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Anticipatory pleasure and approach motivation in schizophrenia-like negative symptoms

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ABSTRACT

Previous research of negative symptoms in schizophrenia has emphasized an anticipatory pleasure deficit, yet the relationship of this deficit to patients' motivation in everyday life is poorly understood. This study tested the link between anticipatory pleasure and two broad motivational systems that are said to regulate the intensity of approach and avoidance behavior, the Behavioral Inhibition system (BIS) and the Behavioral Activation System (BAS). It was hypothesized that high vulnerability for negative symptoms would be associated with low reward responsiveness and that this association will be mediated by the amount of anticipated pleasure. Students ($n=171$) with varying vulnerability for negative symptoms (assessed by the Community Assessment of Psychic Experiences) completed questionnaires regarding (a) anticipatory and consummatory pleasure, and (b) responsiveness to threat and reward. As hypothesized, anticipatory pleasure correlated significantly negatively with subclinical negative symptoms ($r=-0.21$) and significantly positively with BAS ($r=0.55$). Furthermore, evidence for a partial mediation effect was found. The findings support the notion of a close association between negative symptoms, the ability to anticipate pleasure and approach motivation that is evident even in healthy persons. It is suggested that the behavioral deficits immanent to negative symptoms reflect difficulties in the ability to translate emotions into motivation.

1. Introduction

Anhedonia, defined as diminished ability to experience positive emotions (Germans and Kring, 2000) is central in patients with negative symptoms of schizophrenia (Horan et al., 2006; Mäkinen et al., 2008). It impairs patients' engagement in everyday activities and strongly affects quality of life (Rector et al., 2005; Mäkinen et al., 2008). According to Meehl (1962) anhedonia is a possible indicator of a genetic vulnerability to schizophrenia. In support of this assumption, anhedonia has been found to be elevated in unaffected relatives of patients with schizophrenia (Kendler et al., 1996; Laurent et al., 2000) and in healthy participants exhibiting clinical characteristics similar to those seen in individuals with schizophrenia spectrum disorders (Blanchard et al., 2011). Those findings imply a continuity of negative symptoms in the population and healthy individuals seem to vary in their vulnerability for anhedonia. Thus, studying anhedonia at a subclinical level may help to identify mechanisms that are involved in transition from a healthy state to negative symptoms.

One important aspect of anhedonia is the differentiation between its consummatory and anticipatory components (Klein, 1984; Gard et al., 2006). Consummatory pleasure is the ability to actually experience pleasure in response to a pleasurable stimulus in the moment it occurs, whereas anticipatory pleasure refers to the experience of pleasure while anticipating future events (Kring and Caponigro, 2010). Several studies based on self-report measures and experience sampling methods have shown that anticipatory (but not consummatory) deficits are associated with anhedonia in schizophrenia (Horan et al., 2006; Gard et al., 2007; Favrod et al., 2009; Chan et al., 2010). In those studies, patients with schizophrenia reported less anticipated pleasure than controls but comparable levels of positive emotion when they were actually experiencing pleasurable activities. Strauss and Gold (2012) concluded that anhedonia should no longer be defined as diminished capacity for pleasure, but rather reflects beliefs of low pleasure or elevated negative emotions.

As in healthy persons, experience of emotion in schizophrenia is hypothesized to be closely linked to motivational systems (Kring and Caponigro, 2010). Based on Gray's (1970) neurobiological model there are two motivational systems that regulate the intensity of approach and avoidance behavior and are associated with specific emotions. The Behavioral Inhibition or Avoid System (BIS) is related to punishment avoidance and the Behavioral Activation or Approach System (BAS) is related to drive, fun seeking and reward responsiveness (Carver and White, 1994). Whereas BIS is said to inhibit behavior

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towards positive stimuli and to be sensitive to aversive stimuli associated with feelings such as frustration and anxiety, BAS is said to activate behavior towards positive stimuli associated with feelings such as hope and happiness (Gray, 1990). People have been found to differ in their motivation to avoid negative (potential punishing) or attend to positive (potential rewarding) stimuli (e.g., Carver and White, 1994; Derryberry and Reed, 1994; Heimpel et al., 2006). Moreover, it has been suggested that imbalances between BIS and BAS underlie affective vulnerability to psychopathological symptoms (Johnson et al., 2003; Becerra, 2010).

In schizophrenia, BIS but not BAS was found to be positively associated with overall negative symptoms (Scholten et al., 2006; Depp et al., 2011). With regard to anhedonia, Gard et al. (2006, 2007) found BAS but not BIS to be positively associated with anticipatory but not consummatory pleasure in schizophrenia. Similarly, Germans and Kring (2000) found anticipatory as well as consummatory pleasure to be positively associated with BAS but not BIS in a healthy sample with varying levels of anhedonia. Thus, it seems that BIS may be linked to overall negative symptoms whereas BAS may be uniquely related to anhedonia, possibly to its anticipatory component. Furthermore, because evidence suggests that patients with negative symptoms have difficulties to initiate goal-directed behavior (Gold et al., 2008) and motivational deficits in schizophrenia reflect problems in the ability to translate positive experiences into action (Heerey and Gold, 2007), the association between negative symptoms and BAS may be mediated by pleasure anticipation.

The goal of the present study was to examine the association between subclinical negative symptoms, anticipatory/consummatory pleasure and BIS/BAS motivation as well as to test if there is an interaction effect of subclinical negative symptoms and anticipatory pleasure on trait approach motivation (BAS). We studied a sample of healthy participants with varying vulnerability to negative symptoms. This approach appears justified by the fact that subclinical negative symptoms have been used as low-level criterion in high-risk studies (Yung et al., 2003; Lencz et al., 2004; Piskulic et al., 2012) and by the continuity not only of negative symptoms in general (Blanchard et al., 1998; Piskulic et al., 2012) but also of associated anhedonia (Blanchard et al., 2011; Piskulic et al., 2012). We hypothesized that (1) anticipatory, but not consummatory pleasure will be negatively related to subclinical negative symptoms, (2) BAS will be uniquely positively related to anticipatory pleasure, whereas (3) BIS will be positively related to overall subclinical negative symptoms and, (4) the association between subclinical negative symptoms and BAS will be mediated by the ability to experience anticipatory pleasure.

2. Method

2.1. Participants and procedure

The sample consisted of 171 healthy psychology students from the University of Hamburg who participated for partial fulfillment of a curriculum requirement. All participants were 18 years or older. Exclusion criteria for all participants were a present or past mental disorder as assessed with two questions (i.e. “Do you have had or have a mental health problem?” and “What kind of mental health problem do you have had or have?”) before the assessment started. After written informed consent was obtained, participants completed a questionnaire battery that was part of a larger project.

2.2. Measures

Vulnerability for negative symptoms of schizophrenia was measured with the Community Assessment of Psychic Experiences (CAPE; Stefanis et al., 2002). The CAPE is a 42-item self-report instrument developed to rate lifetime psychotic experiences in the general population. It includes items assessing low-grade psychotic, negative and depressive symptom experiences. This 3-factor structure has been demonstrated by Stefanis et al. (2002). For the purpose of this study only the negative and depression dimensions of the CAPE were used. The 14 items assessing vulnerability for negative symptoms are based on instruments often used in clinical studies (Stefanis et al., 2002): the Schedule Assessing Negative Symptoms (SANS; Andreasen, 1989) and the Subjective Experience of Negative Symptoms (SENS; Selten et al., 1993). Participants were asked to report the frequency of their negative symptoms on four-point Likert scales from (1) never to (4) nearly always (e.g. “Do you ever feel that you are lacking in energy?” and “Do you ever feel that you have no interest to be with other people?”) with higher scores reflecting more vulnerability towards negative symptoms. The eight items that assessed vulnerability for depressive symptoms were used as control variables in the present study. Validation studies of the CAPE within large healthy samples have found high correlations between CAPE scores and schizotypy scales as well as observer-rated symptoms (Konings et al., 2006). Participants with schizophrenia obtained higher mean scores in the negative dimension of the CAPE than healthy controls (Hanssen et al., 2003; Moritz and Laroi, 2008). The internal consistency (Cronbach's alpha=0.89 for the negative subscale) and discriminative validity of the German version of the CAPE is good (Woodward et al., 2008).

The ability to experience anticipatory and consummatory pleasure was assessed by the Temporal Experience of Pleasure Scale (TEPS; Gard et al., 2006). The TEPS is a self-report questionnaire that comprises 10 items measuring trait anticipatory pleasure (e.g. “I look forward to a lot of things in my life.”) and eight items measuring trait consummatory pleasure (e.g. “I enjoy taking a deep breath of fresh air when I walk outside.”). Scores of anticipatory pleasure reflect the amount of pleasure experienced in anticipation of a positive stimulus, whereas scores of consummatory pleasure reflect the amount of in-the-moment pleasure in response to a stimulus. The English version of the TEPS has good internal consistency (Cronbach's alpha >0.79; Gard et al., 2006) and test-retest reliability ($r=0.81$, $p<0.001$; Gard et al., 2006). For the purpose of this study the TEPS was translated and back translated into German by an English native speaker. In this study, the Cronbach's alpha was 0.69 for the anticipatory pleasure subscale, 0.68 for the consummatory pleasure subscale and 0.78 for the total scale. Item-total correlation testing and examination of the scree plot revealed a two-factor solution consistent with the two-factor model proposed by Gard et al. (2006).

The BIS and BAS motivation was measured using the short form of the Action Regulating Emotion Systems Scale (ARES-K; Hartig and Moosbrugger, 2003). This questionnaire is based on Carver and White's (1994) self-rating instrument that assesses the general tendency to be motivated by positive or negative emotional outcomes. The ARES-K comprises 10 BIS items and 10 BAS items. Each item has four response options ranging from one (strongly agree) to four (strongly disagree). The BIS subscale assesses “anxiety” (e.g. “Criticism makes me experience fear and nervousness.”) and “frustration” (e.g. “I feel worried when I think I have done poorly at something.”) whereas the BAS subscale measures “drive” (e.g. “If I see a chance to get something, I feel energized.”) and “gratification” (e.g. “Achieving a desired goal makes me very happy.”). Higher BIS scores are associated with more anxiety and frustration, whereas higher BAS scores are associated with more positive affect and engagement in approach behavior. The ARES-K shows excellent psychometric properties and a factorial structure consistent with Gray's neurobiological model of BIS and BAS (Hartig and Moosbrugger, 2003).

2.3. Strategy of data-analysis

Correlation coefficients (Pearson) and one-tailed tests of significance were computed to assess the strength of the associations between the CAPE negative symptom subscale, the TEPS and the ARES-K subscales. Furthermore, we computed partial correlations to test whether partialing out the CAPE depression subscale and gender in the correlations reduces them to non-significance. To test whether the association between subclinical negative symptoms and BAS is mediated by anticipatory pleasure, we conducted a hierarchical multiple regression analysis and the Sobel test (Preacher and Hayes, 2004). BAS was the dependent variable (DV), the CAPE negative symptom score was the independent variable (IV) and the TEPS anticipatory score was the mediator. In a first step, the IV must be significantly associated with the DV. In the second step, the IV must be significantly associated with the potential mediating variable. In the third step, the mediator must be significantly associated with the DV. The final step is to show that the strength of the association between the IV and the DV significantly decreases when the mediator is added to the model (Muller et al., 2005). All analyses were carried out using SPSS version 20.

3. Results

3.1. Sample characteristics

The mean age of the sample was 24.49 (S.D.=5.58) and 66% were female. The TEPS and ARES-K subscales were normally distributed. Kolmogorov–Smirnov tests showed only a slightly significant deviation from a normal distribution for the CAPE