



Mediation effect of beliefs about pleasure and emotional experience between social anhedonia and prediction of pleasant events



Hu Hui-xin^a, Chu Min-yi^a, Yang Yin^b, Wang Ling-ling^c, Zhang Rui-ting^{b,d}, Lui Simon S.Y.^{b,e}, Cheung Eric F.C.^e, Chan Raymond C.K.^{a,b,d,*}

^a Translational Neuropsychology and Applied Cognitive Neuroscience Laboratory, Shanghai Mental Health Centre, Shanghai Jiao Tong University School of Medicine, Shanghai, China

^b Neuropsychology and Applied Cognitive Neuroscience Laboratory, CAS Key Laboratory of Mental Health, Institute of Psychology, Chinese Academy of Sciences, Beijing, China

^c School of Psychology and Cognitive Science, East China Normal University, Shanghai, China

^d Department of Psychology, Chinese Academy of Sciences, Beijing, China

^e Castle Peak Hospital, Hong Kong Special Administrative Region, China

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ABSTRACT

Few studies have examined whether there is a relationship between social anhedonia and prediction of future events and the role of beliefs about pleasure and emotional experience. In this study, 513 college students were recruited to complete a set of self-reported questionnaires, including the Revised Social Anhedonia Scale (CSAS), the Temporal Experience of Pleasure Scale (TEPS), the Belief about Pleasure Scale (BAPS) and the Beck Depression Inventory. Moreover, a checklist of 100 daily life events was also administered to all participants. Mediation analysis found that social anhedonia had a direct impact on prediction of pleasant events. Emotional experience partly mediated the relationship between social anhedonia and subjective prediction of pleasant events. However, beliefs about pleasure had no significant mediation effect between social anhedonia and prediction of pleasant events, but were shown to influence the subjective prediction of pleasant events completely through emotional experience. These findings suggest that beliefs about pleasure and emotional experience may be considered promising factors for interventions in individuals with anhedonia.

1. Introduction

Anhedonia is one of the core features of schizophrenia (Andreasen, 1982) and major depression (Treadway and Zald, 2011). It is generally defined as the reduced ability to experience pleasure. Social anhedonia, in particular, refers to the diminished ability to experience pleasure in social interactions, and is an important trait of schizotypal individuals (Blanchard et al., 2011). Indeed, social anhedonia in non-clinical individuals is found to be associated with increased risk of developing schizophrenia (Kwapil, 1998; Gooding et al., 2005; Blanchard et al., 2011).

Similar to patients with schizophrenia, individuals with high levels of social anhedonia have poorer psychosocial functioning than healthy controls (Blanchard et al., 2011). Improving functional outcome and subjective well-being of patients with schizophrenia is an important target of interventions. Predicting the future is an important factor to influence an individual's subjective well-being and behavior. Predicting the future mainly includes estimating the likelihood of future life events

and assessing the feeling towards these events. Evidence has shown that healthy people tend to overestimate the probability of experiencing future positive events but underestimate the chance of future negative events (Weinstein, 1980). These optimistic expectations may protect individuals from experiencing depression and anxiety, and are important in maintaining one's subjective well-being (Taylor et al., 2000). However, no previous study has investigated the relationship between social anhedonia and prediction of future events in non-clinical populations. It is unclear whether individuals with higher levels of social anhedonia have more negative prediction of future life events.

The extant literature on emotional impairments in schizophrenia patients suggests the existence of "an emotional paradox", which refers to the phenomenon of experiential pleasure deficits in real-life scenarios but intact hedonic processing in laboratory-based assessments (Kring and Moran, 2008; Cohen and Minor, 2010; Cohen et al., 2011; Yan et al., 2012). Experiential pleasure could be conceptualized as consisting of two components: anticipatory experiential pleasure and consummatory experiential pleasure (Gard et al., 2007). Accumulating

* Correspondence author at: China or Institute of Psychology, Chinese Academy of Sciences, 16 Lincui Road, Beijing 100101, China.
E-mail address: rckchan@psych.ac.cn (R.C.K. Chan).

evidence suggests that patients with schizophrenia show deficits in anticipatory experiential pleasure (Gard et al., 2007; Wynn et al., 2010) and reduced motivation in approaching rewards (Gold et al., 2013; Treadway et al., 2015). These deficits in anticipatory experiential pleasure were associated with negative schizotypal features and schizophrenia symptoms (Li et al., 2015). Prediction of future events is to some extent influenced by emotion (Marroquín et al., 2016), but the role of emotional experience in mediating the relationship between social anhedonia and prediction of future events is not clear.

In addition, Strauss and Gold (2012) proposed that anhedonia is not restricted to experiential pleasure deficit, but involves a set of beliefs related to low pleasure when schizophrenia patients are asked to report non-current (such as retrospective, prospective and trait self-report) emotional experiences. These low-pleasure beliefs are believed to reduce pleasure-seeking behaviors and aggravate negative symptoms in patients with schizophrenia. Schizophrenia patients with low-pleasure beliefs may believe that they cannot feel pleasure in certain situations, resulting in experiential pleasure deficits or lack of motivation in participating in enjoyable activities (Strauss et al., 2016). This perspective is consistent with the cognitive model proposed by Beck and Rector (2005). According to this model, there exist different kinds of beliefs which contribute to negative symptoms in schizophrenia patients, including defeatist performance beliefs and low expectancies for pleasure and success (Beck and Rector, 2005). Grant and Beck (2009) proposed that adverse life experiences contribute to the formation of these dysfunctional beliefs, which would in turn contribute to reduction in motivation and interest for enjoyable activities, and eventually lead to poor functional outcome. A recent meta-analysis (Campellone et al., 2016) indicated that there is a significant relationship between defeatist performance beliefs and negative symptoms in patients with schizophrenia. In addition, an association between subclinical negative symptoms and defeatist performance beliefs has been found in individuals with schizotypy (Luther et al., 2016) and non-clinical populations (Fervaha et al., 2015). These provide support for the cognitive model both in clinical and non-clinical samples and suggest that such dysfunctional beliefs may be potential targets for intervention to alleviate negative symptoms and improve functional outcomes. However, previous studies have only focused on the role of defeatist performance beliefs (Horan et al., 2010; Green et al., 2012; Kiwanuka et al., 2014), although defeatist performance beliefs only represent one type of dysfunctional beliefs. Beliefs about pleasure have rarely been examined in either clinical or non-clinical populations. To our knowledge, only one published study has used three items to measure low pleasure expectancy of patients with schizophrenia (Beck et al., 2013), but no validated instrument was used in this study. Given previous studies, such dysfunctional beliefs have been investigated mostly in patients with schizophrenia and it is still not clear when such low pleasure beliefs develop in patients with schizophrenia. Influential factors in schizophrenia patients such as hospitalization, low income, poor medical health and outdoor activities cannot be ignored in the development of such beliefs. In particular, the influence of pharmacological treatment may be a major issue to be considered. Thus, to address this issue, it is necessary to examine the role of such low pleasure beliefs and emotional experience in non-clinical populations, such as individuals with social anhedonia.

In this study, we aimed to examine the relationship between social anhedonia, beliefs about pleasure, emotional experience and prediction of future events in a non-clinical sample. Following Grant and Beck (2009)'s propositions, social anhedonia is considered a relatively stable trait, mediated by beliefs about pleasure and emotional experiences (see Fig. 1A). We hypothesized that individuals with higher levels of social anhedonia would have lower levels of pleasure beliefs, more severe deficits in emotional experience, and more negative prediction of future life events. We further hypothesized that low-pleasure beliefs and emotional experience would mediate the relationship between social anhedonia and prediction of future life events.

2. Methods

2.1. Participants

Six hundred and twenty-six undergraduate students from four universities in Shanghai, Nanjing, Wuhan and Shandong were invited to complete several online self-reported questionnaires, which tapped into trait anhedonia, beliefs about pleasure, experiential pleasure, and expectations of daily life events. Since all participants were recruited through internet advertisements, there were no other exclusion criteria in this study. To screen out invalid responses, we also included an Infrequency Scale (Chapman and Chapman, 1983). Participants were excluded if their score on the Infrequency Scale was higher than 3 (Chmielewski et al., 1995; Kerns et al., 2008). One hundred and thirteen participants were excluded as a result. The final sample comprised 513 participants (81.95% of the original sample) with an age range of 18 to 27 years old ($M = 21.31$, $SD = 1.59$). The sample consisted of 307 participants (59.8%) from Shanghai, 135 participants (26.3%) from Shandong, 39 participants (7.9%) from Nanjing and 32 participants (6.2%) from Wuhan. Seventy-three percent of the participants were females. Table 1 summarizes the demographics and composition of our sample.

2.2. Measures

2.2.1. The Chinese version of the Revised Social Anhedonia Scale (CSAS)

To assess trait anhedonia, the Chinese version of the Chapman Scales for Revised Social Anhedonia Scale (CSAS) (Chapman et al., 1976; Chan et al., 2012a,b) was used in this study. The CSAS consists of 40 true-false items and the total score ranges from 0 to 40. Higher scores indicate more severe social anhedonia. The CSAS has been shown to have good reliability and construct validity (Chan et al., 2012a,b). The Cronbach's alpha for the CSAS in this study was 0.86.

2.2.2. The Infrequency Scale

The 13-item Infrequency Scale (Chapman and Chapman, 1983) was used to measure careless or invalid responses of participants. It consists of 13 true-false items that almost everyone responds in the same direction (e.g. "On some mornings, I did not get up immediately when I awakened"). The total score ranges from 0 to 13. Higher scores indicate more carelessness. If participants answered three or more items in the unexpected direction (Chmielewski et al., 1995; Kerns et al., 2008), they were excluded from subsequent analysis. The Infrequency Scale was randomly inserted into the CSAS.

2.2.3. The Chinese version of the Beck Depression Inventory-I (BDI-I)

Depressive symptoms were assessed using the Chinese version of the Beck Depression Inventory-I (BDI-I) (Beck et al., 1961; Wang et al., 1999). The BDI-I contains 21 items, each with a range from 0 to 3. Higher scores indicate more severe depressive symptoms. A cut-off score of 10 (Beck et al., 1988) indicates mild depression. The Chinese version of the BDI-I has good reliability and validity (Wang et al., 1999). In our study, the Cronbach's alpha for the BDI-I was 0.89.

2.2.4. The Belief about Pleasure Scale (BAPS)

The Belief about Pleasure Scale (BAPS) (Yang et al., 2018, under review) was used to measure beliefs about pleasure. The BAPS comprises 22 items, which can be grouped into four factors: six items on devaluation of pleasure (the items are related to underestimating the value of pleasure such as "It makes no sense to live happily."), six items on pleasurable activity expectancies (the items are related to whether individuals should seek out pleasurable activities/behaviors such as "Nothing happy would occur to me."), five items on negative outcomes expectancies (the items are related to expected negative outcomes of pleasure such as "Once I feel happy, the bad thing would occur to me.") and five items on attention to pleasure (the items describe that one

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