One of their key findings was that older adults were more likely than younger adults to claim that they saw information that had, in fact, only been suggested to them. The researchers concluded that this was related to older participants' failure to use helpful diagnostic source information to make correct source attribution decisions.

Moreover, interest has mounted on how these memory aberrations relate to schizophrenia symptoms. It has been repeatedly found that source monitoring errors are of relevance to hallucination development within schizophrenia (eg, 30]). Furthermore, parallels have been drawn between the clinical presentation of delusions and confabulations in which source monitoring deficits at retrieval should also play a crucial role [31]. Related to semantic false memories (ie, remembering words that are semantically related but never presented), findings are mixed with most of the studies not finding a relationship between semantic false memory paradigms and schizophrenia symptoms [3,16,32]. However, it remains to be answered whether and how schizophrenia symptoms relate to episodically based false memory paradigms.

A well-validated paradigm to investigate episodic-related false memories is the Gudjonsson Suggestibility Scale (GSS) [33-35]. In this paradigm, participants are read out aloud a story, and next, they are presented with questions containing factual information presented in the story (true memory items; eg, "Did the woman have a husband called Simon?") and misleading questions not presented in the story. From these factual information items, a true memory score can be calculated. In contrast, the number of misleading items accepted by the participant provides a score termed "Yield 1". Negative feedback, intended to create "social pressure," is then administered to the participant. Next, the questions are asked for a second time, and in this way, the "Shift" parameter can be obtained: the number of times that participants change their answers under social pressure. Thus, although the "Yield" parameter gives an indication of participants' susceptibility to post hoc misinformation, the Shift parameter reflects social pressure compliance [33-37].

Using the GSS paradigm, we sought to investigate susceptibility to misleading information under social pressure in schizophrenia. In this study, we wanted to test whether the memory deficits elicited by artificial semantic laboratory tests in patients with schizophrenia could be replicated when the more naturalistic false memory paradigm (ie, GSS) is administered. We hypothesized, first, that patients with schizophrenia are more susceptible to misleading information under social pressure (ie, increased acceptance of post hoc misinformation and switching of answers as an indication of social pressure compliance) compared with healthy controls. Second, we were interested in the relationship between GSS indices and schizophrenia symptoms. Given the mixed findings in the past, no specific hypotheses were formulated.

2. Methods

2.1. Participants

Twenty-one patients (17 men, 4 women) fulfilling *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* [38] criteria for schizophrenia were recruited from Medisch Centrum Sint Jozef, Munsterbilzen, Belgium. Diagnoses were made by a panel of experienced psychiatrists on the basis of extensive diagnostic interviews and Brief Psychiatric Rating Scale (BPRS) [34] indices. Sociodemographic information and clinical data are presented in Table. Exclusion criteria were a history of severe neurologic disorders, substance abuse, or another comorbid axis 1 disorder. All patients were on fixed doses of antipsychotic medication, either typical (79%) or atypical (21%).

Eighteen healthy control participants (16 men, 2 women) were recruited from a pool of volunteers through advertisements in local newspapers. They had a similar age, sex, and education background to the patient group (see Table). Control participants were screened with a semistructured interview to rule out a psychiatric history, neurologic disorders, alcohol dependence, or drug addiction. None of the control participants had a first-degree relative with a history of schizophrenia.

All participants gave informed consent before participation. The study was approved by the standing ethical committee of the Faculty of Psychology and Neuroscience, Maastricht University. All data included in this article were

Table
Demographic, symptomatologic, and GSS scores of schizophrenia and control participants

	Patients with schizophrenia (n = 21)	Control participants (n = 18)	Statistics
Age (y)	35.81 (11.14)	35.83 (9.73)	$t_{37} = 0.99$, NS
Sex (men/women)	17/4	16/2	$\chi^2_1 = 0.47$, NS
Premorbid IQ	103.76 (13.52)	111.33 (10.60)	$t_{37} = 1.92$, NS
Education level[a]	4.90 (1.18)	5.33 (0.97)	$t_{37} = 1.23$, NS
No. of hospitalizations	2.34 (4.39)	–	–
Length of illness (y)	2.54 (6.67)	–	–
BPRS		–	–
Positive syndrome	9.95 (4.49)		
Negative syndrome	5.43 (2.44)		
Disorganization	4.67 (1.81)		
Total	35.19 (11.86)		
GSS Yield 1 score	5.19 (2.79)	3.83 (2.12)	$t_{37} = 1.77$, $P = .08$
GSS Yield 2 score	6.48 (3.76)	4.28 (3.30)	$t_{37} = 1.92$, $P = .06$
GSS Shift score	3.95 (2.96)	2.17 (1.92)	$t_{37} = 2.20$, $P < .05$
GSS Shift true memory	0.95 (0.90)	0.00 (0.00)	$t_{37} = 4.50$, $P < .05$
GSS Shift misleading	3.09 (2.43)	2.00 (1.88)	$t_{37} = 1.56$, $P = .13$
GSS total score	9.14 (4.26)	6.00 (3.16)	$t_{37} = 2.58$, $P < .02$
GSS true memory score	3.81 (1.57)	4.61 (.50)	$t_{37} = 2.08$, $P < .05$

Yield 1: number of misleading suggestions that are accepted (range, 0-15); Yield 2: number of misleading suggestions that are accepted in the second round (after receiving false feedback; range, 0-15); Shift: number of changes that are made on the 20 questions after negative feedback (range, 0-20); GSS total score: Yield 1 + Shift scores (range, 0-35); GSS true memory score: number of presented (old) nonleading questions that were correctly remembered in the first round (ie, before receiving false feedback; range, 0-5).
Standard deviations are given in parentheses. NS, not significant.
[a] According to Verhage (1964; where 1 indicates "lower education"; 7, "university degree"). Verhage F (1964). Intelligentie en leeftijd (Intelligence and age). Van Gorcum, Assen, the Netherlands.

obtained in compliance with ethical regulations of the institute at which the data were collected, in compliance with the Helsinki Declaration.

2.2. Materials and procedure

Patients with schizophrenia were screened with the BPRS [39]. To obtain an indication of premorbid intelligence, both groups were administered the Dutch Adult Reading Test (DART) [40], the Dutch version of National Adult Reading Test (NART) [41].

2.2.1. Brief Psychiatric Rating Scale

To measure the current symptom status of patients with schizophrenia, the 18-item BPRS was used [39]. Each BPRS item is rated from 1 (*not present*) to 7 (*extremely present*). We computed negative, positive, and disorganized thought symptoms following prior algorithms [42]. More specifically, a negative symptoms score was obtained by summing scores from the "emotional withdrawal," "motor retardation," and "blunted affect" items. A positive symptoms score was obtained by summing across the "unusual thought content," "grandiosity," "suspiciousness," and "hallucinatory behaviour" items. The disorganized symptom subscale comprises only 2 symptoms: "conceptual disorganization" and "mannerisms and posturing."

2.2.2. Premorbid intelligence

Premorbid intelligence was measured with the DART [40] by having the participants read 50 words with irregular spelling. To estimate premorbid intelligence, scores are compared against normative data.

2.2.3. Gudjonsson Suggestibility Scale

After initial screening, the participants were given the adapted GSS procedure [43]. More specifically, the participants were told that they would hear a story that was presented to them aloud. Their task was to try to remember the story because after the presentation, some questions would be asked about the story. The Dutch version of the GSS [36] uses a narrative paragraph describing a robbery. Following this, the participant is asked 20 questions about the story, 15 of which are subtly misleading (ie, containing information not presented in the story; eg, "Did the woman's glasses break in the struggle?" "Where the assailants tall or short?") and 5 questions are factual information in the story (true memory items; eg, "Did the woman have a husband called Simon?"). From the 5 factual information items, a true memory score can be calculated. From the 15 misleading questions, a Yield 1 score can be derived, indicating the number of misleading questions that the participant gave into (maximum score, 15). Immediately after having answered the 20 questions, the participant is provided with false feedback (ie, "You have made a number of errors, and it is therefore necessary to go through all of the questions once again and this time try to be as accurate as possible"). All 20 questions are then repeated to determine whether the participant shifts his/her answers (eg, from "no" to "yes"). Shift scores range between 0 and 20. The extent to which the participant

gives in to the misleading questions after receiving the false feedback is scored as Yield 2 (maximum score, 15).

Thus, the GSS provides the following parameters:

1. Yield 1: number of misleading suggestions that are accepted (range, 0-15)
2. Yield 2: number of misleading suggestions that are accepted in the second round (after receiving false feedback; range, 0-15)
3. Shift: number of changes that are made on the 20 questions after negative feedback (range, 0-20)
4. GSS total score: Yield 1 + Shift scores (range, 0-35)
5. GSS true memory score: number of presented (old) nonleading questions that were correctly remembered in the first round (ie, before receiving false feedback; range, 0-5).

After the participants had completed the GSS subtests, they were fully debriefed and thanked for their participation.

2.3. Statistical analyses

For all analyses, α was set at $P < .05$. Independent-samples t tests were performed to determine whether the groups differed on the GSS parameters. Finally, to investigate the effects of specific moderating variables, correlations analyses were performed between premorbid intelligence (DART scores) and the GSS parameters (collapsed across groups; Pearson product-moment correlations) and between BPRS scores and the GSS scores for patients with schizophrenia only (Spearman ρ; $-1 >$ skewness > 1).

3. Results

As can be seen in Table, both groups did not significantly differ with regard to age, sex distribution, educational level, and intelligence. Table also shows BPRS indices, length of illness, and number of prior hospitalizations for the schizophrenia subsample.

3.1. Yield 1, Yield 2, Shift, total GSS, and GSS true memory scores

Gudjonsson Suggestibility Scale data for both groups can be found in Table. Controls and patients with schizophrenia did not significantly differ with regard to Yield 1: $t_{37} = 1.77$, $P = .08$. However, compared with controls, patients with schizophrenia were significantly more likely to shift their answers after having been exposed to false feedback: $t_{37} = 2.20$, $P < .05$, Cohen $d = 0.71$. When further analyzing this effect, it was found that patients with schizophrenia shifted significantly more on the memory items compared with the healthy controls: $t_{37} = 4.50$, $P < .001$, Cohen $d = 1.51$. This difference was largely because the controls did not shift at all on the memory items ($M_{\text{schizophrenia}} = 0.95$; SD = 0.89 compared with $M_{\text{controls}} = 0.00$; SD = 0.00). For the shifts on the misleading items, no significant differences were found ($M_{\text{schizophrenia}} = 3.10$; SD = 2.43 compared with $M_{\text{controls}} = 2.00$; SD = 1.88). The patients also tended to go along more often with the suggestive questions after having received false feedback (Yield 2): $t_{37} = 1.92$, $P = .06$, Cohen $d = 0.62$. Participants with schizophrenia showed significant higher total GSS scores compared with control participants, indicating a large effect size: $t_{37} = 2.58$, $P < .02$, Cohen $d = 0.84$.

For the GSS true memory score, control participants outperformed the patients with schizophrenia: $t_{37} = 2.10$, $P = .04$, Cohen $d = 0.70$. This is in line with previous research [1,6,39] reporting reduced levels of correct recognition in patients with schizophrenia.

Furthermore, to investigate the relation between the GSS true memory and different suggestibility indices (Shift, Yield 1, Yield 2, and total score), correlation analyses were performed split for both groups. It was found that GSS true memory score did not significantly relate to the suggestibility indices for both groups separately (all Spearman ρ's < 0.35, all P's $> .05$). Also, when both groups were collapsed, no significant correlations were found (all Pearson r's < 0.30, all P's $> .05$).

3.2. Sex, schizophrenia symptoms, and intelligence

The effect of sex on the GSS measures was also investigated collapsed across groups. None of these GSS indicators differed significantly between male and female participants: all t's$_{37} < 2.0$, all P's $> .05$.[1]

When correlating DART scores with the GSS parameters, no significant correlations emerged: all r's < 0.20, all P's $> .05$. Thus, GSS scores were not related to premorbid intelligence in both groups. For patients with schizophrenia, BPRS subscales were significantly correlated with only 1 of the GSS parameters. That is, a significant negative correlation emerged between Shift and the BPRS disorganization score (Spearman $\rho = -0.45$, $P < .05$), indicating that an increase in disorganized symptoms is related to less shifting between response options. All other correlations remained nonsignificant.

4. Discussion

So far, studies on memory binding and monitoring deficits in the schizophrenia have mainly relied on semantic memory paradigms. The aim of the current studies was to test whether such findings on memory binding and source memory deficits in schizophrenia [4,32] can be replicated with a more episodic false memory paradigm using suggestive misinformation. We found, indeed, that patients with schizophrenia show increased susceptibility to go along with misleading suggestive questions under social pressure. This effect was not moderated by sex or intelligence. Furthermore, patients with schizophrenia showed a reduced

[1] Given the disparity in distribution of sex, these results have to be interpreted with caution.

level of correct recognition compared with healthy controls. Finally, the disorganization dimension of schizophrenia symptoms was found to be inversely related to tendency to shift answer options under social stress.

When comparing GSS parameters of both groups against the normative GSS data presented in Gudjonsson [34] reveals that only the patients with schizophrenia score above average on the total GSS parameter in comparison with the general population ($M = 9.14$; SD = 4.26) against $M = 7.5$; SD = 4.60). Furthermore, we found that the memory corrupting effect of negative feedback is especially pronounced in patients with schizophrenia. Patients also tended to shift more on the memory items compared with the misleading items. These effects were largely caused by the control participants not shifting on GSS true memory items. Also for shift scores on misleading items, increased scores were found in patients with schizophrenia compared with the controls; however, this difference did not attain significance. The GSS true memory score did not correlate significantly with the suggestibility indices, both when split up for each group and collapsed across groups indicating that Shift, Yield 2, and Total Suggestibility scores are rather independent to memory performance.

One important antecedent of making correct memory attributions is the amount of perceptual detail/contextual information that is encoded [9]. In patients with schizophrenia [4,14,15], inefficient storage or retrieval of these distinctive features leads them to making more memory attribution errors. As was found earlier (eg, [1,4]), it appears that schizophrenia contributes to difficulties in encoding and retrieving correct information, thereby making the memory traces less distinctive, which, together with source monitoring deficits [4,17], may lead to a heightened susceptibility to misleading information. Recent studies have demonstrated that a lack of attention during encoding (ie, divided attention) may play an important role in this cascade. For example, when healthy participants are engaged in a dual task during the encoding of semantic word lists, they subsequently show an increased tendency to make memory misattributions [44]. Deficits in attention function are among the best-documented neurocognitive phenotypes in schizophrenia [45]. More specifically, patients with schizophrenia have marked difficulties with both focussing and controlling their attention [15]. With tasks such as the one used in the current study, this would make it more difficult for them to fully attend to the story and, later on, identify discrepancies between their memory for the GSS narrative and the misleading information embedded in the GSS questions [46,47]. Suboptimal focus of attention may then lead to increased reliance on general similarities in a social context, which may provide optimal conditions for memory binding deficits to arise. Future studies could further disentangle the social and cognitive interactions that underlie suggestibility typical for the schizophrenia spectrum.

In relating schizophrenia symptoms to GSS indices, an inverse relationship was found between the tendency to shift and disorganized thinking as measured by the BPRS. For all other relations with positive and negative symptoms, no significant correlations were found. In explaining formal thought disorders, the current information processing models in schizophrenia state that because of central executive malfunctioning, limited attentional resources, and resource sparing, patients have difficulties selecting between competing responses and difficulties in suppressing inappropriate responses [30]. As a consequence, this often leads to resource-sparing processes. When relating our findings to this model, a hypothesis could be that because of this resource-sparing process, patients with formal thought disorder are more conservative and, thus, less willing to give into negative feedback. Future studies should further clarify this possibility. Furthermore, based on previous findings on the relation between hallucinations and source monitoring errors and delusional thinking and impaired reality testing, one would expect to find possible relations with GSS Yield and Shift indices and positive symptoms. One possible reason for not finding this relationship could be that we used a rather general symptom measure that was possibly not sensitive enough to tap hallucinations and delusional thinking. Furthermore, our sample consisted of chronic mostly stabilized patients. In future studies, it would be preferable to use more fine-grained methods to further disentangle these relationships.

Our findings have clinical and forensic implications. For example during psychotherapy, the autobiographical recollections of patients with schizophrenia are of primary importance. However, our results indicate that it would be wise to evaluate these memories critically. Most certainly, therapists should avoid a suggestive interview style. This is even more pertinent in the forensic context, that is, when forensic psychologists or psychiatrists interview suspects or eyewitnesses with schizophrenia. Because their susceptibility to misleading information is pronounced, it is imperative that these patients are not confronted with suggestive questions. In his analysis of false confession cases, Gudjonsson [37] found that some of the suspects involved in these cases had been diagnosed as having severe mental illnesses, among which schizophrenia. Susceptibility to suggestion is one of the key risk factors for a false confession [37]. The fact that we found patients with schizophrenia to have raised total GSS scores argues for caution when interrogating these patients.

Some limitations of the current studies merit attention. One limitation is that we did not include a psychiatric control group, nor did we obtain depression or other psychopathology measures. Therefore, in principle, it is possible that our effects were carried by other psychopathologic features than schizophrenia. For example, it is known that depressive symptoms also relate to memory problems. Furthermore, an unequal distribution of sex was present. Although male and female participants did not differ on the GSS indices, given the disparity in distribution in this study, results on sex should be interpreted with caution. Future

studies could look at more equal sex distributions within each group. In addition, because we had to rely on a validated version of the GSS paradigm [43], we could not add measures of meta-memory like confidence ratings (thinking about one's memory) [4]. Our findings are thus silent about this metacognitive deficit. Furthermore, one could argue that this paradigm, although of practical relevance, is also a bit artificial given the standardized form. Therefore, future research using more ecologic valid paradigms should include meta-memory indices to investigate whether source memory and information processing deficits typical for the schizophrenia spectrum are made with increased confidence. Also, no independent neuropsychologic measure was available to investigate the possible confounding of these potential variables. More specifically, an independent memory measure was not used. However, in previous studies investigating this issue (eg, [4,48]), no schizophrenia-specific overall neuropsychologic indicators as such were found (but see [49]). In relation to symptoms, future studies could use a more fine-grained method to differ between specific symptom groups within the schizophrenia spectrum. Finally, we did not include a free recall measure of the GSS, which is mostly included in the standard methodology. However, recent research by Smeets et al [43] found that even when not including the standard free recall test, GSS suggestibility parameters are comparable with standard measures.

In conclusion, it appears that patients with schizophrenia are more likely to change their answer under social pressure.

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