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Recall of false memories in individuals scoring high in schizotypy: Memory distortions are scale specific

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ABSTRACT

Background and objectives: Previous research has indicated abnormal semantic activation in individuals scoring higher in schizotypy. In the current experiment, semantic activation was examined by using the Deese-Roediger–McDermott paradigm of false memories.

Methods: Participants were assessed for schizotypy using the Oxford-Liverpool Inventory of Feelings (OLIFE). Participants studied lists of semantically related words in which a critical and highly associated word was absent. Participants then recalled the list.

Results: Participants high in Unusual Experiences and Cognitive Disorganization recalled more critical non-presented words, weakly related studied words, and fewer studied words than participants who scored low on these measures.

Limitations: Previous research using the cognitive-perceptual factor of the Schizotypy Personality Questionnaire found reduced false memories, while the Unusual Experiences subscale of the OLIFE was associated with more false memories. Both scales cover similar unusual perceptual experiences and it is unclear why they led to divergent results.

Conclusions: The findings suggest that subtypes of schizotypy are associated with abnormal semantic activation.

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Schizotypal personality traits are associated with unusual beliefs and experiences including hallucinations, odd speech, ideas of reference, perceptual abnormalities, eccentric behavior, suspiciousness, and social isolation (American Psychiatric Association, 2000). Some of these traits may reflect the formation of unusual associations among concepts. For example, magical thinking may involve the formation of associations among relatively unrelated incidents. Certainly, previous research has indicated that schizotypal individuals form unusual semantic associations. Individuals scoring high on 'magical thinking' scales generate more unusual responses in free word association tests (Gianotti, Mohr, Pizzagalli, Lehmann, & Brugger, 2001; Miller & Chapman, 1983). Participants who score high on magical ideation also found unrelated words to be more closely associated with one another than participants low on magical ideation (Mohr, Graves, Gianotti, Pizzagalli, & Brugger, 2001). Schizotypal individuals have also been found to generate more atypical responses to the presentation of category names, such as 'fruit' (Kiang & Kutas, 2006).

These findings suggest that there may be abnormalities in semantic processing, and how concepts activate one another, in schizotypal individuals. This assumes a model of semantic memory in which concepts are represented as nodes that are linked to one another via associations (Anderson & Pirolli, 1984; Collins & Loftus, 1975; Neely, 1977). When a node is activated, controlled semantic activation spreads through semantic memory to associated nodes, while unrelated nodes receive little activation. The abnormalities in semantic processing in schizotypy may be due to an increase in activation of weaker associates in semantic memory, leading to atypical and unusual associations in cognition (Mohr et al., 2001; Pizzagalli, Lehmann, & Brugger, 2001).

It has been suggested previously that the above abnormality primarily affects semantic activation that spreads relatively automatically, rather than controlled activation, which is under conscious control (Niznikiewicz et al., 2002). Semantic priming tasks, which have found spread of activation to weaker associates in high schizotypal individuals, are consistent with this hypothesis. For example, participants who believed in the paranormal have been noted to exhibit greater priming to weak associates of a target (Pizzagalli et al., 2001).

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Semantic processing abnormalities in schizotypy may also be due to a decreased use of context, resulting in failures in inhibition to deactivate unrelated concepts. This research has used the N400 complex from event related potentials to measure semantic priming. N400 refers to a negative peak, approximately 400 ms after exposure to a stimulus, and one factor, which affects negativity, is the relatedness of an item (Kutas & Hillyard, 1980). Consistent with the inhibitory deficit hypothesis, schizotypal individuals exhibit a larger N400 to congruent sentence endings (Niznikiewicz et al., 1999, 2004), and to category exemplars following category definition (Kiang & Kutas, 2005), suggesting abnormal contextual activation.

One measure of semantic activation is the Deese-Roediger–McDermott (DRM) paradigm; whereby participants are presented with lists of words that are all semantically related to a critical non-presented word. Participants typically falsely report the non-presented critical word as present upwards of 40% of the time (Roediger & McDermott, 1995), and participants are highly confident that the false critical item was presented in the study lists (Gallo, 2006). False memories for the critical false item are thought to occur because, during study, the critical item is activated via spreading semantic activation in an associative network that increases the item's accessibility (Gallo & Roediger, 2002; McDermott & Watson, 2001; Roediger & McDermott, 1995; Roediger, Watson, McDermott, & Gallo, 2001). Successful reality monitoring is also required to reject the critical false item, and requires the participant to attribute the critical false item to the participant's thoughts, and not to its occurrence in the study list (Johnson, Hashtroudi, & Lindsay, 1993).

The DRM paradigm has been used to examine unusual semantic activation in schizotypal individuals. Laws and Bhatt (2005) examined whether delusional ideation, as measured by the Peters Delusions Inventory (PDI), was associated with higher rates of false memories for the critical item on DRM lists, as measured by a recall and recognition test. High PDI scorers recognized more critical false items than low PDI scorers, and were more confident in their choices despite being wrong. Low PDI scorers also recognized more studied items than high PDI scorers. Similarly, Dehon, Bastin, and Larøi (2008) used the DRM paradigm with high and low scorers on the PDI. After recalling each list after study, participants were asked whether there had been any items that they had thought of, but had not written down on the recall task because they thought the experimenter had not presented them. Scores on the PDI were found to be associated with false recall, with high scorers on the PDI reporting more intrusions of the critical false item than low scorers. No differences were detected for recall of studied items.

The Laws and Bhatt (2005) and Dehon et al. (2008) studies are important as they show that delusional ideation, one of the positive symptoms of schizotypy and schizophrenia, is associated with increases in false memories. One drawback, however, is that delusional ideation is only one of several positive symptoms associated with schizotypy and schizophrenia, and a broad range of symptoms are actually associated with the disorders. To address this drawback, Dagnall and Parker (2009) examined false memories on a recognition task, and measured schizotypy using the Schizotypal Personality Questionnaire version B (SPQ-B). This allowed schizotypy, as a whole, to be measured as well as the subscales of the SPQ-B: cognitive-perceptual, interpersonal, and disorganized. Associations on the study lists were manipulated, so that lists were either highly associated with the false critical item, or there was a low association. No differences were found in recognition of the critical false items or in recognition of studied items between high and low scorers on the SPQ-B. The cognitive-perceptual subscale was found to be associated with increased recognition of the studied items,

and increased recognition of the critical false item, with low scorers recognizing more studied items, but also recognizing more false critical items.

This latter finding is at odds with Laws and Bhatt (2005) and Dehon et al. (2008). This conflicting evidence needs to be examined further in additional work. One method of addressing this issue is to examine the association between false memories and schizotypy using the Oxford-Liverpool Inventory of Feelings version B (OLIFE-B) which is a widely used measure of schizotypy. The OLIFE-B has not previously been used with the DRM paradigm. Factor analysis has supported a four dimension construct to schizotypy (Claridge et al., 1996), and the scale is based on, probably, the largest data set measuring schizotypy (Claridge et al., 1996). The OLIFE-B is composed of four subscales: Unusual Experiences, which refers to positive symptoms such as distorted perceptions and beliefs including hallucinations and delusions. Cognitive Disorganization which refers to attentional difficulties, disorganized thinking and language, and social anxiety, Introvertive Anhedonia which refers to negative symptoms including negative affect, and Impulsive Nonconformity which refers to antisocial and impulsive behavior.

Cognitive Disorganization has been associated with abnormal semantic priming. Johnston, Rossell, and Gleeson (2008) found that male participants scoring high on Cognitive Disorganization exhibited more indirect priming (between indirectly associated word pairs) and less direct priming (between directly related word pairs). Unusual Experiences has also been associated with unusual word associations. High scorers have been found to produce fewer common responses and more unusual idiosyncratic responses (Rawlings & Locarnini, 2008).

The current study applies the OLIFE-B to the DRM paradigm to see whether schizotypy is associated with increased false memories or not. The advantage of the current study is that it examines four factors – Unusual Experiences, Cognitive Disorganization, Introvertive Anhedonia, and Impulsive Nonconformity – associated with schizotypy and whether they increase susceptibility to false memories. The advantage of using the OLIFE-B is that it divides distorted perceptions and beliefs (i.e., Unusual Experiences) from disorganized thinking and language (i.e., Cognitive Disorganization). The current experiment also provides a measure of indirect priming of weakly related words to the studied items and, therefore, provides a measure of indirect semantic activation.

Based on this previous work, it is predicted that Unusual Experiences and Cognitive Disorganization will be associated with reduced recall of studied items and increased recollection of the false critical item. These two subscales will also be associated with increased recall of weakly related items.

1. Method

1.1. Participants

Forty undergraduate students from Swansea University (16 male, 24 female), with a mean age of 21.3 (SD = 3.50) years (range 18–31), were employed. The participants received course credit, and reported no previous history of psychosis or depression during consent.

1.2. Measures

1.2.1. Schizotypy

The 43-item version of the Oxford-Liverpool Inventory of Feelings and Experiences (OLIFE-B; Mason, Linney, & Claridge, 2005) contains four subscales. Hallucination-proneness is measured through the Unusual Experiences (UE) subscale. The OLIFE-B also

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