



Review article

Cognitive and neural models of threat appraisal in psychosis: A theoretical integration

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ABSTRACT

Cognitive models of psychosis propose that maladaptive appraisals of anomalous experiences contribute to distress and disability in psychosis. Attentional, attributional and reasoning biases are hypothesised to drive these threat-based appraisals. Experimental and self-report data have provided support for the presence of these biases in psychosis populations, but recently there have been calls for neurobiological data to be integrated into these findings. Currently, little investigation has been conducted into the neural correlates of maladaptive appraisals. Experimental and neuroimaging research in social cognition employing threatening stimuli provide the closest equivalent of maladaptive appraisal in psychosis. Consequently, a rapprochement of these two literatures was attempted in order to identify neural networks relevant to threat appraisal in psychosis. This revealed overlapping models of aberrant emotion processing in anxiety and schizophrenia, encompassing the amygdala, insula, hippocampus, anterior cingulate cortex, and prefrontal cortex. These models posit that aberrant activity in these systems relates to altered emotional significance detection and affect regulation, providing a conceptual overlap with threat appraisal in psychosis, specifically attentional and attributional biases towards threat. It remains to be seen if direct examination of these biases using neuroimaging paradigms supports the theoretical integration of extant models of emotion processing and maladaptive appraisals in psychosis.

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1. Introduction

In recent years there have been calls for a re-evaluation of psychosis as a unitary construct with clearly defined diagnostic boundaries (Keshavan et al., 2011). This comes in the light of evidence from multiple fields of inquiry including genetics,

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neuroscience, epidemiology, and cognitive psychology (Kaymaz and van Os, 2010). Notable among these findings is that several major psychiatric disorders, including schizophrenia and bipolar disorder, show overlapping genetic risk (Serretti and Fabbri, 2013; Williams et al., 2010). This is particularly significant as the evidence is derived from large-scale genome-wide association studies, using the very techniques biological psychiatrists employ to bolster the categorical view.

In addition to undermining diagnostic boundaries, epidemiological studies show a continuity of psychotic experiences extending from clinical patients to the general population, with recent meta-analyses finding a much higher prevalence rate for subclinical psychotic experiences in the general population than the incidence rate of clinical psychotic disorder (Linscott and van Os, 2013; van Os et al., 2009). Sub-threshold experiences are generally associated with distress and impairment (DeVylder et al., 2015; Kelleher et al., 2015), and increase the risk of developing a psychotic disorder (Dominguez et al., 2011). However, a minority of individuals in the general population report persistent psychotic experiences without distress or help-seeking behaviour, and remain high functioning (Peters et al., 2016). The persistent experiences in this group are indistinct phenomenologically (Daalman et al., 2011; Heriot-Maitland et al., 2012) and at the level of brain activity (Barkus et al., 2007; Diederer et al., 2012) from clinically relevant psychotic symptoms, implying that these experiences are not in and of themselves pathological.

What constitutes a 'need for care' may therefore be determined by factors secondary to psychotic experiences, such as resulting distress and disability. Indeed, related distress, as well as the frequency, duration, and negative emotional valence of auditory hallucinations, has been found to provide greater predictive ability for distinguishing clinical patients from non-need for care individuals than topographical features such as loudness, location or personification (Johns et al., 2014). Similarly, associated distress and preoccupation, rather than degree of conviction, would appear to affect the clinical outcome of delusions (Lincoln, 2007; Peters et al., 1999; Sisti et al., 2012).

According to cognitive models of psychosis (Bentall et al., 2001, 2007; Garety et al., 2007, 2001; Morrison, 2001), a key influence in the distress experienced by 'need for care' individuals is the negative interpretation or 'appraisal' of anomalous experiences. Clinical groups tend to endorse maladaptive appraisals characterised by perceptions of external, personalised threat, in contrast to the benign or even positive appraisals reported by non-need for care groups (Brett et al., 2007; Lovatt et al., 2010; Ward et al., 2014), which in turn are predictive of less distress (Brett et al., 2014).

Reasoning, attentional, and attributional biases are thought to shape these threat-based appraisals (Garety et al., 2001). While the 'jumping-to-conclusions' (JTC) bias and attributional style in psychosis have been extensively studied (For a review, see Garety and Freeman, 2013), other biases remain relatively under-researched, with two recent questionnaires having been developed to help address this gap (Peters et al., 2014; van der Gaag et al., 2013). Pertinently, a recent review of the cognitive underpinnings of paranoid psychosis highlighted potentially applicable interpretation and information-processing biases that have previously been associated with affective disorders (Savulich et al., 2012). It was noted that while these biases have considerable supporting evidence within the affective literature, few experimental studies have been conducted linking them to psychosis.

In contrast, complementing the clinical literature is a considerable body of experimental and neuroimaging data on threat processing in anxiety and psychosis (Green and Phillips, 2004). Studies investigating social cognition and the neuroscience of threat have revealed findings which echo cognitive accounts of

appraisal in clinical research, even employing analogous terminology (Tone and Davis, 2012).

Altogether this demonstrates the need, as has been recently articulated (Garety et al., 2007; Howes and Murray, 2014), for a rapprochement of clinical, cognitive, and neurobiological approaches to threat appraisal in psychosis by integrating experimental and neuroimaging data from these multiple literatures. Additionally, bearing in mind the mounting evidence for psychosis lying on a continuum, it would be beneficial for research to focus on aetiologically relevant but non-disorder specific cognitive mechanisms in the pathway to psychotic illness. In this review, an attempt will be made to integrate multiple literatures on the cognitive and neural mechanisms underlying threat appraisal, relating them to psychosis. In order to better define the expansive term "appraisal", literature from several cognitive domains will be reviewed, including attention, reasoning, and interpretation. Subsequently, neurobiological models potentially relevant to the biases underlying threat appraisal will be outlined.

2. Need for care and appraisal in psychosis

As stated earlier, cognitive models of the positive symptoms of psychosis have in common the proposal that a principal factor in the transition to a 'need for care' is the cognitive 'appraisal' of the content and meaning of anomalous perceptual experiences. More specifically, Garety et al.'s model (Garety et al., 2007, 2001) suggests that individuals who appraise anomalous experiences as externally located, uncontrollable, and personally significant in nature, are more likely to experience distress and disability. Longitudinal studies of children and adults support these claims, indicating that the temporal relationship between hallucinatory experiences and patient status is cognitively mediated by negative beliefs and a perceived lack of control (Escher et al., 2002; Krabendam et al., 2004, 2005).

2.1. Defining appraisal

In considering research on appraisal across different literatures, a clear definition will aid in limiting the scope of summarised findings to only the most relevant data. The term 'appraisal' is in part derived from clinically-oriented, self-report data, and perhaps ill-suited to a strictly cognitive, experimental approach.

A more parsimonious definition established within the social cognitive literature states that appraisal is the classification of stimuli in terms of their emotional-motivational significance, which then gives rise to emotional responses (Roseman and Smith, 2001). Beyond emotional valence, appraisal establishes the personal relevance of a stimulus according to the individual's goals and needs (Ellsworth and Scherer, 2003). It is possible that in the case of patients with psychosis, anomalous perceptual stimuli have been evaluated as personally relevant to the goal of maintaining safety. Indeed, maladaptive appraisals often result in behaviours designed to nullify the perceived threat to one's safety (Dudley et al., 2012; Freeman et al., 2001; Gaynor et al., 2013).

2.1.1. Assessing appraisal

A particularly fruitful method of examining the role of appraisal in contributing to a need for care has been to compare patients with non-patient groups reporting psychotic symptoms. These non-patient groups are composed of individuals who report first-rank symptoms or psychotic-like experiences but have never sought nor required treatment, and cannot be considered prodromal (Bak et al., 2003; Linscott and van Os, 2013).

Assessing appraisals in these non-clinical individuals requires a measure appropriate for non-clinical contexts. The Appraisals of

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