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Letter to the Editor

Overconfidence in false autobiographical memories in patients with schizophrenia

To the editor,

Patients with schizophrenia tend to display an increased propensity to have false memories as well as an overconfidence in errors (i.e., a higher confidence associated to false memories) compared to controls (Moritz and Woodward, 2006; Balzan, 2016). Although this mechanism is supposed to account for the emergence and maintenance of delusions and that delusions are usually anchored in daily-life events, very few studies have investigated daily-life memory material especially those events related to delusional content. In a recent study, Berna et al. (2014) conducted a diary study including ten outpatients with schizophrenia and 10 controls matched on age, gender and years of schooling. On each day across a two-month period, the participants were asked to document in a diary four autobiographical events (two events associated with a feeling of malevolence (persecutory events, PE), and two events without content of malevolence (non-persecutory events, NPE)). A recognition test then took place two months after the last diary entry. In that test, each participant was presented with a list of event descriptions, half of them being true (corresponding to the original event) and the other half being altered by the experimenter based on either the gist or the content of the event. The participant was required to determine whether the event was true or altered and then gave their confidence rating in the accuracy of this judgment using a 3-point scale (see Berna et al., 2014 for methodological description). While we observed no significant differences in recognition memory performance between groups, suggesting that patients do not display more false memories (here, autobiographical memories) than controls, we have not examined whether an overconfidence in errors was also observed in these patients (cf. Balzan, 2016).

To address the issue, we present here a re-analysis of the published data in Berna et al. (2014) focusing on the interactional relationship between confidence rating and memory performance. It includes three complementary analyses: a regression analysis on the confidence ratings and a group comparison of two widely used metacognitive indices: a metric based on meta-d' and knowledge corruption index. All analyses were performed under Bayesian hypotheses.

Firstly, the regression analysis on confidence ratings using group (patients vs. controls), accuracy (hits vs. false alarms) and type of events (PE vs. NPE) as predictor variables revealed that while confidence ratings did not differ between groups ($M = 2.71$, SD = 0.57 in controls, $M = 2.71$, SD = 0.60 in patients, $Pr(OR > 1) > 0.16$), there was a significant interaction between group and accuracy ($Pr(OR > 1) > 0.99$) .[1] Simple effect tests showed that confidence in false alarms was higher in patients than controls ($M = 2.56$, SD = 0.71 and $M = 2.47$, SD = 0.68, respectively) whereas confidence in hits did not differ between groups ($M = 2.77$, SD = 0.52 in controls and $M = 2.76$, SD = 0.55 in patients). This interaction term revealed differentially higher confidence in false alarm errors in patients than in controls and posed a conflicting pattern to challenge previous studies showing a lower confidence in hits in patients (Balzan, 2016).

Secondly, we used a metacognitive index known as meta-d′ (Fleming and Lau, 2014; Fleming, 2017) to index the metacognitive efficiency between the groups. If meta-d′ is equal to d′, it means that the metacognitive sensitivity is ideal. Here, we calculated the meta-d′ − d′, a metric for estimating the metacognitive efficiency for group comparison. After removing one control participant with an abnormal pattern of result (performance below 3.59 SD of the control group and below 2.66 SD of the whole group), this analysis revealed that the patients displayed significantly lower metacognitive efficiency compared to the controls ($M = -0.46$, SD = 0.69 and $M = 0.05$, SD = 0.57, respectively; $Pr(OR > 1) = 0.048$). This indicates that given a particular level of memory performance or signal processing capacity, patients with schizophrenia are more impaired in their level of metacognition, or in other words, being less cognitively able to monitor or evaluate their own memory performance than controls.

Thirdly, we compared the knowledge corruption index between groups and type of events. This index corresponds to the percentage of errors held with high confidence over the total number of high-confident responses. In line with the literature (Balzan, 2016), our results demonstrated a higher knowledge corruption index in patients than in controls ($M = 0.21$, SD = 0.07 and $M = 0.14$, SD = 0.07, respectively; $Pr(OR > 1) > 0.98$). No interaction was observed between group and type of events ($Pr(OR > 1) = 0.18$). In line with the meta-metric, these results imply that among high-confident responses, the proportion of false memories was higher in patients than in controls.

All in all, these new analyses considering both confidence rating data and memory performance data provide converging results supporting the existence of impaired meta-cognitive accuracy in patients with schizophrenia. Such impairment is manifested in overconfidence in errors as patients display a higher confidence in false memories, or equivalently, a higher proportion of false memories in high-confident responses (knowledge corruption index). This maladaptive increased confidence in false memories of daily life may represent one mechanism accounting for the emergence or maintenance of persecutory delusions, in particular those associated with a feeling of malevolence (for discussion see Balzan, 2016).

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[1] In Bayesian statistics, effects are considered relevant when the probability for the Odd Ratios (OR) to be above 1 (i.e., $Pr(OR > 1)$) is either below 5% (0.05) or above 95% (0.95).

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