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Emotional Experience Predicts Social Adjustment Independent of Neurocognition and Social Cognition in Schizophrenia

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Abstract

Background—Emotion abnormalities are prominent features of schizophrenia. While the capacity for emotions is essential to social adaptation, little is known about the role of emotional experience in the social dysfunction observed in schizophrenia.

Objective—This study examined the contribution of emotional experience, neurocognition, and social cognition to functional outcome in schizophrenia.

Method—Self-reported emotional experience (anhedonia, affect intensity, emotion frequency) was assessed in 33 stable schizophrenic/schizoaffective patients and 33 healthy controls. Symptoms, neurocognition, social cognition, and functional outcome were also assessed.

Results—Patients and controls exhibited good internal reliability on all self-report scales, except for negative affect intensity. Patients reported equally intense but less frequent positive emotions, more intense and frequent negative emotions, and more anhedonia. Results of hierarchical regression analyses showed that emotional experience accounted for significant amounts of variance of social adjustment independent of neurocognition and social cognition.

Conclusion—These data show that emotional experience can be reliably assessed and is an important determinant of functional outcome in schizophrenia.

Keywords

schizophrenia; cognition; social cognition; emotional experience; functional outcome

1. Introduction

Emotional abnormalities are prominent features of schizophrenia. Kraepelin and Bleuler noted pervasive disturbances in emotional characteristics, such as flat affect and loss of pleasure, signs which now serve as important diagnostic criteria of schizophrenia (American Psychiatric Association, 1994; World Health Organization, 1992). Convergent with the clinical

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observation of blunted affect in schizophrenia patients, experiments have shown that individuals with schizophrenia display fewer facial and vocal expressions in response to emotion-eliciting stimuli (e.g., videotapes, food, beverages, social role plays) compared with healthy controls (see for review Kring and Moran, 2008).

Diminished emotion expression, however, does not necessarily mean a lesser capacity to experience emotions. Schizophrenia patients are well known to exhibit significant clinical syndromes reflecting negative emotions, such as anxiety and depression (Siris et al., 2001). In emotion-elicitation experiments, schizophrenia patients often report as much and as intense subjective emotions as normal controls (Aghevli et al., 2003; Berenbaum and Oltmanns, 1992; Kring et al., 1993; Kring and Neale, 1996), although some groups have found reduced responses to positive stimuli (Henry et al., 2007; Paradiso et al., 2003; Quirk et al., 1998). Outside the laboratory, experience-sampling studies have shown that patients experience more intense negative emotions but less intense positive emotions in daily life than controls (Myin-Germeys et al., 2000). These research findings suggest a preserved or enhanced ability to experience negative emotions in schizophrenia, but the capacity to experience positive emotions, particularly pleasurable feelings, remains unclear.

There are numerous reports of reduced hedonic capacity in patients with schizophrenia (Berenbaum and Oltmanns, 1992; Blanchard et al., 1998; Blanchard et al., 2001). These results were often obtained using conventional measuring scales of anhedonia that require substantial projection and anticipation of pleasurable experience from activities that may rarely occur in many individuals with schizophrenia (e.g., “Trying new foods is something I have always enjoyed,” “It’s fun to sing with other people”). Therefore, answers to conventional anhedonia questions may reflect reduced encounters of pleasurable experience rather than diminished capacity to experience pleasure. To reconcile the conflicting findings on hedonic capacity in schizophrenia obtained using conventional anhedonia scales and laboratory approaches, Gard et al. (2007) hypothesized and showed evidence for an impairment in anticipating pleasure but intact ability to experience consumatory (“in-the-moment”) pleasure in a sample of patients with schizophrenia.

Emotional disturbances in schizophrenia also include compromised abilities to perceive emotions accurately (Addington and Addington, 1998; Habel et al., 2006; Hooker and Park, 2002; Kohler et al., 2000; Kohler et al., 2003; Kucharska-Pietura et al., 2005; Sachs et al., 2004; Schneider et al., 2006). As emotions frequently occur in the context of social intercourse, interpreted emotional signals form an important part of social cognition. The capacity for inferring internal emotional states from facial expressions is also impaired in schizophrenia (see for review Brune, 2005). Since perceiving others’ emotions and intentions is a critical step in managing one’s social environment, deficits in these capacities can lead to problems in social adjustment. Indeed, a number of studies have shown that difficulties in emotion perception predict poor functional outcome in schizophrenia (Brekke et al., 2007; Kee et al., 2003; Mueser et al., 1996; Penn et al., 1996; Poole et al., 2000). Furthermore, emerging data suggest that the robust relationship between neurocognitive impairment and social dysfunction found in the schizophrenia literature (see Green et al., 2000; Green et al., 2004) may, in fact, be mediated by social cognition (Addington et al., 2006; Brekke et al., 2005; Sergi et al., 2006; Sergi et al., 2007; Vauth et al., 2004).

Is social functioning also a function of internal emotional experience in schizophrenia? We can imagine that if a person is unable to feel happiness or sadness, his inability to use emotions in social contexts may interfere with social relationships. On the one hand, experimentally-elicited, “in the moment” assays of emotion do not correlate significantly with functional outcome across several domains (Herbener et al., 2008). On the other hand, data suggest that increased trait negative affect (Horan and Blanchard, 2003), increased anhedonia (Blanchard

et al., 1998; Herbener et al., 2005), and diminished subjective affect (Cohen et al., 2005) are related to poorer functioning in schizophrenia. In addition, anxiety and depression—negative emotions often embedded in the concept of clinical syndromes—are associated with poorer clinical and social outcome in schizophrenia (Conley et al., 2007; Sands and Harrow, 1999; Wetherell et al., 2003). Given that elicited emotion in laboratory settings may not reflect the relevant range of psychological states in schizophrenia, we sought to address the question whether or not other measures of emotion, such as trait-like measures of intensity or recent experiences, would show a relationship with social outcome.

In the present study, we assessed converging measures of emotional experience, social cognition, social function and neurocognition. We aimed to replicate the finding that: (1) Neurocognition predicts functional outcome in schizophrenia; and (2) Social cognition, in addition to neurocognition, explains significant variance of functional outcome in schizophrenia. Central to the question of the role of emotion in schizophrenia, we hypothesized that emotional experience could be reliably assessed by self-report measures and would predict functional outcome independent of neurocognition and social cognition in schizophrenia.

2. Methods

2.1. Participants

Thirty-three outpatients who met the DSM-IV (American Psychiatric Association, 1994) criteria for schizophrenia or schizoaffective disorder were recruited from a local community mental health center and a university clinic. Patients who were unable to give informed consent, had other active Axis I disorders, a history of closed head injury, a history of alcohol or substance abuse/dependence in the past 6 months, or were on a court order treatment were excluded.

Thirty-three healthy controls were recruited through community advertisements. They were matched to the patients for age, gender, parental education, and family socioeconomic status. Exclusion criteria for control participants included lifetime history of mental illness, closed head injury, alcohol/substance dependence, history of alcohol/substance abuse in the past 5 years, and having any first-degree relatives with evidence of serious mental illness (e.g., psychotropic treatment, electroconvulsive therapy, or hospitalization).

All participants participated in one of two different functional magnetic resonance imaging (fMRI) experiments, the focus of which is out of the scope of this article and the results are not reported here.

2.2. Assessments

Clinical diagnoses were established or ruled out using the Structured Clinical Interview for the DSM-IV (SCID-I; First et al., 1995) by a trained master's level research associate. A senior research psychiatrist (SFT) verified the diagnoses and assessed patients' symptomatic severity with the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham, 1962). The subscore for positive symptoms was obtained by summing items of Hallucinatory Behavior, Unusual Thought Content, Suspiciousness, and Conceptual Disorganization; the negative symptom subscore was the sum of Emotional Withdrawal, Motor Retardation, and Flat Affect.

Premorbid IQ was estimated with the Reading subtest of the Wide Range Achievement Test (WRAT3-R; Wilkinson, 1993). Neurocognitive functions were assessed with the Brief Assessment of Cognition in Schizophrenia (BACS; Keefe et al., 2004). The composite score (calculated using z-scores of the 6 test domains) and the z-scores of Verbal Memory and Tower of London were used in data analyses, as verbal memory and executive function have been

reported to be the most significant neurocognitive predictors of functional outcome (Green et al., 2000; Green et al., 2004).

Social cognition was assessed with the “Reading the Mind in the Eyes” Test revised version (“Eyes”; Baron-Cohen et al., 2001) and the Mayer-Salovey-Caruso Emotional Intelligence Test—Managing Emotion subscale (MSCEIT; Mayer et al., 1999). These two tests presumably test theory of mind and cognition of emotion regulation, respectively.

Emotional experience was assessed with three self-report measures. The Affect Intensity Measure (AIM) assessed intensity of emotional reactions to typical life events; the Differential Emotion Scale – Modified (DES-MOD; Fredrickson et al., 2003) assessed frequency of positive and negative emotions; and the Revised Physical Anhedonia Scale (Chapman et al., 1976) and Revised Social Anhedonia Scale (Mishlove and Chapman, 1985) were used to assess deficits in hedonic capacity.

Functional outcome was assessed with the Global Assessment of Functioning (GAF) and the Social Adjustment Scale—Self Report (SAS; Weissman and Multi-Health Systems, 1999). The SAS measures six major areas of functioning over a two-week period: work (paid worker/unpaid homemaker/student), social and leisure activities, relationships with extended family, role as a marital partner, parental role, and role within the family unit. An overall adjustment score (possible range: 0 to 4) was calculated by dividing the sum of score by the number of items answered, reverse coded, so that higher scores indicate better social adjustment. Although the self-report version of the SAS was used, it was administered to patients with close supervision of a research associate. The self-report SAS is derived from the interview version of the Social Adjustment Scale – Interview (Weissman & Paykel, 1974), and it exhibits good concurrent validity (Weissman & MHS, 1999).

2.3. Statistical Analyses

Patients were compared with controls for demographic and clinical characteristics, general cognition, social cognition, emotional experience, and functional outcome with t-tests. Within each of the patient and control groups, the inter-relationships of these variables were examined with Pearson correlations.

To assess the contribution of emotional experience to functional outcome independent of neurocognition and social cognition in schizophrenia, we used a model comparison approach. Since neurocognitive functions are robust predictors of functional outcome in schizophrenia and conceptually it is the foundation of upper-level functioning (such as social cognition), core neurocognitive measures including BACS composite score, BACS Verbal Memory and BACS Tower of London were used as predictor variables in the first block of a regression model. Because these variables were moderately correlated with each other, stepwise method was used within the block to select the best neurocognitive predictor to avoid the problem of multicollinearity. Similarly, in the second block, stepwise method was used to select the best social cognitive predictor (“Eyes” or MSCEIT Managing Emotion). Finally, emotional experience variables were examined in the third block. Each emotional experience variable was entered separately into the model in the third block. This enabled us to examine the contribution of each type of emotional experience to functional outcome. This approach also avoided multicollinearity and results that might be due to chance (e.g., claiming that DES negative but not social anhedonia is a significant predictor of SAS in addition to neurocognition and social cognitive). These hierarchical regression analyses were first conducted with GAF as the dependent variable, and then with SAS as the dependent variable. For comparison purpose, the same regression analysis procedure was repeated for control participants.

3. Results

3.1. Patients vs. Controls

Means and standard deviations of demographic and clinical characteristics of patients and controls are summarized in Table 1. The two groups were well matched for age, sex, parental education, and family socioeconomic status. As expected, patients had fewer years of education and lower reading level.

All of the self-report scales of emotional experience demonstrated satisfactory to good levels of internal consistency (Cronbach's alpha) among patients and controls (summarized in Table 2), with the exception of the Affect Intensity Measure (AIM) negative subscale. AIM Negative was dropped from the subsequent analyses.

Patients scored almost 2 SD's below controls on the BACS (see Table 2). They also performed significantly poorer on both of the social cognition tests, "Eyes" and MSCEIT Managing Emotion. As for emotional experience, patients reported more physical and social anhedonia (on the Chapman scales), more frequent negative emotions (on the DES negative), and less frequent positive emotion (on the DES positive) but comparable intensity (on the AIM positive) relative to controls. Finally, patients scored significantly lower on both of the functional outcome measures, GAF and SAS, than controls.

3.2. Correlates of Functional Outcome

Correlates of functional outcome variables among schizophrenia patients and controls are shown in Table 3. Among patients, whereas GAF was correlated significantly with the BACS composite score and BACS Verbal Memory, SAS was correlated with BACS Tower of London, "Eyes", MSCEIT Managing Emotion, DES Positive and Negative subscales, and Social Anhedonia. Clinical symptoms as measured with BPRS were not correlated with either of the functional outcome measures. GAF and SAS were not significantly correlated with each other ($r = .01, n.s.$).

Among controls, while GAF was correlated with DES Negative only, SAS was correlated with WRAT, BACS composite score, BACS Verbal Memory, and DES Positive and Negative. GAF and SAS were moderately correlated ($r = .57, p < .005$).

3.3. Contribution of Emotional Experience to Functional Outcome

Correlations among the predictor variables for the patient group are shown in Figure 1. For patients, regression analysis predicting GAF yielded only one significant predictor—BACS Verbal Memory, explaining 25% of variance, $F(1, 29) = 9.83, p = .004$. However, SAS was best predicted by variables of multiple domains. In step 1 of the hierarchical regression analysis, BACS Tower of London was the significant neurocognitive predictor of SAS, explaining 17% of variance. In step 2, MSCEIT Managing Emotion was a better social cognitive predictor than "Eyes," significantly explaining 14% more variance, $F(2, 28) = 6.03, p < .05$. In step 3, DES Positive, DES Negative, and Social Anhedonia each accounted for significantly more variance of SAS (ranged from 11% to 23%). Detailed results of these hierarchical regression analyses for patients are summarized in Table 4.

For the healthy control group, GAF was best predicted by DES Negative, explaining 14% of variance, $F(1, 29) = 4.75, p = .04$. SAS was predicted by the BACS composite score only, which explained 27% of variance, $F(1, 30) = 10.97, p = .002$.

4. Discussion

Addressing an important but relatively neglected clinical phenotype, this study examined emotional experience and its unique contribution to functional outcome in schizophrenia. As expected, patients with schizophrenia performed more poorly on neurocognitive and social cognitive tasks than healthy controls. Consistent with previous studies, patients reported higher physical and social anhedonia than controls. However, they reported comparable affect intensity, although they experienced negative emotions more frequently and positive emotions less frequently than controls. This suggests that higher anhedonia scores may reflect fewer encounters of positive events rather than impaired hedonic capacity in daily life of patients with schizophrenia. Patients demonstrated similar levels of reliability on self-report measures as control participants. The results of regression analyses supported our hypothesis that emotional experience accounts for functional outcome independent of neurocognition and social cognition in schizophrenia. These results demonstrate the feasibility and importance of assessing socio-emotional functioning to better understand functional outcome in schizophrenia.

We replicated the well-documented relationship between neurocognition and functional outcome in schizophrenia. Interestingly, in this study, these two robust domains of neurocognitive predictors, verbal memory and executive function (Green et al., 2000), were correlated with different measures of functional outcome—BACS Verbal Memory was correlated with GAF, whereas BACS Tower of London was correlated with SAS. This may be due to the difference in what and how is measured by the GAF and SAS. GAF represents the clinician's impression of the patient's global functional level obtained through an interview. It is conceivably subject to the influence of expressive verbal abilities of the patients. SAS is an assessment of adjustment to different areas of life. Since adjusting to the social environment involves substantial problem-solving skills, this may explain why SAS is more correlated with BACS Tower of London, which taps executive function through a problem-solving test. It is noteworthy that GAF and SAS appeared to be independent among patients with schizophrenia, although they were moderately correlated among healthy controls. Whereas the SAS is focused on socio-emotional adjustment, the GAF combines symptom severity and function. Thus, it is not surprising that, although it has convergent validity in healthy individuals (i.e., without active symptoms), it does not show correlations within the patient group. This also echoes with previous findings that different measures of outcome share limited variance with one another in schizophrenia (Dickerson et al., 2000; Smith et al., 1999), thus highlighting the importance of including diverse outcome measures in schizophrenia research.

Our data demonstrated an independent contribution of social cognition in functional outcome in schizophrenia. While previous studies frequently measured social cognition using simple facial emotion identification, we chose two tests tapping higher-level perception of socio-emotional information—the “Eyes” test that measures the affective aspect of theory of mind and the MSCEIT Managing Emotion that measures the ability to identify effective emotion regulation strategies. “Eyes” explained marginally more variance whereas MSCEIT Managing Emotion accounted for significantly more variance of SAS in addition to neurocognition. Given the small sample size and thus the instability of the inference statistics, replications are needed to confirm that cognition of emotion regulation strategies is a more important determinant of social adaptation than affective theory of mind in schizophrenia.

Our data confirmed the presence of excessive negative emotions in the disorder (Horan and Blanchard, 2003; Myin-Germeyns et al., 2000). We found a significant correlation between frequency of negative affect and positive symptoms ($r = .47, p < .01$), supporting the dysphoric experience of psychosis. In the presence of excessive negative emotions in schizophrenia, skills (or learning potential of these skills) for down-regulating negative emotions may help the

patient adjust better to his or her social environment, explaining why cognition of emotion regulation (measured with MSCEIT Managing Emotion) was found to be a significant determinant of functional outcome in schizophrenia in this study.

One may expect that if a patient possesses effective emotion regulation skills, his social functioning should not be susceptible to emotional experience. However, the results of regression analyses in this study showed that increased frequency of negative emotion and decreased positive emotional experience, regardless of emotion regulation skills, remains a significant factor of functional outcome in schizophrenia. This finding is significant, because anxiety and depression are commonplace in schizophrenia, but they are traditionally treated as symptoms secondary to psychotic and deficit symptoms. Studies of prodromal schizophrenia have found that such negative affect is frequently present before onset of full-blown psychotic symptoms (Birchwood et al., 1989; Häfner et al., 1999; Lewandowski et al., 2006) and is associated with poorer subjective wellbeing and more suicidal attempts (Huppert et al., 2001; Pallanti et al., 2004). These data suggest that negative affect and reduced positive emotions may be an independent pathophysiologic process, rather than a mere response to other symptoms, in schizophrenia. Further investigation of the phenomenology of negative affect is warranted to elucidate its role in the disease process of schizophrenia.

In this study, emotional experience was assessed with self-report tools. One concern may be the effect of compromised memory functioning on the accuracy of self reports of recent (past two weeks) emotions. Our finding that patients experienced more negative and less positive emotions with equivalent intensity compared with healthy controls, was consistent with studies using methods that do not require long-term memory in the reporting of emotional experience (Hempel et al., 2007; Kring and Neale, 1996; Myin-Germeys et al., 2000). Moreover, patients' self-report emotional experience in this study exhibited good internal consistency. The only exception was AIM negative subscale. However, because low internal consistency for AIM negative was also observed among healthy controls, this likely reflects a problem of the subscale itself (e.g., containing only 6 items as opposed to 10 items in AIM positive) instead of unreliable self-reports by patients. Taken together, our results lend support to the reliability and usefulness of self-report tools in the measurement of emotional experience with schizophrenia patients.

The present study has several treatment implications. Social cognition and emotional experience were found to contribute to social adjustment independent of neurocognition in schizophrenia. This suggests that besides neurocognitive remedies, treatment for schizophrenia also needs to address socio-emotional functioning (*cf.* Couture et al., 2006; Nuechterlein et al., 2004). Pharmacological and psychosocial treatment may intervene through minimizing negative emotions and enhancing emotion regulating skills. For example, while SSRIs are used in schizophrenia to treat co-morbid depression, the effect of these broad-spectrum thymoleptics may lie in the control of negative affect and possibly enhancing social adaptation. Also, patients may benefit from psychosocial interventions focusing on emotion regulation strategies that enable the reappraisal of emotional events (John & Gross, 2004). Indeed, the management of dysphoria is a key to providing effective treatment in cognitive therapy of schizophrenia (Kuipers et al., 2006), and family education groups emphasize stress reduction (McFarlane et al., 2003).

Limitations of this study include patient sampling and small sample size. The patient sample size of 33 did not allow us to examine other potentially important factors of functional outcome in schizophrenia, such as schizophrenia vs. schizoaffective disorder, subtypes, or duration of illness. Our patient sample may not be representative of all individuals with schizophrenia. We used a chronic sample with possible self-selection bias—they were patients motivated enough to participate in an fMRI study that involved lengthy assessments and computerized tasks. This

may explain the relatively low scores and variability of negative symptoms and a lack of significant correlations between neurocognition and negative symptoms. Replications with larger samples of patients at different stages and severity of the illness are needed to examine other potentially important factors of functional outcome and confirm the generalizability of the results.

To conclude, the present study confirmed that patients with chronic schizophrenia have impaired social cognition but preserved capacity to subjectively experience emotions. In addition to neurocognition and social cognition, emotional experience made unique contributions to social outcome in schizophrenia. The mechanisms by which emotional dysfunction impairs functional outcome in the illness warrant further investigation. The potential rehabilitative and preventive value of socio-emotive training for patient and at-risk populations should also be explored.

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Figure 1.
Correlations among predictors of functional outcome in 33 patients with schizophrenia

Table 1

Demographic and clinical characteristics of schizophrenia patients and healthy controls

	Schizophrenia/ Schizoaffective patients (n = 33)	Healthy controls (n = 33)	<i>t</i> or χ^2
Demographic			
Age (yr)	38.5 ± 11.3	38.2 ± 9.6	0.12
Sex (male/female)	22/11	23/10	0.07
Subject education (yr)	13.8 ± 2.5	16.0 ± 3.0	-3.21***
Parental education (yr)	14.8 ± 3.5	14.9 ± 2.9	-0.15
Socioeconomic Status	2.8 ± 0.8	2.7 ± 0.7	0.62
Clinical			
Duration of illness (yr)	17.9 ± 11.8	—	—
Hospitalizations (#)	3.9 ± 2.4	—	—
BPRS total	34.3 ± 6.8	—	—
BPRS positive	9.8 ± 3.7	—	—
BPRS negative	8.5 ± 3.3	—	—
Antipsychotic dose (CPZeq mg/day)	505.1 ± 403.3	—	—

 $p < .005$.

Table 2

Descriptive statistics of measures of general cognition, emotional experience, social cognition and functional outcome in schizophrenia patients and healthy controls

	Schizophrenic/ Schizoaffective patients (n = 33)	Healthy controls (n = 33)	
	Mean ± SD	Mean ± SD	t
General cognition			
WRAT3-R	47.9 ± 6.7	50.7 ± 4.3	-2.02
BACS composite	-1.9 ± 1.2	0.0 ± 1.0	-6.93***
BACS Verbal Memory	-1.2 ± 1.2	0.0 ± 1.0	-4.62***
BACS Tower of London	-0.8 ± 1.1	0.0 ± 1.0	-3.13***
Social cognition			
“Eyes”	64.4 ± 12.6	73.2 ± 11.6	-2.96***
MSCEIT	0.37 ± 0.09	0.47 ± 0.06	-5.27***
Emotional experience			
AIM positive	3.5 ± 0.7 (α = .68)	3.6 ± 0.5 (α = .71)	-0.60
AIM negative	3.7 ± 0.6 (α = .14)	3.4 ± 0.5 (α = .18)	2.61*
DES positive	3.1 ± 0.7 (α = .82)	3.8 ± 0.5 (α = .80)	-4.32***
DES negative	2.2 ± 0.9 (α = .91)	1.7 ± 0.4 (α = .78)	2.98***
Physical anhedonia	18.0 ± 8.1 (α = .90)	10.4 ± 4.7 (α = .67)	4.46***
Social anhedonia	12.5 ± 6.6 (α = .91)	6.1 ± 4.3 (α = .77)	4.44***
Functional outcome			
GAF	46.7 ± 5.7	83.5 ± 4.9	-27.85***
SAS	2.9±0.4	3.5±0.2	-6.66***

* $p < .05$.

** $p < .01$.

*** $p < .005$.

Table 3

Correlates of functional outcome variables in schizophrenia patients and healthy controls

	Patient		Control	
	GAF	SAS	GAF	SAS
Neurocognition				
WRAT	.00	-.06	.08	.41 *
BACS composite	.52 ***	.13	.17	.52 ***
BACS Verbal Memory	.52 ***	.00	.15	.35 *
BACS Tower of London	.25	.42 **	-.03	.27
Social cognition				
Eyes	.14	.40 *	.07	.01
MSCEIT	.02	.46 **	.00	.34
Emotional Experience				
DES Positive	.06	.49 ***	.33	.35 *
DES Negative	.16	-.41 *	-.38 *	-.35 *
AIM Positive	.16	.00	.06	-.07
AIM Negative	.13	-.32	-.04	-.25
Physical Anhedonia	-.30	-.32	-.11	.13
Social Anhedonia	-.23	-.50 ***	-.19	-.21
Symptoms				
BPRS positive	.06	-.11	--	--
BPRS negative	.19	-.20	--	--
BPRS total	.06	-.21	--	--

*
 $p < .05$.**
 $p < .01$.***
 $p < .005$.

Table 4

Contribution of emotional experience variables to SAS independent of neurocognition and social cognition in 33 patients with schizophrenia

Variable	β^a	r^2	Δr^2	ΔF
Model A				
Step 1: BACS Tower of London	.31	.17	.17	6.10*
Step 2: MSCEIT Managing Emotion	.32	.31	.14	6.03*
Step 3: DES positive	.40	.46	.15	7.83**
Model B				
Step1: BACS Tower of London	.40	.17	.17	6.10*
Step 2: MSCEIT Managing Emotion	.36	.31	.14	6.03*
Step 3: DES negative	-.48	.54	.23	13.85***
Model C				
Step 1: BACS Tower of London	.29	.17	.17	5.88*
Step 2: MSCEIT Managing Emotion	.28	.32	.15	6.01*
Step 3: Social Anhedonia	-.35	.42	.11	4.97*

^aNote. Standardized coefficients of final model.

* $p < .05$.

** $p < .01$.

*** $p < .005$.