Social defeat predicts paranoid appraisals in people at high risk for psychosis

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ARTICLE INFO

ABSTRACT

Background: The experience of social defeat may increase the risk of developing psychotic symptoms and psychotic disorders. We studied the relationship between social defeat and paranoid appraisal in people at high risk for psychosis in an experimental social environment created using Virtual Reality (VR).

Method: We recruited UHR (N = 64) participants and healthy volunteers (N = 43). Regression analysis was used to investigate which baseline measures predicted paranoid appraisals during the VR experience.

Results: At baseline, UHR subjects reported significantly higher levels of social defeat than controls (OR = .957, (CI) .941–.973, p < .000). Following exposure to the VR social environment, the UHR group reported significantly more paranoid appraisals than the controls (p < .000). Within the UHR sample, paranoid appraisals were predicted by the level of social defeat at baseline, as well as by the severity of positive psychotic and disorganised symptoms.

Conclusion: In people who are at high risk of psychosis, a history of social defeat is associated with an increased likelihood of making paranoid appraisals of social interactions. This is consistent with the notion that social defeat increases the risk of developing psychosis.

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1. Introduction

Only a minority of individuals at Ultra High Risk (UHR) for psychosis goes on to develop a psychotic disorder. Recent research suggests that this may reflect increased exposure to or an increased vulnerability to social stressors (or both) in this subgroup (Corcoran et al., 2003, 2012; Thompson et al., 2007). However, the mechanisms by which stress influences the onset of psychosis remain unknown. Previous studies have suggested that lower perceived social rank is associated with paranoid ideation (Atherton et al., 2014; Freeman et al., 2014; Gilbert et al., 2005) and it has been proposed that the cumulative effect of prolonged exposure to social adversity and exclusion can lead to a state of 'social defeat', which may confer an increased risk of psychosis (Johnson et al., 2011; Selten et al., 2013; Selten and Cantor-Graae, 2005; Wicks et al., 2005). The concept of social defeat originates from animal research after it was observed that when an animal is put in a cage with another animal, they fight for dominance. If these fights occur over a prolonged period of time the defeated animal develops symptoms of stress and displays behaviour similar to that expressed in depressed humans (Bjorkqvist, 2001). In humans the definition of social defeat is more complex than in animals, because humans also generate a perception or appraisal of their position in the world (Gilbert, 2000; Gilbert and Gerlsma, 1999; Taylor et al., 2011). Appraisal theory proposes that the emotional response and physiological activation that occur in a situation are dependent on the appraisal, or meaning, given to what just occurred and on whether we think we will be able to cope with what just happened (Lazarus, 1991). In line with this theoretical framework, cognitive models of psychosis propose that early stressful events may result in a cognitive vulnerability which influences the interpretation and appraisal of daily stressors, and increases the likelihood that anomalous experiences develop into a psychotic disorder (Bentall et al., 2007; Freeman et al., 2002; Garety et al., 2001, 2007; Morrison and Wells, 2003).

It is difficult to assess real time appraisals in social situations in life. However, research using virtual reality to study in vivo and in situ reactions to social situations allows the measurement of real-time physiological activation and the assessment of thoughts, mood and symptoms as they occur (e.g., (Fornells-Ambrojo et al., 2013; Freeman et al., 2003, 2005; Stinson et al., 2010; Valmaggia et al., 2007; Veling et al., 2014)).

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The aim of the present study was to use Virtual Reality (VR) to contribute to examine the putative relationship between social defeat and paranoid appraisal in social situations in people at UHR for psychosis. Neither social defeat, nor its relationship with experimentally-induced paranoid ideation has been studied in UHR subjects before. Our first hypothesis was that UHR individuals would report higher levels of social defeat than controls. Our second prediction was that when exposed to a virtual social environment, the UHR group would report more paranoid appraisals than controls. Finally, we tested the hypothesis that within the UHR sample, the level of social defeat would predict the severity of paranoid ideation induced by the VR environment.

2. Design and methods

This was a cross-sectional comparison study. UHR participants and healthy controls (HCs) were compared to establish levels of social defeat and to study the relationship between social defeat and the appraisal of a VR social environment. Regression was then used to investigate which baseline measures predicted paranoid appraisals following the VR experience.

2.1. Participants

Participants meeting criteria for the UHR mental state for psychosis, aged 18–35, were recruited over a three year period from the Outreach and Support in South London (OASIS) service, a clinical service within the South London and Maudsley NHS Foundation Trust for people at heightened risk of developing psychosis (Fusar-Poli et al. 2013). UHR participants were identified according to PACE criteria (Yung et al., 1998) using the Comprehensive Assessment of At Risk Mental States CAARMS (Yung et al., 2005b).

HC participants were recruited from the same area of London through advertisements in the local press and the Mindsearch volunteers scheme at the Institute of Psychiatry, and were matched at group level for age, ethnicity, and gender. A cut-off score of 18 or higher on the PQ was applied to control for the possible presence of at risk mental states in HC.

2.2. Measures

2.2.1. Socio-demographic information
Socio-demographic and psychosocial variables were recorded during a clinical assessment using the First Contact With OASIS Questionnaire, a non-standardised questionnaire modelled on the Census 2001 collection form (Fusar-Poli et al., 2010). Social class was estimated using information on parental occupation according to the National Readership Survey social grades classification, and for the purposes of statistical comparison, participants' social class was assigned to one of two broad categories considered to represent 'middle/upper class' and 'working class' social classes.

2.2.2. Comprehensive Assessment of the At Risk Mental State
The Comprehensive Assessment of the At Risk Mental State (CAARMS) is a semi structured interview designed to assess attenuated psychotic symptoms in people at UHR. The scale has a total of 27 items which can be clustered in seven subscales and has been shown to have excellent reliability and validity (Yung et al., 2005b). Three subgroups of UHR can be identified using the CAARMS: genetic risk (schizotypy or a first-degree relative with a psychotic disorder, both with recently marked social decline), attenuated psychotic symptoms (subclinical psychotic symptoms, not fulfilling the criteria of psychosis), and patients who have experienced a brief limited intermittent psychosis (full-blown psychosis of ≤1 week with spontaneous remission).

2.2.3. Prodromal Questionnaire
The Prodromal Questionnaire (PQ) (Loewy et al., 2005) is a self-report screening questionnaire assessing prodromal and psychotic symptoms which aims to identify individuals who may benefit from a clinical diagnostic interview. The 92 true/false items can be divided into four major subscales: (1) positive symptoms; (2) negative symptoms; (3) disorganised symptoms; and (4) general symptoms. The PQ has good psychometric properties (Loewy et al., 2005).

2.2.4. Entrapment and Defeat Scales
The Social Entrapment and Defeat Scales are two 16 item scales measuring Entrapment and Defeat. Participants are asked to rate themselves a five point scale. An example of an Entrapment Item is: 'I am in a situation I feel trapped in'; 0 = Not at all like me to 4 = Extremely like me. An example item from the Defeat scale is: 'I feel that life has treated me like a punchbag'; 0 = Never to 4 = Always. Good psychometric properties for the Entrapment and Defeat Scales have been established (Gilbert and Allan, 1998). Previous research has suggested that the scales measure the same construct and should be used together (Taylor et al., 2009).

2.2.5. Social Comparison Scale
The Social Comparison Scale is an 11-item scale measuring how participants rate themselves from 1 to 10 in relation to others. For example, the scale asks 'In relation to others I generally feel: Incompetent 1 2 3 4 5 6 7 8 9 10 Competent'. The Social Comparison Scale has good psychometric properties (Allan and Gilbert, 1995).

2.2.6. Social Defeat Composite Score
The Entrapment and Defeat Scales and the Social Comparison Scale were added up to form a social defeat composite score. The internal consistency of the scale was high with a Cohen alpha of .878.

2.2.7. Depression Anxiety and Stress Scales
The Depression, Anxiety and Stress Scale (DASS) is a 42-item measure of current (over the last week) states of depression, anxiety and stress (Lovibond and Lovibond, 1995). Each sub-scale consists of 14-items with a four point severity scale (ranging from 0 = Did not apply to me to 3 = Applied to me very much or most of the time); higher scores indicate greater distress.

2.2.8. Virtual Reality State Social Paranoia Scale
The State Social Paranoia Scale (SSPS) (Freeman et al., 2007) is a 20-item self report questionnaire examining paranoia, specifically paranoid ideation about virtual reality avatars. Each of the 20 items is rated on a five point scale from 1 = 'Do not agree' to 5 = 'Totally agree', with higher scores indicating higher endorsement. The SSPS asks about positive, neutral and paranoid appraisal of the VR environment. The SSPS examines recent paranoid thinking within a controlled social situation rather than assessing stable, trait paranoia. Based on the dataset, responses were grouped into four ordinal categories (corresponding to scores <10; 11–15; 16–25; >26).

2.3. Transition to psychosis

The onset of psychosis in the UHR group was defined using the criteria for transition to psychosis in the CAARMS (Yung et al., 2005a). A first episode diagnosis of psychosis was made by a member of the clinical team and confirmed by the team psychiatrist.

2.4. The virtual reality environment

The virtual environment (developed by the Department of Computer Science at University College London) was a tube train ride modelled on the interior of a London Underground train carriage (see Fig. 1), and was identical to that outlined in previous research (Freeman, 2008; Freeman et al., 2008). The environment was designed to be perceived as a neutral