

Cognitive correlates of schizophrenia signs and symptoms: I. verbal communication disturbances

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Abstract

We examined the relations between verbal communication disturbances and several hypothesized etiological factors in 47 schizophrenia spectrum individuals. Both alogia and disturbed discourse coherence were associated with poor planning abilities. Alogia and discourse coherence were differentially associated with performance on tasks measuring fluency, working memory, word finding abilities, and concentration/attention.

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1. Introduction

The signs and symptoms that comprise schizophrenia are remarkably diverse, ranging from pleasure deficits to hallucinations. Thus, it should probably not be surprising that schizophrenia has been posited to be associated with disturbances in a wide variety of brain regions and cognitive processes. For example, schizophrenia has been linked with disturbances in the left hemisphere (e.g., [Flor-Henry, 1976](#)), the right hemisphere (e.g., [Cutting, 1990](#)), the frontal lobes (e.g., [Goldberg et al., 1987](#)), attention (e.g., [McGhie and Chapman, 1961](#)), and memory (e.g.,

[Saykin et al., 1991](#)). The assumption upon which the present research is based is that although many cognitive disturbances may be associated with schizophrenia, and few if any cognitive disturbances may be specific to schizophrenia, the different signs and symptoms of schizophrenia are differentially associated with different cognitive disturbances. In other words, the heterogeneity of schizophrenia signs and symptoms might be explained by heterogeneity in cognitive disturbances.

Disturbances in verbal communication have long been considered a central feature of schizophrenia (e.g., [Bleuler, 1911/1950](#); [Kraepelin, 1919/1971](#)). Verbal communication disturbances in schizophrenia are often divided into two types: (a) diminished verbal productivity, sometimes called alogia, which is associated with diminished syntactic complexity (e.g., [Barch and Berenbaum, 1997](#)); and (b) disturbances in the comprehensibility or coherence of speech (e.g., [Berenbaum and Barch, 1995](#)), sometimes called formal thought disorder (FTD).

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A variety of different mechanisms have been proposed to explain the reduced quantity of speech in schizophrenia. Most of these proposed mechanisms involve executive processes that are associated with frontal lobe functioning. One possible explanation for poverty of speech that has been proposed is that it is due to a deficit in working memory (e.g., Barch and Berenbaum, 1994). A deficit in working memory might be expected to contribute to poverty of speech because in order to generate speech an individual may need to hold online several pieces of information, such as the topic of conversation and what they have already said. A second possibility, consistent with the results of Stolar et al. (1994), is that poverty of speech is due to a general fluency disturbance that is not limited to verbal communication. A third possibility is suggested by what is known about dynamic aphasia (sometimes referred to as transcortical motor aphasia; see Costello and Warrington (1989) for a discussion of the terminological variations). Dynamic aphasia, which arises from left hemisphere frontal lesions, is characterized by a severe reduction in speech production in the absence of any problems with language comprehension, reading, or naming. Costello and Warrington (1989) provided evidence suggesting that dynamic aphasia is caused by a disturbance in planning ability. Past research and theorizing on dynamic aphasia, along with the results of past research indicating that individuals with schizophrenia have a tendency to exhibit deficits in planning abilities, as measured using the Tower of London task (e.g., Morris et al., 1995; Kravariti et al., 2003), led us to hypothesize that reduced verbosity in schizophrenia is also influenced by a deficit in planning abilities. Another widely acknowledged hypothesis is that poverty of speech in schizophrenia is due to word finding difficulties (e.g., Alpert et al., 1994). Thus, one of the central goals of the present study was to examine which, if any, of these four cognitive processes (i.e., working memory, fluency, planning, and word finding) are associated with reduced quantity of speech in schizophrenia.

FTD, which encompasses at least two distinct types of speech production problems (disturbances in discourse coherence, such as derailments, and disturbances in fluency, such as neologisms; Berenbaum and Barch, 1995), has generally been presumed by most researchers to be due to one or more cognitive deficits (e.g., McGrath, 1991; Kerns and Berenbaum, 2002). In a meta-analytic review of the literature examining the relation between FTD and cognitive deficits, Kerns and Berenbaum (2002) provided strong evidence for impaired executive functioning playing a role in FTD. Thus, a

second central goal of the present study was to examine which, if any, of three different cognitive processes associated with executive functioning (i.e., planning, working memory, and fluency) is associated with FTD. Planning abilities might be expected to be associated with FTD because the ability to generate a discourse plan is generally presumed by psycholinguists to be necessary for coherent language output (Levelt, 1989). Mixed support for this hypothesis was obtained by Barch and Berenbaum (1996), who found that performance on a discourse planning task (designed specifically for their study) was significantly associated with incompetent references ($r=0.49$), was associated in the expected direction, albeit not significantly ($r=0.13$), with the number of derailments and non-sequitur responses, and was not associated with neologisms/word-approximations or with tangential responses ($r=0.01$ and $r=0.01$). From a theoretical standpoint, one would expect difficulty holding information on line to be associated with difficulty generating coherent speech, since in order to produce coherent speech one must be able to hold on line the discourse plan one has generated. Consistent with such theorizing, past research has found that FTD is associated with deficits in working memory (Docherty et al., 1996a,b; Barch and Berenbaum, 1997; Melinder and Barch, 2003). Since fluency is also considered an executive function, and executive functions are associated with FTD, one might therefore expect fluency to be associated with FTD. However, neither Barch et al. (1992) nor Docherty et al. (1996a,b) found evidence of performance on fluency tasks being associated with FTD among schizophrenia patients.

It has often been hypothesized that FTD is associated with cognitive processes that are specific to language production, though the evidence is at best mixed (Kerns and Berenbaum, 2002). If this is the case, one might expect FTD to be associated with word finding difficulties. In addition to examining executive processes and word finding abilities, we also examined attention/concentration (in the form of immediate auditory memory) and episodic memory. One reason to include measures of immediate auditory memory and episodic memory was to explore whether working memory specifically was associated with FTD or whether FTD was associated with all memory functions. A second reason to examine attention/concentration (immediate auditory memory) is that several previous studies have found associations between FTD and performance on non-distraction digit span tasks (e.g., Berenbaum and Barch, 1995; Docherty and Gordinier, 1999).

To summarize, the present study examined whether poverty of speech and FTD are associated with a variety

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