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Attentional disengagement from emotional stimuli in schizophrenia

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ABSTRACT

Previous research indicates that abnormal attention–emotion interactions are related to symptom presentation in individuals with schizophrenia. However, the individual components of attention responsible for this dysfunction are unclear. In the current study we examined the possibility that schizophrenia patients with higher levels of negative symptoms (HI-NEG: n = 14) have greater difficulty disengaging attention from unpleasant stimuli than patients with low negative symptoms (LOW-NEG: n = 18) or controls (CN: n = 27). Participants completed an exogenous emotional cueing task that required them to focus on an initial emotional or neutral cue and subsequently shift attention to a separate location outside of foveal vision to detect a target stimulus (letter). Results indicated that HI-NEG patients had greater difficulty disengaging attention from unpleasant stimuli than CN or LOW-NEG patients; however, behavioral performance did not differ among the groups for pleasant stimuli. Higher self-reported trait negative affect was also associated with greater difficulty disengaging attention from unpleasant stimuli. Abnormalities in disengaging attention from unpleasant stimuli may thus play a critical role in the formation and maintenance of both negative symptoms and trait negative affect in individuals with schizophrenia.

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1. Introduction

In recent years, there has been increased interest in studying affective disturbance in individuals with schizophrenia. This is due in part to what appears to be a consistent set of discrepancies among various methods of emotional self-report that have brought into question what anhedonia actually reflects in these patients. Specifically, previous findings indicate that patients report diminished levels of pleasure relative to controls when queried on clinical rating scales or self-report questionnaires, yet report experiencing similar levels of pleasure to controls when exposed to pleasant stimuli in laboratory paradigms (see Horan et al., 2006a, 2006b; Kring and Moran, 2008; Cohen and Minor, 2010). Although patients do not appear to have reduced hedonic capacity when providing "online" (i.e., in the moment) self-report in response to stimuli, they do report experiencing greater negative affect than controls when exposed to unpleasant, neutral, and pleasant stimuli (Cohen and Minor, 2010). When coupled with the observation that patients have increases in trait negative mood (Horan et al., 2008), this consistent pattern of findings has led some researchers to suggest that abnormalities in emotional experience, and perhaps anhedonia itself, may reflect chronic elevations in negative mood that occur due to a problem in emotion regulation (Horan et al., 2006a, 2006b; Cohen and Minor, 2010; Cohen et al., 2011; Strauss and Herbener, 2011).

Studies examining the potential causes of anhedonia and these elevations in negative affect have been limited. Here, we offer the novel possibility that difficulty disengaging attention from salient unpleasant features of the environment makes it difficult for individuals with schizophrenia to attenuate negative emotional states, resulting in chronic elevations in negative mood and anhedonia. We found some evidence for this possibility in our previous study using the Emotional Stroop task, which indicated that patients with deficit schizophrenia (i.e., primary and enduring negative symptoms) had longer RTs for neutral words than they did for unpleasant words immediately preceding them, ostensibly signifying that negative symptom patients have difficulty disengaging attention once it had been engaged by a salient unpleasant stimulus (Strauss et al., 2008)[1]. However, the precise attentional mechanisms

[1] In this Emotional Stroop task, 3 blocks of pleasant, unpleasant, and neutral words were presented and subjects were asked to identify the color of ink in which the word was presented while ignoring the meaning of the written word. Each block included a total of 25 words, which were further organized into 5 series of 5 words each. Within each series of 5 words, a target word, either a pleasant, unpleasant, or neutral word, was presented in the first position, and was subsequently followed by 4 neutral words (positions 2, 3, 4, 5) that were matched to the target word for frequency and length. To index the effect of emotional stimuli on neutral stimuli following them, a difference score was calculated as neutral word position 2 RT–emotional word position 1 RT. Using this calculation, positive difference scores indicate that when an emotional word initially captures attention, its effect on the attentional system remains past its initial presentation, causing the string of neutral words immediately following it to have a longer RT than the initial emotional word itself.

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operating in that variant of the Emotional Stroop are unclear since the task did not require a shift in visual attention to a different spatial location.

In the current study, we used an exogenous emotional cueing task developed by Fox et al. (2001) (experiment 5) to further examine this emotion–attention interaction and more directly test the possibility that high negative symptom patients display difficulty *disengaging* visual–spatial attention from unpleasant stimuli. In this task, an emotional cue (word) presented in the center of the screen is immediately followed by a target letter (S or K) that is presented in one of 4 locations (above, below, left, or right). On each trial, participants are asked to attend to a cue (word) and indicate which target (letter) was presented. Unlike the Emotional Stroop, this task directly assesses disengagement by requiring a shift in spatial attention to multiple locations within the visual field. If participants display difficulty disengaging attention from a given emotional stimulus, they should display longer RTs while identifying targets (letters) immediately following an emotional cue than targets immediately following a neutral cue. In line with our previous study (Strauss et al., 2008), we hypothesized that patients with more severe negative symptoms would display greater difficulty disengaging attention from unpleasant stimuli than patients with low negative symptoms or controls. No differences were expected among the groups in relation to pleasant stimuli. We also predicted that increased trait negative mood on the Positive and Negative Affect Scale (PANAS-X: Watson and Clark, 1992) and clinical Anhedonia rated on the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1983) (but not alogia or restricted affect), would be associated with difficulty disengaging attention from unpleasant stimuli, in line with our theory that these dysfunctional emotion–attention interactions predict chronic elevations in negative emotion and anhedonia.

2. Methods and materials

2.1. Participants

The current study included 32 participants meeting DSM-IV-TR criteria for schizophrenia or schizoaffective disorder, as determined by the Structured Clinical Interview for DSM-IV (SCID; First et al., 2001), and 27 healthy control participants (CN). Patients were recruited from the outpatient clinics at the Maryland Psychiatric Research Center (MPRC) and were studied during a period of clinical stability. Schizophrenia patients were divided into high (HI-NEG: n = 14) and low (LOW-NEG: n = 18) negative symptom groups based upon a median split on the Scale for Negative Assessment of Negative Symptoms (SANS; Andreasen, 1983; Buchanan et al., 2007) total score of all patients included in our outpatient clinics at the Maryland Psychiatric Research Center (MPRC) (Median score used = 34; n = 1374 ratings). The 22-item version of the SANS used in the current study was developed in the CONSIST clinical trial (Cognitive and Negative Symptoms in Schizophrenia Trial) (Buchanan et al., 2007). For the HI-NEG group the mean SANS item score was in the mild to moderate range (M = 2.12; range = 1.6 to 3.3), and scores in the LOW-NEG are in the normal to absent range ($M = 0.88$; range = 0.1 to 1.5).

Control subjects were recruited from random digit dialing and word of mouth among individuals recruited through random digit dialing. CN were administered a screening interview and denied a lifetime or family history of psychosis and any current Axis I or II disorders according to the SCID and SIDP-IV (Pfohl et al., 1997), respectively. The three participant groups did not significantly differ in age, gender, or ethnicity. Patients had fewer years of total education than controls (Table 1). The HI-NEG and LOW-NEG patients significantly differed on the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham, 1962) positive symptom factor and the disorganization symptom factor score. The two patient groups did not significantly differ on the BPRS total score (p = 0.07).

2.2. Measures

2.3.1. Symptom ratings and trait emotional self-report

The Brief Psychiatric Rating Scale (BPRS; Overall and Gorham, 1962) and Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1983) were administered to assess global psychiatric and negative symptoms, respectively. The Positive and Negative Affect Schedule-Version X (PANAS-X: Watson and Clark, 1992) was used to assess trait positive and negative emotional experience.

2.3.2. Exogenous emotional cueing task

Participants completed a modified exogenous emotional cueing task based on the paradigm developed by Fox et al. (2001) (Experiment 5). To orient participants to the nature of the task, the experimenter

Table 1
Characterizing data for individuals with schizophrenia and controls.

	LOW-NEG (n = 18)	HI-NEG (n = 14)	CN (n = 27)	Test statistic	p
Age	44.28 (9.04)	43.86 (8.68)	42.26 (9.56)	F = 0.30	p = 0.74
Education	13.11 (2.27)	12.50 (2.47)	15.11 (2.01)	F = 8.05	p = 0.001
% Male	61.1%	66.7%	64.3%	$\chi^2 = 1.54$	p = 0.82
Race					
Caucasian	55.6%	60.0%	64.3%		
African–American	33.3%	26.7%	32.1%		
Asian	5.6%	0.0%	0.0%		
American Indian or Alaskan Native	0.0%	6.7%	3.6%		
Other	5.6%	0.0%	0.0%		
Antipsychotic Medications				$\chi^2 = 2.18$	p = 0.34
% Conventional	23.5%	6.7%			
% Atypical	64.7%	86.7%			
SANS Total	21.61 (9.36)	46.60 (11.04)		F = 49.59	p < 0.001
BPRS Symptoms					
Positive	1.97 (0.66)	2.68 (0.96)		F = 6.11	p = 0.02
Disorganized	1.22 (0.24)	1.67 (0.38)		F = 16.79	p < 0.001
Total	31.94 (8.11)	37.79 (9.20)		F = 3.43	p = 0.07
PANAS					
Positive affect	31.0 (5.2)	28.0 (7.4)	33.0 (5.9)	F = 2.16	p = 0.12
Negative affect	18.5 (7.7)	22.3 (8.1)	15.1 (6.3)	F = 3.98	p = 0.02

Note. HI-NEG and LOW-NEG patients were prescribed a similar regimen of antipsychotic medications. The most frequently used medication was clozapine, used alone ($n = 9$), in conjunction with risperidone ($n = 3$), or in conjunction with quetiapine ($n = 1$). Risperidone used alone ($n = 3$) or in conjunction with clozapine ($n = 3$) or olanzapine ($n = 2$) was the second most frequently used antipsychotic. Patients were also prescribed olanzapine ($n = 5$), fluphenazine ($n = 2$), loxapine ($n = 1$), thiothixine ($n = 1$), quetiapine ($n = 1$), haloperidol ($n = 2$), and ziprasidone ($n = 2$) alone. One patient was prescribed a combination of haloperidol and ziprazidone.

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