

Formal thought disorder is characterised by impaired lexical access

Verity C. Leeson^{a,*}, Keith R. Laws^b, Peter J. McKenna^c

^a *Division of Neuroscience and Psychological Medicine, Imperial College London, UK*

^b *School of Psychology, University of Hertfordshire, UK*

^c *Fulbourn Hospital, Addenbrooke's NHS Trust, Cambridge, UK*

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Abstract

Recent studies have proposed that difficulty with accessing the lexical–semantic memory store may underpin some of the specific linguistic problems associated with formal thought disorder (FTD). We examined the consistency of name retrieval as an indicator of the ability to access lexical–semantic knowledge in patients with and without marked FTD to see if problems are specific to the former or common to schizophrenic patients in general. A graded naming test was administered on two separate occasions 8–16 weeks apart to 48 participants in three groups: 16 schizophrenic patients with high ratings of FTD, 16 schizophrenic patients with low ratings of FTD and 16 healthy controls. We compared the groups for naming consistency across time and the relationship between naming consistency and specific symptoms of FTD. Both patient groups had impaired naming and this was significantly greater in high than low FTD patients. The high FTD patients showed a profile that differed from both low FTD patients and healthy controls insofar as their naming was inconsistent across time, characteristic of an access disorder. Specifically, the FTD symptoms of derailment, tangentiality and incoherence were related to the ability to access the lexical–semantic store. In conclusion, most patients with schizophrenia show an impaired semantic memory store. Nevertheless, FTD is associated with additional lexical–semantic difficulties that are quantitatively different to those seen in patients without FTD, and which may reflect disorganized semantic access.

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1. Introduction

Semantic memory refers to the long-term store of knowledge, word meaning, concepts and the relationships between them, abstracted from personal time and place connotations (i.e. episodic memory). Intact semantic processing requires both that information is *stored* in

memory and that those memories can be *accessed*. A large number of studies have now reported deficits in the semantic memory functioning of schizophrenic patients across a wide range of tests (e.g. Tamlyn et al., 1992; Clare et al., 1993; Chen et al., 1994; McKay et al., 1996; Spitzer, 1997; Goldberg et al., 1998; Laws et al., 2000; Gabrovska et al., 2003; Leeson et al., 2005a,b,c). Nevertheless, important issues regarding the nature of this deficit remain unresolved; and this includes whether semantic memory difficulties reported in schizophrenia represent an actual *loss* of information or impaired ability to *access* intact information.

* Corresponding author. Imperial College Faculty of Medicine, Room 9L16, Charing Cross Hospital, St Dunstan's Road, W6 8RP, London, UK.

E-mail address: v.leeson@imperial.ac.uk (V.C. Leeson).

Based on the notion that knowledge retrieval reflects the spread of activation through the semantic memory network (Collins and Quillian, 1969), criteria have been proposed in neurological literature for distinguishing between memory disorders that reflect either a *loss* of the underlying representations themselves or difficulty with *accessing* intact representations (Warrington and Shallice, 1979); and has subsequently been applied to neuropsychiatric disorders (e.g. Laws et al., 1998). In storage disorders, knowledge is assumed to be lost, whereas access disorders describe when knowledge is temporarily inaccessible. One such criterion relates to consistency: the notion is that if representations are ‘lost’, then they should lead to consistent responding i.e. a lost representation will be permanently lost; however, a difficulty with accessing intact representations should produce inconsistency (with items being accessible at some times and not others). This approach is well-established in the neurological literature to determine whether memory disorders reflect a storage or access problem.

Recently, these criteria have been applied to studies of semantic memory in schizophrenia; however, they have produced apparently conflicting outcomes. Earlier studies, using a variety of paradigms, suggested that the deficit was one of access to intact semantic representations, rather than degraded representations (Vinogradov et al., 1992; Allen et al., 1993; Spitzer et al., 1993; Joyce et al., 1996). Some recent studies have supported this notion (Al-Uzri et al., 2004) but others have reported access *and* store deficits in different patients depending upon their overall degree of cognitive deficit (Laws et al., 1998) or largely store type deficits (Kondel et al., 2006; Laws et al., 2000).

One possibility, of course, is that the heterogeneous findings may partly relate to the heterogeneous symptom profiles of the patients examined. Indeed, some evidence indicates that formal thought disorder (FTD), which is characterised by disturbance in the structure and coherence of speech, may be linked with semantic impairment. Kerns and Berenbaum (2002) meta-analysed those studies examining cognitive functioning in patients with FTD by dividing them into four posited cognitive impairments. Of these, they found that two such impairments, executive dysfunction and impaired processing of semantic information, showed a substantial effect size (see this paper for a review of previous research examining executive function and FTD).

Moreover, the findings from several studies suggest an association between formal thought disorder and impaired *access* to semantics. (e.g. Mortimer et al., 1995; Spitzer, 1997; Goldberg et al., 1998; Laws et al., 1999; Leeson et al., 2005a,b).

For example, Goldberg et al. (1998) found that the magnitude of the difference between semantic fluency and phonological fluency was significantly correlated with a global rating of FTD, reporting that patients with FTD have poor item retrieval and that this impacts specifically on the semantic system. They concluded that “patients with more severe thought disorder may have difficulty accessing semantic items because of disorganisation of the semantic systems...”. In a neuropsychological case study, Laws et al. (1999) documented impaired semantic memory functioning in a severely thought disordered schizophrenic patient (TC) using a battery of neuropsychological tests. Furthermore, TC’s naming ability was unaffected by item familiarity and his performance varied across time and modality — all of which are indicative of a disorder affecting semantic access. A recent retest following remittance of his FTD revealed that, as predicted by an access problem, TC’s test performance was improved significantly (Leeson et al., 2005a).

Response consistency has been examined in several studies of schizophrenic patients revealing evidence of both access (Al-Uzri et al., 2004; Allen et al., 1993; Elvegag and Storms, 2003; Laws et al., 1998) and storage disorders (Laws et al., 1998, 2000; Chen et al., 2000; Kondel et al., 2006; Rossell and David, 2006). As noted above, a recent case study of the access–store issue in a highly thought disordered patient (TC) has shown that the patient had an access problem (Laws et al., 1999; Leeson et al., 2005a). Aside from this, no previous study has examined the relationship between consistency and any schizophrenic symptoms. In keeping with this model, we hypothesise that if FTD is associated with impaired semantic access then, in contrast with patients with low FTD, high FTD schizophrenic patients should show less consistency of naming; and we would predict an association between thought disorder symptoms and access difficulties, but not storage difficulties.

2. Materials and method

2.1. Participants

Thirty-two patients with schizophrenia, aged between 22 and 64, were recruited from Addenbrooke’s NHS Trust, Cambridge, United Kingdom. All patients were in the care of one of the authors (PJM) and all met Research Diagnostic Criteria for schizophrenia (Spitzer et al., 1978). The patients comprised two groups: a) 16 patients with high ratings of global thought disorder (high FTD: defined as scoring 3+ for global thought disorder on the Comprehensive Assessment of Symptoms and History [CASH]; Andreasen et al., 1992); and b) 16 with low

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