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Spatial, object, and affective working memory in social anhedonia: an exploratory study

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Abstract

The domain-specificity of working memory was examined in psychosis-prone individuals with elevated social anhedonia scores. A group of individuals with deviant scores on the revised Social Anhedonia Scale ($n=43$) were compared with a normal control group ($n=39$) on delayed match-to-sample tasks involving spatial, identity, and affective information. The social anhedonia group performed less well on the spatial and emotion delayed match-to-sample tasks relative to the normally hedonic group. The two groups did not differ in terms of their performance on the identity delayed match-to-sample task. Although the social anhedonia group reported less positive affect, greater negative affect, and more alexithymic tendencies relative to the control group, there were no significant associations between these personality traits and working memory performance. In summary, the findings suggest that poorer working memory performance is not domain-specific in socially anhedonic individuals. The authors conclude that the socially anhedonic group's relatively poor performance on the emotion delayed match-to-sample task reflects difficulty and/or inefficiency in handling cognitively taxing tasks.

Keywords: Working memory; Social anhedonia; Emotion; Alexithymia

1. Introduction

Working memory refers to a system used for the temporary storage and manipulation of information. This system involves several different processes, including active maintenance, updating, and comparative functions (Baddeley, 1986). In spatial working memory tasks, participants are required to hold information about the location of a target in mind over a delay period. Since the seminal study by Park and Holzman (1992), there have been many independent replications of spatial working memory impairments in schizophrenia patients (c.f. Carter et al., 1996; Keefe et al., 1997, Fleming et al., 1997; Spindler et al., 1997; Gooding and Tallent, 2001). There have been reports of spatial working memory deficits in schizotypal personality disordered patients (Roitman et al., 2000), schizoaffective disordered patients (Gooding and Tallent, 2002), and first-degree relatives of schizophrenia patients (Park et al., 1995; Keri et al., 2001). In contrast, spatial working memory task performance appears to be relatively intact in patients with bipolar disorder (Park and Holzman, 1992; Gooding and Tallent, 2001) and in their first-degree relatives (Keri et al., 2001). Thus, spatial working memory impairments appear to be specific to individ-

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uals at heightened risk for schizophrenia and schizophrenia-spectrum disorders.

In his model of working memory, Baddeley (1986) distinguished spatial working memory from verbal working memory. A central executive, namely, an attentional control system, operates in conjunction with two subsystems in order to maintain and manipulate visual and spatial information (via a visuospatial sketchpad) on one hand, and auditory and speech-based information (via the phonological loop) on the other (Baddeley, 1986, 1998). Neuroimaging data (c.f. Rama et al., 2001) supports the notion that there is a functional dissociation within the neural system so that the maintenance of verbal and spatial visual information is handled separately.

Single-cell recording studies in nonhuman primates (c.f. Wilson et al., 1993; Goldman-Rakic, 1999), as well as human neuroimaging studies (c.f. Belger et al., 1998; Haxby et al., 1994), have demonstrated that in addition to spatial and verbal working memory, there appears to be a form of object working memory. That is, findings suggest that nonspatial features of a stimulus are processed separately from its spatial attributes. Object working memory tasks assess short-term storage of object information, such as identity or color. Relative to studies of spatial working memory, there have been fewer investigations of nonspatial working memory in schizophrenia patients.

To date, findings with schizophrenia patients have been mixed for the other types of working memory. Although Park and Holzman (1992) found that schizophrenia patients did not display verbal working memory deficits, subsequent studies (Gold et al., 1997; Wexler et al., 1998; Conklin et al., 2000; Huguelet et al., 2000) have demonstrated that with more cognitively demanding tasks, schizophrenia patients show deficits on auditory verbal tasks. Spindler et al. (1997) observed deficits in object working memory as well as spatial working memory among schizophrenia patients, though Tek et al. (2002) did not observe deficits in the former domain.

Observations of working memory impairments in unmedicated as well as medicated schizophrenia patients and in their first-degree relatives suggests that working memory deficits may be an endophenotypic marker for the schizophrenia diathesis. Although working memory impairments may be part of the core deficit underlying schizophrenia, the extent to which the working memory deficit may be domain-specific is unclear. If working memory is an indicator of an underlying genetic diathesis for schizophrenia, then it has the potential to be a premorbid indicator of illness. However, the study of schizophrenia patients is limited in terms of its ability to inform us about the development of the disorder and premorbid indicators of heightened risk for the disorder.

One strategy for studying the viability of premorbid indicators of underlying risk is to assess individuals determined to be at heightened risk on the basis of their genetic relationship to a clinically affected person or on the basis of psychometrically defined or clinically defined characteristics (Gooding and Iacono, 1995). Analysis of the Chapmans' longitudinal study of psychosis-prone individuals (Kwapil, 1998) revealed that individuals with abnormally high scores on the revised Social Anhedonia Scale are at heightened risk for the later development of schizophrenia-spectrum disorders. This finding instigated a growing number of investigations of socially anhedonic individuals. To date, there has been only one study of working memory performance in socially anhedonic persons. In a study using a visuospatial working memory task, we (Tallent and Gooding, 1999) observed that individuals with social anhedonia performed less well than comparison subjects. The goal of the present study was to determine whether socially anhedonic individuals would also display subtle impairments in the storage and maintenance of nonspatial visual information. Thus, in addition to a spatial working memory task, we included an object working memory task in the present study.

Social anhedonia, by definition, involves a deficit in affective experience. Previous neurocognitive studies (Luh and Gooding, 1999; Kerns and Berenbaum, 2000) suggest that individuals reporting social anhedonia process affective information differently. These findings, along with a report of normative emotion-modulated startle response in socially anhedonic individuals (Gooding et al., in press), are consistent with the notion that the observed affective abnormalities reflect cortical involvement. Thus, we were interested in investigating whether socially anhedonic individuals would differ from normally hedonic individuals in terms of their ability to store, maintain, and manipulate affective information.