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Thinking about thinking: an exploration of metacognitive factors in the development and maintenance of positive psychotic symptoms

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ABSTRACT

FACULTY OF SOCIAL AND HUMAN SCIENCES

Doctor of Clinical Psychology

THINKING ABOUT THINKING: AN EXPLORATION OF METACOGNITIVE FACTORS IN THE DEVELOPMENT AND MAINTENANCE OF POSITIVE PSYCHOTIC SYMPTOMS

By Catherine Louise Norman

The literature review discusses the role of metacognition, defined as the cognitive processes involved in 'thinking about thinking', in the development and maintenance of persecutory delusions and auditory hallucinations. Much of the literature points to a strong role for metacognitive beliefs in the experience of both clinical and non-clinical levels of these symptoms and evidence is emerging too for the importance of metacognitive strategies, for example thought control, in the maintenance of persecutory delusions. Research to date however, has relied predominantly on non-causal correlational methodology to investigate the relationship between metacognition and psychosis. In addition, there is some difficulty in discerning the contribution of metacognition to persecutory delusions and auditory hallucinations specifically, owing to combined analysis or inclusion of delusions that are not persecutory or hallucinations that are not auditory.

Overall, the findings of this review support the application of the Self-Regulatory Executive Model (S-REF) to the positive symptoms of psychosis and research strongly demonstrates the key role of affective processes in the

development and maintenance of clinical and non-clinical persecutory delusions and auditory hallucinations.

The study aimed to explore the role of metacognitive strategies and metacognitive awareness in the maintenance of distress in non-clinical paranoia. A 2x2 between-subject experimental design (paranoia x condition) was employed. Seventy-three non-clinical staff and students participated in the study and were randomised to an experimental condition including an anxiety-inducing task or control condition. All participants completed measures of paranoia, anxiety, self-focus, metacognitive strategies and metacognitive awareness.

Results demonstrated that participants with non-clinical paranoia experienced more paranoid cognitions, state and trait anxiety and used significantly more metacognitive strategies, including thought suppression. In addition, there was some evidence for lower metacognitive awareness in participants with high paranoia. These findings were not associated with condition. Future research and clinical implications in relation to the results are discussed.

Key words: Paranoia, metacognition, anxiety.

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The Literature Review

A review of the role of metacognition in persecutory delusions and auditory hallucinations

Introduction

This review will outline current models of the positive symptoms of psychosis before synthesising research that investigates the role of metacognition in the development and maintenance of persecutory delusions and auditory hallucinations. Metacognition, which will be described fully shortly, is the application of cognition about cognition (Wells, 2009). It involves appraisals and beliefs about thoughts and strategies implicated in the control of thinking, including thought suppression. Metacognition is the focus of this review because it has already been identified as a key process in the development and maintenance of emotional disorders and other key cognitive processes underlying emotional disorders have previously been hypothesised to play an important role in the development and maintenance of psychosis. Research has logically shifted its focus to metacognitive processes in psychosis. The review will also address the limitations of Varese and Bentall's review (2011) who investigated the role of metacognition in psychosis-related hallucinations. In addition, inclusion of both positive symptoms (delusions and auditory hallucinations) allows for a comparison of the role of metacognition. These are evident in other disorders, but will not be discussed here because this review focuses on hallucinations and delusions within a psychosis context. See Baethge et al. (2005) for a review of hallucinations in Bipolar disorder.

To the author's knowledge, no review has investigated the role of metacognition in persecutory delusions. Varese and Bentall (2011) investigated the relationship between cognitive intrusions and hallucination-proneness, and the role of metacognition in the maintenance of hallucinatory experiences. In brief, their review suggested that there is insufficient support for a unique contribution of metacognition in the association between intrusions and hallucinations. Instead, metacognitive beliefs may constitute a general vulnerability factor in both the development of emotional and psychotic disorders.

Although this review highlighted the potential role of metacognition in hallucinations, it was limited by its reliance on the Meta-Cognitions Questionnaire (MCQ; Cartwright-Hatton & Wells, 1997) to identify relevant studies. This is a trait self-report measure of beliefs and processes associated with one's thoughts. Descriptions of the measure's subscales are reported in Appendix A. The authors restricted their search on this basis to make statistical comparisons in the meta-analysis. However, metacognition is broader in scope than metacognitive beliefs alone, limiting the inclusion of studies that investigated other metacognitive processes.

Further reasons why this review focuses on persecutory delusions and auditory hallucinations are as follows: firstly these positive symptoms represent the hallmark of psychosis; they are the most common (Baker & Morrison, 1998), disabling and distressing psychotic symptoms seen clinically and frequently co-occur (Laroi & Van der Linden, 2005). They also dominate the diagnostic criteria for schizophrenia in the Statistical Manual of Psychiatric Disorders Text Revision (DSM-IV TR; American Psychiatric Association [APA], 2000). Secondly, the current psychological literature in psychosis is increasingly focused on symptoms rather than syndromes in order to understand the psychological processes involved in maintenance, and how to produce change. Thirdly, these symptoms have received the most attention in metacognitive research due to the parallels found with anxiety.

Recent research suggests that psychosis may share the same underlying maintaining processes as anxiety (Clark, 1999; Freeman & Garety, 2003). For example, Freeman (2007) hypothesised that emotional reasoning and cognitive biases including jumping to conclusions maintain persecutory delusions. Earlier research by Moorey and Soni (1994) demonstrated significantly higher levels of anxiety in patients with schizophrenia than a non-clinical group highlighting an overlap between 'neuroses and

psychosis'. This research suggests that anxiety and psychosis co-occur and may share underlying psychological processes.

There has been a recent shift in the psychological conceptualisation of psychosis. The validity of the traditional diagnostic label of schizophrenia has been challenged and deemed an unhelpful way of understanding and treating psychosis (Bentall, 1990; Chadwick, 2006). There are two reasons for this shift; firstly the 'syndrome' approach suggests a stark difference between ill and well which is not supported by the literature. Secondly, a syndrome approach does not allow for idiosyncratic understanding, which is important given the heterogeneity of symptoms experienced (Morrison, Haddock & Tarrier, 1995). This helped to shift the focus of intervention to distress rather than symptoms, with metacognitive processes hypothesised to contribute to this distress (Garety & Hemsley, 1994).

Metacognitive processes feature in two key cognitive-behavioural models that offer a psychological understanding of positive psychotic symptoms, (Garety, Kuipers, Fowler, Freeman & Bebbington, 2001; Morrison, 2001). Morrison (2001) characterises psychotic symptoms (for example a voice tells a father to hit his child) as 'intrusions'. Psychological difficulties occur when this 'intrusion' is appraised as culturally-unacceptable (e.g. 'the devil is telling me to harm my child'). Positive and negative metacognitive beliefs (e.g. 'punishing myself will control my unwanted thoughts') positively reinforce the interpretation of the 'intrusion' and lead to unhelpful cognitive and behavioural coping strategies such as drug-taking. Metacognitive beliefs can also be influenced by mood, including anxiety, which directly affects the meaning attributed to the anomalous experience. Garety et al. (2001) propose that specific cognitive processes lead to the formation and maintenance of positive symptoms. Negative metacognitive beliefs (for example about the uncontrollability of thoughts) increase distress associated

with the anomalous experience. Symptom-specific models will be discussed later in the review.

While traditional cognitive-behavioural therapy (CBT) for psychosis focuses on misinterpretation and has proved effective at reducing comorbid symptoms including depression, outcomes linked directly to hallucinations and delusions are lacking and CBT has no clear benefit over other psychosocial interventions (Jones, Hacker, Cormac, Meaden & Irving, 2012). In addition, treatment often fails to significantly reduce the distress associated with positive symptoms (Mawson, Cohen & Berry, 2010). A narrow focus on understanding and altering the *content* of delusions (Freeman & Garety, 2000) and how this maintains psychosis may explain this. Arguably, other processes, such as the *process* of cognition (including metacognition), require targeting to improve patients' quality of life.

The continuum approach has broadened the scope of metacognitive-psychosis research beyond clinical populations. Epidemiological studies demonstrate that paranoia is widely experienced in the non-clinical population (Ellett, Lopes & Chadwick, 2003; Freeman et al., 2008a; Freeman et al., 2008b), with recent estimates suggesting that 18.6% of the UK population experiences low-level suspiciousness (Freeman et al. 2011). Studies have found similar rates of delusions (17.5%) and hallucinations at a non-clinical level (van Os, Hanssen, Bijl & Ravelli, 2000; Varese, Barkus & Bentall, 2011).

This supports the Paranoia Hierarchy (Freeman, 2007), which suggests that persecutory delusions are not dissimilar from beliefs experienced by the general population. It appears that experiencing paranoia or hallucinations is not sufficient to lead to distressing psychosis requiring mental health input. It is therefore important to understand the causes of distress. This may distinguish clinical from non-clinical populations (Freeman, 2007).

In summary metacognition, broadly termed 'thinking about thinking', is gaining much attention in the understanding of positive psychotic symptoms. It is hypothesised that distress associated with delusions may be partially influenced by uncontrollability of thoughts about the beliefs held, rather than the content of the delusion itself (Freeman & Garety, 2004). As hallucinations and delusions are cognitive phenomena, it is important to examine cognitive processes, such as metacognition, that may play a part in the development and maintenance of associated distress.

Definition of Terms

Metacognition. Metacognition is defined as 'knowledge and cognition about cognitive phenomena' (Flavell, 1979, p. 906), focussing particularly on one's own cognitive processes (Williams, Watts, MacLeod & Mathews, 1997). Metacognitive research has been highly influential in the psychological conceptualisation of emotional disorders, most notably generalised anxiety disorder (GAD). Metacognitive processes (Wells & Carter, 2001), are hypothesised to explain why worry becomes chronic, leading to GAD. Wells (1995) elaborated on this definition, proposing that metacognition is characterised by metacognitive beliefs, which refer to the process of thinking or the content of thoughts. In GAD, individuals may hold the metacognitive belief that 'worry is uncontrollable' and an individual with auditory hallucinations may believe, 'I can't control these voices in my head', 'this means I am going mad'. The distress this provokes leads to maladaptive metacognitive strategies designed to control distress or their appraisals, namely thought suppression, rumination or thought control (Freeman & Garety, 2004). These metacognitive strategies prevent disconfirmation of negative beliefs and hence maintain anxiety and psychological disorder.

'Intrusions' in emotional disorders (for example in obsessive-compulsive disorder) activate beliefs about the significance of intrusions. The Self-Regulatory Executive Function model (S-REF) is a metacognitive model of psychological disorder (Wells, 2007; Wells & Matthews 1994). Research suggesting that anxiety and psychosis share underlying processes has sparked interest in its application to psychosis. The Cognitive Attentional Syndrome (CAS), a central feature of this model, represents a dysfunctional thinking style including worry and rumination which is responsible for psychological disorder. Maladaptive metacognitive coping strategies (for example thought control) lead to the CAS, increasing worry by maintaining the individual's sense of threat (Wells, 2009). The CAS focuses attention on potential sources of threat and is controlled by beliefs about thinking (including positive and negative beliefs), which contribute towards the worry and ruminative thinking style. Wells (2007) suggests that these thinking styles are ignored by traditional cognitive theory in which core beliefs are paramount (Beck, 1976). Wells (2007) proposes that core beliefs are driven by metacognition and therefore altering the belief alone is insufficient for change.

Much of metacognitive research focuses on maladaptive processes. An adaptive component outlined by Teasdale et al. (2002) is meta-awareness, which is the ability to view thoughts and feelings as 'mental events rather than the self' (Teasdale et al., 2002, p. 275). How individuals relate to their thoughts determines whether thoughts are appraised as benign or threatening. Low meta-awareness has been implicated in vulnerability to depression (Teasdale et al., 2002). Meta-awareness has not to the author's knowledge been investigated in psychosis research to date.

Positive psychotic symptoms. There is general agreement that delusions are 'a substantial break with reality' (Bell, Halligan & Ellis, 2006). Freeman and Garety (2000,

2004) have attempted to define persecutory delusions to provide clarity to researchers investigating them. Individuals experiencing persecutory delusions believe that a perpetrator intends to cause physical, social or psychological harm. Crucially, this causes distress to the 'persecuted' individual. Hallucinations are a distortion of perception (APA; DSM-IV-TR). Auditory hallucinations are defined as 'audible thoughts, a discussion or argument about the patients or voices describing the patient's ongoing activity' (Morrison et al., 1995, p. 266).

Method

Databases PsycInfo, Web of Knowledge, Embase and Medline (PubMed) were used to identify literature for the present review. Only recent papers published in English with adult populations and with a primary focus on persecutory delusions or auditory hallucinations were included. The search terms used to identify literature were paranoia & metacognit*, persecutory delusions & metacognit*, hallucinat* & metacognit* and schizophreni* & metacognit*. The reference lists of chosen articles were also inspected to identify additional relevant papers. Only published literature was included. Non-clinical studies were included if they attempted to inform clinical psychosis research. A total of 290 hits were returned and 35 articles were relevant. Figure 1 depicts the flow-chart of literature selection.

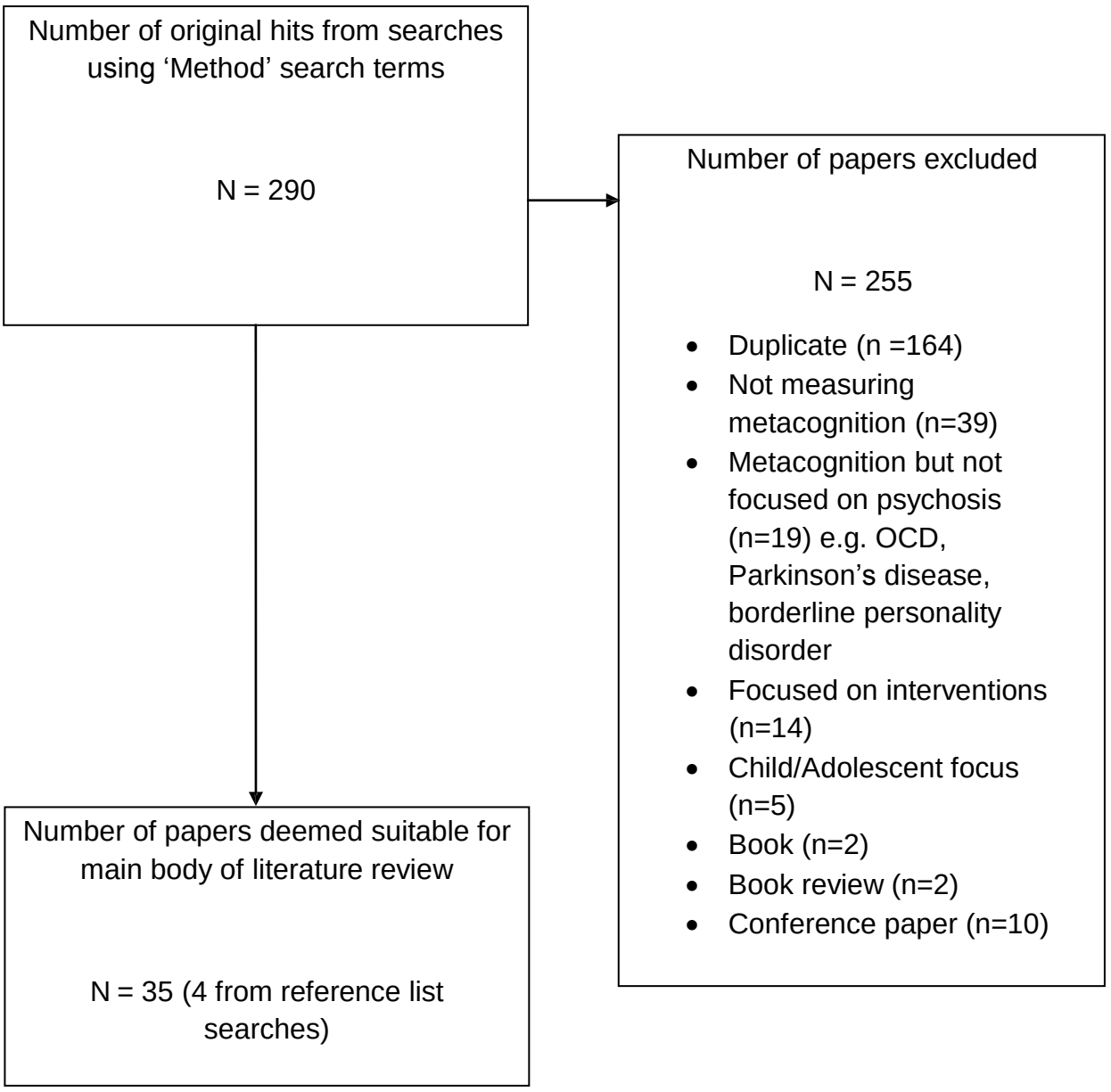

Figure 1. Process of literature selection

Metacognition and Persecutory Delusions

A model (Freeman, Garety, Kuipers, Fowler & Bebbington, 2002) that influenced the psychological understanding and treatment of persecutory delusions, with its focus on cognitive maintenance factors, will be outlined before critiquing the literature examining metacognition and persecutory delusions.

Freeman et al. (2002) propose that anxiety and depression contribute towards vulnerability to persecutory delusions. Anomalous (or unusual) experiences are interpreted as delusions by individuals who demonstrate a tendency to jump to conclusions, which limits the amount of information collected before coming to a conclusion. Pre-existing beliefs about the self (for example 'I deserve harm'), others and the world increase the likelihood of a delusional interpretation. The choice of explanation for anomalous experiences is mediated by beliefs about mental illness, generated as a result of the occurrence of the anomalous experience. Freeman et al. (2002) suggest that beliefs about mental illness (e.g. 'I'm going mad') cause more distress than the belief that they are being persecuted. Therefore the least distressing explanation (persecution from an external source) is chosen to reduce cognitive-dissonance.

Once this explanation is chosen, persecutory delusions are positively reinforced by the relief that comes with an external attribution. A bias towards collecting confirmatory evidence, (for example, 'that man was staring menacingly at me') and acting in a way consistent with the belief, (for example being constantly on-guard) also maintains the delusion. Anxiety is thought to lead to this sense of threat and is also a product of the appraisal of the paranoid thoughts[1]. Will research support the existence of

[1] For example, anxiety may lead to the threat belief 'that man is watching me' and this might be appraised as 'he wants to hurt me', causing further anxiety.

negative metacognitive beliefs and anxiety in the development and maintenance of delusions?

Six studies have examined the role of metacognition in persecutory delusions (Table 1). The majority of these studies draw on the S-REF model (Wells & Matthews, 2004) and lend support for the role of metacognition in both the development and maintenance of persecutory delusions. Two studies (Freeman & Garety, 1999; Morrison & Wells, 2000) examined the use of thought control strategies[2] in patients with delusional beliefs. Freeman & Garety (1999) also explored the role of meta-worry (defined as worry about worry) in the maintenance of delusional beliefs. This study is discussed in detail as it is one of the first to provide support for the key role of anxiety in persecutory delusions at a comparable level to GAD. Metacognitive strategies were measured using the TCQ (Wells & Davies, 1994) and a purpose-designed questionnaire measured meta-worry.

Seventy percent of participants with persecutory delusions and 86% of participants with GAD frequently reported uncontrollability of thoughts. Participants with GAD were more likely to report negative beliefs about worry (12/14) compared to participants with persecutory delusions (8/13). One quarter of each group reported positive beliefs about worry. Similar levels were also found for poor success at controlling worry. Despite the high levels of uncontrollability of thoughts, both clinical groups did not differ on either total or subscale TCQ score and were comparable to Wells and Davies' (1994) control group, suggesting a 'normal' level of thought control in these clinical samples. Meta-worry also correlated highly with delusional distress, suggesting that meta-processes contribute to distress. Furthermore, trait anxiety strongly correlated with meta-worry and distress. This study demonstrates the need to investigate metacognitive processes in persecutory delusions, given comparable levels of meta-worry

[2] Thought control strategies are designed to manage unpleasant thoughts, for example, 'I punish myself for thinking the thought' (Wells & Davies, 1994).

found in these clinical groups. Results must be interpreted with caution; the use of an unvalidated measure, small sample and lack of control group mean that generalisation of findings is problematic.

Other studies examined thought control strategies using the TCQ (Wells & Davies, 1994) with non-patient control groups rather than clinical groups. In line with Morrison and Wells's (2000) hypothesis, patients used significantly more 'worry[3]' and 'punishment[4]' strategies than non-patients, similar to the findings of Newman-Taylor, Graves and Stopa (2009) in a non-clinical population, and less 'distraction'. Morrison and Wells (2000) concluded that low 'distraction' represents an indicator of positive mental health. Owing to the different comparison group, results contrasted to Freeman and Garety (1999). Morrison and Wells (2000) found preliminary support for use of more dysfunctional thought control strategies in psychosis. Although it is likely that the majority of patients held persecutory beliefs, the type of belief was not specified. In addition, half of the patient group also experienced auditory hallucinations, making the unique contribution of thought control strategies in delusional beliefs difficult to determine.

Recent research has taken the investigation of metacognition a step further and explored the interaction between metacognition and psychological wellbeing among participants with persecutory delusions and major depression when compared to non-clinical participants (Valiente, Prados, Gomez & Fuentenebro, 2012). Although both clinical groups demonstrated elevated levels of dysfunctional metacognitive beliefs (MCQ-30; Wells & Cartwright-Hatton, 2004) compared to the control group, participants with depression reported higher levels of 'uncontrollability and danger' and 'lack of cognitive confidence' than participants with persecutory delusions. Interestingly,

[3] A worry item is 'I dwell on other worries'.
[4] A punishment item is 'I tell myself not to be stupid'.

participants displaying frequent persecutory thinking and preoccupation with their own thoughts ('cognitive self-consciousness) reported better wellbeing, suggesting that preoccupation with thoughts is viewed as a positive metacognitive factor. However, the exact relationship between wellbeing and metacognitive beliefs cannot be determined using a correlational design. Therefore, akin to GAD in which worrying is appraised as helpful, the presence of positive metacognitive beliefs associated with persecutory delusions may increase preoccupation with thoughts, which reinforces the delusion. This limits the ability or reduces the inclination to decentre (or step back) from thoughts with metacognitive awareness.

Several of the studies discussed above have investigated positive beliefs about worry. While Valiente et al. (2012) and Freeman and Garety (1999) found no differences in reported levels of positive beliefs between patients with persecutory delusions, depression or GAD, the following research found differing results.

Patients with persecutory delusions scored higher than patients with panic on the MCQ-65 subscale 'positive beliefs about worry'[5] (Fraser, Morrison & Wells., 2006). There was also an association between the Psychotic Symptom Rating Scales (PSYRATS; Haddock, McCarron, Tarrier & Faragher, 1999) delusion ratings, 'general negative beliefs' (including items relating to suspicion and responsibility), beliefs about the 'uncontrollability and danger of thoughts' and 'cognitive self-consciousness'.

In addition, patients with delusions reported comparable levels of meta-worry (Anxious Thoughts Inventory [AnTI]; Morrison & Wells, 2007) to anxious patients. However, meta-worry did not significantly contribute to delusional distress, although social worry did, supporting the social-evaluative basis of paranoia (Freeman, 2007).

[5] For example, worry helps to problem-solve.

Therefore, meta-worry and beliefs were related to delusions, but this study suggests that meta-worry does not predict delusional distress.

Only one multi-site study examined metacognitive beliefs relating specifically to clinical paranoia (Morrison et al., 2011). The BaPS (Morrison et al., 2005) assesses metacognitive knowledge and has demonstrated good internal consistency (α=.89-.91) for the subscales ('negative beliefs' and 'beliefs about paranoia as a survival strategy'), but poorer internal consistency for 'positive beliefs' and 'normalising beliefs'.

Although caution must be taken owing to poor internal consistency, positive beliefs about paranoia positively correlated with suspiciousness, which suggests that as suspiciousness increases, the value of remaining 'paranoid' is reinforced. Morrison et al. (2011) concluded that findings support the S-REF model; beliefs about cognitive processes contribute to the predisposition and maintenance of psychological difficulties. Patients endorsed more negative and positive beliefs about paranoia than non-patients. This builds on the findings of Freeman & Garety (1999), who found a positive association between delusional distress and meta-worry regarding control of delusional-related worries. However, the use of convenience sampling limits generalisation.

Morrison et al. (2011) developed a metacognitive model of clinical paranoia to explain these findings. Positive beliefs about paranoia (for example, 'my paranoia is a coping strategy') are triggered by the onset of a stressful life event. These positive beliefs lead to specific paranoid thoughts that activate negative beliefs about paranoia. A catastrophic interpretation of this paranoia leads to distress and negative emotions and both behavioural and thought control strategies reinforce the paranoia.

Overall, there is evidence for the presence of general metacognitive strategies in participants with persecutory delusions to a comparable degree to people with emotional disorders (Freeman & Garety, 1999) or elevated (Morrison & Wells, 2000). General and

paranoia-specific metacognitive beliefs appear to have a reinforcing role in the paranoia experience (Morrison et al., 2011) and again are comparable to panic or depressed populations or elevated (Fraser et al., 2006; Valiente et al., 2012). In addition, anxiety, cited as key in the development of persecutory delusions (Freeman et al., 2002) contributes substantially to this relationship, correlating highly with meta-worry (Freeman & Garety, 1999), lending tentative support to the hypothesis that the appraisal of a threat belief leads to anxiety (Freeman et al., 2002). However, to date, meta-worry has not been shown to predict delusional distress. Individuals with persecutory delusions have been compared to a wide-range of clinical groups, including major depression and GAD, which might in part explain the mixed results. Furthermore, persecutory delusions have not been fully defined, with a wide-range of diagnoses included, making the unique contribution of metacognition in persecutory delusions difficult to determine.

Table 1

Characteristics of included persecutory delusions papers

Authors	Symptom studied	Design	Sample demographics	Instrument used to assess metacognition	Main Findings
Freeman & Garety (1999)	Persecutory delusions	Cross-sectional	- Patients with persecutory delusions (n=15; 2 with DSM-IV delusional disorder & 13 with DSM-IV Paranoid Schizophrenia) - Patients with DSM-IV GAD (n=14).	TCQ	-Both groups experienced meta-worry, positive and negative beliefs about worry and uncontrollability of thoughts.
Morrison & Wells (2000)	DSM-IV Schizophrenia with delusional beliefs	Cross-sectional	-Patients with delusional beliefs (n=22). -Students and staff (n=22).	TCQ	- Patients with schizophrenia used different strategies.

Fraser, Morrison & Wells (2006)	DSM-IV Delusional disorder or Schizophrenic spectrum disorder experiencing persecutory delusions	Between-groups experimental design	-Persecutory delusions (n=15). - Psychiatric control group with Panic Disorder (n=15). -Non-clinical controls (n=15).	MCQ-65 IUS	-No significant difference between persecutory and panic groups accept for 'positive beliefs about worry'.
Valiente, Prados, Gomez & Fuentenebro (2012)	DSM-IV schizophrenia paranoia type; Schizophreniform disorder; schizoaffective disorder; delusional disorder; brief psychotic disorder; psychotic disorder not specified.	Cross-sectional	-Patients with persecutory beliefs (n=55). - Patients with Major Depression (n=38). - Healthy control participants (n=44).	MCQ-30	- Patients with depression and persecutory beliefs reported metacognitive beliefs. -No differences among groups on positive beliefs about worry.

Morrison et al. (2011)	Clinical Paranoia SCID for DSM-IV	Correlational	-Patients with schizophrenia spectrum disorder (n=122). - Students (n=178).	BaPS	-Stronger associations found between paranoia-related beliefs and clinical paranoia.
Morrison & Wells (2007)	DSM-IV Schizophrenia Spectrum disorder (schizophrenia; Schizoaffective; schizophreniform disorder.	Correlational	- Patients with schizophrenia spectrum disorder (n=51). -Anxiety disorder group with DSM-IV social phobia and panic disorder (n=40). - Non-clinical undergraduate students	AnTI meta-worry subscale	-Clinical groups demonstrated higher level of worry.

(n=60).

Note. TCQ = Thought Control Questionnaire; MCQ-65 = Metacognitions Questionnaire-65; MCQ-30 – Metacognitions Questionnaire-30; IUS = Intolerance of Uncertainty Scale; BaPS = Beliefs about Paranoia Scale; AnTI = Anxious Thoughts Inventory; PSYRATS = Psychotic Symptoms Rating Scales

Metacognition and Non-Clinical Paranoia

Studies of metacognition in non-clinical paranoia suggest anxiety is a key mediator between paranoia and metacognition, in line with Freeman et al. (2002) who suggest that anxiety is central in both the formation and maintenance of persecutory delusions. Studies are reported in Table 2.

Two studies investigated thought control and thought suppression in non-clinical paranoia (Jones & Fernyhough, 2008; Newman-Taylor et al., 2009). Newman-Taylor et al. (2009) hypothesised that trait paranoia, measured using the Paranoia Scale (Fenigstein & Vanable, 1992) would be positively associated with the thought control strategies 'punishment' and 'worry' measured by the TCQ (Wells & Davies, 1994), since these strategies had already been implicated in persecutory delusions.

As predicted, these strategies alongside 'reappraisal[6]' correlated significantly with trait paranoia. However, regression analysis revealed that paranoia only uniquely predicted 'reappraisal' and anxiety uniquely predicted both 'punishment' and 'worry'. Without anxiety, the relationship between paranoia and thought control was weak. Anxiety may mediate the relationship between metacognition and paranoia; with anxiety increasing the likelihood of dwelling and self-punishing in the presence of paranoid thoughts, maintaining the sense of threat.

Jones and Fernyhough (2008) were the first to investigate the relationship between thought suppression and non-clinical persecutory beliefs. They predicted that anxiety, central to the development (Freeman, 2007) and maintenance of persecutory delusions (Freeman et al., 2002) would moderate the relationship between thought suppression and persecutory-like beliefs. Thought suppression only predicted persecutory-like beliefs when anxiety was high,

[6] A 'reappraisal' item is 'I focus on the thought and challenge it'

implicating thought suppression in distress. Further, thought suppression and anxiety only predicted a relatively small amount of variance of persecutory beliefs. Therefore thought suppression is one of many contributing factors for persecutory-like beliefs.

Of note is the variety of measures used to identify paranoia; the PS (Fenigstein & Vanable, 1992), Paranoia Checklist (PC; Freeman et al., 2005) and Persecutory Ideation Questionnaire (PIQ; McKay, Langdon & Coltheart, 2007). Whereas the PS, designed for a non-clinical population, consists mainly of lower-level paranoia items, the PC measures distress, frequency and conviction of items that are hypothesised to be more closely related to clinical paranoia. Similarly, to the PS the PIQ asks participants to endorse the 'trueness' of each item, but is designed for use with clinical and non-clinical populations. Therefore, the findings for thought control and suppression could be related to distress, frequency or simply endorsement of paranoid beliefs.

While research exploring thought control strategies in non-clinical paranoia is limited, other research has used different methodology (for example controlling for the influence of anxiety) to explore the role of metacognitive beliefs in the development of paranoid ideation (Garcia-Montes, Cangas, Perez-Alvarez, Hidalgo & Gutierrez, 2005; Palmier-Claus, Dunn, Morrison & Lewis, 2011). 'Positive beliefs about worry' and 'lack of cognitive confidence' correlated positively with paranoia (Garcia-Montes et al., 2005). However, when trait anxiety was controlled, only 'lack of cognitive confidence' remained a significant predictor of paranoid ideation. Therefore lack of trust in one's own memory and poor attention may lead to the development of cognitive biases and metacognitive strategies including rumination. Here metacognition may contribute towards vulnerability, with findings that partially support its prediction of paranoid ideation. However the influence of anxiety found also by Newman-Taylor et al. (2009) bears heavily on findings. The investigation of thought control strategies

is not reported, potentially indicating a non-significant effect, which may have contrasted with the results of Newman-Taylor et al. (2009).

Metacognitive beliefs as a vulnerability factor in predisposition to paranoia have also been investigated using an experimental design (Palmier-Claus et al., 2011). Seventy non-clinical participants were randomised to a neutral or stress-inducing condition. Interactions between stress and beliefs about controlling one's thoughts and beliefs about the uncontrollability of thoughts and danger predicted negative affect. Main effects of negative affect across conditions were found for 'lack of cognitive confidence' and 'uncontrollability and danger of thoughts'. Preoccupation with one's own thoughts moderated the relationship between negative affect and suspiciousness, suggesting that cognitive self-consciousness is most closely related to paranoia. Palmier-Claus et al.'s (2011) measure of negative affect included anxiety, however other emotions were also factors including sadness and loneliness, making it difficult to add further evidence to a hypothesised relationship between anxiety, metacognition and paranoia. Studies that allow for path analyses may be useful in clarifying these relationships.

The research investigating the role of metacognition in clinical and non-clinical paranoia suggests that metacognitive strategies and beliefs are shared by individuals across the continuum. However, what has not been investigated is a direct comparison between clinical and non-clinical paranoia groups to investigate whether individuals at the severe end of the spectrum demonstrate more conviction in metacognitive beliefs, more frequent use of thought control strategies and levels of anxiety to determine the metacognitive factors that may contribute to the transition from non-clinical to clinical levels of paranoia.

Major flaws across these studies include the absence of power calculations to determine sample size, correlational designs, no clearly articulated hypotheses, failure to

control for order effects (Garcia-Montes et al. 2005), and poor response rates, which may represent a selection bias (Newman-Taylor et al. 2009).

Table 2

Characteristics of included non-clinical paranoia papers

Authors	Symptom studied	Design	Sample demographics	Instrument used to assess metacognition	Main findings
Garcia-Montes, Cangas, Perez-Alvarez, Hidalgo & Gutierrez (2005)	Paranoia (PS)	Correlational	Non-clinical undergraduates (N=148).	MCQ-65 TCQ	-Highlights the role of anxiety in the relationship between paranoia and metacognition.
Newman-Taylor, Graves & Stopa (2009)	Paranoia (PS, PCQ)	Correlational	Non-clinical individuals (N=108).	TCQ	- Anxiety is highlighted as a major contributing factor to the relationship between paranoia and anxiety.
Palmier-Claus , Dunn, Morrison &	Paranoia (PC)	Cross-sectional	Non-clinical undergraduates (N=70).	MCQ-30	-Metacognitive beliefs moderated the association between stress

Lewis (2011)					and negative affect and negative affect and suspicious thinking.
Jones & Fernyhough (2008)	Persecutory delusion-like beliefs (PIQ)	Correlational	Non-clinical undergraduates (N=183).	WBSI	- Only when anxiety levels were high did thought suppression have a significant effect on persecutory-like beliefs.

Note. PS = Paranoia Scale; PCQ = Paranoid Cognitions Questionnaire; PC = The Paranoia Checklist; PIQ = Persecutory Ideation Questionnaire; MCQ-65 = Metacognitions Questionnaire-65; TCQ = Thought Control Questionnaire; MCQ-30 = Metacognitions Questionnaire-30; WBSI = White Bear Suppression Inventory.

Metacognition and Clinical Auditory Hallucinations

The following section will outline the contribution of metacognition to the development and maintenance of auditory hallucinations. Does it compare to the role that metacognition plays in persecutory delusions? Descriptions of studies are reported in Table 3.

Morrison et al. (1995) developed the first comprehensive cognitive model of auditory hallucinations. Although there is consensus that hallucinations occur when internal cognitive events are misattributed to an external event, the causes of this misattribution are disputed. Morrison et al. (1995) suggest that the content of an auditory hallucination, similar to 'intrusive' thoughts in OCD, is inconsistent with beliefs about the self and therefore is attributed externally. Cognitive-dissonance reinforces the hallucination (Morrison et al., 1995). Crucially to this review, metacognitive beliefs regarding the controllability and acceptability of mental events are predicted to contribute towards a vulnerability to auditory hallucinations. Metacognitive beliefs are also hypothesised to be maintaining factors; the appraisal of the symptom, including metacognitive beliefs, leads to emotional and behavioural responses, which reinforce the intrusive thought.

Morrison (1998) later emphasised parallels in the processes that maintain anxiety and psychosis, arguing that auditory hallucinations are fundamentally normal, becoming problematic when they are misinterpreted as threatening, much like bodily sensations in panic disorder, leading to negative emotions such as anxiety and physiological arousal. The perception of hallucinations as threatening may be explained by metacognitive beliefs about the uncontrollability and danger of the anomalous experience. This misinterpretation also leads to cognitive and behavioural safety-seeking behaviour which prevents disconfirmation of the perception of danger related to the hallucination, and increases their frequency.

The metacognitive conceptualisation of auditory hallucinations was taken a step further by the proposition that hallucinations are the direct product of metacognitions (Wells, 2007). Metacognitive beliefs about the significance of hearing voices (thoughts) drive their appraisal and voices become distressing once strategies such as thought control are used. Therefore, altering the content of an auditory hallucination alone would be insufficient as it would not target metacognition. This implies that an exploration of metacognitive factors is warranted to ensure the underlying maintenance factors are fully understood.

Morrison et al. (1995) predict that negative metacognitive beliefs are associated with emotional and behavioural responses to anomalous experiences. The model however does not implicate a role for metacognitive strategies, which may maintain auditory hallucinations.

The contribution of metacognition to auditory hallucinations at a clinical level is difficult to clarify owing to the inclusion of a range of hallucinatory experiences and other psychotic symptoms in research studies, including persecutory delusions. Evidence overall suggests that negative beliefs about 'uncontrollability and danger' maintain auditory hallucinations (Baker & Morrison, 1998; Hill, Varese, Jackson & Linden., 2012; Perona-Garcelan et al., 2012). In addition, the following studies provide partial support to Morrison et al.'s (1995) prediction about the presence of negative metacognitive beliefs, but only Hill et al. (2012) investigated and found evidence for an association between general negative beliefs and distress.

However, some research has not found this association (Garcia-Montes, Perez-Alvarez, Balbuena, Perona-Garcelan & Cangas., 2006a) due perhaps to the inclusion of visual hallucinations, and there is limited evidence for a role of positive metacognitive beliefs, (both general and voice-specific) in the development and maintenance of auditory hallucinations (Morrison et al., 2004). Other metacognitive factors including experiential avoidance (Goldstone et al., 2012) are not implicated in the maintenance of auditory hallucinations.

One of the first studies to investigate the role of metacognition in psychosis aimed to clarify the cognitive processes implicated in the development and maintenance of auditory hallucinations (Baker & Morrison, 1998). Participants with current auditory hallucinations scored significantly higher than non-patients on all MCQ-65 (Cartwright-Hatton & Wells, 1997) factors except 'cognitive self-consciousness' and scored significantly higher than both non-patients and the non-hallucinating psychotic group on 'positive beliefs' and 'negative beliefs about uncontrollability and danger'. 'Cognitive confidence' and 'general negative beliefs' were also significantly more endorsed by both clinical groups compared to controls, suggesting the importance of metacognitive beliefs in psychosis as a whole. Only beliefs about 'uncontrollability and danger' significantly predicted auditory hallucinations. The level of delusions (type not specified) in both clinical groups were comparable, making the unique contribution of metacognition in auditory hallucinations easier to clarify. Akin to much of the persecutory delusions research, individuals who currently experience auditory hallucinations believe that worry must be controlled in order to remain safe.

Subsequent studies have found differing results which may be explained by more robust study designs using several comparison groups and controlling for mediating effects of affect (Garcia-Montes et al., 2006a; Lobban, Haddock, Kinderman & Wells., 2002; Perona-Garcelan et al., 2012). Lobban et al. (2002) controlled anxiety and depression when comparing the role of metacognition in current voice-hearers, participants who had never heard voices, anxious participants and non-patient controls. A shortened and modified version of the MCQ (MCQ-SAM) was developed adding items assessing the consistency and voluntariness of thoughts. When anxiety and depression were controlled, hallucinating and anxious patients had significantly lower confidence in their cognitive processes than non-hallucinators and non-patient groups, and attributed higher importance to the consistency of thoughts. This suggests that individuals with auditory hallucinations believe that thoughts

need to be consistent and that inconsistent thoughts are abnormal, which could explain their attribution as external. Interestingly, there were no group differences on the normality of having unwanted thoughts. Results differed from Baker and Morrison (1998). Although trends were present, no significant differences were found between groups on 'positive beliefs about worry' or 'uncontrollability' by Lobban et al. (2002) once affect was controlled. The MCQ-SAM demonstrated low internal consistency with the additional subscales, threatening its reliability as a measure of metacognition.

The only small but significant predictor of auditory hallucinations found by Perona-Garcelan et al. (2012) was the need to control thoughts. In contrast to Lobban et al. (2002), the anxious group included participants with disorders in which dysfunctional metacognitions are a vulnerability and maintenance factor. Except 'cognitive confidence', patients with auditory hallucinations scored higher than the non-clinical group on metacognitive beliefs. They also scored higher than recovered patients on 'uncontrollability and danger of thoughts', which suggests that this metacognitive belief may be important in the maintenance of auditory hallucinations, rather than a general vulnerability factor. Crucially, differences were lost when current hallucinators were compared with patients with current delusions. Like many studies already discussed, the current auditory hallucinations group also included participants with delusional symptoms. In addition, Perona-Garcelan et al. (2012) failed to report differences between the hallucinating and anxious groups, suggesting a bias in reporting of results.

Members of the same research group (Garcia-Montes et al., 2006a) included similar control groups, with the addition of an OCD group. Hypotheses were based upon Morrison et al. (1995) and the comparison between intrusive thoughts in anxiety and auditory hallucinations and given this, predicted that psychotic patients with auditory hallucinations would demonstrate similar metacognitive beliefs to patients with OCD. Apart from the

'never' hallucinated and 'recovered' hallucinators, the non-clinical control group scored lower than other clinical groups on 'uncontrollability and danger', providing evidence for the role of metacognitive processes in both hallucinations and anxiety. Furthermore, current hallucinators and patients with OCD demonstrated similar levels of 'general negative beliefs', which is unsurprising given the strong role of responsibility in the maintenance of OCD. Endorsement of 'cognitive self-consciousness' was comparable between these groups and the clinical control group. Garcia-Montes et al., (2006a) highlighted similar patterns of preoccupation with thoughts and of attaching significance to negative thoughts among hallucinating and anxious groups.

Metacognitive beliefs did not predict predisposition to hallucinations. However, 'general negative beliefs' was near significance for the current hallucinators and 'uncontrollability and danger' was near significance for the 'never' hallucinated group, differing from the findings of Baker and Morrison (1998). The inclusion of anxious participants could not have impacted on this finding, since the clinical groups were analysed separately, suggesting that without anxiety the relationship between metacognition and hallucinations is weakened. In addition, hallucination-type was not distinguished and the sample may have included other hallucination types.

Recent research has addressed the role of metacognitive beliefs in the development of distress associated with auditory hallucinations (Hill et al., 2012). Clinical voice-hearers scored significantly higher than both control groups on negative beliefs about worry and negative beliefs about the need for control. The two control groups did not differ on metacognitive beliefs, which suggests metacognitive beliefs are not associated with non-clinical voice-hearing. Voice-hearer distress was related to 'uncontrollability and danger' of thoughts and 'lack of cognitive confidence' and statistically-significant associations were

found between anxiety and all metacognitive beliefs other than 'cognitive-self-consciousness'.

Despite these initial findings, only 'general negative beliefs' relating to a need for control remained a significant predictor of distress once anxiety was controlled. Distress was predicted only by group (voice-hearers) once added to the regression. The research of Hill et al. (2012) suggests that beliefs about needing to control worry are associated with the presence of anxiety and distress, not the hallucination itself, supporting the S-REF model of psychopathology. The major flaw is the inclusion of people with disorders other than psychosis, including borderline personality disorder and bipolar disorder, although the majority of voice-hearers had a diagnosis of schizophrenia.

Recent research (Goldstone, Farhall and Ong, 2012) has explored the contribution of metacognitive factors other than beliefs, namely experiential avoidance. Experiential avoidance is defined as an unwillingness to 'remain in contact with particular private experiences' (Hayes et al., 2004, p.554) including thoughts and bodily sensations. Individuals attempt as a consequence to change these inner events through processes such as thought suppression. Experiential avoidance is a metacognitive strategy as it is an attempt to mentally avoid these inner experiences.

The AAQ-II[7] (Bond et al., 2011) measures experiential avoidance; specifically psychological inflexibility and acceptance of internal events[8]. This has been linked to psychological distress (Goldstone et al., 2012), who investigated vulnerability pathways to the development of hallucinations in both non-clinical and clinical populations. The clinical group experienced higher levels of dysfunctional metacognitive beliefs and demonstrated less psychological flexibility than non-clinical participants. Predictors of hallucinations differed between groups; with childhood trauma and life hassles best predicting auditory

[7] An example item of the AAQ-II: 'I worry about not being able to control my worries and feelings'.

[8] For example, negative evaluations of unwanted thoughts, feelings and sensations.

hallucinations in the non-clinical group. This relationship was partially mediated by metacognitive beliefs. In the clinical group, childhood sexual trauma and experiential avoidance were the best predictors of hallucinations in general, but no factors predicted auditory hallucinations. The predictive power of metacognition was therefore not demonstrated in this sample.

Goldstone et al. (2012) highlight the importance of exploring other metacognitive processes that may be involved in the formation of clinical hallucinations. Auditory hallucinations may be negatively reinforced by the short relief provided by experiential avoidance. However, the clinical group effects were confounded by comorbid anxiety disorders (37%), depression (44%) and substance abuse (39%). In addition, mean levels of auditory hallucinations were low (see Table 3).

Morrison, Nothard, Bowe and Wells., (2004) explored specific interpretations of voices using the Interpretation of Voices Inventory[9] (IVI, Morrison et al., 2002a). Frequency of positive beliefs did not differ between voice-hearers and non-patients, which suggests that positive beliefs are stable across the continuum of hallucinatory experience, whereas negative beliefs about loss of control and metaphysical beliefs were higher in the clinical group. Perhaps beliefs about loss of control are associated with feelings of helplessness, which may cause distress. This may contribute towards the transition from non-clinical to clinical levels of hallucinations.

[9] The IVI has three subscales; metaphysical beliefs, positive beliefs and beliefs about loss of control. All three subscales have demonstrated good internal consistency; .94, .80 and .88 respectively.

Table 3

Characteristics of clinical auditory hallucinations papers

Authors	Symptom studied	Design	Sample demographics	Instrument used to assess metacognition	Main findings
Baker & Morrison (1998)	DSM-IV for Schizophrenia (KGV-R)	Correlational and cross-sectional	- Auditory hallucination group (n=15) - Non-hallucinating clinical group (n=15) - Non-psychiatric control group (n=15).	MCQ-65	-The only significant predictor for auditory hallucinations alone was negative beliefs about uncontrollability
Lobban, Haddock, Kinderman & Wells (2002)	DSM-IV Schizophrenia KGV Symptom Scale	Cross-sectional	- Current auditory hallucination group (n=32). - Psychotic group with no auditory hallucinations (n=23). - Anxiety group (n=24).	MCQ-SAM	- Hallucinating and non-hallucinating patients scored significantly higher than both other groups on beliefs about consistency of thoughts.

			- Non-patient control group (n=28).		
Garcia-Montes, Perez-Alvarez, Balbuena, Garcelan & Cangas (2006a)	DSM-IV-TR Schizophrenia LSHS	Correlational	- Current hallucinators (n=21) - Schizophrenia without hallucinations (n=22) - Recovered hallucinators (n=16) with Schizophrenia. - Patients with OCD (n=23) without psychotic symptoms. - Clinical control group with a wide variety of diagnoses (n=26) - Non-clinical control (n=20).	MCQ-65	- No metacognitive factors significantly predicted predisposition to hallucinations.

Goldstone, Farhall & Ong (2012)	Hallucinations - Psychotic disorder LSHS-R	Correlational	- Clinical sample (n=100) mean score on LSHS-R for auditory hallucinations = 5.34 (SD = 3.91). - Non-clinical undergraduate students (n=133). Mean score on LSHS-R for auditory hallucinations = 1.24 (SD = 1.76).	MCQ-30 AAQ-II	- Predictors of vulnerability to hallucinations varied between the clinical and non-clinical groups.
Perona-Garcelan et al. (2012)	Auditory hallucinations DSM-IV-TR Schizophrenia PANSS	Correlational and cross-sectional	- Patients with auditory hallucinations (n=27) - Patients with delusions & no hallucinations (n=20). - Recovered from positive symptoms (n=28).	MCQ-30	- 'General negative beliefs' had the most predictive power for hallucinations.

			- Clinical control (n=22). - Non-clinical control (n=27).		
Morrison, Nothard, Bowe & Wells (2004)	DSM-IV Schizophrenia spectrum disorder	Cross-sectional	- Voice-Hearer group (n=41) - Non-clinical staff and students (n=39).	IVI	- Interpretations of loss of control and metaphysical beliefs about voices were significantly different between groups.
Hill, Varese, Jackson & Linden (2012)	Psychotic disorder	Cross-sectional	- Clinical voice-hearer group (n=20). -Non-clinical voice-hearers (n=20). -Non-clinical control group (n=20).	MCQ-30 PANSS anxiety PSYRATS distress	-'General negative beliefs' was the only significant predictor of voice-hearer distress.

Note. KGV-R = Structured Clinical Interview of affect, positive and negative psychosis symptoms; LSHS-R = Launay-Slade Hallucinations Scale-Revised;

MCQ-65 = Metacognitions Questionniare-65; MCQ-30 = Metacognitions Questionnaire-30; MCQ-SAM = Metacognitions questionnaire-shortened and modified; LSHS = Launay-Slade Hallucinations Scale; AAQ-II = Acceptance and Action Questionnaire II; PANSS = Positive and Negative Syndrome Scale.

Metacognition and Non-clinical Hallucinations

In addition to clinical populations, research has examined the cognitive factors that may feature in predisposition to non-clinical hallucinations (Table 4). Morrison, Wells & Nothard (2000) hypothesised that predisposition to hallucinations using the Revised Hallucination Scale (RHS; Morrison et al., 2000) would be associated with positive beliefs about hallucinations, independent of anxiety and paranoia . Furthermore, individuals highly predisposed to hallucinations would endorse different metacognitive beliefs and use different thought control strategies compared with individuals low in predisposition. Hypotheses were proven correct, with positive beliefs about unusual perceptual experiences, as measured by a visual analogue scale proving the best predictor of auditory hallucinations. Negative beliefs about unusual perceptual experiences and paranoia were not significant predictors. This suggests that positive beliefs predispose individuals to engage initially with their hallucinations at a non-clinical level. This fits with research that indicates limited support for the role of positive beliefs in clinical hallucinations. The finding that paranoia was not a significant predictor of auditory hallucinations may suggest that at a non-clinical level, these anomalous experiences may not co-exist or function differently.

In addition, individuals highly predisposed to hallucinations were more likely to use the thought control strategies ‘punishment’ and ‘reappraisal’ and endorse the metacognitive beliefs ‘cognitive self-consciousness’, ‘uncontrollability and danger’ and ‘general negative beliefs’ (Morrison et al., 2000). At this level of analysis, ‘positive beliefs about worry’ were non-significant. This lends support for the role of metacognition in predisposition to hallucinatory experiences, with positive beliefs specific to anomalous experiences found to be the best predictor and some negative metacognitive beliefs found to be more endorsed by individuals highly predisposed. This may suggest that positive beliefs ‘hook’ individuals into

engaging with their experiences, and negative metacognitive beliefs may be more associated with distress or when experiences become threatening, prompting the use of 'punishment' and 'reappraisal'. However, general metacognitive beliefs were not entered into the multiple regression hence their role is unknown.

Similarly, negative beliefs about 'uncontrollability and danger' as well as 'lack of cognitive confidence' have positively correlated with predisposition to auditory hallucinations (Morrison & Petersen, 2003). This relationship was also found for visual hallucinations. Although metacognitive beliefs explained a significant amount of the variance for predisposition to auditory and visual hallucinations, bereavement and emotional abuse were also significant predictors. This suggests that both internal cognitive and external events contribute to the development and/or maintenance of anomalous experiences, as predicted by the models of Morrison et al. (1995) and general models of the positive symptoms of psychosis (Garety et al., 2001; Morrison, 2001). A combination of these internal and external events may contribute towards the predisposition to hallucinatory experiences. Baker and Morrison (1998) found similar results.

The finding that positive beliefs best predict predisposition to hallucinations was built upon using the Interpretation of Voices Inventory (IVI; Morrison et al., 2002a). Morrison et al. (2002a) hypothesised that positive interpretations of voices would predict frequency of hallucinatory experiences; because voices are more likely to be engaged with if they are appraised as benevolent. Akin to Morrison et al. (2000), positive beliefs about voices were significantly associated with predisposition to auditory hallucinations (Morrison et al., 2002a) and together with positive beliefs about thoughts and trait anxiety, accounted for most of the variance. Although negative interpretations of voices were associated with assessing how much voices were troublesome, neither these nor negative metacognitive beliefs contributed

to the predisposition to hallucinations, which answers the limitation of Morrison et al. 2000 who did not enter general negative metacognitive beliefs into the multiple regression.

Although this study supports the role of positive beliefs and interpretations in predisposition to hallucinations, the role of negative beliefs and interpretations remains unclear. Morrison et al. (2002a) only included two negative belief subscales including beliefs about 'uncontrollability' and 'general negative beliefs'. Correlations between the IVI (Morrison et al., 2002a) and Peters et al. Delusions Inventory (PDI; Peters, Joseph & Garety, 1999) were all significant other than predisposition to auditory hallucinations, which may suggest that the IVI (Morrison et al., 2002a) has insufficient sensitivity to identify factors that may associate with auditory hallucinations, despite good overall psychometric properties. This also points to the contribution of anxiety, similarly to that found in paranoia research.

Laroi, Van der Linden and Marczewski (2004) found significant differences between non-clinical hallucination-prone participants and non-hallucination prone participants on all subscales of a French MCQ, which comprised 64 rather than 65 items (Laroi et al., 2004)[10]. In addition, hallucination-prone participants were more likely to externalise negative self-generated items following a reality monitoring task[11], lending support to cognitive-dissonance and externalisation of negative thoughts in the development of hallucinations (Morrison et al., 1995). Metacognition may also play a role in this process. The theory that positive beliefs engage individuals in hallucinatory experiences contradicts the findings of Laroi et al. (2004). Despite participants with hallucinations endorsing positive metacognitive beliefs, they externalised self-generated negative information, suggesting that positive beliefs are not implicated in the search for an external explanation. Perhaps positive beliefs are

[10] The French version of the MCQ is reported to have adequate psychometric properties compared to the original scale (Laroi et al., 2004).

[11] The task involved eliciting the first word that came to mind when presented with a list of positive and negative words. After a delay, participants were presented with new words, words presented by the experimenter and words generated by participants and were asked to identify whether each word was old or new and to identify the source.

implicated when the hallucinatory experience is benevolent or seen as positive, akin to Morrison et al. (2000). This research suggests that the content of hallucinations and metacognitive factors interact to create either a positive or negative appraisal of hallucinations and subsequent reactions to the experience. However, this study's analysis combined visual and auditory hallucinations (Laroi et al., 2004).

Although several of the above studies found an association between hallucination-proneness and 'uncontrollability and danger' of thoughts among other metacognitive beliefs (Morrison et al. 2000; Morrison & Petersen, 2003; Laroi et al., 2004), one study found that this subscale alone predicted predisposition to auditory hallucinations (Cangas, Errasti, Garcia-Montes, Alvarez & Ruiz, 2006) following completion of a set of questionnaires and a laboratory test of attention[12]. However, level of unwanted intrusions, which may impact upon the use of metacognitive strategies, was not controlled for. This was addressed in another study (Jones & Fernyhough, 2006).

When intrusion items of the WBSI (Wegner & Zanakos, 1994) were extracted and controlled for, 'positive beliefs about worry' and 'general negative beliefs' were no longer significant predictors of hallucination-proneness (Jones & Fernyhough, 2006) suggesting that these maladaptive metacognitive beliefs relate to intrusive thinking. Since both thought suppression and intrusive thoughts also correlated with hallucination-proneness, higher proneness to hallucinations may increase the likelihood of thought suppression. The authors offer a revised model of auditory hallucinations. Thought suppression (among other factors) produces unwanted intrusive thought and this forms the basis of an auditory hallucination. They argue that it is mostly the degree of awareness and attention to these intrusive thoughts ('cognitive self-consciousness') that determines their misinterpretation as auditory hallucinations. To date however, there is insufficient evidence to support this revised model.

[12] The test of attention was an adaptation of the Wisconsin Card Sorting Task (Fey, 1952) assessing attention and perseveration following rule changes.

While positive correlations were also found between all MCQ-30 subscales and hallucination-proneness, the role of thought suppression was also investigated. The strongest predictor of auditory hallucination-proneness was 'cognitive self-consciousness', contrasting to clinical hallucination findings (Garcia-Montes et al., 2006a; Hill et al., 2012). These individuals may experience cognitive-dissonance and therefore make external attributions for their anomalous experiences as a result.

Unlike Morrison et al.'s (1995) assertion, positive beliefs did not significantly contribute towards an understanding of this phenomenon when intrusion items were controlled for, suggesting again that the role of positive beliefs may be dependent on voice content, with malevolent content associated with negative metacognitive beliefs. This is in line with research suggesting that the type of relationship with voices determines the beliefs generated about voices and subsequent affective and behavioural responses (Chadwick & Birchwood, 1994)

More recently, studies have demonstrated the importance of controlling for the effects of anxiety and paranoia in order to clarify the unique contribution of metacognition to hallucination-proneness (Garcia-Montes, Cangas, Perez-Alvarez, Fidalgo & Gutierrez, 2006b; Varese et al., 2011).

Garcia-Montes et al. (2006b) predicted that when anxiety was controlled for (STAI, Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) individuals with a predisposition to hallucinations (measured using the RHS; Morrison et al., 2000) would still demonstrate more metacognitive beliefs (MCQ-65) and thought control strategies than those with a weak disposition (Garcia-Montes et al., 2006b). Results indicated a unique contribution, independent of anxiety, of the metacognitive variable 'lack of cognitive confidence' and the thought control strategy 'worry' in the vulnerability to visual and auditory hallucinations.

The finding that 'lack of cognitive confidence' underlies hallucination-proneness is partially supported by the findings of Jones and Fernyhough (2006), who, without controlling for anxiety, found this metacognitive variable to be a predictor. However, only trait anxiety was controlled for and like several studies discussed, order effects of questionnaires were not controlled for in such a large sample. Research may find differing results if the impact of state anxiety is examined in relation to metacognitive variables. State anxiety may be more closely related to distress, mirroring processes that may occur in individuals with psychosis.

Confounding variables including intrusive, distressing thoughts (Distressing Thoughts Questionnaire [DTQ]; Clark & deSilva, 1985) and deservedness of persecution (Persecution and Deservedness Scale[13] [PDS]; Melo, Corcoran, Shryane & Bentall, 2009) have been controlled for when attempting to clarify the unique relationship between metacognitive beliefs and hallucination-proneness (Varese et al., 2011). Hallucination-proneness was significantly associated with cognitive intrusions and paranoia; however, when hallucination-proneness was controlled for, paranoid ideation had a stronger relationship with cognitive intrusions. This suggests that paranoia has a stronger relationship with depressive and anxious cognitions than hallucination-proneness. This is not surprising, since the DTQ (Clark & deSilva, 1985) measures a wide-range of cognitions, for example worry about health, which would logically associated more closely with paranoia and anxiety disorders including GAD than hallucination-proneness. Metacognitive beliefs only accounted for 2% more of the variance on the LSHS-R (Bentall & Slade, 1985) beyond other factors including paranoia and cognitive intrusions. Only 'cognitive self-consciousness' akin to Jones and Fernyhough (2006) significantly contributed towards hallucination-proneness when other variables were controlled.

[13] The frequency subscale of the DTQ was used to assess cognitive intrusions with depressive and anxious content. Intrusive thoughts include items including 'Thoughts or images that my future is bleak' and respondents rate how often they experiences these thoughts.

Interestingly, when the Five Factors Mindfulness Questionnaire[14] (FFMQ, Baer, Smith, Hopkins, Krietmeyer & Toney, 2006) was entered into the regression this association was lost. This suggests the presence of a strong relationship between hallucination-proneness and acting without awareness. Hallucination-proneness may be related to the metacognitive process of monitoring and controlling of mental events.

The exploration of hallucination-proneness and metacognitive beliefs has broadened to include Schizotypy[15] (Stirling, Barkus & Lewis, 2007). A modified version of the MCQ, named the 'MCQ-th', was used alongside the original[16]. Stirling et al. (2007) hypothesised that hallucination-proneness may not be associated with positive beliefs about worry (Morrison et al., 2000) because those highly prone to hallucinations would have beliefs relating to worry. The high hallucination-prone group scored higher on all metacognitive beliefs other than 'positive beliefs about worry', in-line with hypotheses. This group also scored higher on three of the four MCQ-th factors; (1) 'awareness and usefulness of controlling for thoughts', (2) 'uncontrollability and danger attendant to thinking' and (3) 'negative beliefs about the consequences of thinking' other than 'lacking confidence in own cognition'.

Schizotypy also correlated with all MCQ and MCQ-th factors. The best predictors of Schizotypy were 'uncontrollability and danger of thoughts' and 'negative beliefs about thoughts in general', accounting for 42% of the variance. When the MCQ-th factors were entered into a stepwise multiple regression with Schizotypy, the two best metacognitive predictors accounted for 47% of the variance. Only 84 of 106 participants completed all elements of the study and there were overlaps between the factor structure of the MCQ and MCQ-th; the latter of which requires validating. These findings are comparable to Morrison

[14] An example item is 'I find it difficult to stay focussed on what's happening in the present'

[15] A continuum of personality characteristics and experiences ranging from normal dissociative states and psychosis

[16] Items relating to 'worry' were replaced by 'thinking about or reflecting on thoughts'.

et al. (2000), Baker and Morrison (1998) and Morrison and Wells (2003) in clinical populations.

To some degree, metacognition plays a role in the development and maintenance of auditory hallucinations in non-clinical samples. There is particularly strong evidence for the role of beliefs about the 'uncontrollability and danger of thoughts' and 'cognitive confidence'. However, this apparent relationship is weakened once anxiety or paranoia are considered. The inclusion of visual and auditory hallucinations in the majority of these studies demonstrates that metacognition may play a role in both anomalous experiences and contributes towards vulnerability to psychopathology, as hypothesised by the S-REF model (Wells & Matthews, 1994). The contribution of metacognitive strategies, including thought control, has been paid relatively little attention, but strategies including 'punishment' and 're-appraisal' appear implicated in the maintenance of auditory hallucinations.

Table 4

Characteristics of non-clinical hallucination papers

Author	Symptom studied	Design	Sample characteristics	Instruments used to assess metacognition	Main findings
Morrison, Wells & Nothard (2000)	Auditory & visual hallucination-proneness (RHS)	Within-participant Correlational	Non-clinical undergraduate students/health professionals (N=105).	MCQ-65 TCQ	-Positive beliefs about unusual experiences were the best predictor of predisposition to auditory and visual hallucinations.
Morrison, Wells & Nothard (2002)	Auditory hallucination proneness (RHS)	Within participant correlational	Non-clinical health service staff (N=132).	3 subscales of MCQ-65 IVI	-Beliefs about voices were significantly associated with predisposition to auditory hallucinations and how troublesome voices were.

Varese, Barkus & Bentall (2011)	Hallucination-proneness (LSHS-R)	Correlational	-Non-clinical students screened (N=1,388). -Hallucination-prone individuals (n=67).	MCQ-30 FFMQ	-Metacognitive beliefs were more strongly associated with intrusions and paranoia than hallucination-proneness.
Laroi, Van der Linden & Marczewski (2004)	Hallucination-proneness (LSHS)	Between-subject group design	- Non-clinical hallucination-prone undergraduate students (n=25). - Non-clinical non-hallucination-prone undergraduate students (n=25).	MCQ-64	-There was a significant difference between groups on all factors of the MCQ and significant correlations between LSHS and MCQ scores.
Cangas, Errasti, Garcia-Montes,	Hallucination-proneness (RHS)	Correlational	Non-clinical psychology students	MCQ-65	- Beliefs about 'uncontrollability and danger' explained a large part of the variance in

Alvarez & Ruiz (2006)			(N=81).		predisposition to auditory hallucinations.
Garcia-montes, Cangas, Perez-Alvarez, Fidalgo & Gutierrez, (2006b)	Hallucination-proneness (RHS)	Correlational	Non-clinical university students (N=155).	TCQ MCQ-65	- Lack of cognitive confidence and the thought control strategy worry contributed towards vulnerability to auditory hallucinations.
Stirling, Barkus & Lewis (2007)	Hallucination-proneness (LSHS & O-LIFE)	Correlational	Non-clinical university students (N=106).	MCQ-65 MCQ-th	-Highly hallucination-prone individuals scored higher on awareness and usefulness of controlling thoughts, uncontrollability and danger and negative beliefs about the consequences of thinking. -Schizotypy also correlated with metacognitive beliefs.

Morrison & Petersen (2003)	Visual and auditory hallucination-proneness (RHS)	Correlational	Non-clinical undergraduate students & warehouse operatives (N=64).	MCQ-65 IVI	-Positive, significant correlations were found between auditory hallucinations and 'uncontrollability and danger' and 'lack of cognitive confidence'.
Jones & Fernyhough (2006)	Auditory hallucination-proneness (LSHS-R)	Correlational	Non-clinical undergraduate students (N=751).	WBSI WBSI (sup) MCQ-30	- Both subscales of the WBSI were positively correlated with hallucination-proneness.

Note. LSHS = Launay-Slade Hallucinations Scale; RHS = Revised Hallucination Scale; LSHS-R = Launay-Slade Hallucination Scale-Revised; MCQ-65 = Metacognitions Questionnaire-65; MCQ-th = Metacognitions-thinking Questionnaire; MCQ-30 = Metacognitions Questionnaire – 30; TCQ = Thought Control Questionnaire; IVI = Interpretations of Voices Inventory; FFMQ = The Five Factors Mindfulness Questionnaire; O-LIFE = The Oxford and Liverpool Inventory of Feelings and Experiences; WBSI = White Bear Suppression Inventory; WBSI (sup) = White Bear Suppression Inventory – suppression items.

Metacognition and General Psychosis

The following studies are included because delusions and hallucinations are frequently grouped together (Table 5). This literature may clarify the relationship between metacognition and the positive symptoms of psychosis generally.

Three studies investigated metacognition as a vulnerability factor among non-clinical populations in hallucination and delusion-proneness (Campbell & Morrison, 2007; Laroi & Van der Linden, 2005; Reeder, Rexhepi-Johansson & Wykes, 2010). Hallucination and delusion-proneness and the predictive power of positive and negative metacognitive beliefs were investigated (Laroi & Van der Linden, 2005). Among the LSHS (Launay & Slade, 1981) factors that correlated with the PDI (Peters et al., 1999) were auditory hallucinations, suggesting a positive relationship between symptoms. Following a median split, hallucination-prone participants endorsed more maladaptive metacognitive beliefs with the exception of 'positive beliefs about worry'. However, 'positive beliefs about worry' and 'uncontrollability and danger of thoughts' were the best predictors of hallucinations. The delusion-prone group demonstrated similar results with the addition of 'lack of cognitive confidence'. The best predictor of suspiciousness and persecutory ideas was also 'positive beliefs about worry'.

Results suggest that hallucinations and delusions may share common underlying metacognitive processes that predispose individuals to anomalous experience. Given that the LSHS and PDI assess a wide-range of hallucinations and delusions, metacognition may not uniquely contribute towards suspiciousness and auditory hallucinations, but also to a wide-range of symptoms under the umbrella terms of hallucinations and delusions. Analysing this data together also complicates the comparisons with more symptom-specific studies. The use of a median split also has its limitations. It makes it more difficult to find effects that are

really there, weakening the power of any results found and turns a continuous variable into a categorical one, meaning that participants categorised as 'highly-prone' are seen as equal.

Campbell and Morrison (2007) investigated thought control strategies and psychosis-specific metacognitive beliefs (BaPS, Morrison et al., 1995) as predictors of hallucination and delusion-proneness. Both positive and negative beliefs about psychotic phenomena were significantly positively associated with the frequency of both hallucinations and delusions. The frequency of hallucinations was predicted by positive beliefs and metaphysical beliefs about voices whereas significant predictors of delusion frequency were positive beliefs, survival beliefs and negative beliefs about paranoia. These results are consistent with Morrison (2001) who hypothesised that positive beliefs about psychosis are associated with the occurrence of these phenomena; however, positive beliefs explained little of the variance once negative beliefs were taken into account. A very small number of positive beliefs were endorsed across the sample (M=4.8, SD=1.5) compared to negative beliefs (M=22.8, SD =8.4).

General distress, measured by the General Health Questionnaire (GHQ; Goldberg & Hillier, 1979) was associated with both positive and negative appraisals of voices and delusions. Negative beliefs about paranoia were most strongly related to distress, in line with Morrison (2001). In addition, the thought control strategies 'punishment' and 'worry' were associated with distress and delusion and hallucination-frequency.

One study aimed to address the inconsistent findings regarding metacognitive beliefs, exploring metacognitive beliefs about cognitive skills (Reeder et al., 2010). 'Negative beliefs about thoughts' were identified as a result of high loadings onto four subscales of the MCQ-30[17]. This suggests that negative metacognitive beliefs are associated with psychotic-like phenomena, in line with Morrison (2001). 'Cognitive confidence' was also identified and

[17] Positive beliefs, uncontrollability and danger, general negative beliefs about thoughts and cognitive self-consciousness.

loaded highly onto 'cognitive confidence' of the MCQ-30 and 'beliefs about cognitive regulation' (the extent individuals think they have control over their thinking) was identified through high loadings on the Metacognitive Assessment Inventory[18] (MAI; Baer, Smith, Hopkins, Krietmeyer & Toney, 2006) and 'positive beliefs' subscale of the MCQ-30.

This study suggested the presence of metacognitive beliefs about thoughts and also cognitive skills in psychotic-like phenomena, however owing to the measures used, it is unclear whether beliefs about one's own thoughts or beliefs about thoughts in general are captured (Reeder et al., 2010). This ambiguity may lead to different interpretations of questionnaire items by respondents, which may increase the possibility of invalid results; a general methodological limitation of sole reliance on self-report questionnaires.

Two studies investigated the psychological factors that may contribute towards the transition from risk of developing psychosis to clinical levels of symptoms, with the aim of targeting these processes early in order to prevent transition (Morrison et al., 2002b; Morrison et al., 2006). Individuals at high-risk and non-patients were randomised to one of two conditions; monitoring only or cognitive therapy with monitoring. At month 20 of 30, the high-risk group scored significantly higher than non-patients on 'uncontrollability and danger of thoughts', 'lack of cognitive confidence', 'cognitive self-consciousness' and 'general negative beliefs'. However, no significant difference was found between groups on 'positive beliefs about worry', similar to the findings of Laroi and Van der Linden (2005) in a non-clinical sample.

Building on these preliminary findings, Morrison et al. (2006) compared individuals with at-risk mental states (ARMS) with non-patients to determine the relative contribution of metacognitive factors in this vulnerable population. ARMS patients scored higher on some negative metacognitive factors, including 'uncontrollability and danger of thoughts', 'general

[18] The MAI measured cognitive skill. An example of an item: 'I think of several ways to solve a problem and choose the best one'.

negative beliefs' and 'cognitive self-consciousness'. Findings differed to Morrison et al. (2002b), as here, statistically significant differences were not found. Positive associations were also found between negative metacognitive beliefs about 'uncontrollability and danger' and 'general negative beliefs' and symptoms associated with at-risk patients, including perceived stress, which may suggest a relationship between negative metacognitive beliefs and stress in response to psychotic phenomena. Although consistent with the S-REF model, this study failed to report relative proportions of participants with auditory hallucinations and persecutory delusions.

Voice-hearers with several psychotic disorders were compared to individuals with persecutory delusions, panic and non-patients (Morrison & Wells, 2003) to investigate metacognition across emotional and psychotic disorder. Individuals with auditory hallucinations exhibited higher levels of all metacognitive beliefs apart from 'cognitive self-consciousness' and the persecutory delusions group had comparable levels of 'positive beliefs' and 'cognitive self-consciousness' to panic patients, suggesting a close process relationship between these clinical groups. These findings suggest that metacognitive beliefs lead to interpretation biases that lead to psychotic experience. This study does not describe how persecutory delusions were defined and although conclusions are drawn about auditory hallucinations, all participants in the voice-hearer group had comorbid delusional beliefs.

Brett, Johns, Peters and McGuire., (2009) explored metacognitive beliefs across the continuum of psychosis. ARMS patients and patients with psychosis scored higher than non-patients and the 'undiagnosed' group (experiencing psychotic-like symptoms[19]) most consistently on 'general negative beliefs'. The ARMS group scored significantly higher on

[19] Participants were included in the 'undiagnosed' group only if their anomalous experiences had a duration of more than 5 years. This distinguished them from the 'At risk' group as psychosis usually develops within two years of experiencing anomalous symptoms.

metacognitive beliefs (apart from positive beliefs) than the non-clinical control group and significantly higher on 'general negative beliefs' than the undiagnosed group. However, the ARMS and clinical group did not significantly differ on any subscale, suggesting that metacognitive beliefs alone do not predict transition to psychosis. When anxiety was controlled, significant differences were lost, and when depression was controlled, all but 'positive beliefs' and 'general negative beliefs' remained as significant predictors. This study suggests that metacognitive processes are more closely related to general psychopathology, particularly anxiety and depression, rather than directly stemming from psychotic experiences and suggests that anxiety itself requires addressing in psychosis treatment, rather than the psychotic experience.

While the studies discussed suggest that metacognitive variables including negative metacognitive beliefs are more highly present in at-risk to psychosis groups compared to non-patient controls, they do not address the potential differences between at-risk and diagnosed psychotic groups. This was addressed by Morrison, French and Wells (2007). Based on the S-REF model, patients with a range of psychotic disorders and patients at risk were expected to present with higher levels of metacognitive beliefs than non-patients and patients with psychotic disorders were expected to endorse more maladaptive metacognitive beliefs than those at-risk (Morrison et al., 2007). Both hypotheses were supported by the results. Metacognitive beliefs were endorsed more by the two patient groups than non-patients. Furthermore, 'positive beliefs about worry' alone were higher in the psychotic group than the at-risk group. The authors conclude that negative beliefs about thoughts may predispose people to anxiety, although anxiety was not measured, which they believe explains the results of hypothesis one. Psychosis occurs when positive beliefs about worry are high, which would fit with previous findings of no differences between non-patients and at-risk patients on measures of positive beliefs about worry (Morrison et al., 2002b; Morrison et al., 2006).

More recently, White & Gumley., (2010) explored associations between intolerance of uncertainty, specific metacognitive beliefs relating to psychosis and distress. Growing evidence suggests that intolerance of uncertainty leads to the development of unhelpful beliefs and delusions in psychosis (Broome et al., 2007). A small sample of patients currently distressed by their psychosis with post-psychotic PTSD were asked to complete a battery of measures. Seventy-eight percent of this sample experienced hallucinations, but no mention is made of the proportion of other positive symptoms experienced. Intolerance of uncertainty (IUS[20]; Freeston, Rhe'ume, Letarte, Dugas & Ladouceur, 1994) was hypothesised to be associated with negative metacognitive beliefs about voices and paranoia (BaPS; Morrison et al., 2005).

Intolerance of uncertainty was hypothesised to associate with levels of distress, as measured by the Impact of Event Scale-Revised (IES-R; Weiss & Marmar, 1997). An association was found between intolerance of uncertainty and negative appraisals about paranoia. It was concluded that intolerance of uncertainty may predispose individuals to possess negative metacognitive beliefs (White & Gumley, 2010), which may lead to distress or predispose individuals to appraise a situation as ambiguous, jumping to a threatening conclusion. Conversely, previous experiences of psychosis may influence the association between intolerance of uncertainty and metacognitive beliefs. It is unclear whether this study taps into current or past metacognitive factors, since the IES-R was used to explain the worst moment

of their illness. Intolerance of uncertainty is implicated in the maintenance of GAD (Dugas & Robichaud, 2007) and may represent another process dually implicated in psychosis and anxiety that warrants further investigation.

[20] The IUS contains 27 items measuring emotional, cognitive and behavioural reactions to ambiguous situations, the implications of being uncertain and attempts to control the future. The measure has high internal consistency (.91) and can effectively distinguish between individuals with and without GAD.

Table 5

Characteristics of general psychosis papers

Authors	Symptom Studied	Design	Sample characteristics	Instruments used to assess Metacognition	Main findings
Laroi & Van der Linden (2005)	Hallucination & delusion-proneness LSHS	Correlational	University students (N=296).	MCQ-65	- Participants who were prone to hallucinations and delusions scored significantly higher on most MCQ-65 subscales and total score.
Campbell & Morrison (2007)	Hallucination & delusion-proneness LSHS-R	Cross-sectional survey	University students (N=544).	TCQ IVI BaPS	- Avoidant safety behaviours and punishment-based thought control strategies were found to be associated with distress and frequency of psychotic – like symptoms.
Reeder, Rexhepi-	Psychotic-like experiences	Correlational	Non-clinical general public (N=60).	MCQ-30 MAI	- Three components of metacognitive beliefs were identified and only

Johansson & Wykes (2010)					'general beliefs about thoughts' was significantly associated with psychotic-like experiences.
White & Gumley (2010)	DSM-IV Schizophrenia	Cross-sectional correlational design	Distressed patients (N=27).	IUS BaPS IVI	-IUS was positively and significantly associated with beliefs about voices and paranoia.
Morrison et al. (2002b)	At-risk patients	RCT	- High-risk psychosis patients (n=31). - Non-clinical controls of undergraduate students and staff (n=50).	MCQ-65	- High risk group scored significantly higher on measures of metacognitive beliefs.

Morrison, French & Wells (2007)	DSM-IV Schizophrenia spectrum disorder (Schizophrenia; schizoaffective; Schizophreniform)	Cross-sectional	Schizophrenia spectrum disorder (n=73). - ARMS patients (n=43). - Non-patient undergraduate students (n=188).	MCQ-65	- Patients with psychotic disorders and at risk group scored higher on metacognitive beliefs.
Morrison et al. (2006)	Ultra-high risk patients PANSS	Cross-sectional	- Ultra-high risk patients (n=58). - Non-patients (n=56).	MCQ-65	-Metacognitive beliefs were positively associated with several dimensions of symptomatology of at-risk patients.
Brett, Johns, Peters &	Psychotic disorder. AANEX	Correlational	- Diagnosed group (n=27).	MCQ-65	- Most group differences became non-significant when anxiety and

McGuire (2009)			- At risk group (n=32). - Undiagnosed sub-clinical group (n=24). - Non-clinical control (n=32).		depression were controlled for.
Morrison & Wells (2003)	DSM-IV Schizophrenia, Schizoaffective disorder, Schizophreniform disorder	Correlational	- Voice-hearer group (n=49). - Persecutory delusions Group (n=24). - Panic disorder group (n=35). -Non-patient control	MCQ-65	-Participants with auditory hallucinations exhibited higher levels of dysfunctional metacognitive beliefs.

(n=50).

Note. LSHS = Launay-Slade Hallucinations Scale; LSHS-R = Launay-Slade Hallucinations Scale-Revised; MCQ-65 = Metacognitions Questionnaire-65; TCQ = Thought Control Questionnaire; IVI = Interpretations of Voices Questionnaire; Beliefs about Paranoia Scale; IUS = Intolerance of Uncertainty Scale; RCT = randomised-controlled trial; ARMS = At Risk Mental State; PANSS = Positive and Negative Syndrome Scale; MAI = Metacognitive Assessment Inventory; AANEX = Appraisals of Anomalous Experiences Interview.

Discussion

This review has examined research that investigates the role of metacognition in persecutory delusions and auditory hallucinations. There is a wealth of evidence to suggest that metacognitive beliefs and strategies are implicated in clinical and non-clinical populations. There is also strong evidence to suggest that anxiety mediates the relationship between hallucinations and delusions, and metacognitive beliefs and thought control strategies.

However, the general use of cross-sectional designs limits the ability to establish causality, for example to conclude whether thought control strategies lead to increased anxiety and an increase in paranoia or whether beliefs about the uncontrollability and danger of thoughts lead to the maintenance of auditory hallucinations. In addition, the majority of studies have analysed auditory and visual hallucinations together, or all positive symptoms together because of their frequent co-occurrence. This reflects the complexity of psychosis and presents difficulties in deciphering the role of metacognition specifically in auditory hallucinations. Non-clinical studies address these limitations but have their own shortcomings.

Metacognitive beliefs have received the most attention, with mixed results reported. Metacognitive strategies and awareness have therefore been neglected, with some recent notable exceptions (Freeman & Garety, 1999; Jones & Fernyhough, 2006; Morrison & Wells. 2000; Newman-Taylor et al., 2009). These studies found emerging support for the use of worry and punishment thought control strategies, thought suppression and experiential avoidance across clinical and non-clinical auditory hallucinations and persecutory delusions. These metacognitive strategies warrant further exploration using an experimental design.

The cognitive models offered to explain the predisposing and maintenance factors underlying these psychotic symptoms incorporate some metacognitive beliefs, but do not account for the breadth of metacognitive processes, for example experiential avoidance, that may also contribute. Instead, most of the findings of this literature review point to the S-REF model as a 'best fit'; that metacognitive beliefs associated both with psychotic symptoms and general worry contribute to both the predisposition and maintenance of psychological distress in psychosis. Maladaptive coping strategies including experiential avoidance, thought control and suppression, may lead to a general maladaptive thinking style; the CAS, in line with earlier research that linked underlying processes between emotional and psychotic disorder (Freeman & Garety, 2003).

Clinically, the findings support the consideration of metacognitive processes in the formulation and treatment of psychosis and the application of metacognitive therapy (Moritz, Veckenstedt, Randjbar, Vitzthum & Woodward, 2011), perhaps combined with cognitive-behavioural approaches to the treatment of positive psychotic symptoms. Future research should conduct randomised controlled-trials of metacognitive therapy, closely measuring outcomes of metacognition and distress, to investigate the efficacy of this treatment for psychosis. In addition, through the induction of anxiety, non-clinical experimental studies may help to clarify the metacognitive strategies that are implicated in the maintenance of distress in either paranoia or hallucinations.

Conclusion

The findings overall suggest a stronger relationship between paranoia and metacognition, possibly owing to the wealth of research that has demonstrated a close process relationship between paranoia and anxiety. In addition, the findings indicate a need to consider metacognition in the formulation and treatment of individuals presenting with positive psychotic symptoms. Future research should focus on exploring these relationships experimentally and drawing direct comparisons between clinical and non-clinical levels of hallucinations and delusions in order to further understand the metacognitive factors that may be involved in the transition to clinical psychosis.

The Empirical Paper

What is the role of metacognition in the maintenance of distress in non-clinical paranoia

Introduction

Paranoia is defined as 'the self-referent assumption that one is the object or target of another's thought or behaviour, an assumption that is often unfounded' (Fenigstein & Vanable, 1992, p.129). Paranoia is now well established as existing on a continuum with normal experience (Ellett, Lopes & Chadwick, 2003; Freeman et al., 2005; Freeman et al., 2008a; Freeman et al., 2011; van Os, Hanssen, Bijl & Ravelli, 2000) and has been theoretically framed by the Paranoia Hierarchy (Freeman, 2007), which describes relatively common social evaluative concerns. These concerns are hypothesised to be a risk factor in the development of persecutory delusions, (Freeman & Garety, 2003) through to the severe threat experienced by individuals with persecutory delusions (Freeman, 2007).

Metacognition refers to the process of thinking and has been likened to 'the score and the conductor behind thinking' (Wells, 2009, p. 1). Flavell (1979) was instrumental in the development of this concept and in recent years, metacognition has been applied to depression and anxiety (Teasdale, 1999; Wells & Matthews, 1994) and most recently, to psychosis (Fraser, Morrison & Wells, 2006; Morrison & Wells, 2000, 2007). Metacognition 'monitors, controls, and appraises the products and process of awareness' (Wells, 2009, p. 1). Wells and Matthews (1994) developed the Self-Regulatory Executive Function model (S-REF) and hypothesised that psychological disorder develops when individuals become stuck in an unhelpful relationship with their thoughts, known as the Cognitive Attentional Syndrome (CAS). The CAS consists of metacognitive strategies, which function to alter thinking in order to control cognitive and emotional responses. Examples of metacognitive strategies include thought suppression, thought control, worry and rumination, which are consciously or unconsciously drawn upon to manage unwanted cognitive activity.

Metacognitive knowledge, the beliefs and theories people have about their own thinking (Wells, 2009, p. 5), affects individuals' responses to thoughts and emotions and is deemed positive if an individual is *aware* that thoughts are not always correct (Teasdale, 1999). The ability to decentre or step back from one's thoughts is likely to be a protective factor against the development of psychopathology (Fresco et al., 2007).

Cognitive treatment for emotional disorders, influenced by Beck (1976), hypothesises that altering the content of depressive or anxious thoughts leads to decreased depression or anxiety. Although metacognitive theorists agree to some extent that these thoughts lead to psychological disorder, through the increase in associated distressing emotions and subsequent use of safety behaviours to manage threat, metacognitive theory hypothesises that addressing the content of thoughts alone is insufficient for effective, long-term change (Wells, 2009). It is argued that traditional cognitive theory fails to explain why transitory distressing thoughts or feelings become chronic, leading to serious mental health problems. A metacognitive approach assumes that the relationship to thoughts, feelings and other inner experiences must also be addressed. There is now good evidence demonstrating that interventions targeting people's relationship to their internal experience lead to a reduction in risk of relapse in recurrent depression (Teasdale, 1999; Teasdale et al., 2002).

The first step towards recognising that metacognition may play a role in paranoia was the increasing focus on a psychological understanding of positive psychotic symptoms. This has partly been achieved through an awareness of the similarities between psychotic and emotional disorders (Freeman, 2007; Freeman & Garety, 2003). The psychological literature strongly suggests that both psychosis and emotional disorder lie on a continuum with normal experience, that they are both often triggered by stressful life events, therefore underpinned by a stress-vulnerability model, and are both

characterised by maladaptive psychological processes, including self-focussed attention, the use of safety behaviours, metacognitive beliefs and thought control strategies (Freeman & Garety, 2003).

Specifically, high levels of anxiety and worry have been found to correlate positively with delusional distress (Startup, Freeman & Garety, 2007). One study aimed to understand the role of anxiety in students displaying non-clinical levels of paranoia (Lincoln, Lange, Burau, Exner & Moritz, 2010). Following randomisation to an anxiety or neutral condition, participants in the anxiety condition displayed significantly higher levels of paranoia and were more likely to jump to conclusions during decision-making. Regression analysis suggested that anxiety alone predicted paranoia and jumping to conclusions. Higher paranoia baseline scores led to an increase in paranoia following the induction of anxiety. This study was limited by an observed increase in other negative emotions, therefore anxiety alone may not have predicted increases in paranoia. It does provide some evidence for a causal role of anxiety in the formation and perhaps exacerbation of paranoia in a non-clinical population. It also demonstrates the utility of experimental manipulations.

This work has been supported by a psychological model of persecutory delusions (Freeman, Garety, Kuipers, Fowler & Bebbington, 2002) that highlights the central role of anxiety in the development of psychotic symptoms. Persecutory delusions are conceptualised as threat beliefs, owing to the observed similarities between persecutory delusions and anxious thoughts (Freeman & Garety, 2003). Persecutory delusions and anxiety share the theme of threat to the self. Understanding delusions as threat beliefs has opened the possibilities of psychological research in this area (Freeman, 2007).

The Application of Metacognition and Anxiety to Paranoia

Paranoia exists on a continuum and processes underpinning emotional disorders contribute to the maintenance of associated distress. Based predominantly on the metacognitive theory of generalised anxiety disorder (GAD; Wells & Matthews, 1994), recent research has attempted to determine whether metacognitive processes are also applicable to an understanding of clinical and non-clinical paranoia.

The few studies examining the relationship between non-clinical paranoia and metacognition in undergraduate populations have found mixed results (Garcia-Montes, et al., 2005; Newman-Taylor, Graves & Stopa, 2009; Palmier-Claus, Dunn, Morrison & Lewis, 2011). Two studies employed a correlational design to investigate the relationship between trait paranoia, metacognitive beliefs and thought control strategies. Newman-Taylor et al. (2009) found that the metacognitive strategies 'punishment', 'worry' and 'reappraisal' (measured using the Thought Control Questionnaire [TCQ]; Wells & Davies, 1994) correlated positively with trait paranoia (measured using the Paranoia Scale [PS], Fenigstein & Vanable, 1992). However, the inclusion of anxiety in the regression reduced the predictive power of paranoia alone; with anxiety uniquely predicting 'worry' and 'punishment'. This suggests the crucial role of affect in the use of thought control strategies in paranoia, in line with Lincoln et al. (2010) who also highlighted the positive relationship between anxiety and paranoia. Similarly, Garcia-Montes et al. (2005) found that the presence of anxiety affected the strength of the relationship between metacognitive beliefs (Metacognitive Beliefs Questionnaire [MCQ-65], Cartwright-Hatton & Wells, 1997) and paranoid ideation; with 'lack of cognitive confidence'[21] remaining the only metacognitive belief uniquely predicted by paranoid ideation. Palmier-Claus et al. (2011) employed an experimental design to randomise non-clinical

[21] 'Lack of cognitive confidence' refers to a lack of confidence in one's own memory and attention

participants to a neutral or stress-inducing condition. Following the stress-inducing condition, 'cognitive self-consciousness', which measures preoccupation with one's own thoughts, significantly moderated the relationship between negative affect and suspiciousness. Therefore, stronger preoccupation with one's own thoughts may strengthen the relationship between negative affect and paranoia.

This research demonstrates the relationship between metacognition and paranoia in non-clinical groups. It suggests that when individuals with high levels of non-clinical paranoia are under stress, they are more likely to hold specific metacognitive beliefs. In addition, research suggests that paranoia is associated with use of particular thought control strategies. The predictive power of anxiety in predisposition to persecutory delusions and non-clinical paranoia provides further evidence that processes underlying emotional and psychotic disorders are far from dissimilar. However, most studies have used limited metacognitive measures and adopted non-causal methodological approaches. Causal effects, including whether distress causes individuals with paranoia to employ thought control strategies, have not been investigated.

Although there is limited experimental research examining the relationships between paranoia and metacognition, several experimental studies have induced paranoia by manipulating the environment and focus of attention (Bodner & Mikulincer, 1998; Ellett & Chadwick, 2007; Fenigstein, 1984; Fenigstein & Vanable, 1992), thereby creating an experimental environment in which to investigate paranoia and metacognition. Bodner and Mikulincer (1998) randomly assigned students to a number of conditions to examine paranoid and depressive responses. Personal helplessness[22] was hypothesised to lead to depressive and paranoid-like responses. Further, that the focus of

[22] Personal helplessness has been defined as 'the belief that one personally lacks the responses required to solve the problems, that others, having the needed responses, could solve them, and that the failure is derived from internal causes' (Bodner & Mikulincer, 1998, p.1010).

attention (either internally towards the self or externally) would determine the type of response elicited (Bodner & Mikulincer, 1998). Participants in the personal failure condition, where unsolvable tasks were presented and random correct and incorrect feedback was given, demonstrated the most paranoid-like responses, particularly when self-focused attention was increased with the use of a mirror and camera. This study demonstrates that the combination of personal failure and attentional focus on threatening stimuli produces paranoid cognitions.

The relationship between attentional focus and paranoid cognitions was also investigated by Ellett and Chadwick (2007), who randomised 60 non-clinical students to one of six conditions: (1 and 2) neutral or failure task in the control condition, with no experimenter or camera present, (3 and 4) neutral or failure task in the experimenter condition, with the experimenter but no camera present, (5 and 6) neutral or failure task in the camera condition, with a camera focussed on the participant without the experimenter present. In line with their hypotheses, there was a significant main effect of environment; with participants in the camera condition scoring significantly higher on the PS (Fenigstein & Vanable, 1992), than the other conditions. Although, there was no effect of task on paranoia scores, depression scores were significantly higher in the failure condition. This provides further evidence to suggest that paranoia can be manipulated by increasing attentional focus with the use of a mirror and that failure alone is insufficient to induce paranoia. This fits theoretically with a model of clinical paranoia in which persecutory delusions are defined as 'threat beliefs' (Morrison, 2001). Importantly, both Bodner and Mikulincer (1998) and Ellet and Chadwick (2007) failed to measure attentional focus, and assumed that their findings resulted from the environmental manipulation.

Alongside personal failure and attentional focus, research suggests that self-consciousness, in particular public self-consciousness, is associated with paranoia. Self-consciousness consists of a public (awareness of the self in relation to the world and how others perceive you) and private (awareness of inner thoughts and feelings about the self) factors (Fenigstein & Vanable, 1992). It is argued that this relationship exists because paranoia is unable to develop without a social context, as public self-consciousness is highly correlated with non-clinical paranoia. In an earlier experimental study, students were more likely to perceive themselves, compared to another, as a target of a negative event (an exam), suggesting that self-consciousness influences the sense of the self as a target of other peoples' thoughts and actions (Fenigstein, 1984). The experimental paranoia research to date suggests that an induction of public and private self-consciousness leads to state and trait worry (Wells, 1997) and the perception of the self as a target of threat (Fenigstein, 1984; Govern & Marsch, 2001). It is hypothesised that this may lead to a greater use of metacognitive strategies to control unwanted inner experiences derived from the perception of the self as target.

Owing to the emerging evidence implicating metacognition in the experience of paranoia, an experimental study is warranted. The metacognitive variables of interest to this study (those implicated in the CAS (Wells & Matthews, 1994) which functions to alter thinking) will now be outlined.

Thought control is a metacognitive strategy employed to manage unpleasant thoughts (Wells & Davies, 1994). The role of thought control is well established in the maintenance of distress in emotional disorders. These strategies are hypothesised to maintain distress in emotional disorders through the paradoxical effect of increasing the frequency of unpleasant thoughts, leading to more distress and further attempts at control (Amir, Cashman & Foa, 1997; Coles & Heimberg, 2005). Within non-clinical paranoia,

high levels of uncontrollability of thought (Freeman & Garety, 1999) suggest that anxiety processes underlie paranoia and that thought control strategies in particular may be implicated in the management of distress associated with unwanted thoughts. Preliminary research suggests that 're-appraisal', 'punishment' and 'worry' correlate positively with paranoia (Newman-Taylor et al., 2009). The latter two strategies have also been implicated in clinical paranoia populations (Morrison & Wells, 2000).

Thought suppression, which involves attempts to avoid thinking about unpleasant thoughts, is another form of control. Experimental research suggests that the suppression of an unwanted thought leads to an increased preoccupation with the thought and to distress (Wegner, Schneider, Carter & White, 1987). The presence of thought suppression has been demonstrated in non-clinical populations of individuals with persecutory-like beliefs and hallucinations (Jones & Fernyhough, 2006; Jones & Fernyhough, 2008). Jones and Fernyhough (2008) used a correlational design to investigate the relationship between persecutory-like beliefs and thought suppression (using the White Bear Suppression Inventory [WBSI]; Wegner & Zanakos, 1994) in a non-clinical population. When anxiety was high, thought suppression was implicated in the experience of persecutory-like beliefs, suggesting that thought suppression is activated at times of distress. Similarly, in participants with hallucination-proneness, metacognitive beliefs about the uncontrollability and danger of thoughts correlated with thought suppression (Jones & Fernyhough, 2006).

Experiential avoidance, another metacognitive strategy, occurs when an individual 'is unwilling to remain in contact with particular private events' (Hayes et al., 2004, p. 554). This includes emotions, thoughts and physiological sensations, and attempts are made to change these experiences, akin to thought suppression. Although experiential avoidance leads to an initial positive effect of reducing discomfort, it has the long-term

effect of maintaining distress associated with the private events. An example is worrying about not being able to control worries. Experiential avoidance is also related to other metacognitive strategies including thought suppression (Hayes et al., 2004). The role of experiential avoidance has been investigated recently as a vulnerability pathway to clinical auditory hallucinations. Findings suggest that individuals with hallucinations experience higher levels of dysfunctional metacognitive beliefs and lower meta-awareness (Goldstone, Farhall & Ong, 2012), providing further support for a relationship between aspects of metacognition (beliefs and experiential avoidance). Experiential avoidance therefore warrants investigation in a paranoid population as it has been demonstrated as a maintenance factor of distress in emotional disorders and in psychosis.

Rumination is related to the metacognitive construct of 'cognitive self-consciousness'; the preoccupation with one's own thought processes (Jones & Fernyhough, 2009) and represents a crucial strategy employed in the maintenance of anxiety disorders (Wells & Carter, 2001) yet it has not been experimentally explored in relation to paranoia. Rumination may maintain paranoia-related distress through a repeated focus on the paranoid thought, reinforcing its importance and validity.

Metacognitive awareness is 'a cognitive set in which negative thoughts/feelings are experienced as mental events rather than as the self' (Teasdale et al., 2002, p. 275). Metacognitive awareness has not been explored in relation to paranoia. Low metacognitive awareness has been implicated in vulnerability to and maintenance of emotional disorders, including depression. The psychological factor hypothesised to maintain distress and depression is the inability to recognise depressive symptoms as symptoms. Similarly, individuals with non-clinical paranoia may demonstrate low metacognitive awareness. Individuals believe their paranoid thoughts, for example, that 'people are watching me' or 'other people are always talking behind my back'. Low

metacognitive awareness is defined as 'the inability to distinguish the self from the content of negative thoughts and emotions (seeing the self as defined by or as synonymous with negative mental content)' (Hargus, Crane, Barnhofer & Williams, 2010, p.35). Whereas some individuals may have these same thoughts yet not attach or become cognitively fused to them (i.e. demonstrate the ability to decentre (Teasdale et al., 2002)), others' beliefs remain strong as a result of this fusion. Individuals may therefore enlist metacognitive strategies to manage this fusion, perpetuating the paranoia. Mindfulness- based cognitive therapy (MBCT) has been shown to significantly increase meta- awareness in suicidally-depressed individuals when compared to treatment as usual (Hargus et al., 2010), indicating that participants were more able to view their depressive symptoms as just symptoms following an increase in metacognitive awareness, with beneficial effects.

The Present Study

This study investigated metacognitive strategies and metacognitive awareness in individuals with high and low non-clinical paranoia. An anxiety-induction task was used to explore the metacognitive factors implicated in the maintenance of distress. The current study addresses some of the methodological limitations of previous work, and extends the exploration of metacognitive variables in non-clinical paranoia.

The rationale for conducting this study is based on preliminary evidence for a relationship between paranoia, metacognitive strategies and anxiety. Paranoid thoughts may lead to anxiety and to subsequent attempts to control thoughts. This may have the paradoxical effect of increasing distress. This study also builds on the findings of Flower (2010) who investigated the cognitive maintenance factors associated with anxiety in

individuals with high and low paranoia. Limitations of Flower (2010) include the absence of a control condition, no measurement of pre-manipulation self-awareness or paranoid cognitions and a limited range of metacognitive variables investigated. These findings will be re-investigated with the addition of a control condition. This will produce a more robust design to test whether metacognitive strategies are demonstrated only by individuals high in paranoia exposed to an anxiety-induction or regardless. Flower (2010) found no significant differences between high and low paranoia groups on attentional focus. This will be re-investigated. The study will also extend paranoia research by examining the role of metacognitive awareness in paranoia distress.

There is also preliminary evidence for the effectiveness of a task designed to induce mild anxiety (Flower, 2010), adapted from Bodner and Mikulincer, 1998. It is a computerised task based on personal helplessness theory. Flower (2010) found that following the task, participants in the high paranoia group reported significantly more state anxiety. A significant effect of group was found on paranoid thoughts after the task, showing that individuals high in paranoia experienced more paranoid thoughts owing to the anxiety-activation task.

Hypotheses

1. There will be a main effect of paranoia (high versus low) on affective and metacognitive processes: high paranoia will be associated with increased state and trait anxiety, attentional focus, increased use of metacognitive strategies (thought control, suppression, experiential avoidance and rumination) and lower metacognitive awareness (cognitive fusion and decentring) regardless of task type.

2. There will be a main effect of experimental task (anxiety versus control) on affective and metacognitive processes. The anxiety task will be associated with increased state anxiety, attentional focus, use of metacognitive strategies and level of metacognitive awareness, irrespective of paranoia level.

3. There will be an interaction between paranoia and task. We expect participants with high paranoia in the anxiety-induction condition to report the highest number of paranoid cognitions, attentional focus, anxiety, more use of metacognitive strategies and lower metacognitive awareness than the other three groups.

Method

Design

A 2X2 (paranoia X condition) between-subject experimental design was employed to test the above hypotheses. The independent variables were level of paranoia (high versus low) and experimental task (anxiety versus control). The dependent variables were anxiety, paranoia, attentional focus, metacognitive awareness and metacognitive strategies. School ethical approval was granted (see Appendix B).

Participants

Participants were staff and students from a local university. Table 1 details the demographic data of the sample. Participants completed the PS (Fenigstein & Vanable, 1992) to determine high and low paranoia groups, based on the mean PS (Fenigstein and Vanable (1992) score for a non-clinical group (M = 42.7, SD = 10.2). In order to determine the high and low paranoia groups, participants fell into the 84th percentile or above (+1 SD above the mean, equalling a score of 52.7 and above) or the 16th percentile or below (-1 SD below the mean, equalling a score of 32.7 or below). There were no other inclusion or exclusion criteria. Owing to slow recruitment, these cut-offs were rounded respectively down or up. Figure 1 displays the flow of recruitment.

Power was calculated using G*Power Statistic Version 3 (Faul, Erdfelder, Lang & Buchner, 2007). Assuming that an effect size of at least that of Flower (2010) was

obtained[23], at least 80 participants in total (20 per group) were required to test a two-tailed hypothesis, with 80% power and a 5% significance level.

[23] Based on the findings of Flower (2010): White Bear Suppression Inventory effect size = 0.5 and the Thought Control Questionnaire 'punishment' subscale effect size of 0.3.

Table 1

Demographic data for each group

	High Experimental	Low Experimental	High Control	Low Control
Age				
Mean (*SD*)	21.13 (3.40)	21.1 (3.06)	20.06 (1.99)	20.9 (3.26)
Range	18-31	18-30	18-26	18-29
Gender				
Male	4	4	6	3
Female	12	16	11	17
Educational Level				
Undergraduate	15	18	17	20
Postgraduate	1	2	0	0
Staff	0	0	0	1
Ethnicity				
White British	7	14	11	15
Black British	1	1	0	0
Asian	5	1	5	1
Mixed	1	0	0	0
Other	2	4	1	4

Note. High = high paranoia group; Low = low paranoia group; Experimental = anxiety-induction condition; Control = neutral condition.

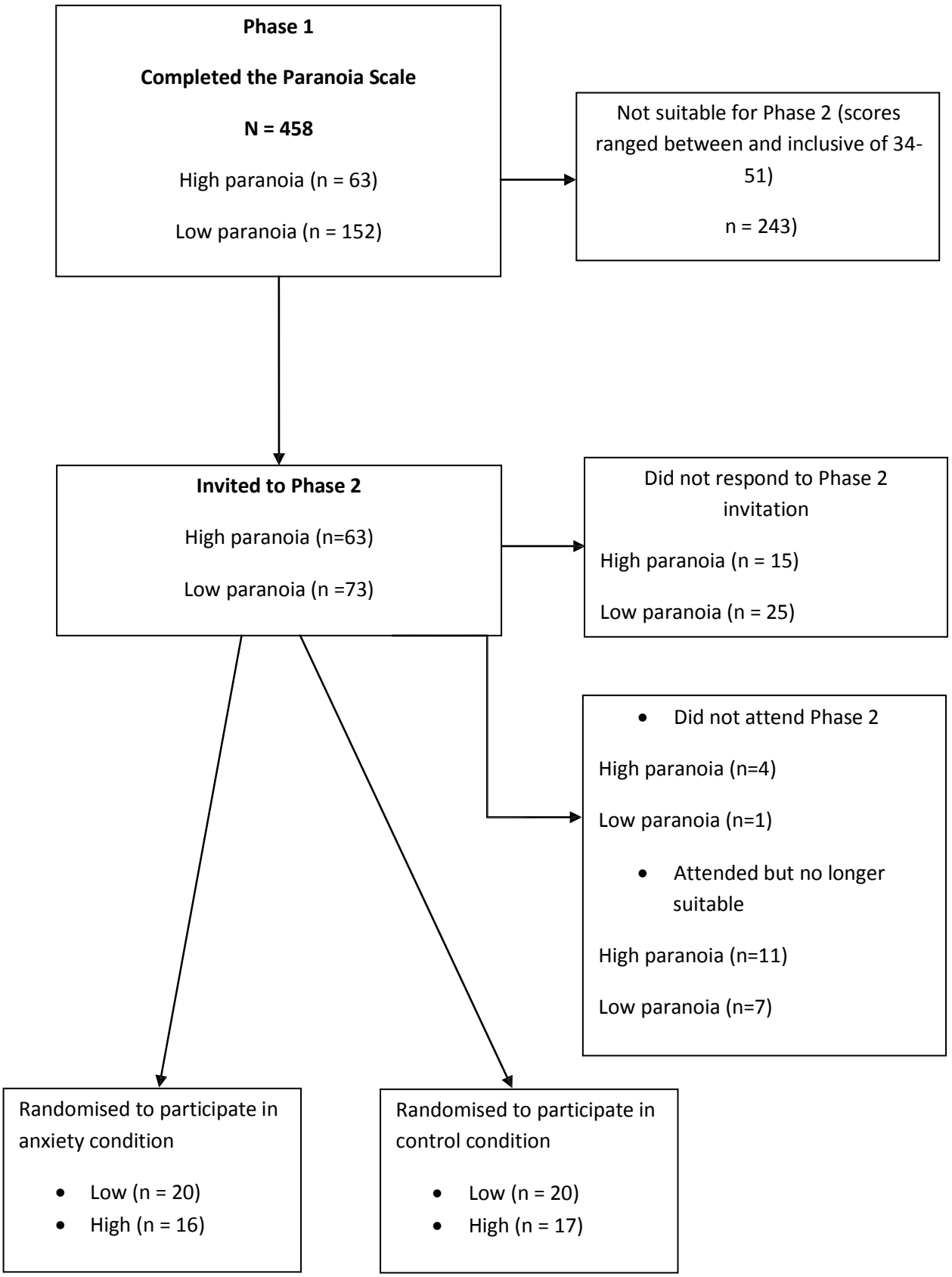

Figure 1. Consort diagram of data attrition

Materials

Copies of questionnaires are detailed in Appendix C.

Paranoia Scale (PS; Fenigstein & Vanable, 1992). This 20-item self-report questionnaire measures non-clinical trait paranoia in college samples. Items were based upon a clinical measure of paranoia; measuring four areas (1) the belief that other people or external powerful sources are trying to influence one's behaviour or thinking (2) belief of a conspiracy (3) the belief of being spied on or talked about (4) general suspicion or mistrust. Respondents rate the applicability of items on a 5-point Likert scale (1 indicates 'not at all applicable', 5 indicates 'extremely applicable'). The scale has good internal consistency (α = .84) and convergent and discriminant validity. Scores on this measure range from 20 to 100 with higher scores indicating greater paranoia.

Paranoia and Depression Scale (PDS; Bodner & Mikulincer, 1998).

This 17-item self-report scale measures state paranoid and depression-like responses. Respondents rate the applicability of items relating to the degree to which they experienced a series of ten depressive and seven paranoid-like responses during an experiment on a 6-point Likert scale (1 = 'not at all', 6 = 'very often'). Each factor of the scale has good internal consistency (α = .87 and α =.79) and discriminant validity and was highly related to other measures of paranoia. Higher scores reflect more depressive and paranoid-like states. The scale was also adapted as a pre-experiment measure, asking respondents to rate their paranoid and depression-like responses to tasks over the past week.

State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983). This 40-item widely-used self-report questionnaire measures state and trait anxiety. Respondents rate the applicability of state items on a 4-point Likert Scale ('not at all' to 'very much so') and the applicability of trait items on a 4-point Likert Scale ('almost never' to 'almost always'). Scores on both scales range from 20-80, taking into account reversed items, with higher scores indicating greater anxiety. Both subscales have demonstrated high internal consistency (male State $\alpha = .91$ and Trait $\alpha = .90$ and (female State $\alpha = .93$ and Trait $\alpha = .91$) and test-retest reliability and good construct and concurrent validity (Spielberger et al., 1983). Normative scores for college student populations are as follows: For State anxiety, males M = 36.47 (SD=10.02) and females M = 38.76 (SD = 11.95). For Trait anxiety, males M = 38.3 (SD = 9.18) and females M = 40.4 (SD = 10.15).

Situational Self-Awareness Scale (SSAS; Govern & Marsch, 2001). This 9-item self-report questionnaire measures three domains of state self-focussed attention; private (3 items), public (3 items) and awareness of surroundings (3 items). Public self-focussed attention refers to features of oneself that are presented to others (for example physical features) and private self-focussed attention refers to attentiveness to the internal personal aspects of oneself (for example pain or memories). Respondents rate the applicability of items on a 7-point Likert scale (1 = 'strongly disagree' to 7 'strongly agree'). It has a reliable factor structure and acceptable internal consistency (public $\alpha = .82$; private $\alpha = .70$ and surroundings $\alpha = .72$). Differences in self-awareness can also be produced by manipulating laboratory conditions. Normative scores for the subscales have been reported as follows; public (M = 12.38, SD = 4.77), private (M = 14.12, SD = 4.05 and surroundings (M = 14.13, SD = 3.57).

Experiences Questionnaire (EQ; Fresco et al., 2007). This 20-item self-report questionnaire measures decentring, the ability to define one's thoughts and feelings as temporary. There are 14 items measuring decentring and 6 items measuring rumination. Scores are summed for a total score. Rumination is included to check that respondents who score high on decentring are in fact decentring and not responding with acquiescence. Items are endorsed on a 5-point Likert scale (1 = never; 5 = all the time). The scale correlates positively and significantly with cognitive re- appraisal and negatively and significantly with depressive rumination, experiential avoidance and emotion suppression (Fresco et al. 2007). Participants with major depression also scored significantly lower on levels of decentring than non-clinical participants.

Cognitive Fusion Questionnaire (CFQ-13; Gillanders et al., 2010). This 13-item self-report questionnaire measures cognitive fusion, the extent to which individuals become enmeshed with their thoughts. Scores are summed for a total score, taking into account reversed items. The CFQ-13 is a recently developed measure. Initial research suggests it has good internal consistency (α =.84 for total score, α =.88 for fusion items and α =.68 for defusion items). It also demonstrates good discriminant validity, distinguishing between individuals who do and do not have psychological disorder and correlates highly with measures of similar constructs, including psychological inflexibility and mindfulness. Therefore the CFQ-13 has demonstrated good internal consistency and discriminant validity.

Thought Control Questionnaire (TCQ; Wells & Davies, 1994). This 30-item self-report questionnaire measures the internal strategies used to control unwanted

thoughts. Respondents rate the applicability of items on a 4-point Likert scale (1='never' to 4='almost always'). The items consist of five subscales (distraction, social control, worry, punishment and re-appraisal) each of which have good internal consistency; distraction (α = .72; social α = .79, worry α = .71; punishment α = .64; re-appraisal α = .67. The scale also correlates with similar measures. Subscale and a total score can be calculated by summing scores, taking into account reversed items. In a non-clinical sample (N=251), the total mean scores for males and females respectively were 49.22 (SD = 7.27) and 48.29 (SD = 6.21).

White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994). This 15-item self-report scale measures suppression of unwanted thoughts. Respondents rate the applicability of items on a 5-point Likert scale (1=strongly disagree; 5= strongly agree). Scores are summed and range between 15 and 75, with higher scores indicating greater suppression. It has demonstrated good internal consistency (α = .89) and concurrent validity (Muris, Merckelbach & Horselenberg, 1996). It correlates positively with measures of obsessional thinking, feelings of depression and correlates positively with trait anxiety. Research has also shown that thought suppression is positively associated with the use of most thought control strategies measured by the TCQ (Wells & Davies, 1994).

Acceptance and Action Questionnaire (AAQ-II; Hayes et al., 2004). This 7-item self-report questionnaire measures experiential avoidance - the ability to take action, the presence of worry, anxiety and negative evaluations and attempts to control or eliminate them. Respondents rate the applicability of items on a 7-point Likert scale. (1= 'never true', 7='always true'). The scale has good concurrent validity and test-retest

reliability (.64). The AAQ-II correlates significantly but not strongly with the WBSI and the TCQ, suggesting that the AAQ-II goes further than the measurement of thought suppression and attempts to control solely intrusive thoughts. It measures control of other private events such as bodily sensations. It correlates significantly (moderate to high) with measures of general psychopathology (including depression measured by the Beck Depression Inventory).

Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991). This 22-item self-report questionnaire measures how often individuals engage in ruminative responses to feeling depressed. It includes three subscales; reflection, brooding and depression-related. Items are rated on a 4-point Likert Scale (1 = 'never' to 4 = 'always'). Items are summed for a total score. The scale has demonstrated good internal consistency (α = .90), test re-test reliability (.67) and acceptable convergent and predictable validity (Treynor, Gonzalez & Nolen-Hoeksema, 2003).

Supplementary state questions. The experimenter devised 7 independent Likert questions for use as a state indicator of the main concepts of the questionnaires detailed above. For example, the question 'During the task how able were you to separate from your thoughts and feelings' was designed to measure the presence of cognitive fusion during the task. The first item was reversed scored.

Procedure

The study included two phases. Informed consent based on details provided in the Participant Information Sheet (Appendix D) was gained from all participants. Phase one

included the screening of potential participants through completion of the PS (Fenigstein & Vanable, 1992) on an online university webpage. Individuals who fell above and below the high and low respective paranoia cut-offs and who had consented to being contacted were invited to participate in the experimental phase of the study (phase two).

Phase two took place in a laboratory. Participants were asked to re-complete the PS (Fenigstein & Vanable, 1992) to verify the high and low paranoia groups. If still eligible, participants completed the PDS (Bodner & Mikulincer, 1998), STAI (Spielberger et al., 1998), SSAS (Govern & Marsch, 2001) and a demographics form. Participants were then randomly allocated using an internet randomizer programme[24] to the anxiety or control condition.

Participants in the anxiety-inducing condition were given a computer task with three unsolvable concept formation problems with 10 trials in each (Bodner & Mikulincer, 1998; Ellett & Chadwick, 2007). Participants were asked to indicate which of the figures on the screen they believed was correct, (see Appendix E for an example). For each of the 10 trials, participants were told at random that they gave a correct (5 times) or incorrect response (5 times). When asked at the end of the 10 trials which value was correct, participants were always told they gave the incorrect answer and were presented with a false overall score of their performance (45%) compared to a list of 19 other false scores (ranging from 45% to 88%). To enhance the feeling of anxiety, the experimenter sat behind the participant (approximately two feet) with a neutral face watching them perform. A two-way mirror directly in front of participants meant that they could see themselves and the experimenter's reflection. Participants also believed that they were being filmed and were able to see themselves and the experimenter in the monitor

[24] The randomiser program can be found at: www.randomizer.org

connected to the camera. The camera and mirror were not activated until the start of the computer task.

The same unsolvable problems were given to participants in the control condition; however no false feedback on task performance was given. Participants were asked to provide a baseline of guesses (Bodner & Mikulincer, 1998). The two-way mirror and camera were not used and the experimenter did not sit behind them watching their performance.

After completing the task, all participants in both conditions again completed the PDS (Bodner & Mikulincer, 1998), STAI (Spielberger et al., 1983) and SSAS (Govern & Marsch, 2001). Participants also completed metacognitive awareness measures including the EQ (Fresco et al., 2007) and CFQ-13 (Gillanders et al., 2010) and metacognitive strategy measures including the TCQ (Wells & Davies, 1994), WBSI (Wegner & Zanakos, 1994), AAQ-II (Hayes et al., 2004), RRS (Nolen-Hoeksema & Morrow, 1991) and supplementary state questions. All participants completed a short self-esteem task at the end of the study (Tamir, Robinson & Clore, 2002) to lift their mood (Appendix G). This task required participants to visualise and write about a happy event and rate their mood.

Finally, participants were fully debriefed (Appendix H) and given the opportunity to ask questions. All participants received college credit or were paid. Phase two took 40-50 minutes per participant.

Results

Data was analysed using the statistical package SPSS 19 for Windows. Data was tested for normality and homogeneity of variance. Several of the dependent variables were not normally distributed according to the Shapiro-Wilk test. Log and Square root transformations, based on positive skew of the data, were attempted. However, these transformations did not normalise the data with the exception of the Decentring subscale of the EQ (Fresco et al., 2007). Therefore the untransformed data was used in an Analysis of Variance (ANOVA) to examine the key hypotheses. Howell (1997) indicates that ANOVA is 'a very robust statistical procedure' (p. 321). In particular, ANOVA is unlikely to be significantly affected by violations of the normality assumption. Appendix F reports Cronbach alphas of measures for the current study.

Descriptive Statistics

The mean Paranoia Scale score measures trait paranoia. There were no differences in trait paranoia between the experimental and control conditions in either the low paranoia groups, (experimental $M = 28.20$, $SD = 2.86$; control $M = 27.35$, $SD = 3.82$, $t(38) = 0.79$, $p = .43$) or in the high paranoia groups, (experimental $M = 61.44$, $SD = 6.23$; control $M = 63.23$, $SD = 9.37$, $t(28) = 0.65$, $p = .52$).

There were no differences in age between the high and low paranoia groups in the experimental condition, (high $M = 21.13$, $SD = 3.40$; low $M = 21.10$, $SD = 3.06$, $t(34) = 0.02$, $p = .98$). There were no significant differences between the high and low paranoia groups in the control condition, (high $M = 20.06$, $SD = 1.98$; low $M = 20.90$, $SD = 3.26$, $t(35) = 0.93$, $p = .36$.

Fisher's Exact Test was used to determine gender differences of participants with high and low paranoia in the control condition, because cells had an expected count of less than five. In the control condition, there were no significant differences in gender, (Fisher's Exact $p = 0.25$). In the experimental condition, there were also no significant differences in gender (Fisher's Exact $p = 1.00$).

A one-way univariate ANOVA was used to identify differences in trait anxiety. There was a significant main effect of paranoia level, $F(1, 69) = 31.76$, $p = <.001$, with participants high in paranoia displaying significantly higher trait anxiety before the experimental manipulation. See Table 4 for group means.

Group Differences following Assignment to Condition

Table 2

PDS means and standard deviations by group

	High Paranoia Experimental	High Paranoia Control	Low Paranoia Experimental	Low Paranoia Control
PDS Paranoia Pre	22.19 (5.93)	25.12 (7.20)	12.2 (3.62)	11.4 (4.57)
PDS Paranoia Post	24.63 (5.69)	26.88 (6.53)	14.65 (5.25)	10.8 (3.61)
PDS Depression Pre	38.25 (11.69)	38.18 (8.38)	24.45 (8.62)	23.65 (7.71)
PDS Depression Post	39.13 (11.09)	35.88 (12.7)	23.30 (8.35)	18.40 (6.63)

Note. PDS = Paranoia and Depression Scale.

Paranoid cognitions. A two-way repeated measures ANOVA with one within-subject factor (time pre and post manipulation) and two between-subjects factors (paranoia and condition) was conducted on PDS Paranoia scores (see Table 2 for group

means). There were significant main effects of time, $F(1, 69) = 10.45$, $p = .002$, and of paranoia, $F(1, 69) = 113.63$, $p = <.001$, but no effect of condition, $F(1, 69) = .01$, $p = .91$. These main effects were qualified by a significant paranoia by condition interaction, $F(1, 69) = 4.44$, $p = .04$. A series of independent t-tests was used to explore this interaction. In the high paranoia group, there was no difference in the number of paranoid cognitions reported in the experimental or control conditions, $t(31) = -1.23$, $p = .23$. However, in the low paranoia group, there was a non-significant trend for participants in the experimental condition to report more paranoid cognitions than those in the control condition, $t(38) = 1.92$, $p = .06$[25].

There was also an interaction between time and condition that just missed significance, $F(1, 69) = 3.95$, $p = .05$. Given that this interaction was close to significance I explored it using paired-samples t-tests. In the experimental condition, there was a significant difference in number of reported paranoid cognitions over time, $t(35) = -4.28$, $p = <.001$, with participants in the experimental condition reporting more paranoid cognitions after the anxiety task. In the control condition, there was no significant difference, $t(36) = -0.66$, $p = .52$.

Depressive cognitions. A two-way repeated measures ANOVA with one within-subject factor (time pre and post manipulation) and two between-subject factors (level of paranoia and condition) was conducted on PDS Depression scores (see Table 2 for means). There was no main effect of time, $F(1, 69) = 3.49$, $p = .07$, or condition, $F(1, 69) = 1.32$, $p = .25$; however, there was a significant main effect of paranoia level, $F(1, 69) = 61.83$, $p = <.001$, with participants with high paranoia reporting significantly more depressive cognitions than participants with low paranoia.

[25] Bonferroni corrected p-values were used to counteract the use of multiple comparisons. Corrected p-value therefore was 0.025.

Table 3

SSAS means and standard deviations by group

	High Paranoia Experimental	High Paranoia Control	Low Paranoia Experimental	Low Paranoia Control
SSAS Surroundings Pre	12.00 (3.65)	14.06 (3.49)	13.60 (3.78)	12.75 (3.14)
SSAS Surroundings Post	12.13 (4.06)	15.24 (4.02)	13.20 (3.74)	13.25 (2.95)
SSAS Private Pre	12.31 (4.40)	13.64 (4.73)	10.35 (4.15)	10.60 (4.22)
SSAS Private Post	13.19 (3.15)	14.00 (5.37)	11.10 (4.23)	11.70 (4.01)
SSAS Public Pre	13.75 (3.04)	15.29 (4.07)	11.00 (4.54)	9.25 (4.57)
SSAS Public Post	13.5 (2.22)	15.41 (4.68)	10.75 (4.45)	9.05 (4.31)

Note. SSAS = situational self-awareness scale.

A two-way between-subject multivariate analysis of variance (MANOVA) was performed to investigate the hypothesis that participants high in paranoia when under threat would show higher levels of self-awareness. See Table 3 for group means. A MANOVA on the SSAS showed a significant overall effect of paranoia, $F(6, 64) = 6.46$, $p = <.001$, but no other overall effects were significant.

Private self-awareness. There was a significant main effect of paranoia, $F(1, 69) = 6.48$, $p = .01$, in which participants with high paranoia displayed greater attention to their inner experience than participants with low paranoia. There was no main effect of time, $F(1, 69) = 3.32$, $p = .73$, and no interactions between time and paranoia level, $F(1, 69) = .14$, $p = .71$, or between time and condition, $F(1, 69) = 0.01$, $p = .92$. In addition,

there was no main effect of condition, $F(1, 69) = 0.66$, $p = 0.42$, and no interaction between paranoia and condition, $F(1, 69) = 0.12$, $p = .73$.

Public self-awareness. Similar to private self-awareness, there was a significant main effect of paranoia, $F(1, 69) = 23.41$, $p = <.001$, in which participants with high paranoia displayed greater attention to aspects of the self presented to others than participants with low paranoia. There was no main effect of time, $F(1, 69) = .25$, $p = .62$ or condition, $F(1, 69) = .00$, $p = .99$) and no interactions between time and paranoia level, $F(1, 69) = .07$, $p = .79$, or between time and condition, $F(1, 69) = .13$, $p = .72$. The interaction between paranoia level and condition missed significance, $F(1, 69) = 3.48$, $p = .07$.

Surroundings. There was no main effect of time, $F(1, 69) = 1.20$, $p = .29$, and no interactions between time and paranoia level, $F(1, 69) = 0.88$, $p = .35$, or between time and condition, $F(1, 69) = 2.32$, $p = .13$. There were no main effects of paranoia, $F(1, 69) = .04$, $p = .84$, or of condition, $F(1, 69) = 2.01$, $p = 0.16$. However, the interaction between paranoia level and condition just missed significance, $F(1, 69) = 3.75$, $p = .06$. A series of independent t-tests was used to explore this near-significant interaction. For the high paranoia groups there was a significant difference between SSAS Surroundings scores in the experimental and control groups, $t(31) = 0.41$, $p = 0.04$, but no differences in the low paranoia group ($p = .68$). Participants with high paranoia in the control group showed significantly more focus on surroundings than participants with high paranoia in the experimental group. No other post-hoc comparisons were significant.

Table 4

STAI means and standard deviations by group

	High Paranoia Experimental	High Paranoia Control	Low Paranoia Experimental	Low Paranoia Control
STAI-State Pre	45.31 (11.53)	45.06 (12.35)	33.05 (8.08)	33.05 (9.23)
STAI-State Post	51.00 (9.03)	52.29 (13.31)	37.40 (11.27)	34.50 (8.92)
STAI-Trait Pre	58.38 (7.62)	59.41 (10.93)	49.40 (10.75)	43.75 (7.18)

Note. STAI = State-trait anxiety inventory.

State anxiety. A two-way univariate ANOVA was used to determine differences in state anxiety scores (see Table 4 for group means). There was a significant main effect of time, $F(1, 69) = 29.91$, $p = <.001$ and a significant main effect of paranoia, $F(1, 69) = 35.91$, $p < .05$. This was qualified by a significant paranoia by time interaction, $F(1, 69) = 4.33$, $p = .04$. A series of paired t-tests was used to explore this interaction. There was a significant difference between STAI-S scores of participants with low paranoia across time, $t(39) = -2.30$, $p = .03$, with anxiety increasing from pre-task to post-task. This indicates a trend, just missing significance at the bonferroni corrected p-value ($p = 0.025$). There was also a significant difference between STAI-S scores of participants with high paranoia across time, $t(32) = 5.91$, $p = <.001$, with anxiety increasing from pre-task to post-task. Over time, participants high in paranoia reported more state anxiety than participants low in paranoia, $t(71) = 6.07$, $p = <.001$.

However, there was no main effect of condition, $F(1, 69) = .04$, $p = .84$ and no paranoia x condition interaction, $F(1, 69) = .18$, $p = .67$. Therefore, although state anxiety was significantly higher in both high paranoia groups, participation in the anxiety condition did not significantly increase state anxiety when compared to the other groups.

Table 5

TCQ, WBSI, AAQ-II and RRS means and standard deviations by group

	High Paranoia Experimental	High Paranoia Control	Low Paranoia Experimental	Low Paranoia Control
TCQ Distraction	15.06 (2.99)	14.94 (4.29)	15.40 (2.80)	15.05 (2.36)
TCQ Punishment	11.31 (2.41)	11.05 (2.84)	8.85 (2.11)	8.40 (1.39)
TCQ Reappraisal	14.25 (3.13)	15.00 (4.64)	13.75 (3.51)	14.30 (4.01)
TCQ Worry	10.88 (4.43)	12.06 (4.32)	8.10 (1.77)	9.25 (2.67)
TCQ Social Control	12.25 (3.45)	13.47 (6.04)	14.50 (4.58)	15.65 (6.94)
WBSI	55.44 (8.02)	60.65 (7.21)	47.15 (10.63)	42.40 (10.56)
AAQ-II	25.69 (10.85)	33.94 (10.66)	16.05 (7.01)	14.30 (5.31)
RRS Brooding	12.19 (2.74)	14.47 (3.48)	9.40 (2.99)	9.20 (2.50)
RRS Reflection	11.50 (4.52)	12.76 (4.67)	10.45 (3.85)	9.90 (2.97)
RRS Depression	31.06 (7.13)	34.29 (7.80)	22.55 (6.02)	23.45 (5.61)
RRS Total	54.75 (11.95)	61.53 (13.50)	42.40 (10.85)	42.55 (8.99)

Note. TCQ = Thought Control Questionnaire; WBSI = White Bear Suppression Inventory; AAQ-II = Acceptance and Action Questionnaire; RRS = Ruminative Responses Questionnaire.

Thought control. A two-way between-group MANOVA was performed to investigate whether participants high in paranoia in the anxiety condition would use the most maladaptive thought control strategies. The independent variables were level of paranoia and condition and the dependent variables were subscales of the thought control

questionnaire. See Table 5 for group means. A MANOVA on the TCQ showed a significant overall effect of paranoia level, $F(5, 65) = 6.58$, $p = <.001$, but not overall effect of condition, $F(5, 65) = .88$, $p = .50$ or interaction between paranoia and condition, $F(5, 65) = .01$, $p = 1.00$.

There was a significant main effect of paranoia for some subscales, with participants high in paranoia scoring significantly higher on two of the thought control strategies, punishment, $F(1, 69) = 24.21$, $p = <.001$, and worry, $F(1, 69) = 12.33$, $p = .001$. There was a trend for participants in the high paranoia group to have lower scores on social control, $F(1, 69) = 2.95$, $p = .09$, which indicated that participants low in paranoia used more social control strategies. There were no main effects of paranoia for distraction, $F(1, 69) = 0.08$, $p = .78$, or reappraisal, $F(1, 69) = 0.44$, $p = .51$. There were no main effects of condition and no interactions (lowest $p = .15$).

Thought suppression. A two-way univariate ANOVA was used to determine significant differences in thought suppression across paranoia level and condition (see Table 5 for group means). There was a significant main effect of paranoia, $F(1, 69) = 36.23$, $p = <.001$, but not of condition, $F(1, 69) = 0.01$, $p = .92$. However, there was an interaction between paranoia and condition, $F(1, 69) = 5.10$, $p = .03$, depicted by Figure 2. When participants with high paranoia were compared on levels of thought suppression across conditions, those in the control condition reported more thought suppression, which just missed significance, $t(31) = -1.97$, $p = .06$. Participants with low paranoia in both conditions did not differ in reported levels of thought suppression, $t(38) = 1.42$, $p = .16$.

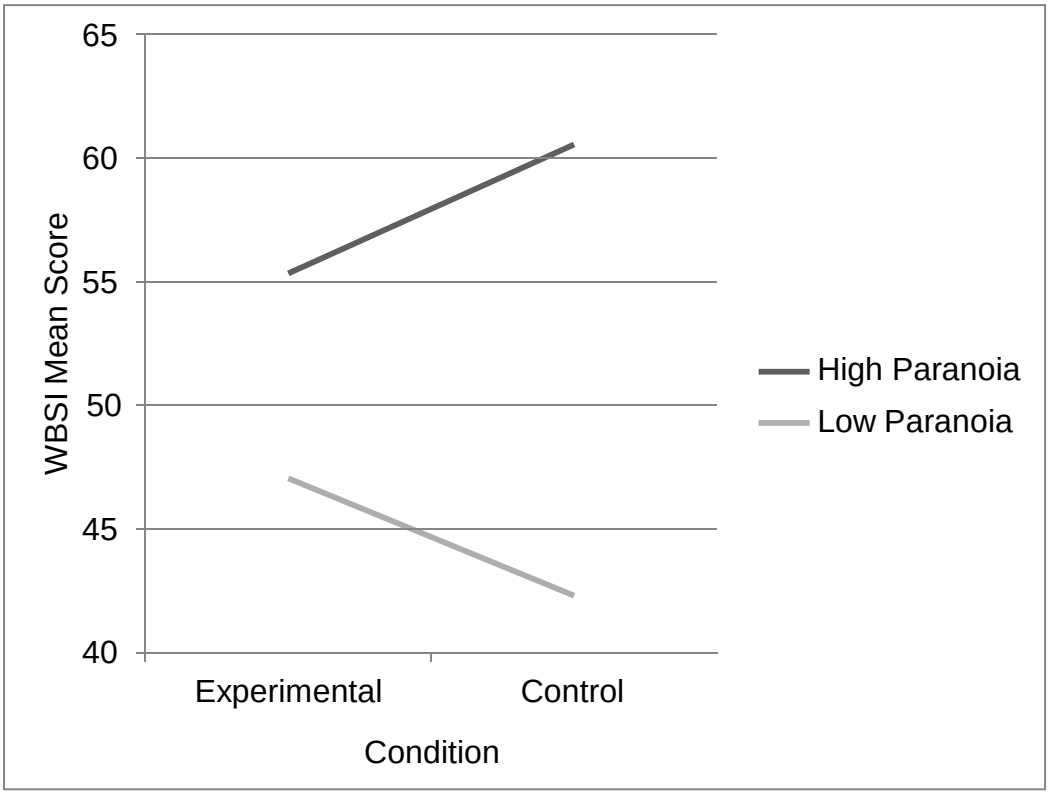

Figure 2. Interaction between paranoia and condition on the WBSI.

Rumination. A two-way between-group MANOVA was performed to investigate the hypothesis that participants high in paranoia when under threat would use the most ruminative strategies (see Table 5 for group means). A MANOVA on the RRS showed a significant overall effect of paranoia level, $F(3, 67) = 14.61$, $p = <.001$, but no overall effect of condition, $F(3, 67) = .84$, $p = .47$ or interaction between paranoia and condition, $F(3, 67) = 1.21$, $p = .31$.

There was a significant main effect of paranoia for all three subscales of brooding, $F(1, 69) = 33.93$, $p = <.001$; depression, $F(1, 69) = 38.62$, $p = <.001$, and reflection, $F(1, 69) = 4.33$, $p = .04$, with participants high in paranoia reporting more ruminative strategies. However, there was no main effect of condition on any of the three subscales (lowest $p = .14$). There were no interactions between paranoia and condition for any of

the subscales, although there was a non-significant trend for brooding, F (1, 69), = 3.22, p = .07, but not for depression or reflection (lowest p = .34).

A two-way univariate ANOVA was used to determine differences on the RRS total score. There was a significant main effect of paranoia level, $F(1, 69) = 34.67$, p = <.001, with participants high in paranoia reporting more ruminative strategies. There was no main effect of condition, $F(1, 69) = 1.69$, $p = 0.19$, and no interaction between paranoia level and condition, $F(1, 69) = 1.55$, $p = 0.22$.

Psychological inflexibility. A two-way univariate ANOVA was used to determine differences across paranoia level and condition on levels of psychological inflexibility (see Table 5 for group means). There was a significant main effect of paranoia level, $F(1, 69) = 52.80$, p = <.001, but no main effect of condition, $F(1, 69)$ = 2.61, p =.11. There was a significant interaction between paranoia level and condition, $F(1, 69) = 6.16$, $p = .02$ (see Figure 3). A series of independent samples t-tests was used to explore this interaction. Participants with high paranoia in the control condition reported more psychological inflexibility than participants with high paranoia in the experimental condition, $t(31) = -2.20$, $p = .04$. This indicates a non-significant trend at the Bonferroni corrected p-value of 0.025. No significant difference was found on levels of psychological inflexibility between participants with low paranoia in the experimental and control condition, $t(38) = 0.89$, $p = .38$.

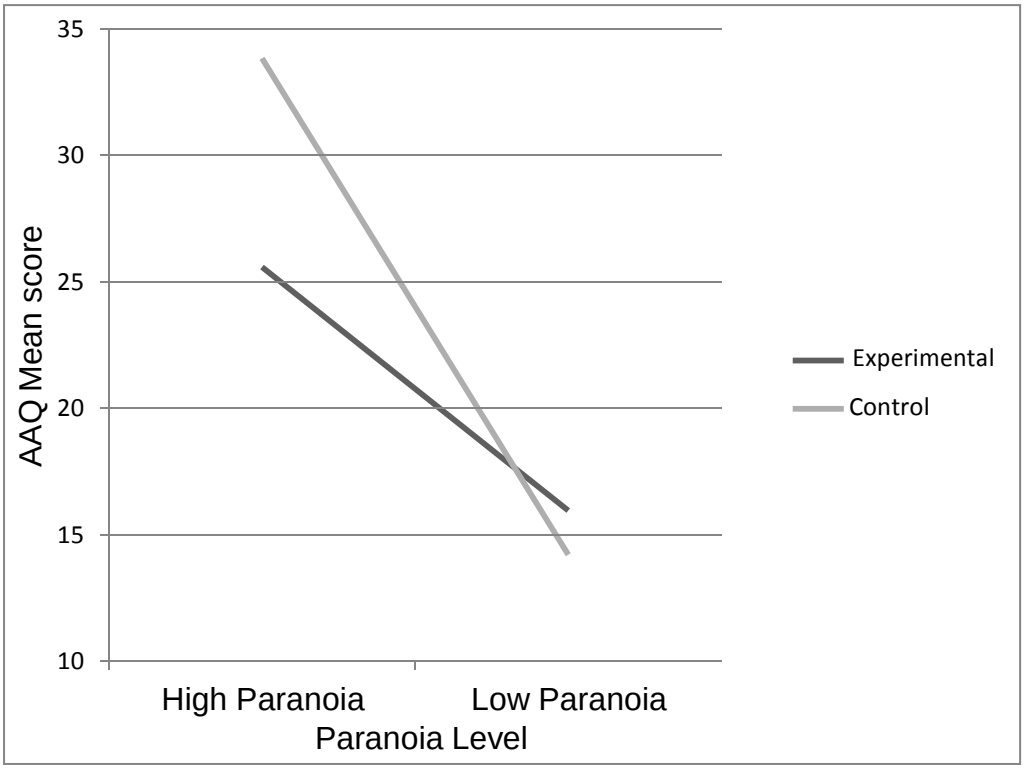

Figure 3. Interaction between paranoia and condition on the AAQ.

Table 6

CFQ and EQ means and standard deviations by group

	High Paranoia Experimental	High Paranoia Control	Low Paranoia Experimental	Low Paranoia Control
CFQ Total	53.81 (13.19)	61.76 (14.73)	41.30 (10.81)	40.50 (9.54)
EQ Decentring	32.56 (7.97)	30.06 (7.96)	35.20 (6.37)	34.85 (4.90)
EQ Total	63.19 (10.19)	62.18 (11.29)	63.90 (8.33)	62.90 (6.81)

Note. CFQ = Cognitive Fusion Questionnaire; EQ = Experiences Questionnaire. Log Transformed means are not reported here to allow for comparison.

Cognitive fusion. A two-way univariate ANOVA was used to determine whether participants with high paranoia in the experimental condition experienced greater

cognitive fusion (see Table 6 for group means). There was a significant main effect of paranoia, $F(1, 69) = 35.45$, $p = <.001$, in which participants with high paranoia reported higher levels of cognitive fusion. There was no main effect of condition, $F(1, 69) = 1.59$, $p = .21$, and no interaction between paranoia level and condition on cognitive fusion, $F(1, 69) = 2.38$, $p = .13$.

Decentring. Two-way univariate ANOVAs were used to determine whether participants high in paranoia in the experimental condition were less able to decentre, or to define one's thoughts as temporary (see Table 6 for group means). For the EQ total score, there was no main effect of paranoia level, $F(1, 69) = 0.11$, $p = .74$ or condition, $F(1, 69) = 0.22$, $p = .64$. Similarly, there was no main effect found for level of paranoia on the decentring subscale, $F(1, 69) = 0.09$, $p = .76$ or condition, $F(1, 69) = 1.49$, $p = .23$.

Table 7

Supplementary state questionnaire means and standard deviations by group

	High Paranoia Experimental	High Paranoia Control	Low Paranoia Experimental	Low Paranoia Control
Ability to separate from thoughts and feelings	3.06 (1.06)	3.24 (0.97)	4.00 (0.79)	3.50 (1.10)
Getting caught up in thoughts	3.63 (0.96)	3.47 (1.18)	2.70 (0.98)	2.55 (1.19)
Attempts to push thoughts away	3.38 (1.20)	3.71 (1.10)	2.30 (1.29)	2.78 (1.40)
Thinking about unwanted thoughts	2.75 (1.39)	2.76 (1.44)	1.90 (1.12)	1.80 (1.32)
Negatively evaluating self as fact	4.06 (1.12)	3.41 (1.42)	2.70 (1.26)	2.15 (1.18)
Anxiety	3.81 (0.98)	3.41 (1.42)	2.65 (1.18)	2.65 (1.39)
Thinking about performance	4.69 (0.79)	4.41 (1.06)	3.85 (0.93)	3.50 (1.36)

Note. There is only one item per subscale.

Supplementary state questionnaire. A two-way between-group MANOVA was performed (see Table 7 for group means). A MANOVA on the supplementary questions showed a significant overall effect of paranoia level, $F(7, 63) = 4.09$, $p = <.001$, but no overall effect of condition, $F(7, 63) = 1.34$, $p = .26$ or interaction between paranoia and condition, $F(7, 63) = .78$, $p = .60$.

There was a significant main effect of paranoia for five of six subscales; 'ability to separate thoughts and feelings', $F(1, 69) = 6.73$, $p = .01$; 'caught up in thoughts', $F(1, 69) = 13.09$, $p = .001$; 'pushing thoughts away', $F(1, 69) = 16.22$, $p = <.001$; 'thinking about unwanted thoughts', $F(1, 69) = 8.62$, $p = .01$; 'negatively evaluating the self and seeing this as fact'; $F(1, 69) = 19.92$, $p = <.001$ and 'anxiety', $F(1, 69) = 10.53$, $p = .002$. There was no main effect of paranoia for 'thinking about performance', $F(1, 69) = 0.02$, $p = .88$. The only significant main effect of condition related to 'negatively evaluating the self and seeing this as fact', $F(1, 69) = 4.17$, $p = .05$. An independent t-test was used to explore this effect. However, there was no significant difference between conditions, $t(71) = 1.76$, $p = .08$. There was a trend for participants in the experimental condition to report more negative evaluations. No interactions were identified between paranoia level and condition.

Discussion

A 2x2 between-subject design was employed to investigate whether metacognitive factors maintain distress in non-clinical paranoia. As hypothesised, participants with high paranoia reported more paranoid and depressive cognitions, state and trait anxiety, public and private self-focus, thought control, suppression, rumination, psychological inflexibility and cognitive fusion. However, the anxiety-induction task failed to significantly increase these variables.

Participants with high paranoia reported significantly more paranoid cognitions than participants with low paranoia. However, the anxiety-induction task failed to significantly increase the frequency of paranoid cognitions reported by participants with high paranoia. Despite not reaching significance, the anxiety task was somewhat effective at inducing paranoid cognitions for participants with low paranoia. Participants in the anxiety condition reported more paranoid cognitions than in the control condition.

The anxiety-induction task may have failed to increase paranoid cognitions in participants with high paranoia for several reasons. Participants with high paranoia may have interpreted the control task as ambiguous and therefore equally as 'threatening' as the anxiety task. This hypothesis fits with experimental studies that suggest higher levels of state paranoia are significantly related to negative interpretations of ambiguous events (Freeman et al., 2012). Further, clinical groups of patients with persecutory delusions require a need for order, desire for predictability and intolerance of ambiguity (McKay, Langdon & Coltheart, 2007). However, the number of reported paranoid cognitions only increased slightly in both high paranoia groups. The PDS (Bodner & Mikulincer, 1998) was adapted as a pre-task measure to identify increases in frequency of paranoid-like responses during the tasks. This may have contributed to lack of effects because it had not been validated and has unknown test re-test reliability.

Participants with high paranoia reported significantly more depressive cognitions than participants with low paranoia, but this was irrespective of condition. This suggests that the anxiety task did not increase levels of depression significantly in participants with high paranoia compared to participants with low paranoia, akin to the findings of Flower (2010).

As hypothesised, participants with high paranoia reported higher levels of public and private self-awareness, referring to how individuals present themselves to others and paying attention to inner experiences including physical feelings of pleasure or pain (Govern & Marsch, 2001). The hypothesis that self-awareness would be increased by the anxiety task in participants with high paranoia was not found.

These findings are partly supported by research that has found a positive correlation between state paranoia and public and private self-consciousness (Freeman et al., 2012). However, being watched, filmed and looking into a mirror did not significantly increase public and private self-awareness. Several other studies have found different results with participants without paranoia (Govern & Marsch, 2001) and with paranoia (Fenigstein, 1984; Fenigstein & Vanable, 1992). In addition, Flower (2010) found no significant differences between high and low paranoia groups in the 'threat' condition on self-focussed attention.

Before randomisation to condition, participants with high paranoia reported significantly higher trait anxiety than participants with low paranoia, akin to Flower (2010). This finding provides support for current psychological models that highlight the central role of anxiety in the predisposition towards clinical (Freeman et al., 2002) and non-clinical paranoia (Freeman, 2007). All groups became more anxious over time, and participants with high paranoia became significantly more anxious over time compared to participants with low paranoia. However the anxiety-induction did not further increase

levels of anxiety above that in the control condition, which contrasts with the findings of Lincoln et al. (2010).

As hypothesised, participants with high paranoia used significantly more thought control, (punishment and worry) than participants with low paranoia. This finding has been evidenced in correlational studies of persecutory delusions (Morrison & Wells, 2000) and non-clinical studies of paranoia (Flower, 2010; Newman-Taylor et al., 2009); although the latter study found that these strategies were related more strongly to the presence of anxiety. The finding that participants with high paranoia report more uncontrollability of thoughts and state anxiety supports the findings of Freeman and Garety (1999), who suggested that anxiety processes underlie paranoia. However, the internal consistency of the subscale 'punishment' in the current study was below sufficient ($\alpha = .55$) and therefore must be interpreted with caution.

As hypothesised, participants with high paranoia also reported significantly more thought suppression than participants with low paranoia. Participants with low paranoia responded as expected, with no increases in thought suppression across conditions. Furthermore in the anxiety condition participants with high paranoia reported significantly more thought suppression than participants with low paranoia. A similar pattern of results was found for the control condition. However, results were not quite as expected, with participants with high paranoia in the control condition reporting more thought suppression than participants with high paranoia in the anxiety condition. This finding may support the hypothesis of ambiguity; however to the author's knowledge, the effect of ambiguity on use of metacognitive strategies has not been investigated.

Participants with high paranoia also used significantly more ruminative strategies and reported higher psychological inflexibility, regardless of condition, than participants with low paranoia. Further, it was surprising that participants with high paranoia in the

control condition endorsed more psychological inflexibility than participants with high paranoia in the anxiety-induction condition. Again, this may suggest that the control task was perceived as more threatening or simply represents greater pre-existing psychological inflexibility in participants randomised to this condition. These findings overall support the application of the S-REF model (Wells & Matthews, 1994) to paranoia, since the thought control strategies implicated in the CAS were endorsed significantly more by participants with high paranoia and fits with research demonstrating the positive correlations between these strategies (Hayes et al., 2004; Wells & Davies, 1994).

As hypothesised, participants with high paranoia reported significantly more cognitive fusion than participants with low paranoia. This has not previously been demonstrated. However, participants with high paranoia in the anxiety-induction condition did not report significantly more fusion than those in the control condition. Participants did not differ across condition or paranoia level on decentring. The findings in relation to metacognitive awareness are mixed and warrant further exploration. The EQ (Fresco et al., 2007) correlates negatively with experiential avoidance therefore it was expected that since there was a significant result for experiential avoidance, a similar finding for decentring would follow. However, these correlations were reported for depressed populations (Fresco et al., 2007). To the author's knowledge, the EQ (Fresco et al., 2007) has not previously been used or validated with a paranoid population.

A correlation matrix (Appendix I) examined the associations between the primary dependent variables. Of particular note were the strong positive correlations between the AAQ and CFQ (r = .887), the WBSI and CFQ (r = .738), and the PDS Paranoia with the AAQ (r = .753) and CFQ (r = .686). Since the CFQ correlated with a number of measures, this warrants further investigation. A seven-item state measure was devised to address the limitation of using trait measures of metacognitive strategies and awareness to

identify group differences. Participants with high paranoia scored higher on five of six subscales. There was a trend for participants with high paranoia in the experimental condition to report more negative evaluations of the self and seeing this as fact than participants with low paranoia. This however, must be interpreted with caution owing to lack of validation and only one item measuring each metacognitive construct.

Overall, the current study provides further support for the role of specific psychological processes implicated in the development and maintenance of anxiety (metacognitive strategies) to non-clinical paranoia and preliminary evidence for the presence of low metacognitive awareness. The findings of the current study lend support to the application of the S-REF model (Wells & Matthews, 1994) in an understanding of non-clinical paranoia, with thought control, suppression, experiential avoidance and rumination all significantly higher in participants with high paranoia. What cannot be concluded is whether these phenomena are implicated in the maintenance of distress in paranoia, owing to the lack of effective increase in anxiety and paranoid cognitions following the anxiety-induction task above that found in the control task.

Study Limitations

There are several other limitations of note in this study. The study relied on trait measures of metacognitive strategies and awareness because of a lack of state versions. It cannot therefore be concluded that the higher levels of metacognitive strategies and lower metacognitive awareness were related directly to the experimental manipulation. Further, some researchers argue that mild social anxiety rather than paranoia was manipulated. However, the paranoia hierarchy (Freeman, 2007) is based upon social-evaluative concerns and the Paranoia Scale (Fenigstein & Vanable, 1992) used to screen appropriate

participants is based upon clinical measures of paranoia. Other methodological limitations include the lack of blinding of experimenter to condition or to level of paranoia, in theory meaning that the experimenter could have introduced bias to the study. In addition, although the differences were not significant, use of randomization with a small sample size led to unequal cognitive fusion scores between the high paranoia groups, with higher scores in the control condition and unequal trait anxiety scores between the low paranoia groups, with higher scores in the experimental condition.

Clinical Implications

Research with non-clinical populations can inform understanding of clinical psychopathology. The findings of the current study suggest that metacognitive strategies and metacognitive awareness should be considered when developing a formulation of clinical paranoia. Morrison et al.'s (2011) metacognitive model of clinical paranoia that implicates both metacognitive beliefs and thought control as a strategy to manage the unpleasant emotions related to delusion content may be a useful framework. Although CBT has to some extent shown its value as an effective treatment for psychosis, it is 'limited to effecting change only within the peripheral features (consequence) of the disorder, such as distress and behavioural reactions' (Tai & Turkington, 2009, p.867) and shows no clear advantage over other interventions (Freeman, 2011; Jones, Hacker, Cormac, Meaden & Irving, 2012).

Therefore, the current study logically supports the integration of metacognitive therapy as an intervention for clinical paranoia. The growth of research that has shown an association between metacognition and psychosis has led to the development of metacognitive-based treatments for positive symptoms, although evidence is in its infancy. Metacognitive therapy, underpinned by the S-REF model (Wells & Matthews,

1994) focuses solely on the styles of thinking (rumination, worry) and strategies used (thought suppression and avoidance) in order to alter the way individuals experience their thoughts and altering maladaptive metacognitive beliefs.

Metacognitive training for psychosis (MCT) is more closely underpinned by cognitive-behaviour therapy for psychosis (CBTp); addressing both cognitive biases and maladaptive behaviour that contributes towards distress; with the addition of raising awareness *about* the cognitive bias through exercises. One randomised controlled trial assigned 48 individuals with schizophrenia spectrum disorder to cognitive remediation or individual MCT (Moritz, Veckenstedt, Randjbar, Vitzthum & Woodward, 2011a). Over four weeks, delusion severity declined significantly more in the MCT group. However, other than addressing thought suppression and rumination it is unclear how different MCT is from CBTp. In addition, the long-term gains of MCT were not analysed, with no follow-up and metacognition was not measured, hence the effects of symptom reduction cannot be attributed to metacognitive processes if this was not measured. Group-format MCT however has shown significant effects on intensity of distress rather than symptom reduction (Moritz et al., 2011b).

A case study of an individual with schizophrenia highlighted a negative association between metacognitive capacity and awareness and delusions and lack of insight following psychotherapy (Lysaker, Buck & Ringer, 2007). Metacognitive training and therapy is therefore in its infancy compared to CBT, but experimental and correlational research demonstrating a link between metacognition and positive psychotic symptoms suggests further clinical randomised trials are required.

Future Research

This experimental study demonstrated the differences in metacognitive strategies and awareness in participants with high and low levels of non-clinical paranoia. However, participants with high paranoia may have interpreted the control task not as neutral, but as ambiguous and therefore equally as 'threatening' as the anxiety task. This may explain the lack of condition effects. Other anxiety-inducing experimental manipulations, for example that of Lincoln et al. (2010) should be used to investigate the hypotheses of the current study. However, it would be useful to replicate this study with a clinical population and to examine the effects of ambiguity on metacognitive processes. For experimental manipulations of paranoia, the development of state metacognition questionnaires would be valuable to research in this area.

Conclusion

In conclusion, this study provides support for the role of metacognitive strategies and awareness in the experience of non-clinical paranoia. Future studies must investigate whether the presence of distress increases the frequency of these metacognitive variables to demonstrate whether metacognition maintains distress in paranoia. In addition, future research should investigate whether identified and validated ambiguous situations lead to an increase in distress and metacognitive processes.

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Appendix A

Definitions of the MCQ-65 subscales (Cartwright-Hatton & Wells, 1997)

Subscale name	Definition
Positive beliefs about worry (PB)	Worry helps planning and problem-solving
Uncontrollability and danger (UD)	Worry must be controlled in order to remain safe and to function and includes beliefs about the uncontrollability of worry.
Lack of cognitive confidence (CC)	Lack of confidence in one's own memory and attentional ability.
General negative beliefs (SPR)	The need to control thoughts in general and superstitious themes of personal responsibility arising from harmful consequences of not controlling thoughts.
Cognitive self-consciousness (CSC)	Refers to cognitive self-awareness or preoccupation with one's own thought processes.

Appendix B School

Ethics Approval

Submission Number: 1482
Submission Name: The role of metacognition in the maintenance of distress in paranoia.
This is email is to let you know your submission was approved by the Ethics Committee.

You can begin your research unless you are still awaiting specific Health and Safety approval (e.g. for a Genetic or Biological Materials Risk Assessment)

Comments
1.BUT the Phase Two consent from needs a slight alteration - in the first bullet point it should read that they have read version 2 of the Information Sheet.

Click here to view your submission

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http://www.ergo.soton.ac.uk

DO NOT REPLY TO THIS EMAIL

Appendix C

Copies of Questionnaire Measures

Paranoia Scale

There are some statements below about certain feelings and beliefs that people usually have concerning themselves, others and certain situations. Your task is to choose how well each statement is applicable to you.

	Not at all applicable to me	Slightly applicable to me	Somewhat applicable to me	Applicable applicable to me	Extremely applicable to me
1. Someone has it in for me	1	2	3	4	5
2. I sometimes feel as if I'm being followed	1	2	3	4	5
3. I believe that I have often been punished without a cause	1	2	3	4	5
4. Some people have tried to steal my ideas and take credit for them	1	2	3	4	5
5. My parents and family find more fault with me than they should	1	2	3	4	5
6. No one really cares much what happens to you	1	2	3	4	5
7. I am sure I get a raw deal of life	1	2	3	4	5
8. Most people will use somewhat unfair means to gain profit or an advantage rather than lose it	1	2	3	4	5
9.I often wonder what hidden reasons another person may have for doing something nice for you	1	2	3	4	5
10. It is safer to trust no one	1	2	3	4	5
11. I have often felt that strangers were looking at me critically	1	2	3	4	5
12. Most people make friends because friends are likely to be useful to them	1	2	3	4	5
13. Someone has been trying to influence my mind	1	2	3	4	5
14. I am sure I have been talked about behind my back	1	2	3	4	5
15. Most people inwardly dislike putting themselves out to help other people	1	2	3	4	5
16. I tend to be on my guard with	1	2	3	4	5

people who are somewhat more friendly than I expect					
17. People have said insulting and unkind things about me	1	2	3	4	5
18. People often disappoint me	1	2	3	4	5
19. I am bothered by people outside, in cars, in stores etc watching me	1	2	3	4	5
20. I have often found people jealous of my good ideas just because they had not thought of them first	1	2	3	4	5

(PS; Fenigstein & Vanable, 1992)

Paranoia and Depression Scale (PDS; Bodner & Mikulincer, 1998)

Following the task you have just completed, please rate how true each statement is for you by circling a number next to it.

1. I'm disappointed from my performance

1 2 3 4 5 6

Not at all — Very often

2. I feel that I do not have energy to perform other tasks

1 2 3 4 5 6

Not at all — Very often

3. I feel ashamed of my task performance

1 2 3 4 5 6

Not at all — Very often

4. I do not have the appropriate abilities to perform the tasks

1 2 3 4 5 6

Not at all — Very often

5. I have doubts about my abilities and skills

1 2 3 4 5 6

Not at all — Very often

6. I'm critical of my task performance

1	2	3	4	5	6
Not at all					Very often

7. I feel guilty about my task performance

1	2	3	4	5	6
Not at all					Very often

8. I feel that I'm less competent than others

1	2	3	4	5	6
Not at all					Very often

9. I feel weak and tired

1	2	3	4	5	6
Not at all					Very often

10. I feel helpless

1	2	3	4	5	6
Not at all					Very often

11. I feel that my behaviour is being analysed

1	2	3	4	5	6
Not at all					Very often

12. I feel that people talk about me

_____

1	2	3	4	5	6
Not at all					Very often

13. I feel that people are hostile to me

_____

1	2	3	4	5	6
Not at all					Very often

14. I feel that others are picking on me

_____

1	2	3	4	5	6
Not at all					Very often

15. I feel that others are examining my actions

_____

1	2	3	4	5	6
Not at all					Very often

16. I feel that others influence my performance

_____

1	2	3	4	5	6
Not at all					Very often

17. I do not trust other people's intentions

_____

1	2	3	4	5	6
Not at all					Very often

WBSI

This survey is about thoughts. There are no right or wrong answers, so please respond honestly to each of the items below. Be sure to answer every item by circling the appropriate letter beside each.

A	B	C	D	E
Strongly Disagree	Disagree	Neutral or Don't Know	Agree	Strongly Agree

1. There are things I prefer not to think about.	A B C D E
2. Sometimes I wonder why I have the thoughts I do.	A B C D E
3. I have thoughts that I cannot stop.	A B C D E
4. There are images that come to mind that I cannot erase.	A B C D E
5. My thoughts frequently return to one idea.	A B C D E
6. I wish I could stop thinking of certain things.	A B C D E
7. Sometimes my mind races so fast I wish I could stop it.	A B C D E
8. I always try to put problems out of mind.	A B C D E
9. There are thoughts that keep jumping into my head.	A B C D E
10. There are things that I try not to think about.	A B C D E
11. Sometimes I really wish I could stop thinking.	A B C D E
12. I often do things to distract myself from my thoughts.	A B C D E
13. I have thoughts that I try to avoid.	A B C D E

14. There are many thoughts that I have that I don't tell anyone.	A B C D E
15. Sometimes I stay busy just to keep thoughts from intruding on my mind.	A B C D E

(Wegner & Zanakos, 1994)

Thought Control Questionnaire

Most people experience unpleasant and/or unwanted thoughts which can be difficult to control. We are interested in the techniques that you use to control such thoughts. Below are a number of things that people do to control these thoughts. Please read each statement carefully, and indicate how often you use each technique by circling the appropriate number. There are no right or wrong answers. Do not spend too much time thinking about each one.

When I experience an unpleasant/ unwanted thought:

		Never	Sometimes	Often	Almost Always
1	I call to mind positive images instead	1	2	3	4
2	I tell myself not to be so stupid	1	2	3	4
3	I focus on the thought	1	2	3	4
4	I replace the thought with a more trivial bad thought	1	2	3	4
5	I don't talk about the thought to anyone	1	2	3	4
6	I punish myself for thinking the thought	1	2	3	4
7	I dwell on other worries	1	2	3	4
8	I keep the thought to myself	1	2	3	4
9	I occupy myself with work instead	1	2	3	4
10	I challenge the thought's validity	1	2	3	4
11	I get angry at myself for having the thought	1	2	3	4
12	I avoid discussing the thought	1	2	3	4
13	I shout at myself for having the thought	1	2	3	4
14	I analyse the thought rationally	1	2	3	4
15	I slap or pinch myself to stop the thought	1	2	3	4
16	I think pleasant thoughts instead	1	2	3	4
17	I find out how my friends deal with these thoughts	1	2	3	4
18	I worry about more minor things instead	1	2	3	4
19	I do something that I enjoy	1	2	3	4
20	I try to interpret the thought	1	2	3	4
21	I think about something else	1	2	3	4
22	I think more about the minor problems I have	1	2	3	4
23	I try a different way of thinking about it	1	2	3	4
24	I think about past worries instead	1	2	3	4
25	I ask my friends if they have similar thoughts	1	2	3	4
26	I focus on different negative thoughts	1	2	3	4
27	I question the reasons for having the thought	1	2	3	4
28	I tell myself that something bad will happen if I think the thought	1	2	3	4
29	I talk to a friend about the thought	1	2	3	4
30	I keep myself busy	1	2	3	4

(TCQ; Wells & Davies, 1994)

Ruminative Responses Scale

People think and do many different things when they feel depressed. Please read each of the items below and indicate whether you almost never, sometimes, often or almost always think or do each one when you feel sad, down or depressed. Please indicate what you generally do, not what you think you should do.

	Almost never	Sometimes	Often	Almost always
1. Think about how alone you feel				
2. Think “I won’t be able to do my job if I don’t snap out of this”				
3. Think about your feelings of fatigue and achiness				
4. Think about how hard it is to concentrate				
5. Think “what am I doing to deserve this?”				
6. Think about how passive and unmotivated you feel				
7. Analyse recent events to try to understand why you are depressed				
8. Think about how you don’t seem to feel anything anymore				
9. Think “why can’t I get going?”				
10. Think “why do I always react this way?”				
11. Go away by yourself and think about why you feel this way				
12. Write down what you are thinking about and analyse it				
13. Think about a recent situation, wishing it had gone better				
14. Think “I won’t be able to concentrate if I keep feeling this way”				
15. Think “why do I have problems other people don’t have?”				
16. Think “why can’t I handle things better?”				
17. Think about how sad you feel				
18. Think about all your shortcomings, failings, faults, mistakes				
19. Think about how you don’t feel up to doing anything				
20. Analyse your personality to try to				

understand why you are depressed				
21. Go someplace alone to think about your feelings				
22. Think about how angry you are with yourself				

(RRS; Nolen-Hoeksema & Morrow, 1991)

AAQ-II

Below you will find a list of statements. Please rate how true each statement is for you by circling a number next to it. Use the scale below to make your choice.

1	2	3	4	5	6	7
never true	**very seldom true**	**seldom true**	**sometimes true**	**frequently true**	**almost always true**	**always true**

1.	My painful experiences and memories make it difficult for me to live a life that I would value.	1	2	3	4	5	6	7
2.	I'm afraid of my feelings.	1	2	3	4	5	6	7
3.	I worry about not being able to control my worries and feelings.	1	2	3	4	5	6	7
4.	My painful memories prevent me from having a fulfilling life.	1	2	3	4	5	6	7
5.	Emotions cause problems in my life.	1	2	3	4	5	6	7
6.	It seems like most people are handling their lives better than I am.	1	2	3	4	5	6	7
7.	Worries get in the way of my success.	1	2	3	4	5	6	7

(AAQ-II; Hayes et al., 2004)

CFQ13

Below you will find a list of statements. Please rate how true each statement is for you by circling a number next to it. Use the scale below to make your choice.

1	2	3	4	5	6	7
never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true

1.	My thoughts cause me distress or emotional pain	1	2	3	4	5	6	7
2.	I get so caught up in my thoughts that I am unable to do the things that I most want to do	1	2	3	4	5	6	7
3.	Even when I am having distressing thoughts, I know that they may become less important eventually	1	2	3	4	5	6	7
4.	I over-analyse situations to the point where it's unhelpful to me	1	2	3	4	5	6	7
5.	I struggle with my thoughts	1	2	3	4	5	6	7
6.	Even when I'm having upsetting thoughts, I can see that those thoughts may not be literally true	1	2	3	4	5	6	7
7.	I get upset with myself for having certain thoughts	1	2	3	4	5	6	7
8.	I need to control the thoughts that come into my head	1	2	3	4	5	6	7
9.	I find it easy to view my thoughts from a different perspective	1	2	3	4	5	6	7
10.	I tend to get very entangled in my thoughts	1	2	3	4	5	6	7
11.	I tend to react very strongly to my thoughts	1	2	3	4	5	6	7
12.	Its possible for me to have negative thoughts about myself and still know that I am an OK person	1	2	3	4	5	6	7
13.	It's such a struggle to let go of upsetting thoughts even when I know that letting go would be helpful	1	2	3	4	5	6	7

Thank you for completing this questionnaire

(CFQ; Gillanders et al., 2010)

Experiences Questionnaire

Instructions: We are interested in your recent experiences. Below is a list of things that people sometimes experience. Next to each item are five choices: "never", "rarely", "sometimes", "often", and "all the time". Please darken one of these to indicate how much you currently have experiences similar to those described.

Please do not spend too long on each item–it is your first response that we are interested in. Please be sure to answer every item.

		Never	Rarely	Sometimes	Often	All the time
1.	I think about what will happen in the future.	①	②	③	④	⑤
2.	I remind myself that thoughts aren't facts.	①	②	③	④	⑤
3.	I am better able to accept myself as I am.	①	②	③	④	⑤
4.	I notice all sorts of little things and details in the world around me.	①	②	③	④	⑤
5.	I am kinder to myself when things go wrong.	①	②	③	④	⑤
6.	I can slow my thinking at times of stress.	①	②	③	④	⑤
7.	I wonder what kind of person I really am.	①	②	③	④	⑤
8.	I am not so easily carried away by my thoughts and feelings.	①	②	③	④	⑤
9.	I notice that I don't take difficulties so personally.	①	②	③	④	⑤
10.	I can separate myself from my thoughts and feelings.	①	②	③	④	⑤
11.	I analyze why things turn out the way they do.	①	②	③	④	⑤
12.	I can take time to respond to difficulties.	①	②	③	④	⑤
13.	I think over and over again about what others have said to me.	①	②	③	④	⑤
14.	I can treat myself kindly.	①	②	③	④	⑤
15.	I can observe unpleasant feelings without being drawn into them.	①	②	③	④	⑤
16.	I have the sense that I am fully aware of what is going on around me and inside me.	①	②	③	④	⑤
17.	I can actually see that I am not my thoughts.	①	②	③	④	⑤
18.	I am consciously aware of a sense of my body as a whole.	①	②	③	④	⑤
19.	I think about the ways in which I am different from other people.	①	②	③	④	⑤
20.	I view things from a wider perspective.	①	②	③	④	⑤

(EQ; Fresco et al., 2007).

Supplementary state questions

1. During the task, how able were you to separate from your thoughts and feelings?

1	2	3	4	5
A lot	A little	Neither able nor unable	Not really able	Not at all able

2. During the task, how much did you get caught up in your thoughts?

1	2	3	4	5
Not at all	Not really	Neither	A little	A lot

3. During the task, how much did you try to push thoughts out of your head?

1	2	3	4	5
Not at all	Not really	Neither	A little	A lot

4. During the task, how much were you thinking about things you didn't want to?

1	2	3	4	5
Not at all	Not really	Neither	A little	A lot

5. During the task, how much did you negatively evaluate yourself and see this as fact?

1	2	3	4	5
Not at all	Not really	Neither	A little	A lot

6. During the task, how anxious did you feel?

1	2	3	4	5
Not at all anxious	Not really anxious	Neutral	A little anxious	Very anxious

7. During the task, how much did you think about how well or badly you were performing?

1	2	3	4	5
Not at all	Not really	Neither	A little	A lot

Appendix D

Participant Information Sheet and Consent Form

Study title: Thinking about Thinking

Researcher: Catherine Seaman, Trainee Clinical Psychologist

Please read this information sheet carefully before deciding to participate in this research. If you are happy to participate you will be asked to sign a consent form.

What is the research about?
I am a Trainee Clinical Psychologist studying at the University of Southampton. As part of my training, I am conducting research examining the process of 'thinking about thinking' in university staff and students. This area of research is currently receiving much attention.

Why have I been chosen?
A large number of people completed a questionnaire for phase one of this study on iSurvey. Following this, some people were selected to take part in the experimental second phase of the study.

What will happen if I take part?
This is an experimental study. You will be asked to complete some questionnaires before and after taking part in a computerised concept learning task. After this, you will be asked to complete a visualisation task. Your participation should take approximately fifty minutes in total.

Are there any benefits in my taking part?
If you choose to take part, you will be granted course credit. Your participation will also contribute towards knowledge in this area of psychology.

Are there any risks involved?
There are no risks involved. You may experience some transient negative thoughts and feelings. After the study has finished, the research will be fully explained to you and you will be given the opportunity to ask questions.

Will my participation be confidential?
Any collected data will not include personal identifying characteristics and will be kept on a password protected computer. Only those involved in the study (myself and my two supervisors) will have access to the study data.

What happens if I change my mind?
Your participation is voluntary and you have the right to withdraw at any time. If you withdraw, this will not have any effect on your grade or your treatment as a student in the psychology department.

What happens if something goes wrong?
I have any questions about my rights as a participant in this research, or if I feel that I have been placed at risk, I may contact the chair of the Ethics Committee, Psychology, University of Southampton, SO17 1BJ, UK. Phone: +44 (0)23 8059 4663, email slb1n10@soton.ac.uk

Finally, if you require any further information, please do not hesitate to contact me.

CONSENT FORM (Version 2, 04.05.2012)

Study title: Thinking about Thinking

Please initial the box(es) if you agree with the statement(s):

I have read and understood the information sheet (Version 2/04.05.2012) and have had the opportunity to ask questions about the study	☐
I agree to take part in this research project and agree for my data to be used for the purpose of this study	☐
I understand my participation is voluntary and I may withdraw at any time without penalty or loss of benefit to myself.	☐
I understand that my data collected will be treated confidentially and that published results of this research project will also retain my confidentiality.	☐

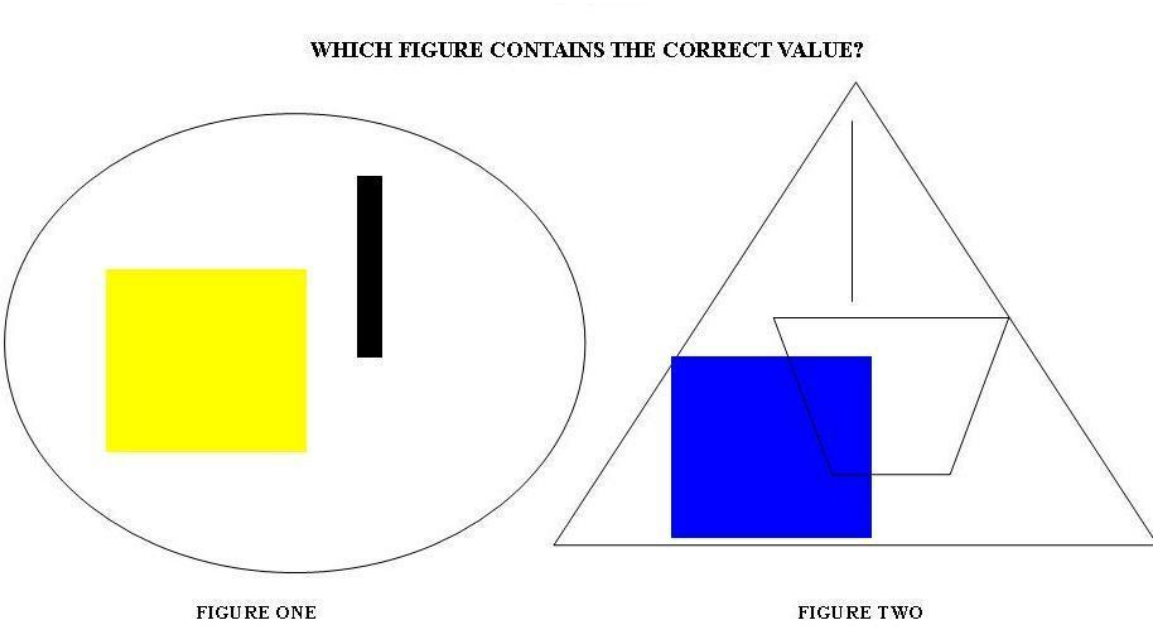
Name of participant (print name)……

Signature of participant……..

Date……

Appendix E

Example item from computer task



Appendix F

Cronbach alpha coefficients for the current study

	Cronbach Alpha coefficient pre task	Cronbach Alpha coefficient post task
PS	.96	/
PDS Paranoia Pre	.91	.91
PDS Depression Pre	.92	.94
SSAS Private	.86	.86
SSAS Public	.87	.88
SSAS Surroundings	.76	.87
STAI Trait	.88	/
STAI State	.94	.95
EQ Total	/	.81
EQ Decentring	/	.84
CFQ	/	.91
TCQ Distraction	/	.64
TCQ Punishment	/	.55
TCQ Worry	/	.86
TCQ Re-appraisal	/	.73
TCQ Social Control	/	.76
WBSI	/	.89
AAQ	/	.96

RRS Depression	/	.90
RRS Brooding	/	.79
RRS Reflection	/	.85
RRS Total	/	.93

Note. PS = Paranoia Scale; PDS = Paranoia and Depression Scale; SSAS = situational self-awareness scale; STAI = state trait anxiety inventory; EQ = experiences questionnaire; CFQ = cognitive fusion questionnaire; TCQ = thought control questionnaire; WBSI = white bear suppression inventory; AAQ = acceptance and action questionnaire; RRS = ruminative response questionnaire.

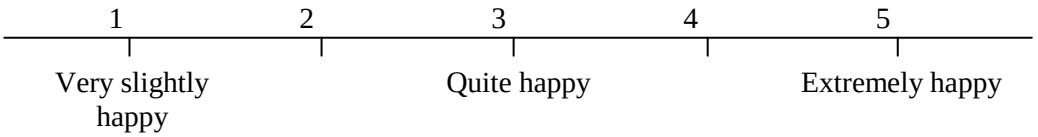
Appendix G

Brief self-esteem task

Please think about your own life. Try to think about an event that made you feel really happy in the past few years. Please take time to imagine what this event was like that made you feel truly happy and try to relive it again in your mind's eye. Then describe what made you feel happy as vividly and in as much detail as you can.

You can write for up to ten minutes about this event below:

How happy do you now feel having completed this exercise (please circle)?



(Tamir, Robinson & Clore, 2002)

Appendix H

Debriefing statements for the anxiety and control conditions

Thinking about Thinking Study
Debriefing Statement - Threat Group (Version 1, 04.05.2012)

Brief paranoid thoughts or passing suspiciousness is experienced at some point by most people and is common in the general population. Examples of suspiciousness include thinking that other people are trying to irritate you or feeling like you are being watched. Passing suspicious thoughts can have a useful function. For example, if you think that someone might be following you when walking along a dark path, you may change your direction in order to feel more safe. This level of suspiciousness is not a sign of (mental health difficulties/a clinical problem). However, examining non-clinical levels of suspiciousness can inform our understanding of the phenomenon in clinical populations. Investigating low-level phenomena is a common method of research. People with low level anxiety or low mood are often recruited to studies in order to inform an understanding of emotional disorders.

The overall aim of this study was to explore the role of meta-cognition in the maintenance of distress in non-clinical paranoia/suspiciousness. Meta-cognition can be described as thinking about thinking or the process of thinking. It involves making sense of thoughts (for example, 'the fact I am having this thought means I can't cope') or controlling thoughts (for example attempting to push thoughts away). Understanding the process of thinking is gaining much attention in certain areas of research. Research suggests that meta-cognition plays a role in the maintenance of emotional disorders (anxiety and depression) and research also suggests a link between meta-cognition and paranoia/suspiciousness at a non-clinical and clinical level.

The study involved completing some questionnaires before and after a computer task. The study assigned one half of all individuals recruited to participate in a threat activation task, which was designed to induce mild paranoia/suspiciousness. The other half of individuals were assigned to a neutral task which was not designed to induce paranoia/suspiciousness. The purpose of this was to test whether or not there is a relationship between meta-cognition and non-clinical suspiciousness. **You were assigned to participate in the threat task.**

This study involved deception. Deception was necessary in order for the experimental manipulation to be effective. **The task that you were asked to do on the computer could not be solved.** In addition, **you were not being observed**. The two-way mirror was not used.

It is expected that people who are more suspicious will be more likely to become stuck on thoughts (cognitive fusion), go over thoughts lots of times in an attempt to resolve a problem (rumination), try to control thoughts (thought control), try not to think about thoughts (thought suppression) and attempt to control worry, anxiety and being negatively evaluated. They may also see thoughts as fixed rather than temporary thoughts that pass through the mind. The questionnaires you were asked to complete measured these areas.

The visualisation task at the end of the experiment was designed to restore your mood, in case you experienced any negative thoughts or feelings during the task.

If you have any further concerns or questions, please do not hesitate to contact me or contact your GP for further advice.

You may have a copy of this summary if you wish. Thank you very much for your participation in this study.

References for further reading on this topic:

Freeman, D. (2007). Suspicious minds: the psychology of persecutory delusions. *Clinical Psychology Review, 27*, 425-457.

Freeman, D., & Freeman, J. (2008). *Paranoia: the 21st Century Fear*. New York: Oxford University Press.

Newman-Taylor, K., Graves, A., & Stopa, L. (2009). Strategic cognition in paranoia: the use of thought control strategies in a non-clinical sample. *Behavioural and Cognitive Psychotherapy, 37*, 25-38.

Thinking about Thinking Study
Debriefing Statement - Control Group (Version 1, 04.05.2012)

Brief paranoid thoughts or passing suspiciousness is experienced at some point by most people and is common in the general population. Examples of suspiciousness include thinking that other people are trying to irritate you or feeling like you are being watched. Passing suspicious thoughts can have a useful function. For example, if you think that someone might be following you when walking along a dark path, you may change your direction in order to feel more safe. This level of suspiciousness is not a sign of (mental health difficulties/a clinical problem). However, examining non-clinical levels of suspiciousness can inform our understanding of the phenomenon in clinical populations. Investigating low-level phenomena is a common method of research. People with low level anxiety or low mood are often recruited to studies in order to inform an understanding of emotional disorders.

The overall aim of this study was to explore the role of meta-cognition in the maintenance of distress in non-clinical paranoia/suspiciousness. Meta-cognition can be described as thinking about thinking or the process of thinking. It involves making sense of thoughts (for example, 'the fact I am having this thought means I can't cope') or controlling thoughts (for example attempting to push thoughts away). Understanding the process of thinking is gaining much attention in certain areas of research. Research suggests that meta-cognition plays a role in the maintenance of emotional disorders (anxiety and depression) and research also suggests a link between meta-cognition and paranoia/suspiciousness at a non-clinical and clinical level.

The study involved completing some questionnaires before and after a computer task in which you were asked to solve problems. The study assigned one half of all individuals recruited to participate in a threat activation task, which was designed to induce mild paranoia/suspiciousness. The other half of individuals were assigned to a neutral task which was not designed to induce paranoia/suspiciousness. The purpose of this was to test whether or not there is a relationship between meta-cognition and non-clinical suspiciousness. **You were assigned to participate in the neutral, non-threatening task.**

This study also involved deception. Deception was necessary in order for the experimental manipulation to be effective. **The task that you were asked to do on the computer could not be solved.**

It is expected that people who are more suspicious will be more likely to become stuck on thoughts (cognitive fusion), go over thoughts lots of times in an attempt to resolve a

problem (rumination), try to control thoughts (thought control), try not to think about thoughts (thought suppression) and attempt to control worry, anxiety and being negatively evaluated. They may also see thoughts as fixed rather than temporary thoughts that pass through the mind. The questionnaires you were asked to complete measured these areas.

The visualisation task at the end of the experiment was designed to restore your mood, in case you experienced any negative thoughts or feelings during the task.

If you have any further concerns or questions, please do not hesitate to contact me, or contact your GP for further advice.

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Newman-Taylor, K., Graves, A., & Stopa, L. (2009). Strategic cognition in paranoia: the use of thought control strategies in a non-clinical sample. *Behavioural and Cognitive Psychotherapy, 37*, 25-38.

Appendix I

Exploratory correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. WBSI	-																
2. AAQ	.721**	-															
3. RRS	.658**	.738**	-														
4. TCQ Distraction	0.031	-0.113	-0.026	-													
5. TCQ Punishment	.596**	.435**	.518**	0.04	-												
6. TCQ Worry	.431**	.549**	.504**	0.033	.265*	-											
7. TCQ Reappraisal	0.015	0.005	.283*	.231*	0.131	0.043	-										
8. TCQ Social Control	-.368**	-.326**	-0.11	0.161	-0.179	-0.175	.267*	-									
9. CFQ	.738**	.887**	.671**	-0.206	.409**	.621**	-0.156	-.405**	-								
10. EQ total	-0.195	-.306**	0.008	.389**	0.033	-.270*	.518**	.336**	-.464**	-							
11. EQ Decentring	-.462**	-.593**	-.306**	.393**	-0.164	-.427**	.376**	.360**	-.715**	.900**	-						
12. SSAS Surroundings	0.102	0.109	0.122	0.109	0.05	0.002	0.172	0.091	0.074	0.212	0.041	-					
13. SSAS Private	0.222	0.174	0.214	0.044	0.155	0.112	0.115	0.003	0.191	.306**	0.132	.465**	-				
14. SSAS Public	.400**	.487**	.402**	0.085	0.227	.302**	0.109	-0.104	.507**	-0.005	-.243*	.351**	.456**	-			
15. PDS Depression	.624**	.632**	.547**	-0.066	.511**	.462**	-0.118	-0.193	.697**	-.284*	-.476**	-0.027	0.203	.422**	-		
16. PDS Paranoia	.593**	.753**	.635**	-0.019	.444**	.458**	0.099	-.234*	.686**	-0.069	-.384**	0.187	0.23	.582**	.625**	-	
17. STAI State	.666**	.783**	.618**	-0.107	.464**	.494**	-0.011	-0.162	.756**	-.238*	-.486**	0.081	0.176	0.512	.726**	.671**	-

Note . WBSI = White Bear Suppression Inventory; AAQ = Acceptance and Action Questionnaire; RRS =Ruminative Responses Questionnaire; TCQ = Thought Control Questionnaire; CFQ = Cognitive Fusion Questionnaire; EQ = Experiences Questionnaire; SSAS = Situational Self Awareness Scale; PDS = Paranoia and Depression Scale; STAI = State Trait Anxiety Inventory.
*p <.05, **p <.01.