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Anhedonia and emotional word memory in patients with depression

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ABSTRACT

Anhedonia is a key diagnostic criterion for major depression. Investigating the relation between the specific symptoms and emotional processing may help to understand the underlying cognitive mechanism of anhedonia in depression. In this study, we explored the potential association between memory for emotional words and anhedonia in 71 patients with depression and 61 healthy individuals. An emotional word-rating task was administered to assess self-reported emotional experience to words on both valence and arousal dimensions, and subsequent recall and recognition memory for these words. Depressed patients demonstrated a reduction in pleasure and arousal experience to positive words, but an increase in arousal experience to negative words. Depressed patients also displayed a lower overall memory performance in recall measure and a bias to memory of more negative words. Moreover, state anhedonia and trait anhedonia were associated with attenuated positive experience and enhanced negative experience in patients with depression only. Higher levels of anhedonia and depression severity were also associated with fewer positive words and more negative words memory. Patients with depression displayed a flat pattern of emotional experience to positive stimuli and a tendency towards rating negative stimuli more intensely.

1. Introduction

Anhedonia, defined as a reduced capacity to experience or pursue pleasure, is a main symptom of depression (APA, 1994). A rich literature has shed light on the ways that anhedonia could influence life function and increase vulnerability to the development of psychic disease (Chapman et al., 1994; Mason et al., 2004; Gooding et al., 2005); however, the underlying mechanisms by which these changes may occur are still not clearly known.

One way to help understand this question is to determine the correlation between anhedonia and other cognitive processing of depression. Meehl suggested that hedonic capacity serves as a buffer against the negative influences of stress (Meehl, 1962). Anhedonia might change cognitive processing for emotional information in such a way that positive information is more difficult to retrieve and sustain than the negative information (Mathews and Barch, 2006). Hence, there will be less availability of cognitive or emotional resources to buffer against stressful or negative experiences. Indeed, findings have confirmed a range of cognitive deficits in patients with depression (Jaeger et al., 2006; Beblo et al., 2011; Elderkin-Thompson et al., 2011), and among these deficits, memory deficit is supposed to be a premorbid marker of depression (Airaksinen et al., 2007), and is found in particular sub-types of depressed patients (Burt et al., 1995). Preliminary findings also indicate that memory of positively valenced information can predict depressive symptomatic improvement (Johnson et al., 2007; Roy et al., 2010). Interestingly, despite the obvious abnormal affective features of the construct of anhedonia, little is known about memory for emotionally valenced information of individuals identified as high in anhedonia.

Empirical findings show that decreased emotional experiences in the valence or arousal aspects have been demonstrated in healthy individuals with anhedonia (Mathews and Barch, 2006; Kerns et al., 2008; Leung et al., 2010), and such emotional experience abnormalities could influence the encoding processes relating to memory (Mickley Steinmetz and Kensinger, 2009; Mickley Steinmetz et al., 2010). Furthermore, it is also suggested that arousal and valence may work in distinct neural pathways to mediate the enhancing effect of emotion on memory formation (Kensinger, 2004; Kensinger and Corkin, 2004). In particular, arousal depends on an amygdalar–hippocampal network, whereas non-arousing valence is linked to a prefrontal cortex–hippocampal network (Kensinger and Corkin, 2004). To date, most studies have been limited to healthy samples. Although

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empirical findings indicate there is a reduction in the intensities of pleasure in depression (Watson and Naragon-Gainey, 2010), the relationship among anhedonia, emotional experience and memory in the individuals with major depression remains unclear.

The current study sought to examine emotional response and memory performance in patients with depression compared to healthy individuals. We measured emotional experience and memory using an emotional word-rating method (Mathews and Barch, 2006), which required participants to rate emotional words on both valence and arousal dimensions, then immediately recall and recognize these words. We expected emotional experience in valence and arousal to be decreased and memory deficits to be increased in patients with depression compared with the healthy individuals. In addition, in a more tentative and exploratory way, we would like to examine, in the case of an association between memory deficit and anhedonia, which types of anhedonia (e.g., state or trait anhedonia) might be responsible for this association.

2. Materials and method

2.1. Participants

Seventy-one outpatients with depression (52.1% males; age: 27.33 ± 8.90 years) were recruited to this study from a local psychiatric hospital, the Guangzhou Psychiatric Hospital, in China. Based on hospital records, patients with depression were enrolled if they met the diagnosis for major depressive disorder according to the Diagnostic and Statistical Manual, Fourth Edition (DSM-IV) (APA, 1994). Patients with any other concurrent Axis I disorders, current or past psychotic features, neurological disorders, substance abuse and electroconvulsive therapy in the previous 6 months were excluded. Addition entry criteria into the study for patients required a score of >16 on the Beck Depression Rating Scale (Beck et al., 1961). The mean Beck Depression Inventory (BDI) score for the patients was 27.87 (standard deviation (S.D.)=7.60; range 17–49). The average length of illness was 2.34 years (S.D.=3.07) and the cumulative duration treated was 9.18 months (S.D.=10.09) for the patients. Sixty-one healthy individuals (50.80% males; age: 26.11 ± 5.65 years) were recruited from the local community and were screened by the experienced psychiatrists to ascertain the healthy controls did not have psychiatric or neurologic disorders. The mean BDI score for the healthy controls was 2.72 (S.D.=2.28; range 0–9).

2.2. Emotional word-rating task

The words for this task were selected from those used in previous research (Mathews and Barch, 2006) and from those rated high frequency of occurrence in *Frequency Dictionary of Chinese Words*. An initial set of words (50 positively, 50 negatively and 50 neutrally valenced words) were selected according to equated word frequency and same word length. Then, the affective valence and arousal of these words were rated by 20 undergraduates, using a 9-point scale to report the levels of emotional pleasantness and arousal. Based on acquired valence and arousal ratings, five categories of 20 words (neutral, positive-high arousal, positive-low arousal, negative-high arousal and negative-low arousal words) were chosen. Analysis of variance (ANOVA) showed there were significant differences between the five categories of words in the valence ($F(4,95)=396.824$, $P<0.001$) and arousal variable ($F(4,95)=16.60$, $P<0.001$), and categories did not differ significantly in word frequency ($F(4,95)=1.40$, $P=0.24$).

These words were randomly selected into two sets of words, each of which comprised five categories of 10 words. One of the sets (target words) was presented in the whole task and one of the sets (distracter words) was included in the recognition measure. The words were presented in different random orders for every participant.

Participants used a 9-point scale to report how pleasant (range: 1=extremely unpleasant; 9=extremely pleasant) and arousing (range: 1=not at all arousing; 9=extremely arousing) each word was. After finishing the word ratings, each participant was asked to recall and write the words on a sheet of paper in 5 min, as many as possible. Finally, participants were given a list of 100 words of which 50 were the target words and 50 were distracters. For each word, participants were asked to indicate which words they had previously rated. The dependent variable for recall and recognition measure was the number of words recalled and recognition d' (Mathews and Barch, 2006). The recognition d' (d'=Z(hits) − Z(false alarm)) is a measure of discriminability between the old and new stimuli, which was described elsewhere (Ramponi et al., 2010).

2.3. Emotion assessment instruments

The Snaith–Hamilton Pleasure Scale (SHAPS) (Snaith et al., 1995) was used to assess the state of anhedonia of the participants. The SHAPS is a 14-item checklist to assess an individual's pleasure experience in the recent days. The Chinese translation of the SHAPS (SHAPS-C) showed excellent internal consistency in this sample, with an alpha of 0.95. The Temporal Experience of Pleasure Scale (TEPS) (Gard et al., 2006) was used to evaluate the long-term experience of pleasure among the participants. The TEPS includes two subscales, anticipatory pleasure scale (TEPS-ANTI) which measures the pleasure experienced in anticipation of a positive stimulus and consummatory pleasure scale (TEPS-CON) which measures the online, in-the-moment pleasure in response to a stimulus. The study used a 20-item Chinese version, which has been proved to possess adequate reliability (Chan et al., 2010; Chan et al., 2012a; Chan et al., 2012b). The Cronbach's alphas for TEPS-ANTI and TEPS-CON in the current sample were 0.70 and 0.78, respectively. The BDI (Beck et al., 1961) was widely used to assess the severity of depressive symptoms in the past 2 weeks. The Chinese version of BDI has excellent psychometric properties (Wang et al., 1999) and the Cronbach's alpha in the current sample for BDI was 0.95.

2.4. Procedure

The study was approved by the ethics committees of the Guangzhou Psychiatric Hospital and written informed consent was obtained from all of the participants. After completing the self-reported measures, the emotional word-rating task was administered to each participant in a quiet room in hospital.

2.5. Data analysis

A 2 (group: depressed group, healthy controls) × 5 (word type: neutral, positive-high arousal, positive-low arousal, negative-high arousal and negative-low arousal words) ANOVA was used to examine whether the patients with depression differed from the healthy controls in the word ratings and memory performance, with group as a between-subject factor, and word type as within-subject factor. The Greenhouse–Geisser correction was used for the ANOVAs where applicable, and *post hoc* Bonferroni tests were performed in cases of significant ANOVA effects.

Pearson correlation analysis was run between the SHAPS, TEPS, BDI and the level of recall and recognition d' to examine the association of anhedonia, depression severity and memory performance in the patients with depression. To test a possible specific link between anhedonia and memory performance, hierarchical regression analysis was run to evaluate if anhedonia (measured by the SHAPS and TEPS) uniquely predicted memory performance during recall and recognition measures after controlling BDI measure of depression severity (entered in the first step).

3. Results

3.1. Demographic and emotional information

There were no significant differences between groups on demographic variables. The patients with depression demonstrated significantly higher levels of depressive symptoms, state and trait anhedonia than the healthy controls (Table 1).

3.2. Valence and arousal ratings

ANOVA for the valence ratings revealed a main effect of word type ($F(4,520)=1300.843$, $P<0.001$, partial $\eta^2=0.909$) and interaction of word type × group ($F(4,520)=3.627$, $P=0.031$, partial $\eta^2=0.027$). *Post hoc* analysis for interaction indicated that the two groups rated negative words as more negative and positive words as more positive than neutral words (all P's <0.001), and compared to the control group, the depressed group rated neutral, positive-low arousal and positive-high arousal words as more negative(all P's <0.05) (Fig. 1).

ANOVA for the arousal ratings revealed a main effect of word type ($F(4,520)=76.763$, $P<0.001$, partial $\eta^2=0.371$) and interaction of word type × group ($F(4,520)=8.613$, $P<0.001$, partial $\eta^2=0.062$). *Post hoc* analysis for interaction indicated that the two groups rated neutral words as less arousing than negative-high arousal, positive-high arousal and positive-low arousal words