Factors associated with delusional themes

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Declaration

I, the author, confirm that the Thesis is my own work. I am aware of the University's Guidance on the Use of Unfair Means (www.sheffield.ac.uk/ssid/unfair-means). This work has not been previously presented for an award at this, or any other, university.

Structure and Word Counts

Lay Summary: 456

Section One: Literature Review

Excluding references and tables: 7500

Including references and tables: 13,597

Section Two: Research Report

Excluding references and tables: 7960

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Total

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Lay summary

There is debate regarding the definition and development of psychiatric delusions, but they are typically defined as false, idiosyncratic beliefs. The extent to which delusional themes differ across the world and according to demographic factors is unclear. The first section of this thesis includes a meta-analytic review of the prevalence of five common delusional themes (persecutory, reference, grandiose, control, and religious) across the world, including sub-group and meta-regression analyses.

There were 117 studies (130 samples) included in the systematic review and 109 samples were meta-analysed with a total of 17,922 participants. Persecutory delusions were most common delusional theme, followed by reference, grandiose, control, then religious delusions. Prevalence rates of delusions did not significantly differ between developed and developing countries or according to study quality or year of publication. Persecutory and religious delusions were more prevalent in younger samples, and grandiose, control, and religious delusions were more prevalent in males. As predicted, persecutory delusions are the most common delusion across the world. The prevalence of delusional themes did not differ between developed and developing countries, but they were influenced by age and gender, suggesting that delusions reflect universal human concerns that vary according to stages of life and gender. Prevalence rates of delusional themes may differ according to other cultural factors, such as the level of individualism and income inequality.

Grandiose delusions have received relatively little empirical investigation and the second section includes two empirical studies on grandiosity in the general population. Based on past research on predictors of paranoia and other strongly held beliefs, the first study was a cross-sectional survey investigating factors associated with grandiosity. Younger age, male gender, non-white ethnicity, paranoia, religiosity, and narcissism were associated with grandiosity. Paranoia was associated with grandiosity, attachment anxiety, negative self-

esteem, and younger age. Grandiose delusions have been described as providing a sense of meaning in life and Terror Management Theory proposes that human's boost their self-esteem to protect against existential anxiety. Therefore, the second study aimed to test whether grandiosity reflects a defence against existential anxiety. An online between-subjects experiment investigated changes in participant's grandiosity and self-esteem after being primed to think about their mortality or dental pain, as a control condition. There was no effect of mortality salience on changes in self-esteem or grandiosity, as self-esteem significantly increased, and grandiosity significantly decreased in both conditions. Interestingly, males and non-white participant's grandiosity decreased in the dental pain group, but not in the mortality salience group, whereas female and white participant's grandiosity decreased in both conditions. Taken together, the findings suggest that male gender, non-white ethnicity, high religiosity, narcissism, and paranoia are associated with increased grandiosity. Future research is needed to replicate these findings in clinical populations with more diverse samples and include different subtypes of grandiose beliefs.

Acknowledgements

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Section One: Literature Review

The prevalence of delusional themes across the world: a systematic review and meta-analyses

Abstract

Objectives

This systematic review and meta-analyses investigated the prevalence of five delusional themes (persecutory, grandiose, reference, religious, control) in clinical populations worldwide, and whether rates significantly differed between developed and developing countries, and according to age, gender, and year of publication.

Methods

Databases were searched to identify studies which investigated the prevalence of delusions in adult psychiatric samples. A quality appraisal and random-effects meta-analysis was conducted, with subgroup and meta-regression analyses.

Results

Overall, 117 studies met inclusion criteria and 96 (109 samples, n = 17,922) recorded all present delusions. Persecutory delusions were most common (pooled point estimate: 64%, CI = 59.8 – 68, n = 17,081, k = 101), followed by reference (38.7%, CI = 33.2 – 44.6, n = 11,251, k = 62), grandiose (28.5%, CI = 24.9 – 32.5, n = 16,250, k = 94), control (20.9%, CI = 15.6 – 25.9, n = 8102, k = 50), and religious delusions (18.5%, CI = 15.3 – 22.1, n = 8606, k = 46). Prevalence rates did not significantly differ between developed and developing countries, according to study quality or year of publication. Persecutory and religious delusions were more prevalent in younger samples, and grandiose, control, and religious delusions were more prevalent in males.

Conclusions

Persecutory delusions are the most common delusion worldwide, and the prevalence rates of the five delusional themes were consistent across developed and developing countries but

varied according to age and gender, supporting the theory that delusions reflect universal human concerns that vary according to stages of life and gender.

Keywords: delusions, psychosis, schizophrenia, culture, demographic factors, meta-analysis

Practitioner points:

- Persecutory delusions are the most common type of delusion worldwide, followed by reference, grandiose, control, and religious delusions.
- The prevalence of persecutory, reference, grandiose, control, and religious delusions does not significantly differ between developed and developing countries.
- Persecutory and religious delusions are more prevalent in younger patients.
- Delusions of reference and control, and religious delusions are more prevalent in males.

Introduction

Defining delusions

Delusional beliefs are observed in patients with a range of psychiatric diagnoses but are most typically associated with psychotic disorders such as schizophrenia and bipolar disorder (Adhikari et al., 2017; Appelbaum et al., 1999; Picardi et al., 2018). The fifth edition of the Diagnostic and Statistical Manual for Mental Disorders (DSM-5) defines delusions as:

> A false belief based on incorrect inference about external reality that is firmly sustained despite what almost everyone else believes and despite what constitutes incontrovertible and obvious proof or evidence to the contrary. The belief is not one ordinarily accepted by other members of the person's culture or subculture (APA; American Psychological Association, 2013).

There has been continuing debate regarding what constitutes an "incorrect inference about external reality" (Coltheart et al., 2011), not least because a wide range of beliefs held by the general population, for example, some political and religious beliefs, might arguably be encompassed by this criterion (Bentall, 2018). A dimensional approach considers delusions to exist on a continuum with other kinds of beliefs and attitudes (Johns & van Os, 2001). This is consistent with research which has found that patient's delusional beliefs vary in their levels of conviction and distress (Garety et al., 1988; Garety & Hemsley, 1987). Additionally, delusional beliefs have been reported in the general population (Heilskov et al., 2020; Linscott & Van Os, 2013) and taxometric research has supported the hypothesis that these lie on a continuum with pathological and mundane beliefs at either end (Elahi et al., 2017). However, other researchers, beginning with Jaspers (Walker, 1991), have argued that psychiatric delusions are associated with subtle experiential abnormalities; hence these

authors dispute the idea that delusions are simply false beliefs that are comparable to apparently similar beliefs reported in the general population (Feyaerts et al., 2021).

Content of delusions

These phenomenological observations have led some investigators to argue that the form of a delusion is more important than the content. Feyaerts et al. (2021) argue that Cognitive Behaviour Therapy (CBT) for delusions is limited because they are not simply incorrect beliefs that can be altered with reality testing, but they involve a phenomenological experience in which the sense of self is altered. Instead of directly addressing the content, phenomenological approaches focus on reducing the experiential conditions involved in delusions, including disconnection, self-alienation, and hyper-reflexiveness, using body and therapeutic alliance focused therapies (Feyaerts et al., 2021; Skodlar & Henriksen, 2019).

It is nonetheless striking that delusional beliefs typically reflect a small number of themes which reflect common existential challenges (Musalek et al., 1989) or concerns about the individual's position in the social universe (Bentall, 2018). There is evidence of a strong relationship between traumatic experiences and delusions (Bailey et al., 2018; Scott et al., 2007), and that delusional content reflects life events (Read & Argyle, 1999; Rhodes & Jakes, 2000). The DSM-5 (APA, 2013) refers to delusions with persecutory, referential, grandiose, somatic, and religious themes and, of these, persecutory delusions have been the most thoroughly investigated (Bentall et al., 2001; Freeman, 2016). Persecutory delusions involve the person believing that other individuals or organisations are trying to harm or mistreat them (APA, 2013; Freeman, 2016). Grandiose delusions involve the person having an unrealistically inflated sense of their abilities, power, or knowledge (APA, 2013) and Leff et al. (1976) found four subthemes relating to grandiose identity, talent, mission, or wealth. Delusions of reference involve a person believing that innocuous events in the world relate

specifically to them (APA, 2013). Startup & Startup (2005) identified two types of delusions of reference: one in which the person believed that they are being observed, spied on, or gossiped about (delusions of observation), and the other involving the person believing that messages on the television or radio are being directly addressed to them (delusions of communication). Referential delusions of observation were associated with persecutory ideation (Startup & Startup, 2005). Delusions may also have religious or spiritual content which are not considered "normal" within the person's culture or background (Brewerton, 1994; Siddle et al., 2002). Delusions of control, when the person believes that other people or forces are controlling their thoughts, feelings, or behaviour, were one of Schneider's (1959) 'first rank' symptoms of schizophrenia.

Delusions are typically diagnosed and categorised using structured interviews and standardised assessment tools. There are several assessment tools that can be used for this purpose. For example, they can be assessed by mental health examinations such as the Schedule Clinical Assessment in Neuropsychiatry (SCAN; World Health Organisation, 1992) which was formally called the Present State Examination (PSE; Wing et al, 1974), the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984), Positive and Negative Syndrome Scale (PANSS; Kay et al. 1987), and the Structured Clinical Interview for the DSM (SCID; First, 2014). Bell et al. (2006) reviewed the reliability of diagnosing delusions using these various instruments and found that most assessment tools were adequate, including the SAPS (Cronbach's alpha = .86 - .88) and the PANSS (Cronbach's alpha = .45 – 93). However, they cautioned that most studies of this kind used raters who were involved in the development of the measure, potentially producing biased estimates.

Factors influencing the prevalence of delusional themes

Many observers have claimed that persecutory delusions are consistently the most common across cultures, followed by referential and grandiose delusions (Garety et al., 2013; Tateyama et al., 1998; Turgut & Yenilmez, 2013). However, many people experience more than one type of delusion, for example Garety et al. (2013) found 58% of patients experienced both persecutory and grandiose delusions at the same time, and persecutory and grandiose themes were present in other types of delusions.

There is some evidence that the prevalence of different delusions has changed over time (Cannon & Kramer, 2012; Škodlar et al., 2008). In Slovenia, Škodlar et al. (2008) found a significant increase in delusions of persecution and reference in the second half of the 20th century compared to the first half, which they proposed was related to the rise in industrialisation and technical developments and consequent increased modes of communication. There was also an increase in the frequency of religious delusions between 1980 and 2000, reflecting the increase in new religious movements and cults (Škodlar et al., 2008). In the USA, the prevalence of persecutory delusions increased over the 20th century, which has been related to socio-cultural factors, such world wars, and developments in technology (Cannon & Kramer, 2012; Mitchell & Vierkant, 1989; Škodlar et al., 2008). In the light of these observations, any review of the prevalence of delusions should consider the year that studies are published.

If the prevalence of delusional themes is consistent across cultures, this would support the theory that delusions reflect universal human needs, including the need for safety and trust (persecutory), meaning in life (reference), and social status (grandiosity) (Bentall, 2018; Musalek et al., 1989). However, some cross-cultural comparisons have suggested that the prevalence of themes varies between countries, perhaps because delusional symptoms are sensitive to social and political context (Kim et al., 2001; Stompe et al., 1999; Suhail & Cochrane, 2002). For example, Stompe et al. (1999) found more grandiose delusions in

patients in Austria compared to Pakistan, and Suhail and Cochrane (2002) found higher rates of persecutory delusions in Pakistani patients compared to white British or British Pakistani patients. Additionally, Tateyama et al. (1993) found more religious delusions in German compared to Japanese samples, although the frequency of persecutory or grandiose delusions did not significantly differ between the countries. Some comparative studies have considered the prevalence of delusions between Eastern and Western countries (e.g., Suhail & Cohrane, 2002), individualistic and collectivist cultures (e.g., Stompe et al., 1999), and countries with differing levels of economic and industrial development (e.g., Jablensky et al., 1992). This review will adopt the latter strategy, categorising countries as developed or developing using the World Economic Situation and Prospects report by the United Nations (Guterres, 2020).

Some studies have suggested that age and gender influence the content of delusions, with grandiose and persecutory delusions being more common in males (Allan & Hafner 1989; Gutiérrez-Lobos et al., 2001) although Musalek et al. (1989) found that persecutory delusions were more common in older women compared to similar aged men. Tateyama et al. (1993) found a higher prevalence of grandiose delusions in males in a German sample, but the overall rate of persecutory delusions did not significantly differ between the countries. However, the specific persecutory content varied according to gender and culture, for example the theme of being watched was more common in Japanese males and German females (Tateyama et al., 1993). Hence there is a need to clarify whether there are gender effects in the thematic content of delusions.

To the authors' knowledge, there has not yet been a systematic review of the prevalence of different delusional themes across countries. It is acknowledged that delusions are more complex than can be captured by thematic categories. However, investigating the prevalence of delusional themes, and whether they differ depending on the nature of development of a country, age, gender, and year of publication, will enhance our

understanding of the importance of culture, environment, and demographic factors on delusions. The findings may facilitate an understanding of how much the content of delusions reflect universal or more culturally specific themes, which could support the development of appropriate psycho-social models of delusions. As delusions in clinical populations are typically associated with increased distress, this review focused exclusively on clinical samples.

Aims

This review and meta-analysis aimed to investigate the relative prevalence of five common delusional themes reported in the psychiatric literature (persecutory, grandiose, referential, religious, control) in patients diagnosed with psychiatric disorders, across the world. It was hypothesised that persecutory delusions would be most prevalent. Additionally, we sought to explore whether the prevalence of each type significantly varied between developed and developing countries, and whether there was an effect of age, gender, or year of publication. The review also assessed the quality of the relevant evidence.

Method

The review protocol was registered on the international prospective register of systematic reviews, PROSPERO (reference: CRD42020203245).

Search strategy

A database search by title, abstract and key term was completed on three electronic databases: Scopus, PsycINFO and Medline, in April 2020. An updated search was completed in November 2020 to check for any new literature. A title, abstract, and keyword search was conducted using two filters with the following terms “delusion* theme” OR “delusion* content” OR “delusion* characteristics” or “phenomenology” AND “schizo*” OR

"psychos*" OR "psychotic" OR "bipolar disorder" OR "manic depression" OR "mania". The symbol * was used for selected filters to search for all words that ended with the truncated search term. As there had not been any previous reviews in this area, there were no limits placed on the search with regards to language or date. The "delusions" and "schizophrenia" Medical Subject Headings (MeSH) were included in the PsycINFO and Medline searches. The reference lists of the full text articles were examined, and a forward citation search was conducted. Unpublished, grey literature was not included to ensure studies had been reviewed for methodological quality.

Inclusion Criteria

Table 1 outlines the criteria required for studies to be included in the review.

Table 1

Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
● Working age participants (18 - 65 years) ● Clinical sample with a psychiatric diagnosis relating to psychosis (e.g., schizophrenia, psychosis, bipolar, manic depression, delusional disorder, etc) ● States the country the participants were living in and/or ethnicity of participants ● Quantitative assessment of the prevalence of delusional themes (including persecutory, grandiose or reference) or quantitative analysis of the contents of delusions	● Participants under the age of 18 or over age 65 years ● General population sample ● Does not state the country or ethnicity of participants ● Does not report quantitative prevalence of delusional themes or content of delusions ● Does not report prevalence of delusions of persecution, grandiosity, reference, control, or religion ● Qualitative analysis only ● Case studies ● Book chapters (descriptive based on clinician's experiences). ● Reviews

Screening

A flow diagram of the systematic review process is shown in Figure 1. The titles and/or abstracts of all identified studies were screened for relevance (n = 9594). Full text articles were examined (*k* = 255) and 138 were excluded as they did not meet the inclusion criteria. If the study was not available in English and an email address for correspondence was available, then the author was contacted to request an English summary. Authors were given two weeks to respond and if they did not respond or an English version was not available, it was excluded. If an English summary could be obtained, it was included for screening and review.

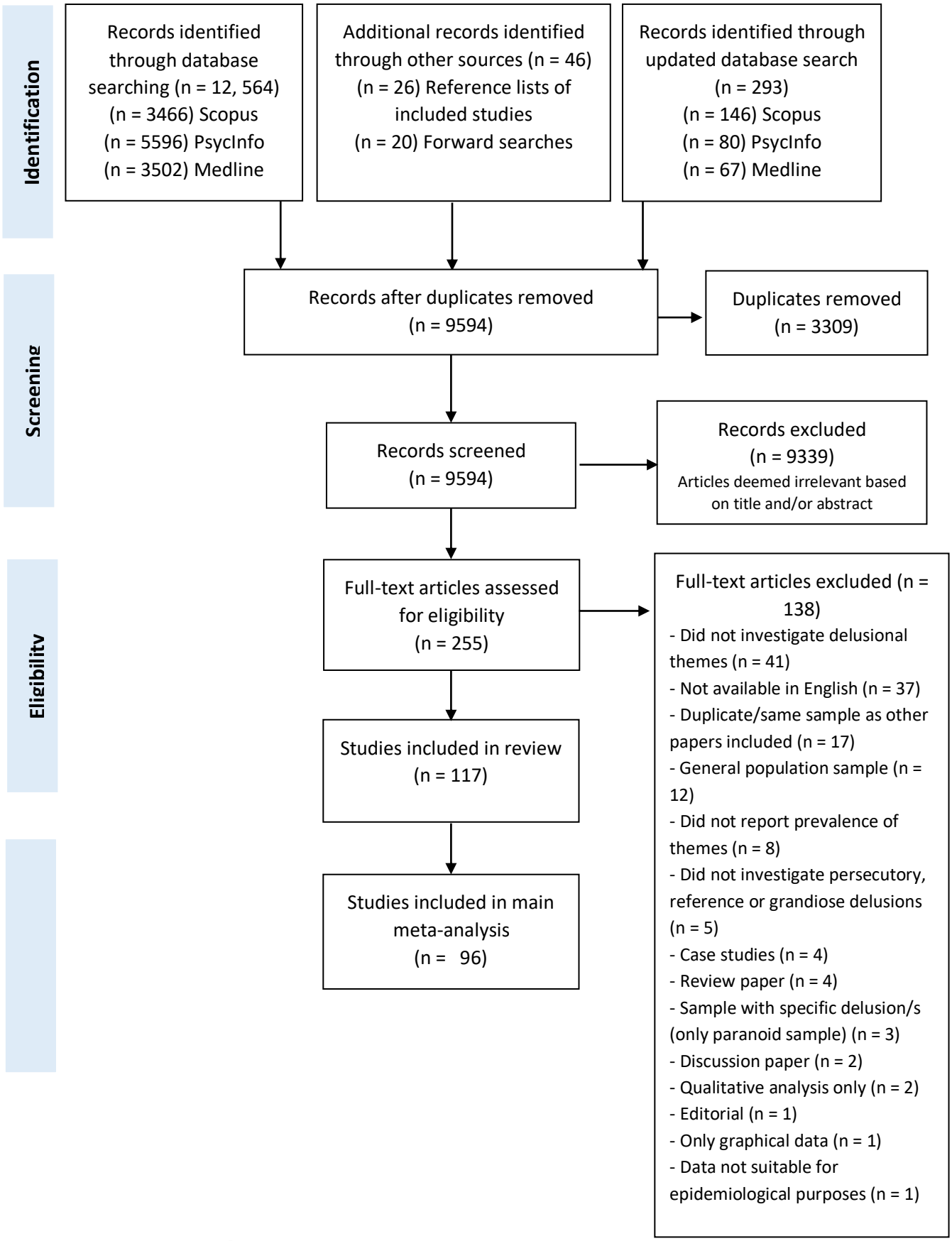

Figure 1. PRISMA diagram.

Data extraction

Key data was extracted from articles meeting the inclusion criteria. This included the author, year of publication, study design, country/countries of the study, country classification (developing or developed), available sample demographics (e.g., size, gender, age, ethnicity, diagnosis), measure used to assess delusions, methodology (e.g., self-report, clinical records, interview), and prevalence of delusions.

Studies were categorised into two main types according to their methodology: 1) Studies that recorded all present delusional themes (this method accounted for patients that experienced more than one theme) and 2) Studies that recorded only the patient's main delusion.

If the study reported the number of patients experiencing any delusion this number was used as the sample size, and the prevalence of delusions was calculated from this. An inclusive approach was taken so that if studies reported prevalence rates in a sample of patients with psychotic diagnoses and other non-psychotic psychiatric diagnoses, such as depression, anxiety, and organic psychosis, then the data was included. These studies were noted as having mixed samples (to test for significant differences in analysis). If studies reported prevalence rates across more than one country or samples within the same country, then sample and prevalence data were extracted separately.

If studies reported sub-themes of delusions (e.g. grandiose identity and grandiose ability), then they were categorised into overarching main themes (e.g. grandiose). If delusions were split into subtypes, then the average of these was calculated. If studies investigated differences between groups (e.g., between gender, diagnosis, or ethnicities), then this data was extracted. For the few studies that combined grandiose and religious delusions together, this was recorded as grandiose because it was considered that grandiose reflected

the overall theme most accurately. One study combined delusions of persecution and reference, and this was recorded as persecutory, as persecutory was the most common theme.

Quality appraisal

The quality of the included studies was assessed using Munn et al., (2015) prevalence study checklist from the Joanna Briggs Institute (JBI) Critical Appraisal tools (Appendix A). The prevalence study checklist included nine items assessing sample frame, size, and bias, and the validity and reliability of the assessment of delusions. Some items were adapted to fit the methodological nature of the studies included, for example, to assess whether there was systematic bias which prevented the sample being representative of patients with a range of delusional themes. If the study met the criteria for an item, it was rated 'yes' (score of 1), if it did not then it was rated 'no' (score of 0), or 'unclear' (score of 0). Item nine referred to the study's response rate and was rated as 'not applicable' for studies that used retrospective analysis of case notes. Studies were not excluded due to poor quality however, the effect of study quality on prevalence rates was assessed using the overall score as a moderator in the meta-regressions.

To determine the reliability of quality appraisals, a second (trainee clinical psychologist) and third rater (clinical psychologist) each coded 12 articles (10%). Inter-rater reliability was calculated between raters for 20% of the included studies using the Intraclass Correlation Coefficient (ICC: Shrout & Fleiss, 1979). There was moderate agreement between the first and second rater (ICC = .55, 95% CI [.34 - .69], $p < .001$) and moderate agreement between the first and third rater (ICC = .7, 95% CI [.54 - .81], $p < .001$) (Koo & Li, 2016). The main items where there was disagreement was regarding whether the study provided sufficient details of the sample and setting, the reliability of the assessment method,

and whether there was a sufficient response rate. Disagreements were discussed and the primary rater used this discussion to inform the appraisal of the remaining papers.

Meta-analytic strategy

The statistical software package Comprehensive Meta-analysis (CPA) version 3 was used to conduct a series of meta-analyses to assess the estimated prevalence (Borenstein et al., 2018). Prevalence data from the studies which investigated all delusional themes that a patient experienced were meta-analysed. Meta-analyses were completed on prevalence data for persecutory, grandiose, reference, religious, and control delusions, as these were most reported. A random-effects model was used as the studies were heterogenous in their methodology. Heterogeneity was assessed using Cochrane's Q and the I^2 statistics (Higgins & Thompson, 2002). To test the hypotheses and examine causes of heterogeneity, moderator analyses were completed. Subgroup analyses were completed to assess the association between prevalence rates and the type of country (developed vs developing) and diagnosis (all psychosis vs mixed). Meta-regression was used to assess the relationship between prevalence rates and the quality of the study, year of publication, mean age, and proportion of females in the sample.

A pooled point prevalence estimate was calculated for persecutory, grandiose, reference, religious, and control delusions in the 21 studies that reported the patient's main delusion. However, these estimates are likely to be less representative of the actual prevalence of delusional themes as many patients experience more than one delusional theme.

Publication bias

Studies with non-significant or smaller effect sizes are less likely to be published, which may result in a biased representation of findings (Rothstein et al., 2005). Funnel plots

were visually examined for asymmetry indicating publication bias. Egger's regression intercept and Begg's ranking correlation were used to test for significant asymmetry (Begg & Mazumdar, 1994; Egger et al., 1997). Due to the high heterogeneity and inconsistency in observational studies, Iorio et al. (2015) suggest that Begg's test may be more appropriate, and it is more powerful for larger meta-analyses with 75 studies or more (Begg & Mazumdar, 1994). There is debate regarding the use of meta-analytic methods to account for publication bias, particularly for prevalence data and when there is high heterogeneity between studies (Carter et al., 2019; Migliavaca et al., 2020). If significant asymmetry is indicated, Duval and Tweedie's (2000) trim and fill method provides adjusted estimates to account for missing studies (Rothstein et al., 2005). As it is advised that the trim and fill method is used as a sensitivity analysis (Carter et al., 2019; Gilbody et al., 2000), both unadjusted and adjusted prevalence rates were calculated to compare any differences.

Results

Overall, 117 studies were included in the review. Nine studies reported prevalence rates in more than one sample (in different countries) resulting in a total of 130 samples. The overall sample size was 21,336 across 30 countries. Tables summarising the study characteristics and findings can be found in Appendix B and C.

Studies that recorded all present delusions

Study characteristics

Ninety-six studies recorded all the delusions that a patient experienced (this method accounted for patients that experienced more than one delusional theme); these included 17,922 patients (mean age: 35.9 years, mean proportion of females: 47.8%) in 109 samples across 28 countries. There were 70 samples from 66 studies in 14 developed countries (*n* =

13,349): Australia, Austria, Canada, Denmark, Germany, Greece, Italy, Japan, Netherlands, New Zealand, Norway, Spain, United Kingdom (UK), and United States of America (USA). There were 38 samples from 30 studies in developing countries (n = 4525): China, Egypt, India, Iraq, Kenya, Malaysia, Namibia, Nepal, Pakistan, South Africa, South Korea, Taiwan, and Turkey. Suhail and Cochrane (2002) and Stompe et al. (1999) included samples from both developing and developed countries (Austria, UK, and Pakistan). Murphy et al. (1963) conducted their study with a sample pooled from 27 different developing and developed countries therefore it could not be classified into either group.

Prevalence of delusional themes

Table 2 summarises the prevalence estimates for the five delusional themes in the studies which recorded all delusional themes that a patient experienced. These results are summarised visually in Figure 2. Funnel plots and the trim and fill analyses used to calculate the adjusted prevalence estimates are shown in Appendices E to I. The only substantial difference on the adjusted prevalence rates was that the prevalence of grandiose delusions increased, making them the second most common theme instead of delusions of reference. Forest plots are shown in Appendices J to M.

Persecutory. Persecutory delusions were reported in 101 samples (94 studies). Using the random-effects model, the pooled point prevalence estimate was 64% with a 95% confidence interval of 59.8% to 68%. There was high heterogeneity between the studies (Q = 2571, df = 100, $p < .001$, I^2 = 96.1). Begg's rank correlation did not indicate significant asymmetry (p = .43) but Egger's regression intercept did (p = .01).

Moderator analysis indicated no effect of the diagnosis (mixed = 10, all psychosis = 91 studies), $Q_{between}$ = 3.42, df = 1, p = .06, or country (developed = 63, developing = 38), $Q_{between}$ = 0.95, df = 1, p = .33, on prevalence rates. Meta-regression indicated no significant

effect of year of publication (β = -0.0014, p = .12), study quality (β = .055, p = .42), or gender (β = -0.0073, p = .36). Meta-regression indicated a significant effect of age (β = -.0341, p = .01, k = 77), in which the prevalence of persecutory delusions increased when the mean age of the sample was younger.

Reference. Delusions of reference were investigated in 62 samples in 54 studies and the pooled point prevalence estimate was 38.7% (95% CI = 33.2 - 44.6%). There was high heterogeneity between the studies (Q = 1760.66, df = 61, p < .001, I^2 = 95.5%) and Begg's rank correlation and Egger's regression intercept indicated significant asymmetry (p = .02 and p = .01, respectively).

There was a higher prevalence of reference delusions in samples of patients with all psychosis diagnoses (56 samples, point estimate: 41.3%, CI 35.4 – 47.5%) compared to mixed diagnosis samples (6 samples, point estimate: 19.4%, CI 10.1 – 34%), $Q_{between}$ = 6.87, df = 1, p < .01, but no significant effect of country (developed = 35, developing = 27) $Q_{between}$ = 0, df = 1, p = .99. Meta-regression indicated no significant effect of year of publication (β = 0.0068, p = .4763), quality (β = .043, p = .66), or age (β = -0.0237, p = .23). There was a near significant effect of gender (β = -0.0179, p = .051), in which delusions of reference were significantly more prevalent in samples with higher proportions of males.

Grandiose. Grandiose delusions were investigated in 94 samples in 83 studies; in seven the mean of grandiose subtypes was taken for the prevalence. The pooled point prevalence estimate was 28.5% (95 % CI = 24.9 - 32.5%). There was high heterogeneity between the studies (Q = 2145.82, df = 93, p < .001, I^2 = 95.7%). Begg's rank correlation did not indicate significant asymmetry (p = .27), but Egger's regression intercept did (p = .01).

Moderator analysis indicated no significant effect of diagnosis (mixed = 8, all psychosis = 86 samples, $Q_{between}$ = 3.68, df = 1, p = .06) or country (developed = 58,

developing = 35 samples, $Q_{between}$ = 0.084, *df* = 1, *p* = .96). Meta-regressions indicated no significant effect of year of publication (β = -0.0042 *p* = .63), quality (β = .52, *p* = .42), gender (β = -0.0075, *p* = .3299), or age (β = -0.0309, *p* = .08).

Control. Delusions of control were investigated in 50 samples in 42 studies. The pooled point prevalence estimate for delusions of control was 20.9% (95% CI = 16.7 – 25.9%). There was high heterogeneity between the studies (*Q* = 1124.71, *df* = 49, *p* < .001, I^2 = 95.6%). Begg's rank correlation did not indicate significant asymmetry (p = .07) but Egger's regression intercept did (*p* = .006).

There was a higher prevalence of delusions of control in samples of patients with all psychosis diagnoses (44 samples, point estimate: 24.7%, CI 20.1 - 29.8%) compared to mixed diagnosis samples (6 samples, point estimate: 6.1%, CI 3.6 – 10.1%), $Q_{between}$ = 28.86, *df* = 1, *p* < .001. There was no significant effect of country, (developed = 28, developing = 22) $Q_{between}$ = 0.131, *df* = 1, *p* = .72, and meta-regression indicated no significant effect of year of publication (β = -0.0059, *p* = .62), quality (β = 0.0746, *p* = .53), age (β = -0.0227, *p* = .30). There was a significant effect of gender (β = -0.0221, *p* = .02, *k* = 47) in which the prevalence of delusions of control was higher in samples with a higher proportion of males.

Religious. Religious delusions were investigated in 46 samples in 40 studies and the pooled point prevalence estimate was 18.5% (95% CI = 15.3 – 22.1%). There was high heterogeneity between the studies (*Q* = 593.12, *df* = 46, *p* < .001, I^2 = 92.4%). Begg's rank correlation indicated significant asymmetry (*p* = .03) but Egger's regression intercept did not (*p* = .06).

Moderator analysis indicated that there was a higher prevalence of religious delusions in samples of patients with all psychosis diagnoses (41 samples, point estimate: 21.9%, CI 18.8 – 25.4%) compared to mixed diagnosis samples (5 samples, point estimate: 3.6%, CI 1.0 – 11.9%), $Q_{between}$ = 9.27, *df* = 1, *p* < .001. There was no significant effect of country,

(developed = 29, developing = 17), $Q_{between}$ = 2.93, *df* = 1, *p* = .09. Meta-regression (*k* = 35) indicated no significant effect of year of publication (β = -0.014, *p* = .90), study quality (β = 0.1184, *p* = .36). There was a significant effect of gender (β = -0.0255, *p* = .0129, *k* = 43) and age (β = -0.0484, *p* = .007, *k* = 37), in which the prevalence of religious delusions was higher in samples with a higher proportion of males and younger mean age. As age and gender were both significant, they were entered into a multivariate meta-regression which showed that age remained significant (β = -0.0394, *p* = .03, *k* = 37), and gender was near significance (β = -0.0189, *p* = .06, *k* = 37).

Table 2

Prevalence estimates of delusions based on studies investigating all delusions

Delusion	Total samples Total studies	Sample size (*n*)	Pooled point prevalence estimate (%) and 95% CI	Adjusted Pooled point prevalence estimate (%) and 95% CI
Persecutory	101 samples 94 studies	17,081	64 (59.8 – 68)	58.6 (54.4 – 62.7)
Reference	62 samples 54 studies	11,251	38.7 (33.2 – 44.6)	31.7 (26.1 – 38.1)
Grandiose	94 samples 83 studies	16,250	28.5 (24.9 – 32.5)	35.7 (31.3 – 40.3)
Control	50 samples 42 studies	8505	20.9 (16.7 – 25.9)	26.7 (21.6– 32.5)
Religious	46 samples 40 studies	8491	18.5 (15.3 – 22.1)	14.0 (11.0 – 17.7)

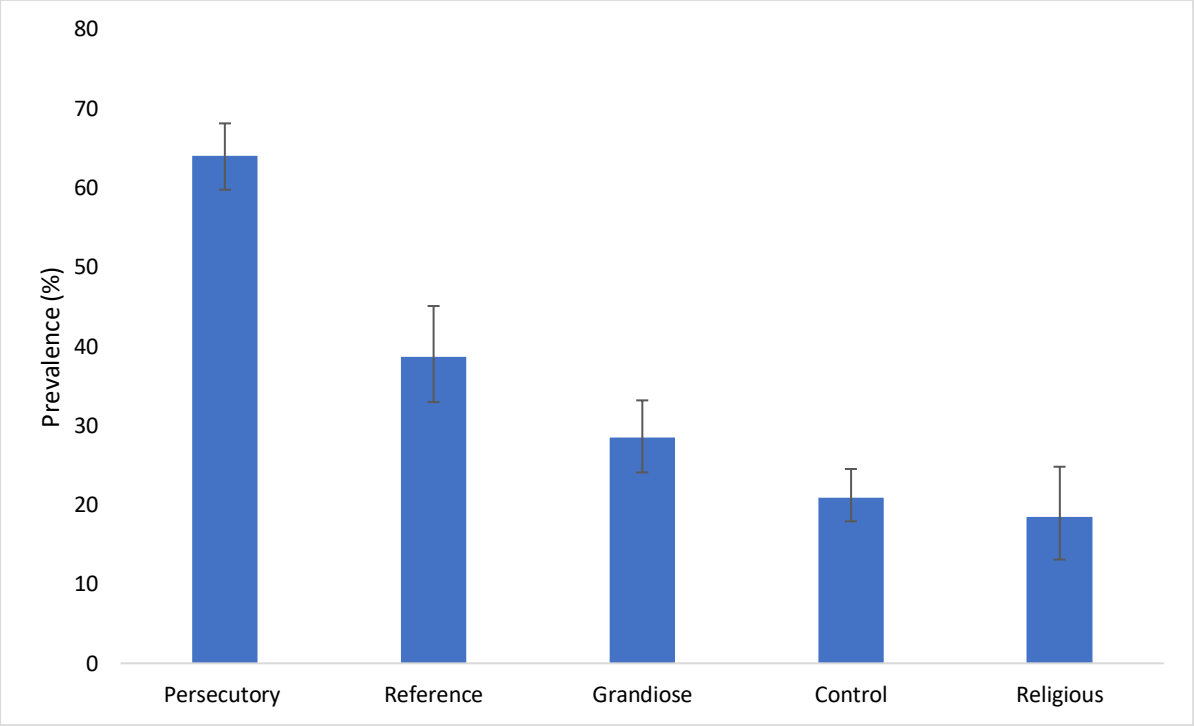

Figure 2. Pooled point prevalence estimates and 95% confidence intervals of delusional themes

Studies that recorded patient's main delusional theme

Twenty-one studies recorded the patient's one, main delusional theme; these included 3414 patients (mean age 43.1 years; 53.7% female) across 15 countries. Thirteen studies were conducted in developed countries (n = 1845) and seven were completed in developing countries (n = 1569). In one study, de Portugal et al. (2008), the number of patients and percentage of delusions did not accurately total. The percentages were used as these summed up to 100%. The weighted average prevalence rates from these studies are shown in Table 3.

Table 3

Prevalence estimates of delusions based on studies investigating patient's main delusion

Delusion	Number of studies	Sample size (*n*)	Pooled point estimate (%) and 95% CI
Persecutory	21	3414	49.8 (44.1 – 55.5)
Control	1	32	15.6 (6.6 – 32.4)
Religious	3	540	9.8 (1.3 – 47.1)
Reference	6	1203	9.8 (4.4 – 20.3)
Grandiose	19	2988	5.6 (3.3 – 9.4)

Quality appraisal

The quality appraisal ratings are presented in Appendix D. Two studies (Rossler et al., 2016; Turgut & Yenilmez, 2013) could not be quality appraised as the results were taken from English summaries as the full-text article was not available in English. The overall quality ratings ranged from two to nine (M = 6.7) where higher scores indicated greater quality. Meta-regressions indicated that there was no effect of study quality on the prevalence rate of any delusional theme. The appraisal indicated that possible sources of bias were studies not reporting response rates or relying on retrospective analyses of case notes and not utilising reliable methods to assess delusional themes.

Discussion

Summary of main findings

The aims of this meta-analysis were to investigate the prevalence of different delusional themes, whether the prevalence varied between developed and developing countries, or according to age, gender, and year. A total of 117 studies were identified

through the systematic search. Of these, 96 studies with 109 samples, recorded all the delusional themes that a patient experienced. These studies were included in a series of meta-analyses to calculate a pooled point estimate prevalence rate for persecutory, referential, grandiose, religious, and control delusions. The findings supported the hypothesis that persecutory delusions would have the highest prevalence rate, being reported in over half of patients. Delusions of reference were the second most prevalent theme, reported in just over a third of patients, followed by grandiose delusions and delusions of control, both experienced by about a third of patients, and finally religious delusions, which were reported by about one in five patients. Additionally, there was overlap between the confidence intervals of the unadjusted and adjusted prevalence estimates of each delusional theme except persecutory. Significant asymmetry in the funnel plot in all analyses suggested the presence of publication bias. Adjusting for publication bias resulted in grandiose delusions being identified as the second most common theme, followed by reference. There was significant heterogeneity between the prevalence rates reported in different studies, but this was expected as the context and methodology of studies varied, and the prevalence of delusions was not always the primary outcome.

An important finding from the subgroups analyses was that the prevalence of persecutory, grandiose, reference, control, and religious delusions did not significantly differ between developed or developing countries. This consistency points to culturally invariant processes that are causal in determining delusion themes. These processes could result from many factors, including theoretically, biological processes. For example, it has been hypothesised that the dopamine abnormalities long linked to psychosis may be particularly important in paranoid symptoms (Howes & Murray, 2014). Culturally invariant psychological processes could also be important; for example, insecure attachment appears to be particularly important in paranoid beliefs (Wickham et al., 2015). Yamada et al. (2006)

proposed that delusional themes could be influenced by the individualistic or collectivist focus of a culture. They found grandiose delusions were more common in Euro-Americans compared to Latinos and hypothesised that this reflected the focus on uniqueness and individual achievement in individualistic cultures (Yamada et al., 2006). Whilst this meta-analysis did not find differences in the prevalence rates of delusions in developed and developing countries, there may be significant differences between individualistic and collectivist cultures, between subcultures within a country, and in the content or the form of different types of delusion (Gecici et al., 2010).

The prevalence of all delusional themes, except persecutory and grandiose, were higher in samples of patients with only psychosis diagnoses, compared to samples that included some patients with non-psychosis diagnoses. This is to be expected as delusions are considered a core 'symptom' of psychosis and schizophrenia-spectrum disorders (APA, 2013), and Schneider (1959) argued that delusions of control are a first rank symptom of schizophrenia. These findings somewhat support dimensional theories of delusions in which paranoid and grandiose beliefs are considered to exist on a continuum and therefore may be observed in the general population and in samples with other, non-psychotic psychiatric diagnoses. Phenomenological theorists might argue that delusions of reference and control are the more ontological delusions associated with schizophrenia (Sass & Pienkos, 2009).

Meta-regressions indicated that the prevalence of persecutory and religious delusions was higher in samples with a lower average age, and grandiose, reference, and control delusions were not significantly associated with age. According to Erikson (1968), during adolescence and early adulthood, humans are concerned with discovering an identity and values and then sharing these to develop intimacy and relationships with others. Young adults, particularly those experiencing adversity (Sideli et al., 2020), or a lack of secure attachments (Lavin et al., 2020), may have difficulties developing trusting relationships and

finding purpose in life (Bodner et al., 2014; Lopez et al., 2015), and therefore be more likely to experience persecutory (Pickering et al., 2008) or religious delusions (Huguelet et al., 2015). Additionally, the prevalence of referential, control, and religious delusions were higher in samples with a higher proportion of males. The results suggested that age may be a more important moderator of religious delusions than gender, as gender became non-significant when accounted for the effect of age. In contrast González-Rodríguez et al.'s (2019) narrative review, the prevalence of grandiose delusions did not significantly differ between the genders. However, religious delusions often have grandiose themes (e.g., believing you are god) and González-Rodríguez et al. (2019) did not discuss delusions of reference, control, or religious delusions.

There were 21 studies that recorded the patient's main delusional theme. These studies are considered less representative as they only reported the experience of one main delusion, when patients often experience more than one theme. Therefore, no strong inferences can be made from the analysis of these studies. However, it is noteworthy that persecutory delusions were by far the most prevalent theme in these studies too. The second most common was delusions of control, followed by reference and religious delusions. Grandiose delusions were the least prevalent theme in these studies which may be because patients often experience grandiose delusions in the context of other delusions, particularly persecutory and religious delusions (Jolley et al., 2006; Lake, 2008), so they may not have been recorded as the main delusion.

The quality of the studies did not influence the prevalence rates of any delusional theme. About half of the studies recorded delusional themes retrospectively from case records which may have biased the results as there is a degree of subjectivity when categorising themes. Information from case notes relies solely on clinician's reports and raters may not have known the patient or been able to gather more information. This bias could have been

reduced by using validated and reliable methods to record delusions, however approximately half of the studies did not measure delusional themes in a reliable and consistent way. There has been an increase in the development of validated and reliable tools to rate delusions over the last 20 years so it was possible that there may have been differences in prevalence rates between more recent and older studies. However, the year of publication did not influence the prevalence rates of any delusional theme.

How do the findings contribute to our understanding of delusions?

The findings of this review and meta-analysis support the theory that delusions reflect universal human needs and existential challenges (Bentall, 2018; Musalek et al., 1989). Humans need to trust others, have a sense of control and meaning or purpose to life, and have social rank (Bentall, 2018). The results confirm previous findings that persecutory delusions are the most common theme (Bentall et al., 2001; Garety et al., 2013; Tateyama et al., 1998; Turgut & Yenilmez, 2013) and extend our understanding that this applies worldwide. Social isolation, loneliness, adversity, and insecure attachment have been shown to be associated with psychosis (Lim et al., 2018; Longden & Read, 2016; Sideli et al., 2020; Trotta et al., 2015) and severity of delusions (Bailey et al., 2018; Scott et al., 2007). Wright et al. (2020) found that emotional reactivity and hallucinations fully mediated the relationship between childhood trauma and persecutory, referential, and control delusional ideation. The relationship between trauma and grandiosity was only mediated by hallucinations and religiosity was not related to trauma (Wright et al., 2020). Dissociation also appears to mediate the relationship between childhood trauma and delusions in clinical and subclinical populations (Cole et al., 2016; Sun et al., 2018), and could be one explanation for the self-focused phenomenological nature of delusions. This research suggests that delusions could be one way of making sense of traumatic memories and defend against the experience of overwhelming emotions or threats in their current environment (Read et al., 2003). As

experiences of trauma and adversity are universal, it is understandable that the prevalence of delusional themes is consistent across the world. Research investigating the association between different coping mechanisms and types of delusions (e.g., Sitko et al., 2014; Wright et al., 2020) may be useful in identifying areas for intervention for different delusional themes.

There is debate regarding the utility of developing content-focused models of delusions that do not attend to the experiential nature of them (Feyaerts et al., 2021). Whilst the overarching themes of delusions may be universal, the specific content often reflects societal and personal concerns and pressures at different periods of life (Musalek et al., 1989). The higher prevalence of grandiose, control, and religious delusions in males could be understood in terms of gender stereotypes and constructions of masculinity which largely involve dominance, control, and authority, based on patriarchal systems (Connell, 2005; Schrock & Schwalbe, 2009). Religious delusions often include grandiose themes in which the person believes they are or have special connections with religious figures (Smith et al., 2005) who are broadly considered to be male.

There is increasing recognition that distress needs to be contextualised, which involves understanding how aspects of identity and socio-economic factors influence how people make sense of emotional and behavioural problems (Power Threat Meaning Framework; Johnstone et al., 2018). In the UK, rates of psychotic disorders are higher in people from racially minoritized backgrounds, specifically Black African and Caribbean men (Kirkbride et al., 2012; Tortelli et al., 2015). Experiences of racism, discrimination, and alienation can understandably lead to paranoia and suspiciousness (Singh et al., 2007). To expand on this review, a more detailed review of studies investigating the association between delusional themes and ethnic groups would provide more specificity on how social and cultural factors influence delusional themes. Additionally, further understanding of the

specific content of delusions is needed, as this appears to reflect the individual's adverse life experiences, regardless of the type of delusion (Read et al., 2003; Read & Argyle, 1999b).

Limitations

There is debate regarding the appropriateness of completing meta-analyses of prevalence across countries, where different diagnostic criteria may be used (Barendregt et al., 2013; Migliavaca et al., 2020). Countries have different healthcare systems and both psychiatric diagnoses and delusions are culturally defined and constructed. Therefore, finding a similar prevalence of delusional themes across countries does not necessarily mean that the prevalence reflects a specific, universal symptom. Studies with patients with any psychotic diagnosis were included because delusions are observed in both bipolar disorder and schizophrenia, and there is significant comorbidity between these diagnoses suggesting that the discrete classification system is not reliable (Bambole et al., 2013; Laursen et al., 2009). However, there are limitations of combining the diagnoses in meta-analyses as delusions in bipolar disorder could be more episodic and phenomenologically different. Therefore, the prevalence rates of different delusional themes may differ between diagnoses.

It was expected that there would be high heterogeneity between the studies, with many uncontrolled factors likely to influence prevalence rates. For example, studies used a range of assessment tools, and it was not possible to include these as moderators. One of the key issues with meta-analysis of prevalence is accurately assessing risk of bias (Migliavaca et al., 2020) but this review utilised an appropriate critical appraisal tool and took an inclusive approach with regards to quality appraisal due to the variation in study's methodologies.

A small proportion of studies combined the prevalence rates of multiple types of delusions and for the purposes of the analysis, only one percentage could be included. This

highlights the overlap and complexity of delusional beliefs and the issues with the current classification system, as many patients experience multiple themes.

Some studies were not available in English and therefore could not be included in the review and there was evidence of publication bias. This resulted in the inclusion of a larger proportion of studies completed in developed countries. Categorising studies by developed or developing could be argued to be too simplistic, as there are large economic disparities within countries which have changed over time. As beliefs are only considered delusional if they are not accepted within the person's culture, the review would be improved by the inclusion of more countries and by considering additional dimensions of cultural difference, for example individualism vs collectivism.

Clinical and research implications

The finding that persecutory delusions are the most prevalent theme across a range of countries suggests that fear and mistrust is common across the world. The higher prevalence of persecutory and religious delusions in younger patients highlights the need for resources in early intervention and prevention, for example through schools, colleges, and community services. In clinical practice, practitioners need to be trained in psycho-social understandings of paranoia. Whilst CBT for persecutory delusions has been shown to be moderately effective in treating delusions, the effects were not sustained at follow up and it was not significantly more effective than other interventions (Mehl et al., 2019). The findings suggest that the prevalence of delusional themes is consistent across developed and developing countries, but that they vary according to age and gender. This suggests that the individual's immediate environment and experiences are likely to impact the content of their delusions, highlighting the importance of understanding someone's delusional beliefs within their context, and

trauma-focused interventions may be effective (Bloomfield et al., 2020; Keen et al., 2017; Van Den Berg et al., 2015).

At the preventative level, investigation of wider factors that contribute to higher levels of mistrust and paranoia in society is needed. Income inequality has been associated with higher levels of mistrust and anxiety about social status (Buttrick & Oishi, 2017; Rözer & Volker, 2016), therefore comparing prevalence rates of delusional themes according to country's income inequality may be useful in exploring if these socio-economic factors influence the prevalence of delusions.

There remains a need for evidence-based models of other delusions, which include the consideration of relevant psychological, social, and demographic factors. Given the overlap between delusional themes, there may be common issues to be addressed, such as the experience of isolation and loneliness, which has been associated with the development and maintenance of delusions (Freeman, 2016; Michalska Da Rocha et al., 2018; Skodlar & Henriksen, 2019). This is supported by Freeman et al. (2019) who found that the most frequent patient-generated goal for treatment was increasing social connection.

Conclusions

This review confirms that persecutory delusions are the most common type of delusion worldwide, followed by reference, grandiose, control and religious delusions, and that this is consistent across a range of developed and developing countries. The results suggest that persecutory and religious delusions are more common in younger patients, and delusions of reference and control, and religious delusions are more common in males. Significant heterogeneity and publication bias was found suggesting that the prevalence estimates may be biased and vary according to other, uncontrolled factors, and unpublished studies were not included. Overall, the findings suggest that delusional themes reflect some

universal existential challenges and pressures that vary according to different life periods and genders. Content-specific models of delusions could be improved by incorporating ways in which these demographic factors influence delusions. In addition, social and psychological risk factors could be addressed during treatment and at a preventive level. For example, by increasing trust, social connection and status, and purpose in people's lives. Future research could compare if prevalence rates of delusional themes differ across countries according to factors other than economic status (developed vs developing), such as income inequality rates.

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Appendices

Appendix A. Joanna Brigg's Institute (JBI) Critical Appraisal Checklist.

JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data

Item	Yes	No	Unclear	N/A
1. Was the sample frame appropriate to address the target population? *Target population: clinical sample, psychosis diagnosis, adults*				
2. Were study participants sampled in an appropriate way? *Random sampling if possible but consecutive or complete samples also acceptable (e.g. all patients in a unit/service at a particular time)*				
3. Was the sample size adequate? *Either provides sample size calculation or if it is a complete/consecutive sample then this is acceptable as the sample is based on availability*				
4. Were the study subjects and the setting described in detail? *Setting and participants described in detail for comparison*				
5. Was the data analysis conducted with sufficient coverage of the identified sample? *Any systematic bias in sampling? Is the sample representative of patients with a range of delusions? Any subgroup refuse to take part? E.g. paranoid patients* *For this one I put "no" if the study only looked at one category of delusion*				
6. Were valid methods used for the identification of the condition? *Is a standardised and validated tool used to assess for delusions? Or do they provide definitions of the categories of delusions?*				
7. Was the condition measured in a standard, reliable way for all participants? *Were the researchers trained in the tool? Was the procedure the same for all participants? Comparison between raters?*				
8. Was there appropriate statistical analysis? *Numerator and denominator should be reported, and percentages (%) or number (n) of patients should be given*				
9. Was the response rate adequate, and if not, was the low response rate managed appropriately? *Do the authors discuss the response rate? Did a certain demographic refuse to take part? E.g. lower SES, older patients. If all patients took part/high response rate, then this is yes. Not applicable (N/A) if a retrospective study of case records.*				

Appendix B. Main characteristics of 96 studies which recorded all delusional themes that patients experienced

First author, year	Title	Country Country classification	Design	Sample size (*n*); Age (mean years) % Female	Sample Characteristics Population; Diagnosis, *n* (%); Ethnicity, *n* (%)	Assessment tool & method	Prevalence of delusions, *n* (%)	Quality
Adebimpe, 1981	Hallucinations and delusions in Black Psychiatric Patients	USA Developed	CS	275 NS NS	Inpatient Schizophrenia**:** 275 (100%) White: 149 (54.2%) Black: 126 (45.8%)	BPRS Interview	Influence: 164 (59.6%) **Reference: 152 (55.3%)**	6
Adhikari, 2017	Psychotic symptoms in bipolar disorder: Two years' retrospective study	Nepal Developing	RS	77 32.27 ± 11.3 37.9%	Inpatient Bipolar: 77 (100%)	NS Records	**Grandiose 66 (93.5%)** **Persecutory 15 (19.5%)** Jealous 3 (3.9%) Other 1 (1.3%)	6
Ahmed, 1978	Cultural influences on delusion	Pakistan Developing	CS	51 30 39.2%	Community Schizophrenia: 51 (100%) Indian migrant: 37 (72.5%) Pakistani: 14 (27.5%)	NS Interview	**Persecution 36 (70.6%)** **Religious 25 (49%)** Magic 23 (45.1%) **Reference 18 (35.3%)** **Control 13 (25.5%)** **Grandiose 13 (25.5%)** Spouse infidelity (7) (13.7%) Somatic 5 (9.8%) Sexual 3 (5.9%) Nihilistic 3 (5.9%) Self-derogatory 3 (5.4%) Guilt 1 (2%)	8

Albee, 1950	Delusions in schizophrenia as a function of chronological age	USA Developed	CS	184 NS NS	Inpatient Schizophrenia: 184 (100%)	NS Records	**Persecutory: 136 (73.9%)** Self-condemnatory: 55 (29.9%) **Grandiose: 51 (27.7%)** Bizarre & depersonalised: 40 (21.7%) Wish fulfilment: 20 (16.3%)	7
Albee, 1951	The prognostic importance of delusions in schizophrenia	USA Developed	CS	261 NS NS	Inpatient Schizophrenia: 261 (100%)	NS Records	**Persecutory: 199 (76.2%)** Self-condemnatory: 88 (33.7%) Bizarre & depersonalised: 61 (23.4%) **Grandiose: 58 (22.2%)** Wish fulfilment: 43 (16.5%)	6
Allan, 1989	Sex Differences in the Phenomenology of Schizophrenic Disorder	Australia Developed	CS	60 2.1 50%	Inpatient Schizophrenia: 60 (100%)	NS Records	**Persecutory 59 (98.3%)** **Grandiose 38 (63.3%)** Somatic 27 (45%) **Religious 19 (31.7%)** Jealous 15 (25%) Guilt 11 (18.3%) Nihilistic 10 (16.7%) Poverty 0 (0%)	7
Appelbaum, 1999	Dimensional Approach to Delusions: Comparison Across Types and Diagnoses	USA Developed	CS	238 NS NS	Inpatient Schizophrenia: 138 (58%) Bipolar Disorder: 73 (30.7%) Other Psychotic Disorder: 27 (11.3%)	MMDAS Interviews	**Persecutory 191 (80.3%)** **Control 158 (66.3%)** **Grandiose 120 (50.4%)** Thought broadcasting 96 (40.3%) **Religious 80 (33.6%)** Guilt 24 (10.1%) Somatic 27 (11.3%) Other 68 (28.6%)	7

Azhar, 1995	Phenomenological differences of delusions between schizophrenic patients of two cultures of Malaysia	Malaysia Developing	CS	270 NS NS	Inpatient Schizophrenia: 270 (100%) Penang Malay: 82 (30.4%) Chinese: 84 (31.1%) Kota Bharu Malay: 84 (31.1%) Chinese: 20 (7.4%)	PSE Interviews	**Persecutory 194 (71.9%)** **Grandiose 108 (40%)** Sexual 56 (20.7%) **Reference 54 (20%)** **Religious 50 (18.5%)** Jealousy 39 (14.4%) Nihilistic 18 (6.6%) Guilt 18 (6.6%) Others 37 (13.7%)	8
Baethge, 2005	Hallucinations in bipolar disorder: characteristics and comparison to unipolar depression and schizophrenia	Germany Developed	CS	549 44.8 54.4%	Inpatient Bipolar Disorder: 549 (100%)	AMDP Interview	**Persecutory 52 (9.5%)** **Grandiose 52 (9.5%)** **Reference 44 (8%)** Guilt 42 (7.7%) Hypochondria 15 (2.7%) Poverty 24 (4.4%) Jealousy 2 (0.3%) Other 28 (5.1%)	9
Ben-Zeev, 2012	Predicting the Occurrence, Conviction, Distress, and Disruption of Different Delusional Experiences in the Daily Life of People with Schizophrenia	USA Developed	CS	67 46.2 ± 11.24 41%	Community Schizophrenia: 67 (100%)	PANSS Interview	**Control 48 (71.6%)** **Reference 40 (59.7%)** **Grandiose 36 (53.7%)**	7

Beveridge, 1995	Madness in Victorian Edinburgh: a study of patients admitted to the Royal Edinburgh Asylum under Thomas Clouston, 1873-1908 Part I	UK Developed	RS	606 NS 52.8%	Inpatient MDD (Depressed): 128 (21%) MDD (Mania): 97 (16%) Schizophrenia: 78 (12.9%) Organic: 434 (71.5%) Unclassified: 415 (68.5%)	NS Records	**Persecutory 345 (56.9%)** **Grandiose 147 (24.3%)** Guilt 86 (14.2%) Misidentification 53 (8.7%) Ill-health (somatic) 44 (7.2%) **Control 35 (5.8%)** Nihilism 26 (4.3%) Unworthiness 15 (2.5%) Love 15 (2.5%) Poverty 14 (2.3%) Infidelity 10 (1.7%) Demon possession 4 (0.7%) **Reference 4 (0.7%)** Infestation 4 (0.7%) Sexual interest 4 (0.7%)	7
Bhaskaran, 1963	A psychiatric study of paranoid schizophrenics in a mental hospital in India	India Developing	CS	33 27.9 24.2%	Inpatient Paranoid schizophrenia: 33 (100%)	NS Interview	**Persecutory 23 (69%)** Spouse infidelity 10 (30%) **Grandiose 9 (27%)**	7
Bhuyan, 2016	Nature and Types of Delusion in Schizophrenia and Mania – is there a difference?	India Developing	CS	60 31.43 18.3%	Inpatient Schizophrenia: 30 (50%) Mania: 30 (50%)	PSE Interview	**Reference 32 (53.3%)** Grandiose abilities 26 (43.3%) **Persecution 30 (50%)** Grandiose identity 24 (40%) **Grandiose (average) 25 (41.6%)** **Religious 15 (25%)** Lover 10 (16.6%) Jealous 6 (10%) Misinterpretation 4 (6.6%) Paranormal explanations 5 (8.3%)	7

							Guilt 0 (0%)	
Bowins, 1998	Delusions and self-esteem	Canada Developed	CS	40 NS NS	Inpatient Schizophrenia: 21 (52.5%) SchizoAffective psychosis: 5 (12.5%) Manic depressive: 5 (12.5%) Major depressive episode with psychotic features: 5 (12.5%) Organic delusional disorder: 2 (5%) Delusional disorder: 1 (2.5%) Drug induced psychosis: 1 (2.5%)	PSE Interviews	**Reference 37 (92.5%)** **Persecutory 29 (72.5%)** **Grandiose 23 (57.5%)** **Control 17 (42.5%)** Thought insertion 9 (22.5%) Thought broadcasting 8 (20%) Somatic 7 (17.5%) Guilt 7 (17.5%) Thought withdrawal 7 (17.5%) Thought reading 6 (15%) **Religious 4 (10%)** Jealousy 2 (5%) Catastrophe 2 (5%) Sexual 1 (2.5%)	7
Brakoulias, 2008	A cross-sectional survey of the frequency and characteristics of delusions in acute psychiatric wards	Australia Developed	CS	90 37.8 ± 11.9 45.6%	Inpatient Schizophrenia: 60 (66.6%) Schizoaffective: 10 (11.1%) Drug-induced psychosis: 7 (7.7%) Delusional disorder: 2 (2.2%) Other psychotic disorders: 6 (6.6%) Bipolar Affective psychosis: 5 (5.5%)	SAPS Records	**Persecutory 72 (80%)** **Religious 24 (26.7%)** **Grandiose 21 (23.3%)** **Reference 14 (15.6%)** Somatic 13 (14.4%) **Control 4 (4.4%)** Guilt 4 (4.4%) Mind reading 4 (4.4%) Thought broadcasting 3 (3.3%) Thought withdrawal 2 (2.2%) Misidentification 2 (2.2%) Extra-terrestrial 2 (2.2%) Other delusions 6 (6.7%)	8

Breslau, 1988	Validity of subtyping psychotic depression: examination of phenomenology and demographic characteristics	USA Developed	CS	111 34.6 65.6%	Inpatient Unipolar: 39 (35.1%) Bipolar: 38 (34.2%) Schizoaffective: 34 (30.6%) White: 70 (63%)	PSE, SADS Interview	**Persecutory 54 (48.6%)** Depressive 52 (46.8%) **Reference 42 (37.8%)** **Grandiose 16 (14.4%)**	9
Campbell, 2017	The content of delusions in a sample of South African Xhosa people with schizophrenia	South Africa Developing	CS	200 35 (20 – 54) 16%	In-patient: 104 (52%) Community: 96 (48%) Schizophrenia: 197 (98.5%) Schizoaffective: 3 (1.5%) Eastern Cape: 142 (71%) Western Cape: 58 (29%)	SCID-I Interview	**Persecutory 127 (63.5%)** **Grandiose 118 (59%)** **Reference 105 (52.5%)** **Control 118 (59%)** Thought broadcast 117 (58.5%) Thought control & broadcast 74 (37%) Somatic 73 (36.5%) Persecutory & reference 54 (27%)	9
Cannon, 2012	Delusion content across the 20th century in an American psychiatric hospital	USA Developed	CS	102 38.7 ± 14.9 52%	Inpatient Paranoid schizophrenia: 43 (42.2%) Chronic schizophrenia: 10 (9.8%) Catatonic schizophrenia: 10 (9.8%) Manic: 9 (8.8%) Hebephrenic: 6 (5.9%) Paranoid condition: 6 (5.9%) Paranoid state: 1 (%) Other psychotic disorder: 16 (15.7%)	NS Records	**Persecutory 78 (76%)** **Religious 39 (38%)** Somatic 29 (28%) Poisoning 25 (25%) **Grandiose 20 (20%)**	6

Carpenter, 1980	A Study of Mental Illness in Asians, West Indians and Africans Living in Manchester	UK Developed	CS	141 NS NS	Inpatient NS Immigrants: 69 (48.9%) British: 72 (51.1%)	PSE Records	**Persecutory 38 (27%)**	4
Conus, 2004	Schneiderian first rank symptoms predict poor outcome within first episode manic psychosis	Australia Developed	CS	108 22.2 ± 3.9 42.6%	Inpatient Bipolar: 87 (80.5%) Schizoaffective: 21 (19.4%)	RPMIP Interview	**Grandiose 98 (90.6%)** **Persecutory 78 (72.5%)** **Religious 45 (41.5%)** Somatic 21 (19%) Catastrophe 15 (13.6%) Guilt 10 (9.7%)	9
Crowe, 1988	Delusional Disorder: Jealous and Non-jealous Types	USA Developed	CS	101 40.65 55.4%	Inpatient Delusional disorder: 61 (60.4%) Schizophrenia: 20 (19.6%) Affective psychosis: 7 (6.9%)	DSM-III-R Records	**Persecutory 75 (74.3%)** Jealous 43 (42.6%) Hypochondriacal 7 (7%) Erotic 3 (3%) **Grandiose 2 (2%)** **Religious 2 (2%)** Other 3 (3%)	8
Dagaonkar, 2016	Psychotic features in patients with Bipolar I Mood Disorder current episode mania	India Developing	CS	29 31.72 ± 10.3 44.8%	Inpatient Bipolar with psychotic features: 29 (100%)	BPRS Interview	**Grandiose (54%)** **Reference (46%)** **Persecutory (46%)** **Control (8%)** Somatic (4%)	9
Doody, 1996	Poor and mad: a study of patients admitted to the Fife and Kinross District Asylum between 1874	UK Developed	RS	339 41.3 50.4%	Inpatient Affective psychosis: 122 (36%) Organic disease: 88 (26%)	NS Records	**Persecutory 184 (54.3%)** **Grandiose 67 (19.8%)** Guilt 58 (17.1%) Nihilistic 37 (10.9%) Misidentification 29 (8.6%)	8

	and 1899				Schizophrenia: 27 (8%) Unknown: 118 (35%)		Unworthiness (depressive) 22 (6.5%) Ill-health (Hypochondriacal) 20 (5.9%) Poverty 18 (5.3%) Infidelity 9 (2.7%) **Control 9 (2.7%)** Demonic possession 7 (2.1%) Love 7 (2.1%) **Reference 5 (1.5%)** Infestation 4 (1.2%) Sexual 1 (0.3%)	
Freedman, 1978	Paranoid Symptoms in Patients on a General Hospital Psychiatric Unit	USA Developed	CS	264 NS NS	Inpatient Schizophrenia: 81 (30.7%) Neuroses: 43 (16.3%) Affective psychosiss: 36 (13.6%) Personality disorders: 37 (14%) Organic psychotic: 19 (7.2%) Organic Nonpsychotic: 6 (2.3%) Paranoid states: 4 (1.5%) Other psychoses: 10 (3.8%) Other diagnosis: 28 (10.6%)	HDRS-P Records	**Persecutory 56 (21.2%)**	6
Garety, 2013	Differences in Cognitive and Emotional Processes	UK Developed	CS	301 37.59 ± 10.98 26.2%	Community Schizophrenia: 244 (81.1%)	SCAN Interview	**Persecutory 192 (64%)** **Reference 174 (57.8%)** **Grandiose 97 (32%)** Mind reading 83 (27.6%) **Religious 56 (18.6%)**	8

	Between Persecutory and Grandiose Delusions				Schizoaffective: 34 (11.3%) Delusional disorder: 2 (0.7%) Not stated: 21 (7%)		Somatic 54 (17.9%) Thought insertion 46 (15.3%) **Control 41 (13.6%)** Thought broadcast 39 (13%) Guilt/sin 38 (12.6%) Thought withdrawal 15 (5%) Jealousy 7 (2.3%)	
Gaudiano, 2009	Prevalence and clinical characteristics of psychotic versus nonpsychotic major depression in a general psychiatric outpatient clinic	USA Developed	CS	12 37.0 ± 11.7 73.3%	Inpatient Psychotic major depression: 12 (100%)	SCID Interview	**Persecutory 9 (75%)** **Reference 7 (58.3%)** Bizarre 2 (16.6%) **Control 2 (16.6%)** Thought insertion 2 (16.6%) Thought broadcasting 0 (0%) Jealous 0 (0%) Mind reading 0 (0%)	8
Gecici, 2010	Phenomenology of Delusions and Hallucinations in Patients with Schizophrenia	Turkey Developing	CS	Total: 373 36.23 ±11.03 42.4% Western: 201 37.83 ± 9.27 NS Central: 172 34.36 ± 12.57 NS	Inpatient Schizophrenia Paranoid: 189 (50.7%) Undifferentiated: 124 (33.2%) Disorganised: 41 (11%) Residual: 19 (5.1%)	SCID Interview	***Persecutory (Western, Central)** **150, (74.6%), 144 (83.7%)** ***Reference (W, C):** **116 (57.7%) 122, (70.9%)** *Poisoning (W, C): 19 (9.5%), 45 (26.2%) ***Religious (W, C):** **22 (10.9%), 36 (20.9%)** ***Grandiose (W, C):** **20 (10%), 34 (19.8%)** ***Control (W, C):** **12 (6%), 34 (19.8%)** *Mind reading (W, C): 9 (4.5%), 30 (17.4%) *Jealous (W, C):	8

							7 (3.5%), 24 (14%) *Guilt/Sin (W, C): 1 (0.5%), 23 (13.4%) *Hypochondria (W, C): 2 (1%), 21 (12.2%) *Erotomania (W, C): 5 (2.5%), 16 (9.3%) *Thought broadcasting (W, C): 1 (0.5%), 19 (11.1%) *Thought insertion (W, C): 2 (1%), 16 (9.3%) Nihilistic (W, C): 8 (4%), 9 (5.2%) *Thought withdrawal (W, C): 1 (0.5%), 9 (5.2%) *Inferiority (W, C): 0 (0%), 6 (3.5%) *Homosexual (W, C): 0 (0%), 6 (3.5%) Parasitosis (W, C): 0 (0%), 2 (1.2%) World catastrophe (W, C): 0 (0%), 2 (1.2%) Resurrection (W, C): 0 (0%), 2 (1.2%) *Others 9 (4.5%), 1 (0.6%)	
Grover, 2007	Delusional disorder: Study from North India	India Developing	RS	88 41.78 ± 15.16 55.7%	Inpatient Delusional disorder: 88 (100%)	NS Records	**Persecutory 48 (54.5%)** **Reference 41 (46.6%)** Hypochondriacal 27 (30.7%) Infidelity 25 (28.4%) Parasitosis 15 (17%) Love 1 (1.1%)	7

							Grandiose 1 (1.1%)	
Gutierrez-Lobos, 2001	Delusions in First-Admitted Patients: Gender, Themes and Diagnoses	Italy Developed	RS	639 48.3 ± 19.5 62.6%	Inpatient Schizophrenia: 200 (31.3%) Paranoid states: 194 (30.4%) Organic psychoses: 150 (23.6%) Affective psychoses: 47 (7.4%) Alcohol dependence: 26 (4.2%) Neuroses: 17 (2.7%) Non-organic psychoses: 15 (2.5%)	ICD-8 Records	**Persecutory 468 (73.2%)** **Religious or metaphysical 42 (6.6%)** **Grandiose 30 (4.7%)** Jealousy 28 (4.4%) Erotomania 16 (2.5%) Invention or overvalued ideas 12 (1.9%) Hypochondria 9 (1.4%)	8
Hafner, 1993	The Influence of Age and Sex on the Onset and Early Course of Schizophrenia	Germany Developed	CS	276 NS 51.8%	Inpatient Schizophrenia: 276 (100%)	PSE Interviews Records	**Persecutory 155 (56.2%)** **Reference 201 (72.8%)**	7
Haward, 1964	A Quantitative Method of Studying Delusional Intensity	UK Developed	CS	200 NS 43%	Inpatient NS	NS Interview	**Paranoid 130 (65%)** **Grandiose 80 (40%)** Sexual 62 (31%) **Religious 50 (25%)** Hypochondriacal 32 (16%) Inferiority 16 (8%)	4

Husain, 2009	Clinical study on a group of Iraqi patients in diwaniya teaching hospital & Al-Rashad mental hospital.	Iraq Developing	CS	120 44.05 50%	Inpatient Acute Schizophrenia: 60 (50%) Chronic Schizophrenia: 60 (50%)	DSM-IVR Interview	**Persecutory 64 (53.3%)** **Reference 45 (37.5%)** **Control 34 (28.3%)** Thought broadcasting 29 (24.2%) Thought withdrawal 13 (10.8%) Thought insertion 34 (28.3%) Grandiose 33 (27.5%) Religious 19 (15.8%) Somatic 12 (10%) Nihilistic 5 (4.2%)	8
Jablensky, 1992	Schizophrenia: manifestations, incidence, and course in different cultures A World Health Organization Ten-Country Study	China; Colombia; Czechoslovakia; Denmark; India; Nigeria; USSR; UK; USA. Developed & Developing		Developed countries: 70 NS 51.4% Developing countries: 204 NS 46.1%	Community From larger sample: Schizophrenia: 1151 Psychogenic psychosis and unspecified psychosis: 69 Paranoid states: 32 Alcohol/drug psychosis: 12 Personality disorder: 2 Other: 113	PSE Interview	Developed countries: **Reference 51.4%** **Persecutory 44.3%** Developing countries: **Reference 43.1%** **Persecutory 42.6%**	6
Jolley, 2006	Attributional style in psychosis—The role of affect and belief type	UK Developed	CS	71 37.1 ± 9.3 29.6%	Inpatient: 44 Community: 26 Schizophrenia, Schizoaffective psychosis or delusional disorder White: 46 (64.8%) Black Caribbean: 7 (10%)	SAPS Interview	**Persecutory 37 (52.1%)** **Grandiose 14 (19.7%)**	6

					Black African: 7 (10%) Black other: 2 (2.8%) Indian: 3 (4.2%) Other: 6 (8.5%)			
Jones, 2020	A retrospective case study of the thematic content of psychotic experiences in a first episode psychosis population Amy	UK Developed	RS	160 23.74 ± 5.57 50%	Community Mental & behavioural disorder due to substance use: 22 (13.75%) Paranoid schizophrenia or schizophrenia unspecified: 18 (11.25%) Unspecified nonorganic psychosis: 24 (15%) Mania with psychosis: 8 (5%) Acute and transient psychotic disorder: 10 (6.25%) Non-psychotic diagnosis: 12 (7.5%) Other nonorganic psychotic disorders: 3 (1.88%) Acute polymorphic psychotic disorder: 3 (1.9%) Other acute and transient psychotic disorders: 2 (1.3%) Schizoaffective psychosis: 5 (3.1%) Severe depressive episode with psychosis: 5 (3.1%) Not listed: 48 (30%)	NS Records	**Persecutory (average) 71 (44.4%)** Conspiracy 37 (23.1%) **Reference 45 (28.1%)** Somatic 40 (25%) Grandiose abilities 33 (20.6%) Grandiose identity 24 (15%) **Grandiose (average) 28.5 (17.8%)** **Religious 33 (20.6%)** **Control 32 (20%)** Guilt 9 (5.6%) Infidelity 5 (3.1%) World catastrophe 5 (3.1%)	5

Jørgensen, 1985	Manic-depressive patients with delusions	Denmark Developed	RS	114 37 (18-59) 58.8%	Inpatient Manic Depressive: 86 (75.4%) Mania: 28 (24.6%)	PSE Records	Depression 44 (38.6%) **Persecutory 54 (47.4%)** **Reference 72 (63.2%)** **Grandiose 20 (17.5%)** Control 11 (9.6%) Others 65 (57%)	6
Jørgensen, 1986	Delusional psychosis	Denmark Developed	CS	88 33 (19-63) 61%	Inpatient Reactive psychosis: 22 (25%) Non-classifiable psychosis: 20 (22.7%) Affective Psychosis: 17 (19.3%) Schizophrenia: 13 (14.7%) Other: 16 (18.2%)	PSE Records	**Persecution 70 (79.5%)** **Reference 66 (75%)** Other (morbid jealousy, and sexual and fantastic delusions) 33 (37.5%) Guilt/Hypochondria 25 (28.4%) **Control 23 (26.1%)**	6
Jørgensen & Munk-Jørgensen, 1986	Patients with delusions in a community psychiatric service: a follow-up study	Denmark Developed	RS	37 57 69.6%	Community Manic depression: 14 (37.8%) Schizophrenia: 5 (13.5%) Paranoid state: 6 (16.2%) Reactive psychoses: 4 (10.8%) Other: 8 (21.6%)	NS Records	**Persecution 14 (37.8%)** **Reference 11 (29.7%)** Depression 11 (29.7%) Misinterpretation 10 (27%) **Control 2 (5.4%)** Others 15 (40.5%)	6
Kala, 1982	Delusions across cultures	India Developing	CS	200 NS 46.5%	Inpatient Schizophrenia: 190 (95%) Paranoid state: 10 (5%)	PSE Interview	**Persecutory 164 (82%)** **Reference 119 (59.5%)** **Control 62 (31%)** Poisoning 58 (29%) Erotomania 50 (25%) Infidelity 42 (21%) **Religious 41 (20.5%)** **Grandiose 39 (19.5%)**	7

							Somatic 32 (16%) Thought reading 24 (12%) Other 21 (10.5%) Depressive 17 (8.5%)	
Karson, 1980	A New Look at Delusions of Grandeur	USA Developed	CS	132 29.8 34.1%	Inpatient Schizophrenia: 95 (73.5%) Mania: 37 (28%)	NS Records	**Grandiose 66 (50%)**	7
Keck, 2003	Psychosis in Bipolar Disorder: Phenomenology and Impact on Morbidity and Course of Illness	USA & Netherlands Developed	CS	238 41.5 57.1%	Community Bipolar: 238 (100%)	SCID Interview	**Reference 148 (62.2%)** **Grandiose 145 (60.9%)** **Persecutory 121 (50.8%)** **Control 37 (15.5%)** Thought broadcasting 34 (14.3%) Somatic 31 (13%) Bizarre 23 (9.7%)	6
Kennedy, 2004	Ethnic differences in first clinical presentation of bipolar disorder: results from an epidemiological study	UK Developed	RS	234 30.8 54.1%	Inpatient & community Bipolar/mania: 234 (100%) White European: 149 African–Caribbean: 52 African: 33	PSE Records	**Grandiose 136 (58.1%)** **Persecutory 126 (53.8%)**	8
Kim, 1993	Schizophrenic delusions among Koreans, Korean Chinese	China & South Korea Developing	CS	Total: 771 Korean: 370 33 ± 10.1 46.2%	Inpatient Schizophrenia: 771 (100%)	NS Interviews	***Persecutory (Korean, Korean-Chinese, Chinese):** 289 (78.1%), 145 (64.4%), 101 (57.4%) ***Grandiose (K, K-C, C):**	7

	and Chinese: a transcultural study			Korean-Chinese: 225 41.2 ± 11.6 39.1% Chinese: 176 34.9 ± 12.7 44.3%			154 (41.6%), 52 (23.1%), 30 (17.0%) **Reference (K, K-C, C):** 75 (22.2%), 40 (17.7%), 34 (19.3%) Somatic (K, K-C, C): 51 (13.8%), 39 (17.3%), 25 (14.2%) **Control (K, K-C, C):** 36 (9.7%), 23 (10.2%), 19 (10.7%) *****Jealous (K, K-C, C): 37 (10%), 18 (8.0%), 5 (2.8%) *Guilt (K, K-C, C): 16 (4.9%), 2 (0.9%), 0 (0%) Nihilistic (K, K-C, C): 3 (0.8%), 0 (0%), 0 (0%) Poverty (K, K-C, C): 0 (0%), 0 (0%), 0 (0%)	
Kim, 2001	Schizophrenic delusions in Seoul, Shanghai, and Taipei: a transcultural study	South Korea, China, & Taiwan Developing	CS	Total: 430 34.7 ± 11.2 41.6% South Korea: 143 34.2 ± 11.3 57.3% China: 147 36.5 ± 11.4 63.3% Taiwan: 140 33.5 ± 11.1	Inpatient Paranoid Schizophrenia: 277 (69.3%) Undifferentiated: 74 (17.4%) Disorganised: 25 (5.9%) Other: 21 (5.1%) Residual: 8 (1.9%) Catatonic: 3 (0.9%)	NS Interview	**Persecutory (South Korea, China, Taiwan):** 103 (72.3%), 115 (78.9%), 110 (79.1%) **Reference (SK, C, T):** 94 (66%), 79 (54.2%), 82 (59%) ***Grandiose (SK, C, T):** 68 (48.2%), 40 (27.5%), 54 (38.8%) **Control (SK, C, T):** 50 (35.5%), 35 (23.9%), 43 (30.9%) Somatic (SK, C, T):	6

				54.3%			33 (23.4%), 20 (14.1%), 34 (24.5%) *Guilt (SK, C, T): 44 (31.2%), 7 (4.9%), 8 (5.8%) *Jealous (SK, C, T): 24 (17.0%), 12 (8.5%), 5 (3.6%) Poverty (SK, C, T): 3 (2.1%), 6 (4.2%), 7 (5.0%) Nihilistic (SK, C, T): 1 (0.7%), 3 (2.1%), 5 (3.6%)	
Kim, 2018	Association of types of delusions and hallucinations with childhood abuse and neglect among inpatients with schizophrenia in South Korea: A preliminary study	South Korea Developing	CS	42 32.6 ± 10.6 47.6%	Inpatient Schizophrenia: 42 (100%)	SAPS Interview	**Persecutory 31 (73.8%)** **Reference 22 (52.4%)** **Grandiose 6 (14.3%)** **Religious 4 (9.5%)** Thought broadcasting 3 (7.1%) Guilt 3 (7.1%) **Control 2 (4.8%)** Thought withdrawal 0 (0%) Somatic 0 (0%) Mind reading 0 (0%)	6
Kulhara, 1986	A phenomenological study of delusions in schizophrenia	India Developing	CS	98 27.65 ± 7.61 49%	NS *Schizophrenia* Paranoid: 58 (59.2%) Acute: 19 (19.4%) Chronic: 12 (12.2%) Catatonic: 10 (10.2%) Hebephrenic: 5 (5.1%) Schizoaffective: 3 (3.1%) Other: 5 (5.1%)	PSE Interview	**Persecutory 83 (84.6%)** **Reference 72 (73.5%)** Misinterpretation 44 (44.9%) Paranormal phenomena 33 (33.7%) Thought reading 31 (31.6%) **Control 29 (29.6%)** Grandiose abilities 19 (19.3%)	4

							Grandiose (average) 17 (17.3%) Sub-culturally influenced 17.3% Grandiose identity 15 (15.3%) **Religious 14 (14.3%)** Alien forces penetrating 12 (12.2%) Morbid Jealously 12 (12.2%) Sexual 12 (12.2%) Assistance 11 (11.2%) Physical forces 8 (8.1%) Hypochondriacal 8 (8.1%) Guilt 7 (7.1%) Catastrophe 4 (4.1%) Depersonalization 2 (3%) Appearance 1 (1%) Pregnancy 0%	
Kusztrits, 2020	Mapping psychotic-like experiences: Results from an online survey	Norway Developed	CS	436 Mean of larger sample including non-clinical: 39.1 ± 13. 37 87.1%	Community Percentages from larger sample: Depression 25% Anxiety 18.8% Schizophrenia: 2.2% Bipolar: 3% Personality disorder: 3.3% Neurological disorder 3.1%: Other: 1.7%	QPE Survey	**Persecutory 21%** Somatic 13.4% Guilt 8.4% **Reference 6.9%** **Grandiose 4.5%** **Control 3.9%** Nihilistic 2.2% **Religious 1.5%** Misidentification 0.4%	6
Leff, 1976	A Cross-National Epidemiological Study of Mania	UK & Denmark	RS, CS	Total: 63 Aarhus: 25	Inpatient Manic episode: 63 (100%)	PSE Records	*Special Mission (Aarhus, London, Non-UK London): 3 (12%), 3 (14%), 8 (47%)	

		Developed		NS 40% London UK patients: 21 NS 45% London non-UK patients: 17 NS 35.3%	London non-UK sample: Caribbean: 6 (35.5%) Cyprus: 3 (17.6%) Australia: 2 (11.8%) Mauritius: 2 (11.8%) Nigeria: 2 (11.8%) France: 1 (5.9%) USA: 1 (5.9%)		*Special abilities (A, L, N): 4 (16%), 5 (24%), 13 (77%) *Grandiose identity (A, L, N): 1 (5%), 5 (24%), 13 (77%) Wealth (A, L, N): 1 (4%), 1 (5%), 2 (12%) **Grandiose (average) (A, L, N):** 2.25 (9%), 3.5 (16.6%), 8 (47.1%)	
Lemonde, 2020	Delusional content at initial presentation to a catchment-based early intervention service for psychosis	Canada Developed	CS	636 23.8 ± 4.75 30%	Inpatient & community Non-affective psychosis: 412 (65%) Affective psychosis: 172 (27%) Missing: 52 (8.2%)	SAPS Interview	**Persecutory 494 (77.7%)** **Reference 413 (64.9%)** **Grandiose 256 (40.3%)** **Religious 177 (27.8%)** Mind reading 150 (23.6%) **Control 125 (19.7%)** Somatic 107 (16.8%) Guilty or sin 89 (14.0%) Thought insertion 88 (13.8%) Thought broadcasting 72 (11.3%) Thought withdrawal 38 (6.0%) Jealousy 21 (3.3%)	8
Li, 2012	Association between degrees of social defeat and themes of delusion in	Canada Developed	RS	35 45.3 40%	Community Schizophrenia: 35 (100%) Chinese: 22 (62.9%) Vietnamese: 5 (14.3%) Korean: 4 (11.4%) Tamil: 4 (11.4%)	SCID Records	**Persecution 21 (60%)** **Reference 14 (40%)** **Control 14 (40%)** **Grandiose 10 (28.6%)** Somatic 3 (8.6%) Erotomania 3 (8.6%) Jealousy 1 (2.9%)	8

	patients with schizophrenia from immigrant and ethnic minority backgrounds				Jamaican: 1 (2.9%) Average years post immigration: 20.9 (10.4)			
Linskey, 1994	Theme and Content of Delusions in Asian Indian Psychotic Patients: Correlation with Diagnosis	India Developing	CS	50 38.8 38%	Inpatient Affective psychosis: 26 (52%) Schizophrenia: 24 (48%)	DSM-III-R, BPRS Interview	**Persecutory 23 (46%)** **Grandiose 18 (36%)** **Reference 12 (24%)** **Control 8 (16%)** Guilt 7 (14%) Somatic 6 (12%) Bizarre 3 (6%) Jealousy 3 (6%) Other 2 (4%) Nihilistic 1 (2%) Thought Insertion 1 (1.2%) Thought withdrawal 1 (1.2%) Thought broadcasting 0 (0%)	4
Liss, 1973	Psychiatric Symptoms in White and Black Inpatients. I: Record Study	USA Developed	CS	256 NS 61%	Inpatient Depression: 59 (23.2%) Schizoaffective: 47 (18.5%) Schizophrenia: 23 (9.1%) Phobic & obsessive neuroses: 22 (8.7%) Antisocial personality: 18 (7.1%) Schizoaffective: 18 (7.1%) Drug dependency: 11 (4.3%) Hysteria: 8 (3.1%) Anxiety: 8 (3.1%)	NS Records	**Grandiose 25 (9.8%)** **Control 23 (9%)**	2

					Mania: 6 (2.4%) Alcoholism: 4 (1.6%) Organ brain syndrome: 3 (1.2%) Obsessive compulsive: 2 (0.8%) Mental retardation: 2 (0.8%) Homosexuality: 1 (0.4%) Undiagnosed: 83 (36.7%) White: 196 (77.2%) Black: 56 (22%)			
Littlewood, 1981	Acute psychotic reactions in Caribbean born patients	UK Developed	CS	24 NS 66.6%	Inpatient Schizophrenia: 20 (83.3%) Other: 4 (16.6%) West Indian: 20 (83.3%) West African: 4 (16.6%)	PSE Interview	**Persecutory 21 (87.5%)** **<u>Grandiose</u> & religious 20 (83.3%)** Sexual & fantastic 15 (62.5%)	4
Loudon, 1977 [54]	A study of the symptomatology and course of manic illness using a new scale	UK Developed	CS	16 47 62.5%	Inpatient Mania: 16 (100%)	PSE Interview	**Grandiose 6 (38%)** **Persecutory 4 (25%)** **Religious 4 (25%)**	6
Lucas, 1962	A social and clinical study of delusions in schizophrenia	UK Developed	CS	288 Average: 51.4 Males 49.5 ± 14.7 Females 53.3 ± 14.9	Inpatient Schizophrenia/schizoaffective: 288 (100%)	NS Interviews, Records	**Paranoid 205 (71%)** **Grandiose 127 (44%)** Sexual 126 (44%) **Religious 61 (21%)** Hypochondrial 59 (20%) Inferiority 34 (12%) Various 23 (8%)	7

				51.6%				
Lykouras, 1985	Type and Content of Delusions in Unipolar Psychotic Depression	Greece Developed	PS	11 NS NS	Inpatient Psychotic depression: 11 (100%)	NS Interview	**Persecutory 9 (81.9%)** Oncoming disaster (Catastrophe) 8 (72.7%) Guilt 4 (36.4%) Somatic 1 (9%)	5
Lykouras, 1986	Delusional Depression: Phenomenology and Response to Treatment	Greece Developed	RS	55 52.6 ±11.3 47.3%	Inpatient Psychotic MDD: 55 (100%)	DSM-III Records	**Persecutory 28 (50.9%)** Impending disaster 29 (52.7%) Guilt 24 (43.6%) Somatic 7 (12.7%) Nihilistic 4 (7.3%)	6
Maslowski, 1998	A polydiagnostic approach to the differences in the symptoms of schizophrenia in different cultural and ethnic populations	South Africa & Namibia Developing	CS	Total: 113 South Africa: 57 Namibia: 56 32.5 60.2%	Inpatient Schizophrenia: 113 (100%)	PSE Interview	**Persecutory 96 (85%)** **Religious 71 (62.8%)** **Control 57 (50.4%)** Thought reading 56 (49.6%) Misinterpretation 56 (49.6%) **Grandiose 43 (38%)**	7
McCabe, 1976	Symptom Differences in Reactive Psychoses And Schizophrenia With Poor Prognosis	USA & Denmark Developed	CS	Total: 65 36.5 61.3% USA: 25 32 60%	Inpatient Reactive psychosis: 40 (61.5%) Schizophrenia: 25 (38.5%)	PSE Interview	**Persecutory 33 (50.8%)** **Reference 26 (40%)** Depersonalisation 16 (24.6%) **Religious 8 (12.3%)** **Control 8 (12.3%)** **Grandiose 7 (10.8%)** Sexual 4 (6.2%)	8

				Denmark: 40 41 62.5%				
Megha, 2019	Clinical profile, treatment received, follow up and current status of individuals treated for delusional disorder at a tertiary care centre	India Developing	CS	48 42.43 ± 9.54 45.8%	Community Delusional disorder: 48 (100%)	NS Records	Infidelity 35 (72.9%) **Persecutory 11 (22.9%)** **Grandiose 2 (4.2%)** **Reference 1 (2.1%)** Hypochondria 1 (2.1%)	6
Miller, 1988	Suicide Attempts Correlate with Delusional Content in Major Depression	USA Developed	RS	45 53.7 ± 13.5 73%	Inpatient Unipolar major depression: 45	NS Records	**Persecutory 31 (68.8%)** Guilt 30 (66.6%) Somatic 14 (31.1%)	**6**
Mitchell, 1989	Delusions and Hallucinations as a Reflection of the Subcultural Milieu Among Psychotic Patients of the 1930s and 1980s	USA Developed	RS	300 NS 40.6%	Inpatient Psychosis: 300 (100%) Black: 158 (52.6%) White: 142 (47.3%)	NS Records	**Persecutory 211 (70.3%)** Possession 44 (14.6%) Identity 38 (12.6%) **Grandiose (average) 36.25 (12.1%)** Special powers 17 (5.6%) Wealth 46 (15.3%)	4
Mitropoulos, 2015	Psychosis and societal prescriptions of gender; a	Greece Developed	RS	174 NS 40.2%	Inpatient Schizophrenia: 112 (64.4%)	DSM-IV-TR Records	**Persecution 119 (68.4%)** **Reference 79 (45.4%)** **Grandiose 68 (39.1%)** **Religious 45 (25.9%)**	7

	study of 174 inpatients				Bipolar disorder: 18 (10.3%) SchizoAffective psychosis: 14 (8%) Major depression: 7 (4%) Obsessive compulsive disorder: 6 (3.4%) Dementia: 5 (2.9%) Substance-related disorders: 5 (2.9%) Brief psychotic disorder: 2 (1.1%) Delusional disorder: 2 (1.1%) Alcoholism: 2 (1.1%) Delirium: 1 (0.5%)		Being accused of homosexuality 16 (9.2%) Paranormal 16 (9.2%) Hypochondriacal 15 (8.6%) Thought insertion 12 (6.9%) Love 10 (5.7%) Thought reading 8 (4.6%) **Control 7 (4%)** Pregnancy 5 (2.9%) Thought withdrawal 6 (3.4%) Guilt 4 (2.3%) Thought broadcast 2 (1.1%) Jealousy 2 (1.1%) Appearance 2 (1.1%)	
Mosotho, 2008	Clinical manifestations of mental disorders among Sesotho speakers	South Africa Developing	CS	100 NS 42%	Community Schizophrenia: 100 (100%)	PIQ Interview	**Persecutory 67 (67%)** **Grandiose 17 (17%)** Bizarre 11 (11%)	7
Murphy, 1963	A Cross-Cultural Survey of Schizophrenic Symptomatology	Australia; Brazil; Bulgaria; Canada; Caribbean; Chile; China; Colombia; Czechoslovakia; Ecuador; Germany; India;	CS	48 NS NS	NS Schizophrenia: 48	NS Survey	**Grandiose 16 (33.3%)** Depersonalisation 27 (56.3%)	2

		Indonesia; Japan; Kenya; Kuwait; New Zealand; Nigeria; Norway; Peru; South Africa; South Korea; Taiwan; Thailand; Turkey; Uganda; USA						
Ndetei, 1982	Study of delusions in Kenyan schizophrenic patients diagnosed using a set of research diagnostic criteria	Kenya Developing	CS	80 27.5 52.5%	Inpatient Schizophrenia: 80 (100%)	PSE Interview	**Persecutory 32 (40%)** Grandiose ability 30 (37.5%) **Reference 20 (25%)** **Grandiose (average) 23 (28.8%)** Thought reading 19 (23.6%) **Religious 17 (21.3%)** Grandiose identity 16 (20%) Appearance 16 (20%) Jealousy 8 (10%) Brain ceased to exist 8 (10%) Assistance 7 (8.8%)	8
Ndetei, 1984	Frequency and clinical significance of	UK Developed	CS	593 NS	Inpatient Schizophrenia or paranoid schizophrenia: 593 (100%)	NS Records	**Persecutory 202 (34.1%)** **Reference 89 (15%)** **Grandiose & religious 96 (16.2%)**	5

	delusions across cultures			NS	Jamaican: 137 (23.1%) English: 94 (15.8%) Continental: 72 (12.1%) Indian: 90 (15.2%) Caribbean: 62 (10.5%) Black African: 53 (8.9%) English speaking non-European: 37 (6.2%) Middle Eastern: 33 (5.6%) Far Eastern: 15 (2.5%)		Sexual & fantastic 86 (14.5%)	
Okasha, 1993	Presentation of Acute Psychosis in an Egyptian Sample: A Transcultural Comparison	Egypt Developing	CS	50 26.95 ± 9.75 50%	Inpatient Reactive psychogenic: 25 (50%) Affective psychoses: 13 (26%) Schizophrenia: 8 (16%) Other psychoses: 4 (8%)	SCAAPS Interview	**Persecutory 26%**	7
Paolini, 2016	Delusions in first-episode psychosis: Principal component analysis of twelve types of delusions and demographic and clinical correlates of resulting domains	USA Developed	CS	245 23.9 ± 4.7 26%	Inpatient Schizophrenia: 141 (57.6%) Psychotic Disorder Not otherwise specified: 38 (15.5%) Schizoaffective: 31 (12.6%) Schizophreniform: 29 (11.8%) Delusional disorder: 4 (1.6%) Brief psychotic disorder: 2 (0.8%)	SAPS Interview	**Persecutory 182 (74.3%)** **Reference 165 (67.4%)** **Grandiose 113 (46.2%)** Mind reading 110 (44.9%) **Religious 87 (35.6%)** Thought Broadcasting 84 (34.2%) **Control 83 (33.9%)** Thought insertion 71 (29%) Thought withdrawal 47 (19.2%) Somatic 44 (18%) Sin/guilt 32 (13%) Jealousy 25 (10.2%)	8

					Asian: 4 (1.6%) African American: 211 (86.1%) White: 19 (7.8%) Other: 11 (4.5%)			
Park, 2014	Distinctive Clinical Correlates of Psychotic Major Depression: The CRESCEND Study	South Korea Developing	RS	24 44.7 ± 18.5 75%	Inpatient Psychotic major depression: 24 (100%)	BPRS Interview	**Persecutory 16 (66.6%)** Guilt 7 (29.2%) Nihilistic 3 (12.5%) Somatic 1 (4.2%) Other 3 (12.5%)	9
Peralta, 1999	Dimensional structure of psychotic symptoms: an item-level analysis of SAPS and SANS symptoms in psychotic disorders	Spain Developed	CS	660 36.0 ± 14 41.8%	Inpatient Schizophrenia: 352 (53.8%) Schizophreniform: 88 (13.3%) Mood disorder with psychosis: 83 (12.6%) Atypical psychosis: 50 (7.6%) Schizoaffective: 37 (5.6%) Delusional disorder: 25 (3.8%) Brief reactive psychosis: 25 (3.8%)	SAPS Interview	**Persecutory 442 (67%)** **Reference 251 (38%)** **Control 251 (38%)** Thought broadcasting 205 (31%) Mind reading 145 (22%) **Grandiose 139 (21%)** Somatic 125 (19%) **Religious 106 (16%)** Thought insertion 99 (15%) Thought withdrawal 86 (13%) Guilt/Sin 46 (7%) Jealousy 20 (3%)	8
Picardi, 2018	Delusional themes across affective and non-affective psychoses	Italy Developed	CS	830 39.1 ± 11.5 33%	Inpatient Schizophrenia: 318 (38.3%) Bipolar: 217 (26.1%)	BPRS Interview	**Persecutory 181 (21.8%)** **Grandiose 71 (8.6%)** Somatic 64 (7.7%) Guilt 52 (6.3%) Other 532 (64.1%)	8

					Schizoaffective: 118 (14.2%) Delusional disorder: 95 (11.4%) Psychotic MDD: 82 (9.9%)			
Pini, 2004	Cross-sectional similarities and differences between schizophrenia, schizoAffective psychosis and mania or mixed mania with mood-incongruent psychotic features	Italy Developed	CS	156 36.3 47.4%	Inpatient Mixed mania: 49 (31.4%) Schizophrenia: 46 (29.5%) Schizoaffective: 32 (20.5%) Mania: 29 (18.6%)	SCID-P, BPRS Interview	**Persecutory 133 (85.3%)** **Reference 122 (78.2%)** **Grandiose 71 (45.5%)** Bizarre 63 (40.4%) **Control 58 (37.2%)** Guilt 46 (29.5%) Broadcasting 36 (23%) Somatic 27 (17.3%)	8
Rajapaske, 2011	Themes of delusions and hallucinations in first-episode psychosis	Australia Developed	CS	143 20.7 ± 2.8 37.8%	Inpatient & community Schizophreniform: 37 (25.9%) Drug-induced psychosis: 22 (15.4%) Psychotic disorder not otherwise specified: 20 (14%) Psychotic MDD: 14 (9.8%) Schizophrenia: 12 (8.4%) Bipolar: 11 (7.7%) Schizoaffective: 5 (3.5%) Delusional disorder: 2 (1.4%)	NS Records	**Persecution 77 (53.7%)** **Reference 35 (24.5%)** **Grandiose 19 (13.3%)** Thought broadcasting 13 (9.1%) Thought insertion/withdrawal 13 (9.1%) Sexual 3 (2.1%) Somatic 3 (2.1%)	4

Raune, 2005	Event attributes and the content of psychotic experiences in first-episode psychosis	UK Developed	CS	39 29.6 ± 11.1 41.5%	Inpatient & community Schizophrenia: 25 (64.1%) Bipolar: 8 (20.5%) Other diagnosis: 8 (20.5%) White: 22 (56.4%) Black: 18 (46.2%) Unspecified: 1 (2.6%)	PSE Interview	**Persecutory 34 (87%)** **Grandiose 17 (43%)** Persecutory & grandiose 13 (33%) Depressive 11 (28%) Persecutory & depressive 11 (28%) Grandiose & depressive 3 (8%)	7
Read, 1999	Hallucinations, Delusions, and Thought Disorder Among Adult Psychiatric Inpatients with a History of Child Abuse	New Zealand Developed	CS	10 35.5 ± 8.6 54.5%	Inpatient MDD: 8 (80%) Schizophrenia: 4 (40%) Bipolar: 4 (40%) Dual diagnosis: 6 (60%)	NS Records	**Persecutory 5 (50%)** **Grandiose 3 (30%)**	3
Renvoize, 1989	Mental illness and the late Victorians: a study of patients admitted to three asylums in York, 1880-1884	UK Developed	LG	86 NS 54.2%	Inpatient Schizophrenia: 37 (43%) Affective psychosis: 39 (45.3%)	RDC Records	**Persecutory 64 (74.4%)** Guilt 33 (38.4%) **Grandiose 32 (32.2%)** Love 13 (15.1%) Ill health (hypochondriacal) 8 (9.3%) Nihilistic 7 (8.1.%) Demonic possession 5 (5.8%) Poverty 5 (5.8%) Pregnancy 5 (5.8%) Misinterpretation 4 (4.7%) Sexual 3 (3.5%) **Reference 2 (2.3%)** Infestation 1 (1.5%) Spouse Infidelity 1 (1.5%	7

Rhodes, 2005	A qualitative analysis of delusional content	UK Developed	CS	25 NS 40%	Community Schizophrenia: 15 (60%) Delusional disorder: 4 (16%) Psychotic depression: 3 (12%) Bipolar: 2 (8%) Schizoaffective: 1 (4%) White/European: 10 (40%) African-Caribbean: 9 (36%) South-Asian: 2 (8%) Middle Eastern: 2 (8%) Dual-ethnic background: 2 (8%)	DSM-IV Interview	**Persecution 13 (52%)** **Reference 12 (48%)** **Grandiose 7 (28%)** Somatic 5 (20%) **Control 2 (20%)** Bizarre 4 (16%) **Religious 4 (16%)** Thought Broadcast 3 (12%) Guilt 2 (9%) Jealous 1 (4%) Erotomanic 1 (4%)	5
Rossler, 2016	Delusion and Gender in Paranoid Schizophrenia: Results of a Clinical Study	Germany Developed		182 41.45 ± 15.09 49.5%	Inpatient Paranoid Schizophrenia: 182 (100%)	Unknown (Article not in English)	**Persecutory 117 (64%)** **Grandiose 23 (12.6%)** **Religious 20 (11%)** Hypochondrial 12 (6.6%) Guilt/sin 10 (5.5%)	-
Rudden, 1983	A Comparison of Delusional Disorders in Women and Men	USA Developed	CS	88 Average: 31.8 Women 35.7 ± 1.7 Men 27.9 ± 1.2 50%	Inpatient Delusional disorder: 88 (100%)	DSM-III Records	**Persecutory 75 (85.2%)** Somatic 39 (44.3%) **Grandiose 31 (35.2%)** **Reference 30 (34%)** **Control 26 (29.5%)** Erotic 25 (28.4%) Guilt 14 (15.9%) Nihilistic 7 (8%) Jealous 3 (3.4%)	8

Sajid, 2011	Phenomenology of delusions and hallucinations in schizophrenia in central Punjab, Pakistan	Pakistan Developing	CS	80 30 22.5%	Inpatient Schizophrenia: 80 (100%) Sunni Muslims: 77 (96.2%) Shia sect: 3 (3.8%)	NS Interview	**Persecutory 73 (91.3%)** **Reference 34 (42.5%)** **Control 25 (31.3%)** **Grandiose 19 (23.8%)** Infidelity 11 (14.8%) Hypochondrial 5 (6.3%) Love 3 (3.8%) Guilt 3 (3.8%)	7
Scott, 1967	A study of the content of delusions and hallucinations in 100 African female psychotics	South Africa Developing	CS	100 NS 100%	Inpatient Psychosis: 100 (100%)	NS Interview	**Persecutory 55 (55%)** **Grandiose 49 (49%)** Bewitched 29 (29%) Other 9 (9%)	4
Sharma, 1979	Socio-clinical aspects of delusions in schizophrenia	India Developing	CS	198 NS 31.3%	Inpatient *Schizophrenia* Acute episode: 87 (43.9%) Paranoid: 48 (24.2%) Chronic undifferentiated: 47 (23.7%) Schizoaffective: 6 (3%) Hebephrenic: 5 (2.5%) Catatonic: 4 (2%) Simple schizophrenia: 1 0.5%)	PSE Interview	**Persecutory 156 (78.8%)** **Reference 86 (43.4%)** Sexual 57 (28.8%) **Grandiose 53 (26.7%)** **Control 48 (24.2%)** **Religious 31 (18.7%)** Hypochondriacal 25 (12.6%) Inferiority 22 (11.1%) Miscellaneous 14 (7.1%)	8
Sinha, 1989	Persistence of Delusional Content among Psychotics over Consecutive Episodes	India Developing	CS	48 35 41.6%	Inpatient Affective psychosis: 30 (62.5%) Schizophrenia: 18 (37.5%)	NS Interview	**Persecutory 30 (62.5%)** **Grandiose 20 (41.6%)** **Reference 4 (8.3%)** **Control 6 (12.5%)**	6

Sood, 2019	Psychopathology of Schizophrenia in South Asia: Has there been a change over the last few decades?	India Developing	CS	154 32.8 ± 9.2 46%	Inpatient Schizophrenia: 154 (100%)	PSE Interview	**Persecutory 132 (85.7%)** Bizarre 8 (5.2%) **Grandiose 7 (4.5%)**	7
Stompe, 1999	Comparisons of delusions among schizophrenics in Austria and Pakistan	Austria & Pakistan Developed & Developing	CS	Total: 232 Austria: 126 29.9 44.4% Pakistan: 106 32.4 32.4%	Inpatient Schizophrenia: 232 (100%)	NS Survey	**Persecutory (Austria, Pakistan):** **100 (79.4%), 88 (81.5%)** ***Grandiose (A, P):** **27 (21.4%), 11 (10.2%)** ***Religious (A, P):** **27 (21.4%), 5 (4.6%)** *Guilt (A, P): 24 (18.9%), 0 (0%) Hypochondria (A, P): 13 (10.3%), 4 (3.7%) Poisoning (A, P): 9 (7.1%), 15 (13.9%) World catastrophe (A, P): 6 (4.7%), 1 (0.9%) Erotomania (A, P): 4 (3.1%), 1 (0.9%) Jealousy (A, P): 1 (0.8%), 2 (1.9% Pregnancy (A, P): 1 (0.8%), 0 (0%) Poverty (A, P):	8

							0 (0%), 1 (0.9%)	
Suhail, 2002	Effect of Culture and Environment on the Phenomenology of Delusions and Hallucinations	UK & Pakistan Developed & Developing	CS	Total: 201 White British: 50 36.48 ± 9.54 24% British Pakistani: 53 33.37 ± 11.99 42% Pakistan: 98 38.44 ± 11.32 51%	Inpatient Schizophrenia: 149 (74.1%) Paranoid: 38 (18.9%) Schizoaffective: 14 (7%)	PSE Records	**Persecutory (White British, British Pakistani, Pakistani):** **24 (48%), 32 (60%), 61 (62%)** Grandiose ability (W, BP, P): 13 (26%), 10 (19%), 27 (28%) *Grandiose identity (W, BP, P): 7 (14%), 12 (23%), 41 (42%) **Grandiose (average) (W, BP, P):** **10 (20%), 11 (20.8%), 34 (34.7%)** ***Reference (W, BP, P):** **24 (48%), 23 (43%), 11 (11%)** ***Control (W, BP, P)):** **25 (50%), 14 (26%), 13 (13%)** Sexual (W, BP, P): 9 (18%), 7 (13%), 16 (16%) **Religious (W, BP, P):** **7 (14%), 11 (21%), 11 (11%)** *Hypochondrial (W, BP, P): 4 (8%), 9 (17%), 5 (5%) Misinterpretation (W, BP, P): 4 (8%), 3 (6%), 8 (8%) *Depersonalisation (W, BP, P): 6 (12%), 6 (11%), 2 (2%)	7

Suhail, 2010	Phenomenology of delusions and hallucinations in schizophrenia by religious convictions	Pakistan Developing	CS	53 35.16 ± 10.29 25.5%	Inpatient Schizophrenia: 53 (100%)	PSE Interview	Grandiose ability 40 (75.5%) Grandiose identity 27 (50.9%) **Grandiose (average) 33.5 (63.2%)** **Religious 33 (62.3%)** **Persecutory 31 (58.5%)** Jealousy 31 (58.5%) **Reference 28 (52.8%)** **Control 24 (45.3%)** Catastrophe 15 (28.3%) Guilt 14 (26.4%) Assistance 13 (24.2%) Sexual 12 (22.6%) Alien forces 20 (37.7%) Hypochondrial 10 (18.9%) Depersonalisation 8 (15.1%)	9
Tateyama, 1993	Comparison of schizophrenic delusions between Japan and Germany	Germany & Japan Developed	CS	Total: 420 Germany: 131 25.5 ± 8.45 51.2% Japan: 289 26.1 ± 8.96 50.5%	Inpatient Schizophrenia: 420 (100%)	NS Records	**Persecutory (Germany, Japan):** **109 (83.2%), 246 (85.1%)** Poisoning (G, J): 27 (20.6%), 26 (9%) Hypochondrial (G, J): 14 (10.7%), 28 (9.7%) **Grandiose (G, J):** **28 (21.4%), 63 (21.8%)** Guilt/sin (G, J): 23 (17.6%), 16 (5.5%) Jealous (G, J): 9 (6.9%), 6 (2%) Erotomania (G, J): 10 (7.6%), 21 (7.2%) Being stolen from (G, J): 4 (3%), 16 (5.5%)	6

							Descent (G, J): 1 (0.8%), 9 (3.1%) Pregnancy (G, J): 1 (0.8%), 3 (1%) Separation of being (G, J): 2 (1.5%), 5 (1.7%) Invention (G, J): 1 (0.8%), 1 (0.3%) Parasitosis (G, J): 3 (2.3%), 3 (1%) Poverty (G, J): 3 (2.3%), 0 (0%) **Religious (G, J):** **32 (24.4%), 22 (7.6%)** Other (G, J): 12 (9.1%), 19 (6.6%)	
Tateyama, 1998	Transcultural Study of Schizophrenic Delusions Developed	Austria	CS	92 24.3 ± 6.75 51%	Inpatient Schizophrenia: 92 (100%)	NS Records	**Persecutory 71 (77.2%)** **Grandiose 20 (21.7%)** Hypochondrial 20 (21.7%) **Religious 20 (21.7%)** Guilt/sin 21 (22.8%) Poisoning 15 (16.3%) Erotomania 6 (6.5%) Pregnancy 3 (3.3%) Parasitosis 3 (3.3%) Being stolen from 2 (2.2%) World catastrophe 2 (2.2%) Jealous 1 (1%) Death of relations 1 (1.1%) Descent 1 (1%) Poverty 1 (1%) Resurrection 1 (1%) Other 11 (11.6%) Invention 0 Homosexual 0	6

Taylor, 1973	The Phenomenology of Mania	USA Developed	CS	52 41.3 55.8%	Inpatient Schizophrenia: 48 (92.3%) Organic brain syndrome: 3 (5.8%) Hysteria: 1 (1.9%) White: 40 (76.9%) Black: 12 (23.1%)	NS Interview	**Grandiose 31 (59.6%)** **Persecutory 22 (42.3%)**	7
Thompson, 2013	Does specific psychopathology predict development of psychosis in ultra-high-risk (UHR) patients?	Australia Developed	RS	120 18.3 ± 2.7 59.2%	Community Psychosis not otherwise specified: 33 (55%) Schizophreniform disorder: 11 (18.3%) Schizophrenia: 6 (10.0%) Psychotic MDD: 6 (10.0%) Bipolar I disorder: 1 (1.7%) Brief psychotic disorder: 1 (1.7%) Delusional disorder: 1 (1.7%) Schizoaffective: 1 (1.7%) Other non-psychotic diagnoses: 60 (50%)	OPCRIT Records	**Persecutory 77 (64.2%)** **Reference 27 (22.5%)** **Control 21 (17.5%)** Others 15 (12.5%)	6
Turgut, 2013	Relationship among the types of delusions and sociodemographic and clinical characteristics of patients with	Turkey Developing	CS	177 38.84 ± 10.51 45.2%	NS Schizophrenia: 105 (59.3%) Bipolar Manic episode: 72 (40.7%)	SCID Interview	**Persecutory 136 (76.8%)** **Reference 86 (48.6%)** **Grandiose 50 (28.2%)** **Religious 29 (16.4%)** Somatic 28 (15.8%) Jealous 23 (13%) Thought reading 19 (10.7%)	-

	schizophrenia and acute manic with psychotic features						Love 15 (8.5%) Erotomanic 12 (6.8%) Guilt 5 (2.8%) Nihilistic 3 (1.7%) Thought insertion 2 (1.1%) Thought broadcast 2 (1.1%) Thought withdrawal 1 (0.6%)	
van Bergen, 2019	The characteristics of psychotic features in bipolar disorder	Netherlands Developed	CS	916 48.2 ± 11.9 59.2%	Community Bipolar with psychosis: 916 (100%)	SCID Interview	**Grandiose 565 (61.7%)** **Reference 563 (61.5%)** **Persecutory 352 (38.5%)**	8
Winokur, 1977	Delusional Disorder (Paranoia)	USA Developed	RS	29 NS 30%	Inpatient Delusional disorder: 29 (100%)	NS Records	**Persecutory 24 (82.8%)** **Reference 22 (75.9%)** Jealousy 14 (48.3%) Hypochondriacal 3 (10.3%) **Grandiose 2 (6.9%)**	4
Yamada, 2006	Cross-ethnic evaluation of psychotic symptom content in hospitalized middle-aged and older adults	USA Developed	CS	122 50 ± 8.0 51.9%	Inpatient Schizophrenia/ Schizoaffective: 84 (69%) Mood disorder & Psychosis: 24 (20%) Psychotic disorder not otherwise specified: 14 (11%) Euro-American: 49 (40.2%) Latino: 44 (36.1%) African American: 29 (23.7%)	SCID, SSCI/RSPS Records	**Persecutory 96 (78.7%)** **Grandiose 43 (35.2%)**	8

*statistically significant difference between groups ($p < .05$).

Abbreviations: AMDP: Association for Methodology and Documentation in Psychiatry system; BPRS: Brief Psychiatric Rating Scale; CS: Cross-sectional; DSM-III-R: Diagnostic and Statistical Manual of Mental Disorders (3rd edition Revised); DIS-R: Diagnostic Interview Schedule Revised; HDRS-P: Hamilton Depression Rating Scale of Paranoia; ICD-8: International Classification of Diseases, Revision 8; LG: Longnitudinal; MDD: Major Depressive Disorder; MMDAS: MacArthur-Maudsley Delusions Assessment Schedule; NS: not stated; OPCRIT: Operational Criteria for Psychotic Illness; PIQ: Psychiatric Interview Questionnaire; PS: Prospective; PSE: Present State Examination; QPE: Questionnaire for Psychotic Experiences; RS: Retrospective; SADS: The Schedule for Affective psychosiss and Schizophrenia; SAPS: Scale for the Assessment of Positive Symptoms; SCAAPS: Schedule of Clinical Assessment of Acute Psychotic States; SCAN: Schedules for Clinical Assessment in Neuropsychiatry; SCID-I: Structured Clinical Interview for DSM-IV Axis I Disorders; SSCI/RSPS; Semi-structured Clinical Interview and Rating Scale for Psychotic Symptoms; RDC: Research Diagnostic Criteria; RPMIP: Royal Park Multidiagnostic Instrument for Psychosis; UK: United Kingdom; USA: United States of America; USSR: Union of Soviet Socialist Republics.

N.B. The n/percentages of the diagnosis and ethnicities less than the total sample size for some studies as the sample size only includes the number of patients who experienced delusions. The n/percentage is larger than the total sample size for some studies if the demographic data was only available for a larger sample.

Appendix C. Main characteristics of 21 studies which recorded one delusional theme per patient

First author, year	Title	Country	Design	Sample size (*n*); Age (mean years); % Female	Sample Characteristics Population; Diagnosis, *n* (%); Ethnicity, *n* (%)	Assessment tool & method	Prevalence of delusions, *n* (%)	Quality
Adeosun, 2013	Symptom Profile and Severity in a Sample of Nigerians with Psychotic versus Nonpsychotic Major Depression	Nigeria	CS	129 39.94 ± 13.47 70.5%	Community Psychotic major depression: 129 (100%)	SCID Interview	**Persecution 55 (42.6%)** **Reference 43 (33.3%)** Guilt 10 (7.8%) **Religious 8 (6.2%)** Somatic 7 (5.4%) Jealousy 3 (2.3%) **Grandiose 0 (0%)**	9
Al Banna, 1997	Socio-demographic characteristics and outcome of delusional disorders in Qatar	Qatar	CS	51 NS 45.1%	Community Delusional disorder: 51 (100%)	DSM-III Records & interview	**Persecutory 41 (80.4%)** Jealous 4 (7.8%) Somatic 3 (5.8%) **Grandiose 1 (2%)** Erotomanic 1 (2%) Mixed 1 (2%)	7
Combs, 2006	The conviction of delusional beliefs scale: Reliability and validity	USA	CS	50 36.4 ± 11.8 34%	Inpatient Schizophrenia: 39 (78%) Schizoaffective: 7 (14%) Delusional disorder: 4 (8%)	BPRS Interview	**Persecutory 25 (50%)** **Grandiose 15 (30%)** **Reference 10 (20%)**	7
Dawson, 1966	Prognostic significance of	USA	CS	123 NS	Inpatient	NS Interview	**Persecutory 52 (42.6%)** Bizarre 32 (26.2%)	4

	delusions in schizophrenia			NS	Schizophrenia: 123 (100%)		Self-condemnatory 17 (13.5%) **Grandiose 13 (10.1%)** Wish-fulfilment 9 (7.6%)	
de Portugal, 2008	A descriptive case-register study of delusional disorder	Spain	CS	370 54.65 ± 15.44 58.9%	Community & inpatient Delusional disorder: 370 (100%)	DSM-IV Records	**Persecutory 164 (47.4%)** Jealous 47 (10%) Mixed 40 (11.5%) Somatic 14 (4.9%) **Grandiose 4 (2%)** Erotic 5 (1.2%) Not otherwise specified (NOS) 95 (23.1%)	8
Ellersgaard, 2014	Prospective study of the course of delusional themes in first-episode non-affective psychosis	Denmark	CS	411 26.6 ± 6.4 43%	Inpatient & community First episode non-affective psychosis: 411 (100%)	SAPS Interview	**Persecutory or reference 167 (40.6%)** Mind reading 66 (16.1%) Somatic 21 (5.1%) **Grandiose/religious 18 (4.4%)** Jealousy, sin, or guilt 3 (0.7%)	7
El Sendiony, 1976	Cultural aspects of delusions: a psychiatric study of Egypt	Egypt	CS	110 NS 49%	Inpatient Paranoid or schizophrenic psychoses: 110 (100%)	NS Records	**Religious 44 (40%)** **Persecutory 25 (22.7%)** Physical, chemical, or technical 14 (12.7%) Food poisoned 9 (8.2%)	5
Garety, 1987	Characteristics of Delusional Experience	UK	CS	55 40.3 ± 15.9 50.9%	Inpatient: 46 (83.6%) community 9 (16.4%) Schizophrenia: 35 (63.6 %)	NS Interview	**Persecutory 18 (36%)** **Grandiose 17 (31%)**	4

					Schizoaffective: 3 (5.5%) Depression: 3 (5.5%) Manic Depression: 3 (5.5%) Hypomania: 3 (5.5%) Other: 8 (14.5 %)			
Gentner, 2010	Psychometric Evaluation of the Characteristics of Delusions Rating Scale as an Expert Rating Scale	Germany	CS	200 40.54 ± 13.66 55%	Inpatient Schizophrenia: 123 (61.5%) Schizoaffective: 32 (16%) Delusional disorder: 12 (6%) Bipolar: 6 (3%) Major depression: 27 (13.5%)	CDRS Interview	**Persecutory 79 (39.5%)** **Reference 25 (12.5%)** **Grandiose 23 (11.5%)** Somatic 18 (9%) Guilt 14 (7%) Other 41 (20.5%)	8
González-Rodríguez, 2014	A descriptive RS study of the treatment and outpatient service use in a clinical group of delusional disorder patients	Spain	RS	78 54.13 74.6%	Inpatient Delusional disorder: 78 (100%)	DSM-IV Interview	**Persecutory 58 (74.4%)** Erotomanic 6 (7.7%) **Grandiose 2 (2.6%)** Somatic 5 (6.4%) Jealous 4 (5.1%) Mixed 3 (3.8%)	7
Goreishizadeh, 2010	Delusional Disorder: Clinical and Demographic Features and Outcome	Iran	CS	68 50 20.5%	Inpatient Delusional disorder: 68 (100%)	DSM-IV Interview	**Persecutory 36 (52.9%)** Jealous 26 (38.2%) Somatic 2 (2.9%) **Reference 2 (2.9%)** Erotomanic 1 (1.5%) **Grandiose 1 (1.5%)**	7

Heilbrun, 1978	An analysis of structural factors in schizophrenic delusions	USA	CS	32 39.3 46.9%	Inpatient Schizophrenia: 32 (100%)	NS Interview	**Persecutory 16 (50%)** **Grandiose 7 (21.9%)** **Control 5 (15.6%)** Sexual 4 (12.5%)	5
Hsiao, 1999	Delusional disorder: RS analysis of 86 Chinese outpatients	Taiwan	RS	86 42.4 ± 15.4 47.7%	Community Delusional disorder: 86 (100%)	DSM-IV Records	**Persecutory 61 (70.9%)** Mixed 12 (14.0%) Jealous 7 (8.1%) Somatic 2 (2.3%) Unspecified 2, (2.1%) Erotomanic 1 (1.2%) **Grandiose 1 (1.2%)**	8
Kulkarni, 2016	Clinical Presentation and Course of Persistent Delusional Disorder: Data From a Tertiary Care Center in India	India.	RS	455 32.36 ± 10.47 48.1%	Inpatient Delusional disorder: 455 (100%)	NS Records	Infidelity 203 (44.6%) **Persecutory 149 (32.7%)** Hypochondrial 29 (6.4%) Body dysmorphic 24 (5.3%) Erotomanic 18 (4%) Somatic 15 (3.3%) **Reference 5 (1.1%)** **Grandiose 5 (1.1%)**	7
Maina, 2001	Occurrence and clinical correlates of psychiatric comorbidity in delusional disorder	Italy.	CS	64 47.9 ± 13.9 65.6%	Community Delusional disorder: 64 (100%)	DSM-IV Interview	**Persecutory 26 (40.6%)** Mixed 19 (29.7%) Somatic 9 (14.1%) Jealous 7 (10.9%) Unspecified types 3 (4.7%) Erotomanic 0 (0%) **Grandiose 0 (0%)**	8
Marino, 1993	Delusional Disorder and Mood Disorder: Can They Coexist?	Italy	CS	67 39.3 ± 12.7 65.7%	Inpatient Delusional disorder: 67 (100%)	DIS-R Interview	**Persecutory 53 (79.1%)** Somatic 7 (10.4%) Erotomanic 2 (3%) Jealous 1 (1.5%) **Grandiose 0 (0%)**	9

							Other 4 (6%)	
Opjordsmoen, 1987	Hypochondriacal delusions in paranoid psychoses	Norway	L	301 NS NS	Inpatient Schizophrenia: 97 (32.2%) Major affective: 54 (17.9%) Paranoid disorder: 53 (17.6%) Schizophreniform: 47 (15.6%) Schizoaffective: 35 (11.6%) Others: 15 (5%)	SADS Interview	**Persecutory 178 (59.1%)** **Reference 38 (12.6%)** Jealousy 21 (7%) Depressive 19 (6.3%) Hypochondria 15 (5%) **Grandiose 11 (3.7%)** Sex 11 (3.7%) **Religious 8 (2.7%)**	7
Özen, 2019	Clinical and Demographical Profiles of the Patients with Delusional Disorder: a Retrospective Study	Turkey	RS	320 46.55 ± 15.54 47.2%	Inpatient Delusional disorder: 320 (100%)	DSM-IV Records	**Persecutory 158 (49.4%)** Jealous 63 (19.7%) **Grandiose 37 (11.6%)** Mixed 24 (7.5%) Somatic 22 (6.9%) Erotomaniac 16 (5%)	7
Rao, 1966	Culture and mental disorder: a study in an Indian mental hospital	India	CS	350 NS NS	Inpatient Schizophrenia: 244 69.9%) Affective psychosis: 40 (11.3%) Involutional psychosis: 35 (10.1%) Alcohol induced: 11 (3.1%) Other: 20 (5.7%)	NS Records	**Persecutory 130 (37.1%)** **Grandiose 84 (24%)** Somatic 61 (17.4%) Infidelity 28 (8%)	2

Wustmann, 2011	Gender-related features of persistent delusional disorders	Germany	CS	43 51.9 48.8%	Inpatient Delusional disorder: 43 (100%)	SCID Interview	**Persecutory 26 (60.5%)** Somatic 12 (27.9%) Jealous 3 (7%) Erotomanic 2 (4.7%)	9
Yamada, 1998	Age at onset of delusional disorder is dependent on the delusional theme	Japan	CS	51 46.8 ± 16 2 74.5%	Community Delusional disorder: 51 (100%)	DSM-III Interview	**Persecutory 26 (51%)** Somatic 14 (27.5%) Jealous 7 (13.7%) Other 3 (5.9%) Erotic 1 (2%) **Grandiose 0 (0%)**	8

Abbreviations: BPRS: Brief Psychiatric Rating Scale; CDRS: Characteristics of Delusions Rating Scale; CS: Cross-sectional; DSM-III/DSM-IV: Diagnostic and Statistical Manual of Mental Disorders (3^{rd}/4^{th} edition); DIS-R: Diagnostic Interview Schedule Revised; MDD: Major Depressive Disorder; NS: not stated; OPCRIT: Operational Criteria for Psychotic Illness; RS: Retrospective; SADS: The Schedule for Affective psychosiss and Schizophrenia; SAPS: Scale for the Assessment of Positive Symptoms; SCID-I: Structured Clinical Interview for DSM-IV Axis I Disorders; UK: United Kingdom; USA: United States of America.

Appendix D. Quality assessment scores of the included studies

Author & Year	1. Sample frame	2. Sampling	3. Sample size	4. Setting and sample	5. Coverage bias	6. Valid measurement	7. Reliable measurement	8. Analysis	9. Response rate	Total score
Adebimpe et al. (1981)	1	0	1	0	1	1	1	1	0	**6**
Adeosun & Jeje (2013)	1	1	1	1	1	1	1	1	1	**9**
Adhikar et al. (2015)	1	1	1	1	1	0	0	1	0	**6**
Ahmed (1978)	1	1	1	1	1	0	1	1	1	**8**
Al Banna & Ibrahim (1997)	1	1	1	0	1	1	1	1	0	**7**
Albee (1950)	1	1	1	0	1	1	1	1	0	**7**
Albee (1951)	1	1	1	0	1	1	0	1	0	**6**
Allan & Hafner (1989)	1	1	1	1	1	1	0	1	0	**7**
Appelbaum et al. (1999)	1	1	0	0	1	1	1	1	1	**7**
Azhar et al. (1995)	1	1	1	0	1	1	1	1	1	**8**
Baethge et al. (2005)	1	1	1	1	1	1	1	1	1	**9**
Ben-Zeev et al. (2012)	1	0	0	1	1	1	1	1	1	**7**
Beveridge (1995)	1	1	1	0	1	1	1	1	0	**7**
Bhaskaran (1963)	1	1	1	1	1	0	0	1	1	**7**
Bhuyan & Chaudhury (2016)	1	1	0	1	1	1	1	1	0	**7**
Bowins & Shugar (1998)	1	1	1	0	1	1	1	0	1	**7**
Brakoulias & Starcevic (2008)	1	1	1	1	1	1	1	1	0	**8**
Breslau & Meltzer (1988)	1	1	1	1	1	1	1	1	1	**9**
Campbell et al. (2017)	1	1	1	1	1	1	1	1	1	**9**
Cannon & Kramer (2011)	1	1	1	1	1	0	0	1	0	**6**

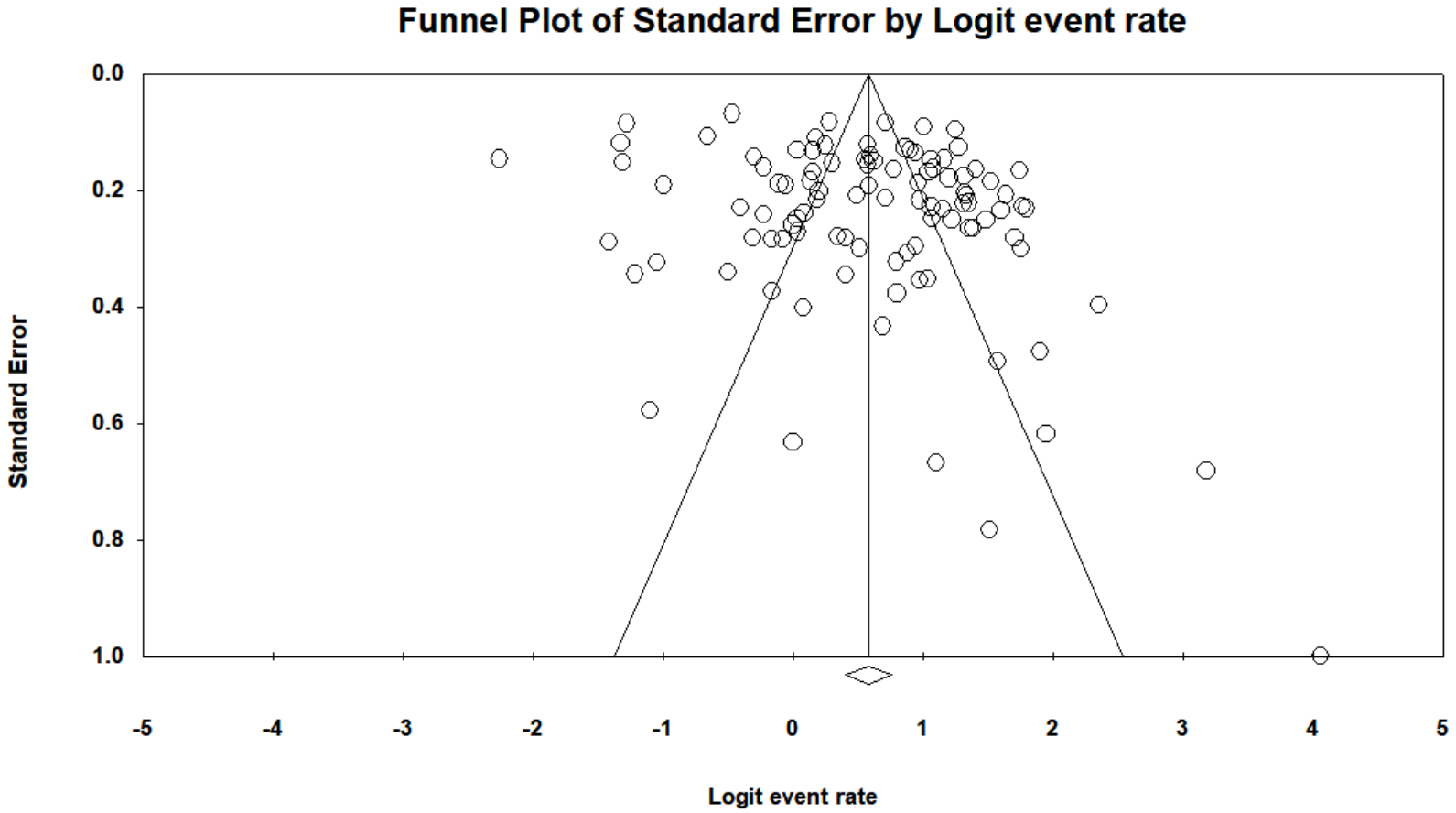
Carpenter & Brockington (1980)	1	1	1	0	0	1	0	0	0	**4**
Combs et al (2006)	1	0	0	1	1	1	1	1	1	**7**
Conus et al. (2004)	1	1	1	1	1	1	1	1	1	**9**
Crowe et al. (1988)	1	1	1	1	1	1	1	1	0	**8**
Dagaonkar et al. (2016)	1	1	1	1	1	1	1	1	1	**9**
Dawson & Weinqold (1966)	1	1	0	0	1	0	0	1	0	**4**
de Portugal et al. (2008)	1	1	1	1	1	1	1	1	0	**8**
Doody et al. (1996)	1	1	1	1	1	1	1	1	0	**8**
Ellersgaard et al. (2014)	1	0	0	1	1	1	1	1	1	**7**
El Sendiony (1976)	1	1	1	0	1	0	0	1	0	**5**
Freedman & Schwab (1978)	1	1	1	0	0	1	1	1	0	**6**
Garety & Hemsley (1987)	1	0	0	1	1	0	0	0	1	**4**
Garety et al. (2013)	1	1	0	1	1	1	1	1	1	**8**
Gaudiano et al. (2009)	1	1	0	1	1	1	1	1	1	**8**
Gecici et al. (2010)	1	1	1	1	1	1	1	1	0	**8**
Gentner et al. (2010)	1	0	1	1	1	1	1	1	1	**8**
González-Rodríguez et al. (2014)	1	1	1	1	1	1	0	1	0	**7**
Goreishizadeh et al. (2010)	1	1	1	1	1	1	0	1	0	**7**
Grover et al. (2007)	1	1	1	1	1	1	0	1	0	**7**
Gutierrez-Lobos et al. (2001)	1	1	1	1	1	1	1	1	0	**8**
Hafner et al. (1993)	1	1	1	1	0	1	1	0	1	**7**
Haward (1964)	1	0	0	0	0	0	1	1	1	**4**
Heilbrun & Madison (1978)	1	0	0	1	0	0	1	1	1	**5**

Hsiao et al. (1999)	1	1	1	1	1	1	1	1	0	**8**
Husain (2009)	1	1	1	1	1	0	1	1	1	**8**
Jablensky et al. (1992)	1	1	1	0	0	1	1	0	1	**6**
Jolley et al. (2006)	1	1	0	1	0	1	1	1	0	**6**
Jones et al. (2020)	1	1	0	1	0	0	1	1	0	**5**
Jørgensen (1985)	1	1	1	1	1	0	0	1	0	**6**
Jørgensen & Munk-Jørgensen (1986)	1	1	1	1	1	0	0	1	0	**6**
Jørgensen (1986)	1	1	1	1	0	1	0	1	0	**6**
Kala & Wig (1982)	1	1	1	1	1	1	0	1	0	**7**
Karson (1980)	1	1	1	1	1	1	0	1	0	**7**
Keck et al. (2003)	1	0	0	1	1	1	1	1	0	**6**
Kennedy et al. (2004)	1	1	1	1	1	1	1	1	0	**8**
Kim et al. (1993)	1	1	1	1	1	0	0	1	1	**7**
Kim et al. (2001)	1	1	1	1	1	0	0	1	0	**6**
Kim et al. (2018)	1	0	0	1	1	1	0	1	1	**6**
Kulkarni et al. (2016)	1	1	1	1	1	1	0	1	0	**7**
Kulhara et al. (1986)	1	0	0	0	1	1	0	1	0	**4**
Kusztrits et al. (2020)	0	0	1	1	1	1	1	0	1	**6**
Leff et al. (1976)	1	1	1	1	0	1	0	1	0	**6**
Lemonde et al. (2020)	1	1	1	1	1	1	1	1	0	**8**
Li et al. (2012)	1	1	1	1	1	1	1	1	0	**8**
Linskey (1994)	1	0	0	1	1	1	0	0	0	**4**
Liss et al. (1973)	1	0	0	0	0	0	1	0	0	**2**
Littlewood & Lipsedge (1981)	1	0	0	1	0	1	0	1	0	**4**
Loudon et al. (1977)	1	0	0	1	1	1	1	1	0	**6**
Lucas et al. (1962)	1	1	1	1	1	0	0	1	1	**7**
Lykouras et al. (1985)	1	1	1	0	1	0	0	1	0	**5**
Lykouras et al. (1986)	1	1	1	1	1	0	0	1	0	**6**

Maina et al. (2001)	1	1	1	1	1	1	0	1	1	**8**
Marino et al. (1993)	1	1	1	1	1	1	1	1	1	**9**
Maslowski et al. (1998)	1	0	1	1	1	1	0	1	1	**7**
McCabe (1976)	1	1	1	1	1	1	1	1	0	**8**
Megha et al. (2018)	1	1	1	1	1	0	0	1	0	**6**
Miller & Chabrier (1988)	1	1	1	1	1	1	0	0	0	**6**
Mitchell & Vierkant (1989)	1	1	0	1	1	0	0	0	0	**4**
Mitropoulos et al. (2015)	1	1	1	1	1	1	0	1	0	**7**
Mosotho et al. (2008)	1	1	1	0	1	1	0	1	1	**7**
Murphy et al. (1963)	1	0	0	0	0	0	1	0	0	**2**
Ndetei & Singh (1982)	1	1	1	1	1	1	0	1	1	**8**
Ndetei & Vadher (1984)	1	1	0	0	1	1	0	1	0	**5**
Okasha et al. (1993)	1	1	1	1	0	1	0	1	1	**7**
Opjordsmoen & Retterstol (1987)	1	1	1	0	1	1	1	1	0	**7**
Özen et al. (2019)	1	1	1	1	1	1	0	1	0	**7**
Paolini et al. (2016)	1	1	1	1	1	1	0	1	1	**8**
Park et al. (2014)	1	1	1	1	1	1	1	1	1	**9**
Peralta & Cuesta (1999)	1	1	1	1	1	1	1	1	0	**8**
Picardi et al. (2018)	1	0	1	1	1	1	1	1	1	**8**
Pini et al. (2004)	1	1	1	1	1	1	1	1	0	**8**
Rajapakse et al.(2011)	1	1	0	1	1	0	0	0	0	**4**
Rao (1966)	1	0	0	0	0	0	1	0	0	**2**
Raune et al. (2005)	1	1	1	1	0	1	0	1	1	**7**
Read & Argyle (1999)	1	1	0	1	0	0	0	0	0	**3**
Renvoize & Beveridge (1989)	1	1	1	1	1	1	0	1	0	**7**

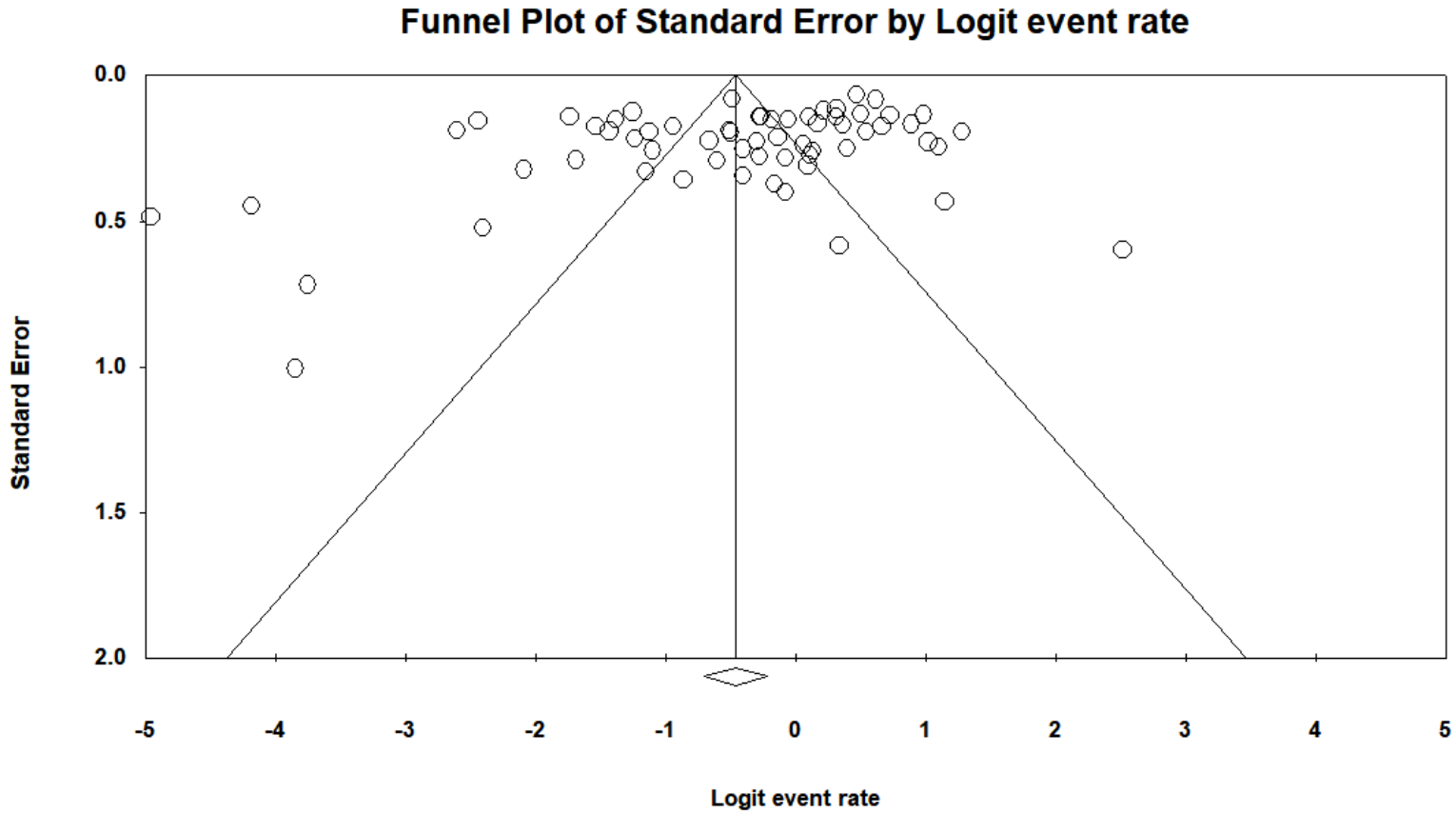
Rhodes et al. (2005)	1	0	0	1	1	0	1	1	0	**5**
Rossler et al (2016)										-
Rudden et al. (1983)	1	1	1	1	1	1	1	1	0	**8**
Sajid et al. (2011)	1	1	1	1	1	0	0	1	1	**7**
Scott (1967)	1	1	0	0	1	0	0	1	0	**4**
Sharma & Gupta (1979)	1	1	1	1	1	1	0	1	1	**8**
Sinha & Chaturvedi (1989)	1	1	0	1	1	0	0	1	1	**6**
Sood et al. (2019)	1	1	1	1	1	1	0	0	1	**7**
Stompe et al. (1999)	1	1	1	1	1	0	1	1	1	**8**
Suhail & Cochrane (2002)	1	1	1	1	1	1	0	1	0	**7**
Suhail & Ghauri (2010)	1	1	1	1	1	1	1	1	1	**9**
Tateyama et al. (1993)	1	1	1	1	1	0	0	1	0	**6**
Tateyama et al. (1998)	1	1	1	1	1	0	0	1	0	**6**
Taylor & Abrams (1973)	1	1	1	1	1	0	0	1	1	**7**
Thompson et al. (2013)	0	1	1	0	1	1	1	1	0	**6**
Turgut & Yenilmez (2013)										-
van Bergen et al. (2018)	1	1	1	1	1	1	1	1	0	**8**
Winokur (1977)	1	1	1	0	0	0	0	1	0	**4**
Wustmann & Pillmann (2011)	1	1	1	1	1	1	1	1	1	**9**
Yamada et al. (1998)	1	1	1	1	1	1	0	1	1	**8**
Yamada et al (2006)	1	1	1	1	1	1	1	1	0	**8**

Appendix E. Persecutory delusions funnel plot and trim and fill analysis



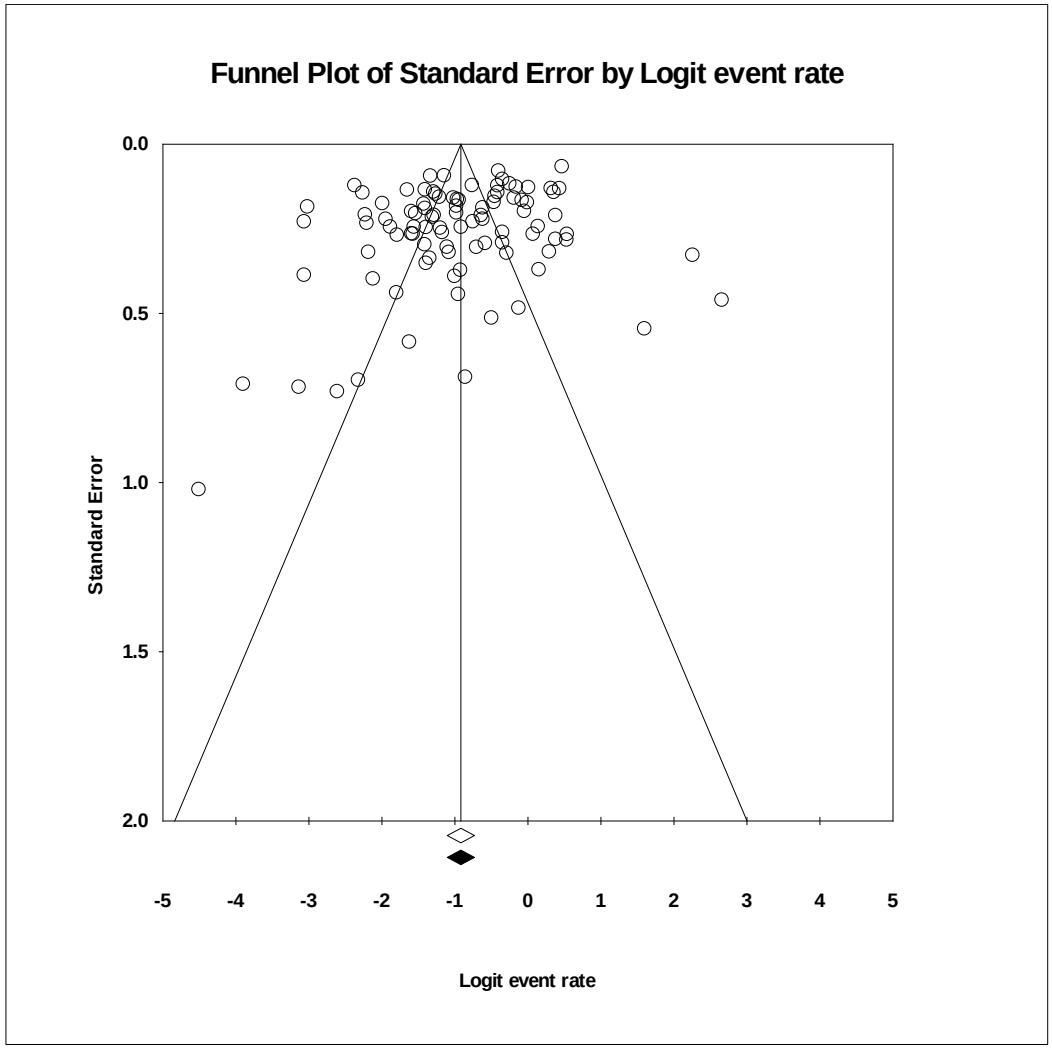
As visual examination of the funnel plot indicated asymmetry, Duval and Tweedie's (2000) trim and fill method was used and 17 studies were trimmed (left of the mean) which slightly reduced the adjusted point prevalence estimate to 58.6% (95% CI = 54.4 – 62.7%).

Appendix F. Reference delusions funnel plot and trim and fill analysis



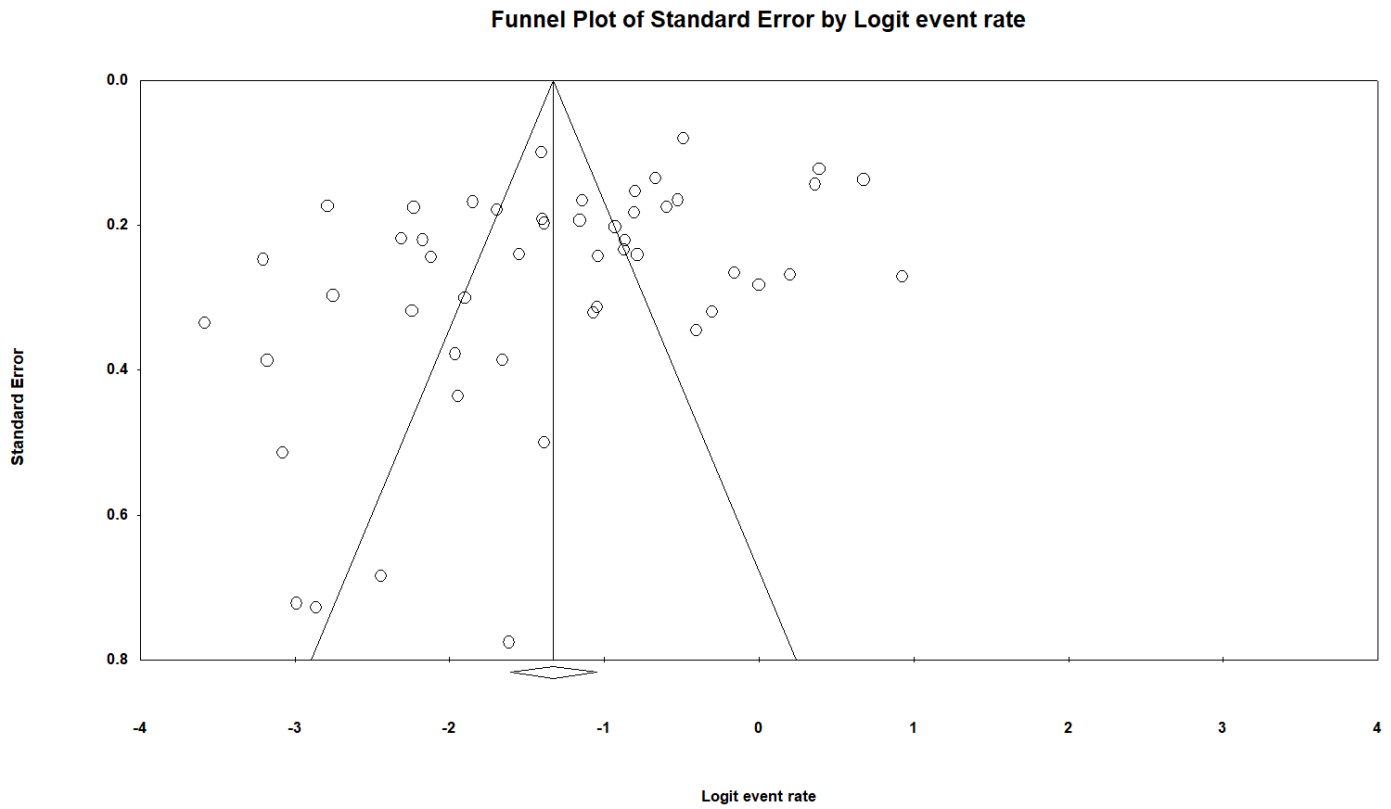
Ten studies were adjusted (left of the mean) decreasing the adjusted prevalence estimate to 31.7% (95% CI = 26.1 – 38.1%).

Appendix G. Grandiose delusions funnel plot and trim and fill analysis



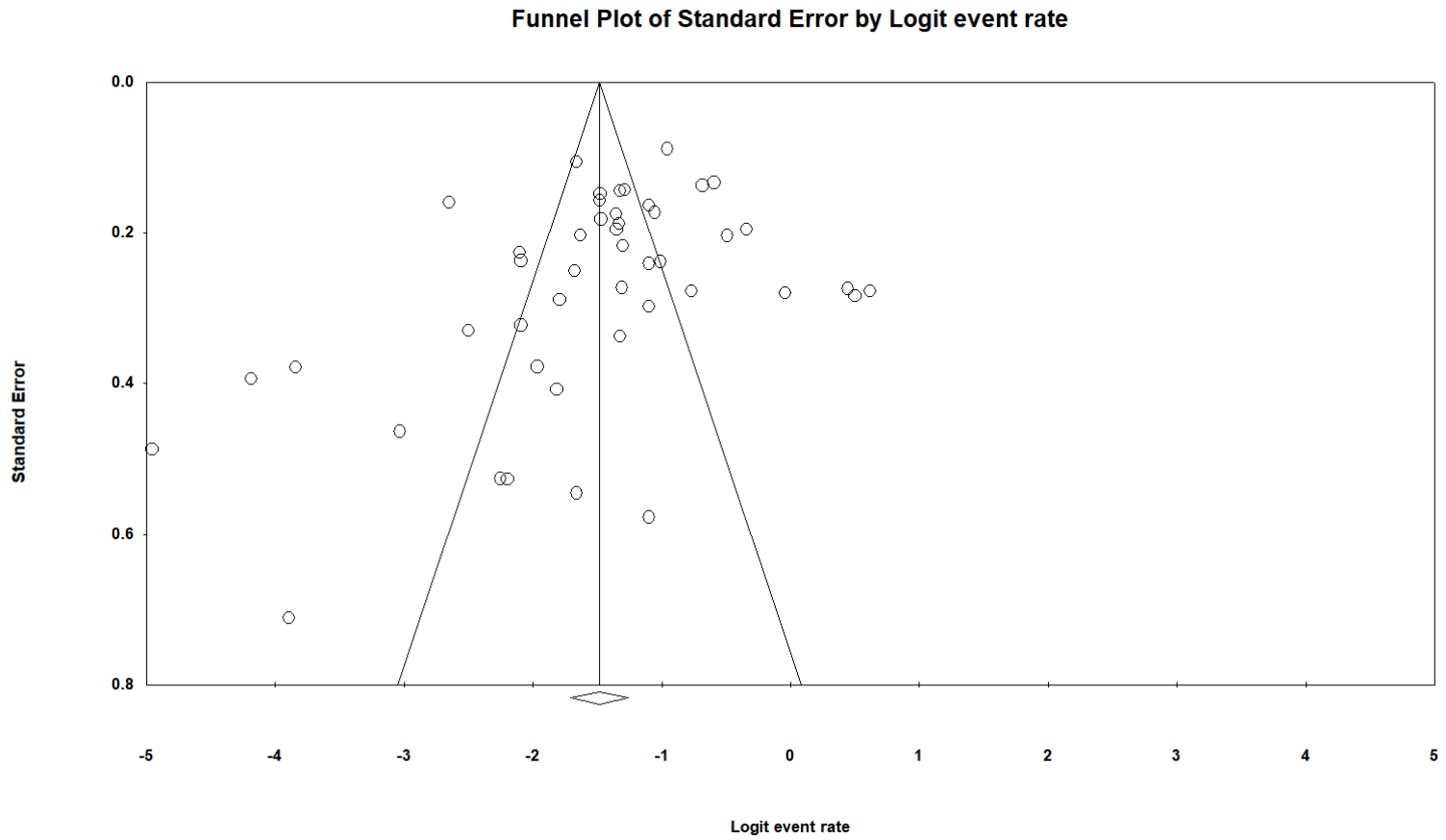
Eighteen studies were adjusted (right of the mean) giving an increased adjusted point prevalence estimate increased to 35.7% (95% CI = 31.3 – 40.3%).

Appendix H. Control delusions funnel plot and trim and fill analysis



Nine studies were adjusted (right of the mean) increasing the adjusted point prevalence estimate to 26.7% (95% CI = 21.6 – 32.5%).

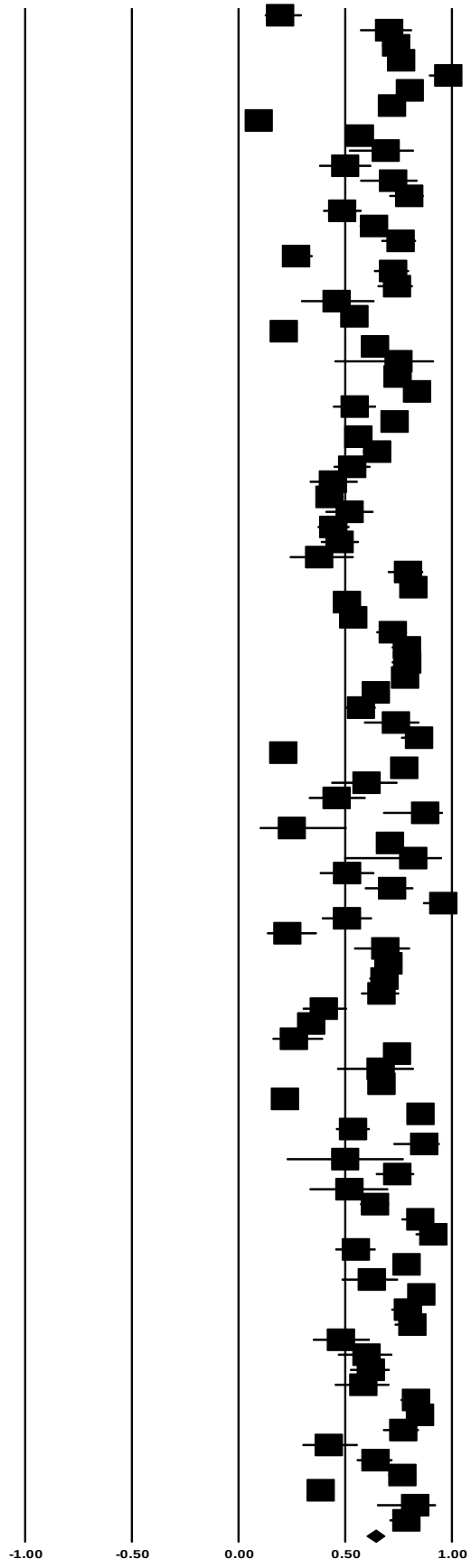
Appendix I. Religious delusions funnel plot and trim and fill analysis



Eight studies were adjusted (left of the mean) which decreased the adjusted point prevalence estimate to 14.0% (95% CI = 11.0 – 17.7%).

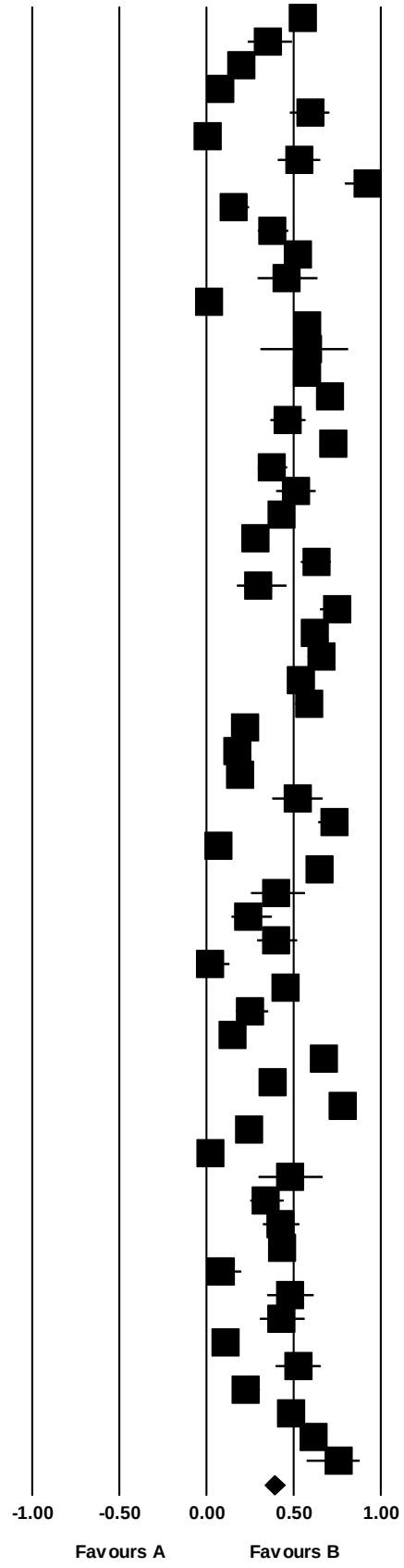
Appendix J. Persecutory delusions forest plot

Study name	Event rate	Lower limit	Upper limit
Adhikar, 2017	0.195	0.121	0.299
Ahmed, 1978	0.706	0.568	0.814
Albee, 1950	0.739	0.671	0.797
Albee, 1951	0.762	0.707	0.810
Allan, 1989	0.983	0.891	0.998
Appelbaum, 1999	0.803	0.748	0.849
Azhar, 1995	0.719	0.662	0.769
Baethge, 2005	0.095	0.073	0.123
Beveridge, 1995	0.569	0.529	0.608
Bhaskaran, 1963	0.690	0.516	0.823
Bhuyan, 2016	0.500	0.376	0.624
Bowins, 1998	0.725	0.568	0.841
Brakoulias, 2008	0.800	0.705	0.870
Breslau, 1988	0.486	0.395	0.578
Campbell, 2017	0.635	0.566	0.699
Cannon, 2012	0.760	0.668	0.833
Carpenter, 1980	0.270	0.203	0.349
Conus, 2004	0.725	0.633	0.801
Crowe, 1988	0.743	0.649	0.819
Dagaonkar, 2016	0.460	0.291	0.639
Doody, 1996	0.543	0.490	0.595
Freedman, 1978	0.212	0.167	0.265
Garety, 2013	0.640	0.584	0.692
Gaudiano, 2009	0.750	0.448	0.917
Gecici, 2010 (1)	0.746	0.681	0.801
Gecici, 2010 (2)	0.837	0.774	0.885
Grover, 2007	0.545	0.441	0.646
Gutierrez-Lobos, 2001	0.732	0.696	0.765
Hafner, 1993	0.562	0.503	0.619
Haward, 1964	0.650	0.581	0.713
Husain, 2009	0.533	0.444	0.620
Jablensky, 1992 (1)	0.443	0.332	0.560
Jablensky, 1992 (2)	0.426	0.360	0.495
Jolley, 2006	0.521	0.406	0.634
Jones, 2020	0.444	0.369	0.522
Jorgensen, 1985	0.474	0.384	0.566
Jorgensen & Munk-Jorgensen, 1986	0.378	0.238	0.542
Jorgenson, 1986	0.795	0.698	0.867
Kala, 1982	0.820	0.761	0.867
Keck, 2003	0.508	0.445	0.571
Kennedy, 2004	0.538	0.474	0.601
Kim, 1993 (1)	0.723	0.644	0.790
Kim, 1993 (2)	0.789	0.716	0.847
Kim, 1993 (3)	0.791	0.716	0.850
Kim, 2001 (1)	0.781	0.736	0.820
Kim, 2001 (2)	0.644	0.579	0.704
Kim, 2001 (3)	0.574	0.500	0.645
Kim, 2018	0.738	0.586	0.849
Kulhara, 1986	0.846	0.760	0.905
Kusztrits, 2020	0.210	0.174	0.251
Lemonde, 2020	0.777	0.743	0.808
Li, 2012	0.600	0.433	0.747
Linskey, 1994	0.460	0.328	0.598
Littlewood, 1981	0.875	0.676	0.959
Loudon, 1977	0.250	0.097	0.508
Lucas, 1962	0.710	0.655	0.759
Lykouras, 1985	0.819	0.494	0.955
Lykouras, 1986	0.509	0.379	0.638
Maslowski, 1998 (1)	0.720	0.591	0.821
Maslowski, 1998 (2)	0.960	0.863	0.989
McCabe, 1976	0.508	0.388	0.627
Megha, 2019	0.229	0.132	0.368
Miller, 1988	0.688	0.540	0.806
Mitchell, 1989	0.703	0.649	0.752
Mitropoulos, 2015	0.684	0.611	0.749
Mosotho, 2008	0.670	0.572	0.755
Ndetei, 1982	0.400	0.299	0.510
Ndetei, 1984	0.341	0.296	0.389
Okasha, 1993	0.260	0.157	0.398
Paolini, 2016	0.743	0.685	0.794
Park, 2014	0.666	0.461	0.823
Peralta, 1999	0.670	0.633	0.705
Picardi, 2018	0.218	0.191	0.247
Pini, 2004	0.853	0.788	0.900
Rajapakse, 2011	0.537	0.455	0.617
Raune, 2005	0.870	0.725	0.944
Read, 1999	0.500	0.225	0.775
Renvoize, 1989	0.744	0.642	0.825
Rhodes, 2005	0.520	0.331	0.704
Rossler, 2016	0.640	0.568	0.706
Rudden, 1983	0.852	0.762	0.912
Sajid, 2011	0.913	0.828	0.958
Scott, 1967	0.550	0.452	0.644
Sharma, 1979	0.788	0.726	0.839
Sinha, 1989	0.625	0.482	0.749
Sood, 2019	0.857	0.792	0.904
Stompe, 1999 (1)	0.794	0.715	0.856
Stompe, 1999 (2)	0.815	0.730	0.878
Suhail, 2002 (1)	0.480	0.346	0.617
Suhail, 2002 (2)	0.600	0.464	0.722
Suhail, 2002 (3)	0.620	0.520	0.710
Suhail, 2010	0.585	0.449	0.709
Tateyama, 1993 (1)	0.832	0.758	0.887
Tateyama, 1993 (2)	0.851	0.805	0.888
Tateyama, 1998	0.772	0.675	0.846
Taylor, 1973	0.423	0.297	0.560
Thompson, 2013	0.642	0.553	0.723
Turgut, 2013	0.768	0.700	0.824
van Bergen, 2019	0.385	0.354	0.417
Winokur, 1977	0.828	0.647	0.927
Yamada, 2006	0.787	0.705	0.851
	0.640	0.598	0.680



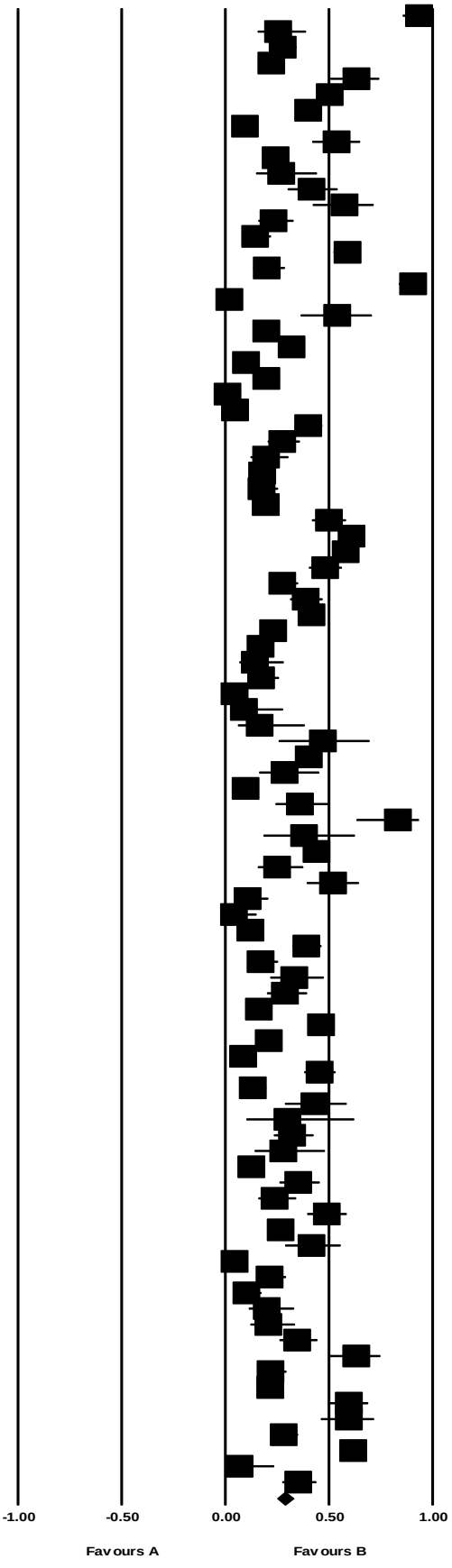
Appendix K. Reference delusions forest plot

Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Adebimpe, 1981	0.553	0.494	0.611	1.754	0.079
Ahmed, 1978	0.353	0.235	0.492	-2.068	0.039
Azhar, 1995	0.200	0.157	0.252	-9.112	0.000
Baethge, 2005	0.080	0.060	0.106	-15.525	0.000
Ben-Zeev, 2012	0.597	0.476	0.707	1.578	0.115
Beveridge, 1995	0.007	0.003	0.018	-10.169	0.000
Bhuyan, 2016	0.533	0.407	0.655	0.511	0.609
Bowins, 1998	0.925	0.792	0.976	4.185	0.000
Brakoulias, 2008	0.156	0.095	0.246	-5.812	0.000
Breslau, 1988	0.378	0.293	0.471	-2.544	0.011
Campbell, 2017	0.525	0.456	0.593	0.707	0.480
Dagaonkar, 2016	0.460	0.291	0.639	-0.430	0.667
Doody, 1996	0.015	0.006	0.035	-9.365	0.000
Garety, 2013	0.578	0.521	0.633	2.695	0.007
Gaudiano, 2009	0.583	0.307	0.815	0.572	0.567
Gecici, 2010 (1)	0.577	0.508	0.643	2.175	0.030
Gecici, 2010 (2)	0.709	0.637	0.772	5.305	0.000
Grover, 2007	0.466	0.365	0.570	-0.637	0.524
Hafner, 1993	0.728	0.672	0.777	7.278	0.000
Husain, 2009	0.375	0.293	0.465	-2.709	0.007
Jablensky, 1992 (1)	0.514	0.398	0.628	0.234	0.815
Jablensky, 1992 (2)	0.431	0.365	0.500	-1.965	0.049
Jones, 2020	0.281	0.217	0.356	-5.342	0.000
Jorgensen, 1985	0.632	0.540	0.715	2.785	0.005
Jorgensen & Munk-Jorgensen, 1986	0.297	0.173	0.461	-2.395	0.017
Jorgenson, 1986	0.750	0.649	0.829	4.463	0.000
Keck, 2003	0.622	0.559	0.681	3.726	0.000
Kim, 1993 (1)	0.660	0.579	0.733	3.757	0.000
Kim, 1993 (2)	0.542	0.461	0.621	1.017	0.309
Kim, 1993 (3)	0.590	0.507	0.668	2.118	0.034
Kim, 2001 (1)	0.222	0.183	0.267	-10.025	0.000
Kim, 2001 (2)	0.177	0.132	0.232	-8.798	0.000
Kim, 2001 (3)	0.193	0.141	0.258	-7.490	0.000
Kim, 2018	0.524	0.375	0.669	0.311	0.756
Kulhara, 1986	0.735	0.639	0.813	4.457	0.000
Kusztrits, 2020	0.069	0.049	0.097	-13.771	0.000
Lemonde, 2020	0.649	0.611	0.685	7.398	0.000
Li, 2012	0.400	0.253	0.567	-1.175	0.240
Linskey, 1994	0.240	0.142	0.377	-3.481	0.000
McCabe, 1976	0.400	0.289	0.523	-1.601	0.109
Megha, 2019	0.021	0.003	0.134	-3.817	0.000
Mitropoulos, 2015	0.454	0.382	0.528	-1.212	0.226
Ndetei, 1982	0.250	0.167	0.356	-4.255	0.000
Ndetei, 1984	0.150	0.118	0.189	-12.279	0.000
Paolini, 2016	0.674	0.613	0.730	5.329	0.000
Peralta, 1999	0.380	0.344	0.418	-6.105	0.000
Pini, 2004	0.782	0.710	0.840	6.587	0.000
Rajapakse, 2011	0.245	0.181	0.322	-5.788	0.000
Renvoize, 1989	0.023	0.006	0.088	-5.212	0.000
Rhodes, 2005	0.480	0.296	0.669	-0.200	0.842
Rudden, 1983	0.340	0.249	0.445	-2.948	0.003
Sajid, 2011	0.425	0.322	0.535	-1.337	0.181
Sharma, 1979	0.434	0.367	0.504	-1.852	0.064
Sinha, 1989	0.083	0.031	0.202	-4.592	0.000
Suhail, 2002 (1)	0.480	0.346	0.617	-0.283	0.777
Suhail, 2002 (2)	0.430	0.305	0.565	-1.016	0.310
Suhail, 2002 (3)	0.110	0.062	0.189	-6.476	0.000
Suhail, 2010	0.528	0.395	0.657	0.407	0.684
Thompson, 2013	0.225	0.159	0.308	-5.657	0.000
Turgut, 2013	0.486	0.413	0.559	-0.372	0.710
van Bergen, 2019	0.615	0.583	0.646	6.898	0.000
Winokur, 1977	0.759	0.574	0.881	2.642	0.008
	0.387	0.332	0.446	-3.720	0.000

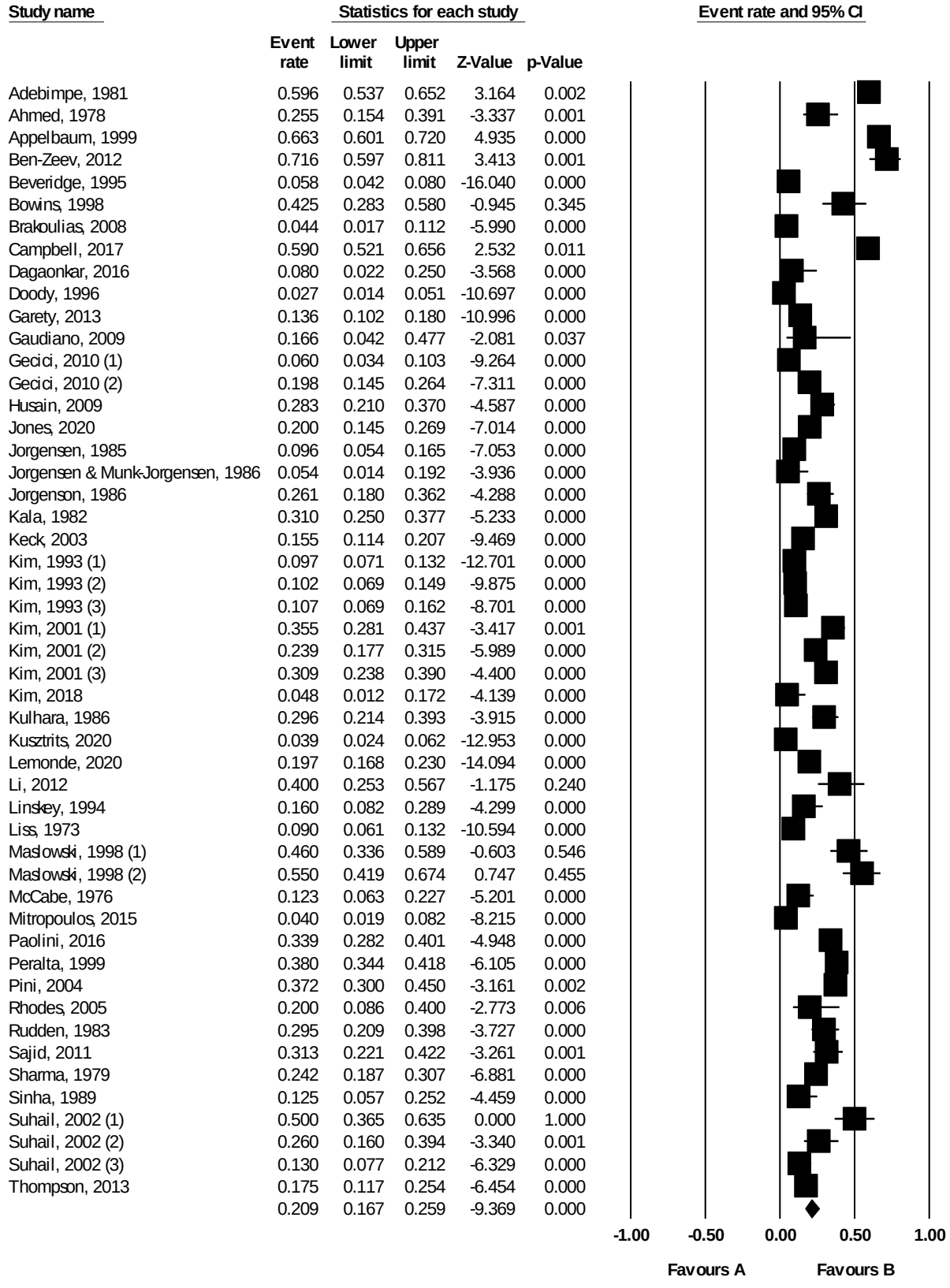


Appendix L. Grandiose delusions forest plot

Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Adhikar, 2017	0.935	0.853	0.973	5.768	0.000
Ahmed, 1978	0.255	0.154	0.391	-3.337	0.001
Albee, 1950	0.277	0.217	0.346	-5.824	0.000
Albee, 1951	0.222	0.176	0.276	-8.420	0.000
Allan, 1989	0.633	0.505	0.745	2.035	0.042
Appelbaum, 1999	0.504	0.441	0.567	0.123	0.902
Azhar, 1995	0.400	0.343	0.460	-3.264	0.001
Baethge, 2005	0.095	0.073	0.123	-15.486	0.000
Ben-Zeev, 2012	0.537	0.418	0.652	0.605	0.545
Beveridge, 1995	0.243	0.210	0.279	-11.997	0.000
Bhaskaran, 1963	0.270	0.146	0.444	-2.537	0.011
Bhuyan, 2016	0.416	0.299	0.543	-1.295	0.195
Bowins, 1998	0.575	0.420	0.717	0.945	0.345
Brakoulias, 2008	0.233	0.157	0.331	-4.778	0.000
Breslau, 1988	0.144	0.090	0.222	-6.593	0.000
Campbell, 2017	0.590	0.521	0.656	2.532	0.011
Cannon, 2012	0.200	0.133	0.289	-5.600	0.000
Conus, 2004	0.906	0.835	0.948	6.871	0.000
Crowe, 1988	0.020	0.005	0.076	-5.476	0.000
Dagaonkar, 2016	0.540	0.361	0.709	0.430	0.667
Doody, 1996	0.198	0.159	0.244	-10.263	0.000
Garety, 2013	0.320	0.270	0.375	-6.100	0.000
Gecici, 2010 (1)	0.100	0.065	0.150	-9.345	0.000
Gecici, 2010 (2)	0.198	0.145	0.264	-7.311	0.000
Grover, 2007	0.011	0.001	0.076	-4.402	0.000
Gutierrez-Lobos, 2001	0.047	0.033	0.066	-16.100	0.000
Haward, 1964	0.400	0.334	0.469	-2.809	0.005
Husain, 2009	0.275	0.203	0.362	-4.742	0.000
Jolley, 2006	0.197	0.120	0.306	-4.709	0.000
Jones, 2020	0.178	0.126	0.245	-7.403	0.000
Jorgensen, 1985	0.175	0.116	0.256	-6.291	0.000
Kala, 1982	0.195	0.146	0.256	-7.944	0.000
Karson, 1980	0.500	0.416	0.584	0.000	1.000
Keck, 2003	0.609	0.546	0.669	3.336	0.001
Kennedy, 2004	0.581	0.517	0.643	2.467	0.014
Kim, 1993 (1)	0.482	0.401	0.564	-0.430	0.667
Kim, 1993 (2)	0.275	0.209	0.353	-5.248	0.000
Kim, 1993 (3)	0.388	0.311	0.471	-2.628	0.009
Kim, 2001 (1)	0.416	0.367	0.467	-3.216	0.001
Kim, 2001 (2)	0.231	0.181	0.291	-7.603	0.000
Kim, 2001 (3)	0.170	0.121	0.233	-7.902	0.000
Kim, 2018	0.143	0.066	0.284	-4.062	0.000
Kulhara, 1986	0.173	0.110	0.261	-5.858	0.000
Kusztrits, 2020	0.045	0.029	0.069	-13.224	0.000
Leff, 1976 (1)	0.090	0.025	0.280	-3.311	0.001
Leff, 1976 (2)	0.166	0.059	0.386	-2.752	0.006
Leff, 1976 (3)	0.471	0.256	0.698	-0.239	0.811
Lemonde, 2020	0.403	0.366	0.442	-4.861	0.000
Li, 2012	0.286	0.161	0.455	-2.446	0.014
Linskey, 1994	0.098	0.067	0.141	-10.559	0.000
Liss, 1973	0.360	0.240	0.501	-1.953	0.051
Littlewood, 1981	0.833	0.631	0.936	2.936	0.003
Loudon, 1977	0.380	0.183	0.627	-0.950	0.342
Lucas, 1962	0.440	0.384	0.498	-2.032	0.042
Maslowski, 1998 (1)	0.250	0.155	0.378	-3.592	0.000
Maslowski, 1998 (2)	0.520	0.391	0.647	0.299	0.765
McCabe, 1976	0.108	0.052	0.209	-5.283	0.000
Megha, 2019	0.042	0.011	0.152	-4.346	0.000
Mitchell, 1989	0.121	0.089	0.163	-11.201	0.000
Mitropoulos, 2015	0.391	0.321	0.465	-2.852	0.004
Mosotho, 2008	0.170	0.108	0.257	-5.956	0.000
Murphy, 1963	0.333	0.215	0.476	-2.268	0.023
Ndetei, 1982	0.288	0.200	0.396	-3.666	0.000
Ndetei, 1984	0.162	0.129	0.202	-12.004	0.000
Paolini, 2016	0.462	0.400	0.525	-1.188	0.235
Peralta, 1999	0.210	0.181	0.243	-13.864	0.000
Picardi, 2018	0.086	0.069	0.107	-19.090	0.000
Pini, 2004	0.455	0.379	0.534	-1.123	0.262
Rajapakse, 2011	0.133	0.086	0.199	-7.613	0.000
Raune, 2005	0.430	0.286	0.587	-0.871	0.384
Read, 1999	0.300	0.100	0.624	-1.228	0.220
Renvoize, 1989	0.322	0.232	0.427	-3.226	0.001
Rhodes, 2005	0.280	0.140	0.482	-2.120	0.034
Rossler, 2016	0.126	0.085	0.183	-8.671	0.000
Rudden, 1983	0.352	0.260	0.457	-2.734	0.006
Sajid, 2011	0.238	0.157	0.343	-4.432	0.000
Scott, 1967	0.490	0.394	0.587	-0.200	0.841
Sharma, 1979	0.267	0.210	0.333	-6.287	0.000
Sinha, 1989	0.416	0.286	0.558	-1.158	0.247
Sood, 2019	0.045	0.022	0.092	-7.859	0.000
Stompe, 1999 (1)	0.214	0.151	0.294	-5.989	0.000
Stompe, 1999 (2)	0.102	0.057	0.176	-6.778	0.000
Suhail, 2002 (1)	0.200	0.111	0.333	-3.921	0.000
Suhail, 2002 (2)	0.208	0.119	0.338	-3.951	0.000
Suhail, 2002 (3)	0.347	0.260	0.446	-2.979	0.003
Suhail, 2010	0.632	0.496	0.750	1.899	0.058
Tateyama, 1993 (1)	0.218	0.155	0.297	-6.036	0.000
Tateyama, 1993 (2)	0.217	0.173	0.268	-8.992	0.000
Tateyama, 1998	0.596	0.493	0.691	1.830	0.067
Taylor, 1973	0.596	0.459	0.720	1.376	0.169
Turgut, 2013	0.282	0.221	0.353	-5.595	0.000
van Bergen, 2019	0.617	0.585	0.648	7.015	0.000
Winokur, 1977	0.069	0.017	0.238	-3.552	0.000
Yamada, 2006	0.352	0.273	0.441	-3.219	0.001
	0.285	0.249	0.325	-9.646	0.000

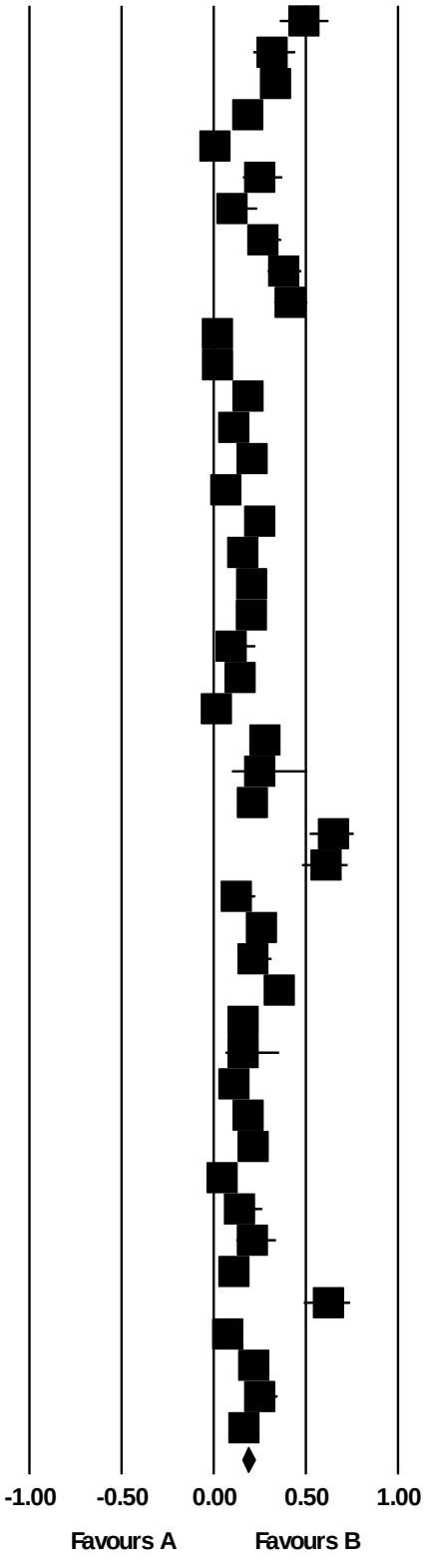


Appendix M. Control delusions forest plot.



Appendix N. Religious delusions forest plot

Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Ahmed, 1978	0.490	0.357	0.625	-0.143	0.886
Allan, 1989	0.317	0.212	0.444	-2.767	0.006
Appelbaum, 1999	0.336	0.279	0.398	-4.964	0.000
Azhar, 1995	0.185	0.143	0.236	-9.461	0.000
Beveridge (1995)	0.007	0.003	0.018	-10.169	0.000
Bhuyan, 2016	0.250	0.157	0.374	-3.685	0.000
Bowins, 1998	0.100	0.038	0.238	-4.169	0.000
Brakoulias, 2008	0.267	0.186	0.368	-4.238	0.000
Cannon, 2012	0.380	0.291	0.478	-2.400	0.016
Conus, 2004	0.415	0.326	0.510	-1.758	0.079
Crowe, 1988	0.020	0.005	0.076	-5.476	0.000
Doody, 1996	0.021	0.010	0.043	-10.143	0.000
Garety, 2013	0.186	0.146	0.234	-9.966	0.000
Gecici, 2010 (1)	0.109	0.073	0.160	-9.283	0.000
Gecici, 2010 (2)	0.209	0.155	0.276	-7.097	0.000
Gutierrez-Lobos, 2001	0.066	0.049	0.088	-16.631	0.000
Haward, 1964	0.250	0.195	0.315	-6.728	0.000
Husain, 2009	0.158	0.103	0.235	-6.685	0.000
Jones, 2020	0.206	0.150	0.276	-6.902	0.000
Kala, 1982	0.205	0.155	0.267	-7.738	0.000
Kim, 2018	0.095	0.036	0.227	-4.283	0.000
Kulhara, 1986	0.143	0.087	0.227	-6.205	0.000
Kusztrits, 2020	0.015	0.007	0.032	-10.621	0.000
Lemonde, 2020	0.278	0.245	0.314	-10.783	0.000
Loudon, 1977	0.250	0.097	0.508	-1.903	0.057
Lucas, 1962	0.210	0.167	0.261	-9.158	0.000
Maslowski, 1998 (1)	0.650	0.519	0.762	2.229	0.026
Maslowski, 1998 (2)	0.610	0.478	0.728	1.633	0.103
McCabe, 1976	0.123	0.063	0.227	-5.201	0.000
Mitropoulos, 2015	0.259	0.199	0.329	-6.074	0.000
Ndetei, 1982	0.213	0.137	0.316	-4.786	0.000
Paolini, 2016	0.356	0.299	0.418	-4.443	0.000
Peralta, 1999	0.160	0.134	0.190	-15.618	0.000
Rhodes, 2005	0.160	0.061	0.357	-3.040	0.002
Rossler, 2016	0.110	0.072	0.164	-8.825	0.000
Sharma, 1979	0.187	0.139	0.247	-8.063	0.000
Stompe, 1999 (1)	0.214	0.151	0.294	-5.989	0.000
Stompe, 1999 (2)	0.046	0.019	0.107	-6.539	0.000
Suhail, 2002 (1)	0.140	0.068	0.266	-4.454	0.000
Suhail, 2002 (2)	0.210	0.121	0.340	-3.929	0.000
Suhail, 2002 (3)	0.110	0.062	0.189	-6.476	0.000
Suhail, 2010	0.623	0.487	0.742	1.772	0.076
Tateyama, 1993 (1)	0.076	0.041	0.136	-7.576	0.000
Tateyama, 1993 (2)	0.217	0.173	0.268	-8.992	0.000
Tateyama, 1998	0.250	0.172	0.348	-4.563	0.000
Turgut, 2013	0.164	0.116	0.226	-8.024	0.000
	0.185	0.153	0.221	-12.940	0.000



Section Two: Research Project

Investigating Factors associated with Grandiose Beliefs, and the effect of Mortality Salience on Self-esteem and Grandiose Beliefs

Abstract

Objectives

Little is known about the factors associated with the development and maintenance of grandiose delusions (GDs). This study aimed to investigate factors associated with grandiosity in the general population, and test the hypothesis that GDs develop as a defence against existential anxiety.

Methods

A cross-sectional online survey was conducted with 327 participants to investigate the association between attachment, self-esteem, analytic reasoning, existential anxiety, religiosity, atheism, and narcissism, with grandiosity and paranoia. Additionally, an online between-subjects experiment to manipulate mortality salience was conducted in which 421 participants were randomly allocated to a mortality salience (MS) or dental pain control condition. Changes in grandiose and self-esteem scores were compared between conditions.

Results

In the survey, grandiosity was significantly associated with younger age, male gender, non-white ethnicity, paranoia, religiosity, and narcissism, whilst paranoia was significantly associated with grandiosity, attachment anxiety, negative self-esteem, and younger age. In the experiment, there was no effect of MS on self-esteem or grandiosity. In both groups, self-esteem significantly increased, and grandiosity significantly decreased, but mainly for females.

Conclusions

Grandiosity and paranoia have some shared and non-shared aetiologies. Attachment anxiety and negative self-esteem are consistently associated with paranoia. The association between

religiosity and grandiosity fits with the higher number of religious themes in GDs. Further research is required to replicate the association with grandiosity and demographic variables and to establish whether religiosity and narcissism are associated with different subtypes of GDs. Using a more diverse sample, future research could investigate whether grandiosity increases following existential threats for certain demographic groups.

Keywords: grandiosity, grandiose delusions, paranoia, self-esteem, existential anxiety, religiosity, narcissism

Practitioner points:

- People of a younger age, male gender, and non-white ethnicity, who experience increased paranoia, religiosity, and narcissism, may be likely to have more grandiose beliefs, therefore it may be useful to explore these factors during assessment and formulation.
- Interventions focusing on improving self-esteem could support individuals' experiencing, or at risk of, GDs as self-esteem appears to protect against threats to the self.
- Grandiosity does not appear to reflect a defence against existential anxiety in the general population, but this may not be the same for all demographic groups.

Introduction

Grandiose delusions

Grandiose delusions (GDs) are defined as a fixed belief about "having some great (but unrecognised) talent or insight" which is not amenable to change despite conflicting evidence (American Psychiatric Association, 2013). Research suggests that grandiose beliefs occur along a continuum, as shown by studies in the general population (Peters et al., 1999; Ronald et al., 2014). Knowles et al. (2011) developed a theoretical model of GDs which generated several hypotheses about factors involved in the development and maintenance of GDs. The model incorporates the delusion-as-defence account which argues that delusions develop to protect against feelings of unworthiness, loneliness (Freeman et al., 1998) or reminders of low social rank or power (Birchwood et al., 2007; Tzemou & Birchwood, 2007). Whilst qualitative studies support the delusion-as-defence account (Beck & Rector, 2005; Isham et al., 2019; Rhodes & Jakes, 2000), studies investigating discrepancies between patient's implicit and explicit self-esteem have not supported it (Smith et al., 2005). The emotion-consistent account argues that GDs develop from preserved positive beliefs about the self (Smith et al., 2005). Knowles et al. (2011) integrate both accounts by proposing that people with low self-esteem or social rank may be motivated to eradicate these feelings and consequently inaccurately appraise a positive physiological, cognitive, or emotional internal state change. Therefore, GDs may be a defensive strategy, whilst the initial grandiose thought develops from a positive affective state. This accounts for the links between GDs and positive self-beliefs (Smith et al., 2006). The factors that influence how people appraise a positive internal state, and how grandiose beliefs are maintained, remain unclear and require empirical investigation.

Development of GDs

Childhood trauma and adversity has been shown to be associated with the severity of delusions (Bailey et al., 2018) and negative life experiences could be associated with the development of GDs as they impact how people appraise and regulate internal states (Mansell et al., 2007). Attachment styles refer to an individual's beliefs about the self and others based on early life relationships (Bartholomew & Horowitz, 1991; Bowlby, 1969). The four main adult attachment styles (secure, preoccupied, dismissive, and fearful) describe varying types of attachment anxiety, associated with a negative model of the self, and attachment avoidance, associated with a negative model of others (Bartholomew & Horowitz, 1991). Paranoia includes feelings of mistrust and suspiciousness and persecutory delusions (PDs) involve beliefs that persecutor/s are intending to cause harm (Freeman, 2016). Childhood neglect has been associated with paranoia (Sitko et al., 2014) and insecure attachment and negative self-esteem have been shown to mediate this relationship (Fowler et al., 2012; Gumley et al., 2014; Pickering et al., 2008; Wickham et al., 2015), but the association between attachment and grandiosity is unclear.

Grandiosity and paranoia appear to be correlated (Ronald et al., 2014) and Fowler et al. (2006) found that paranoia predicted levels of grandiosity in students. GDs could develop from PDs if a positive fluctuation in self-esteem leads the individual to believe that others are trying to harm them due to their special identity or abilities. Alternatively, PDs may develop from existing GDs if the individual begins to believe that others are trying to harm or steal their special abilities or talents (Knowles et al., 2011; Lake, 2008). Grandiosity and paranoia may have some shared aetiological factors, such as insecure attachment, and fluctuations in self-esteem be related to fluctuations between them. It is useful to understand the shared and separate mechanisms involved in the development and maintenance of GDs and PDs to inform more specific psycho-social models of GDs.

Terror Management Theory (TMT) proposes that humans manage anxiety about death through the development of cultural worldviews and self-esteem which provide personal meaning and value (Pyszczynski et al., 1997). Attachment styles may influence how people respond to existential or relational threats and Hart et al. (2005) found that attachment avoidance was associated with greater self-enhancement bias. Individuals who lack self-esteem, and have a more avoidant attachment style, may experience greater existential anxiety, and respond to threats to their safety or social rank with greater self-enhancement defences. This would support qualitative research indicating that GDs provide a sense of meaning and belonging or a way of making sense of difficult experiences (Isham et al., 2019). It would be useful to examine the relationship between existential anxiety and grandiosity in the general population and investigate whether grandiosity increases following existential threats.

Knowles et al. (2011) suggest that cultural factors influence the development of GDs as their content appears to vary across cultures and ethnicities (Suhail & Cochrane, 2002; Yamada et al., 2006). Religiosity is influenced by culture and could impact the appraisal of internal state changes or anomalous experiences. The review by Bonelli & Koenig (2013), found that religiosity was related to better mental health, but the relationship between bipolar, schizophrenia and religion was unclear (Bonelli & Koenig, 2013). Religiosity may promote better mental health by reducing existential or death anxiety (Baker et al., 2018; Menzies et al., 2019) and increasing emotional and social support (Hovey et al., 2014). However, Baker et al. (2018) found that paranoia was lower in atheists than religious individuals. Alsuhibani et al. (2020) proposed that religiosity and atheism, whilst negatively correlated, are not opposite ends of one construct, and only religiosity had a positive linear association with death anxiety. The relationship between religiosity and mental health is nuanced and the extent to which religious or atheist beliefs provide ideological certainty and community

participation could impact how protective it is (Baker et al., 2018). GDs often have religious themes (Smith et al., 2005), and therefore when religiosity fails to protect against death anxiety or provide a sense of meaning or purpose in life, it may become a risk factor for GDs.

Maintenance of GDs

It is important to understand how GDs are maintained as this can inform interventions (Knowles et al. 2011). Cognitive biases are considered to be crucial in the maintenance of delusions. Garety et al. (2013) found increased cognitive reasoning biases in individuals with GDs compared to those with PDs. Analytic reasoning involves the ability to reflect on a question and resist automatically responding based on immediate, but misleading, information (Evans & Curtis-Holmes, 2005). Trippas et al. (2015) found that poorer analytic reasoning, measured using the Cognitive Reflection Task (CRT), predicted increased motivated reasoning and belief bias. Alsuhibani et al. (2020) hypothesised that analytic reasoning may be involved the development of strongly held beliefs but found that it did not predict paranoia. However, Bronstein et al. (2019) found that reduced engagement in analytic reasoning and bias against disconfirmatory evidence was related to paranoid beliefs. Therefore, further research is required to establish whether analytic reasoning is associated with the development or maintenance of GDs or PDs.

Narcissism

Grandiose narcissism is characterised by overt arrogance and high explicit self-esteem (Paulhus & Williams, 2002). The mask model of narcissism has overlap with the delusion-as-defence account, as it proposes that inflated, but fragile, self-esteem develops to protect against shameful feelings of inferiority and low self-worth (Morf & Rhodewalt, 2001; Tracey & Robbins, 2003). Discrepancies between implicit and explicit self-esteem (Zeigler-Hill, 2006) and increased self-enhancement bias (Bosson et al., 2003) in narcissism, support the

mask model, but these findings have been inconsistent (Bosson et al., 2008). Instead, researchers have proposed that narcissism is related to specific aspects of self-esteem that are dependent on personal achievement and appearance, but not those concerning other's validation or approval (Kuchynka & Bosson, 2018; Zeigler-Hill et al., 2008). Despite overlaps in the narcissism and GDs literature, there are qualitative differences between them. Narcissism and GDs may defend against different aspects of low self-esteem or existential concerns. Isham et al. (2019) argue that GDs are not synonymous with superiority over others, which may be the case with narcissism, and GDs may instead provide a sense of meaning, connection, and validation from others. To the author's knowledge, the relationship between GDs and narcissism has not been investigated.

The current study: aims and hypotheses

Part one

The first study aimed to identify factors associated with grandiosity in the general population. The inconsistent findings regarding self-esteem with GDs and narcissism suggests there are potential shared and non-shared aetiologies. TMT research suggests that self-esteem protects against existential anxiety, and consequently existential anxiety may be associated with grandiosity, but not narcissism. Insecure attachment has been associated with paranoia, but this is unclear for grandiosity. Exploring the association between religiosity, atheism and grandiosity and paranoia could enhance our understanding of whether they are important cultural factors that are similarly or differently associated with GDs and PDs. Additionally, it is unclear whether analytic reasoning is associated with grandiosity or paranoia in the general population, or whether it becomes poorer once the delusional belief has developed. Therefore, the study aimed to measure the above variables' differential association with grandiosity and paranoia.

The primary hypotheses were:

1. When controlling for paranoia, grandiosity will be significantly associated with insecure attachment, high self-esteem, existential anxiety, religiosity, atheism, and low analytic reasoning, but not high narcissism.

2. When controlling for grandiosity, paranoid beliefs will be significantly associated with insecure attachment, low self-esteem and analytic reasoning, and high existential anxiety, religiosity, and atheism, but not high narcissism.

Part two

If GDs provide a sense of meaning, they may develop partly to protect the self from existential fears of death or living a meaningless life. If grandiosity reflects a defensive strategy, individuals with higher grandiosity and self-esteem may unconsciously respond to existential threats by boosting their grandiose beliefs and self-esteem. A between-subjects TMT experimental manipulation was conducted, in which participants were primed to think about their mortality or a control topic (dental pain).

When primed to think about death, compared to dental pain, it was hypothesised that:

3. Participants with higher baseline grandiose beliefs will show a greater attempt to increase their grandiose beliefs.

4. Participants with higher baseline self-esteem will show a greater attempt to increase their self-esteem.

Method

Design

Part one was an online cross-sectional survey with grandiosity and paranoia as the continuous dependent variables. There were nine independent variables: attachment anxiety, attachment avoidance, positive self-esteem, negative self-esteem, analytic reasoning, existential anxiety, religiosity, atheism, and narcissism.

Part two was an online experimental study with an independent groups design. The independent variable was mortality salience (MS) or dental pain control and baseline grandiose beliefs and self-esteem scores were the covariates. Changes in grandiosity and self-esteem scores from pre- to post- experimental manipulation were the between-subjects dependent variables.

Ethical Considerations

Ethical approval was gained from the Department of Psychology University research ethics committee (Appendix A). Data was stored in a password protected file and email addresses were stored securely and deleted after data collection was completed. Upon completion of the study, participant's data was cleared from Qualtrics.

The study may have evoked distress as participants were asked to think about personal topics including death, self-esteem, and paranoid and grandiose beliefs. Participants were made aware of this beforehand to ensure informed consent to participate and advised to contact the researcher or mental health services if required.

In line with the British Psychological Society (2014) ethical guidelines, participants were able to opt into a prize draw for a £25 voucher for each study. In the first study, 222 participants entered the price draw, and 326 participants entered in the second study. Prizes

were awarded to randomly selected participants on 5th January and 8th February 2021, respectively.

Participants & recruitment

The only exclusion criteria were participants under the age of 18 and those unable to read English. Opportunity sampling was used, and the studies were advertised on social media, the university volunteers list, and research recruitment website 'Call for Participants' (adverts shown in Appendix B and C). To increase the diversity of the sample and range of grandiose beliefs, enriched sampling methods were used by advertising through mental health charities (including Peer Talk and Mind) and social media accounts aimed at people from racially minoritized backgrounds (such as Taraki, who work with Punjabi communities, the Muslim Counsellor Network, and Time to Talk Black). All data was collected between June 2020 and January 2021.

Sample size calculations

As the survey had a total of 13 predictor variables, an *a priori* power analysis was calculated using G*Power Version 3. For a linear regression fixed model (R^2 increase), with a medium effect size ($F^2 = 0.15$), an alpha of 0.05, and power of 0.80, a sample size of 173 was required. In line with attrition rates in a recent online study (Alsuhibani, 2020), the sample size needed to account for attrition was 230.

An *a priori* power analysis was used for the online experimental design study, based on previous online MS studies which found a small effect size (Frischlich et al., 2015). Assuming a small effect size, an alpha of 0.05, with one independent variable and one covariate, a sample size of 393 participants was needed to achieve 80% power (Cohen, 1992). To account for attrition and 197 participants in each group, the sample size aimed for was 524.

Measures

Part one measures

Demographic Information. Participants were asked for information on their age, gender, ethnicity, religious identity, highest qualification, country of residence, and type of geographical location (Appendix D).

Specific Psychotic Experiences Questionnaire (SPEQ). Grandiosity and paranoia were measured using the subscales of the SPEQ which measures psychotic experiences in the general population (Ronald et al., 2014; Appendix E). The grandiosity subscale asks participants to rate how much they agree with eight items on a 4-point Likert scale from not at all to completely. Scores range from 0 to 24 with higher scores indicating more grandiosity, and the scale good internal consistency (α = .85) and test-retest reliability (r = .66). The paranoia subscale includes 15 items rated on a 6-point Likert scale of frequency. Possible scores range from 0 – 75 with higher scores indicating more paranoia, and the scale has good internal consistency (α = .93) and test re-rest reliability (*r* = .66; Ronald et al., 2014).

Relationship Questionnaire (RQ). Bartholomew and Horowitz's (1991) RQ measures attachment style (Appendix F). Participants are presented with four adult attachment styles (secure, preoccupied, dismissing and fearful) and select the description which best fits them and rate each style from 1 (not at all like me) to 7 (very much like me). The scale was calculated into two underlying dimensions, attachment anxiety and attachment avoidance (Griffin & Bartholomew, 1994). The scale has good internal consistency (α = .87-.95) and test-retest reliability (*r* = .44 - .68; Bartholomew & Horowitz, 1991; Herzberg et al., 1999).

Self-esteem Rating Scale Short Form (SERS-SF). The SERS-SF consists of two 10-point scales measuring positive and negative self-evaluations of social competence, problem-

solving ability, intellectual ability, and self-worth compared with others (Lecomte et al., 2006; Appendix G). Items are rated on a 7-point Likert scale ranging from never (1) to always (7). Scores are calculated by summing the items and a separate score for positive and negative self-esteem was used for the survey (scores ranged from 10 – 70). The positive and negative subscales have good internal consistency (α = .91 and .87, respectively) and test-retest reliability (r = .90 and r = .91, respectively; Lecomte et al., 2006).

Existential Anxiety Questionnaire (EAQ). The EAQ measures existential anxiety, covering three domains: fate and death, meaningless and emptiness, and guilt and condemnation (Weems et al., 2004; Appendix H). Participants state whether 13 items regarding existential concerns are true or false for them. Scores range from 0 to 13 and higher scores indicate more existential anxiety. The EAQ has good internal consistency (α = .71-.76) and test–retest reliability (r = .72).

Cognitive Reflection Task (CRT). An expanded version of Frederick's (2005) CRT which included 10 multiple choice items was used (Alsuhibani, 2020; Appendix I). Participants gain a score of one for each correct answer, therefore scores range from 0 to 10. The CRT has good internal consistency (α = .7; Alsuhibani, 2020). Items were presented separately with a 45 second timer so participants could not look up answers online.

Monotheist and Atheist Beliefs Scale (MABS). The MABS is an 18-item (11 religious items and 7 atheist items) measure of atheist and monotheist belief systems (Alsuhibani, 2020; Appendix J). Participants rate how much they agree with each item on a 5-point Likert scale and religiosity and atheism scores are calculated by summing the corresponding items. The religiosity and atheism scales have internal consistency (α = .96 and .79, respectively; Alsuhibani., 2020). Test re-test analysis has not yet been investigated.

Narcissistic Personality Inventory-16 (NPI-16). The NPI-16 is a 16-item self-report measure of trait narcissism (Ames et al., 2006; Appendix K). Participants are presented with 16 pairs of statements and asked to indicate which statement in each pair most closely describes their thoughts and beliefs. Scores range from 0 to 16 with higher scores indicating higher narcissism and it has good internal consistency (α = .72) and test-retest reliability (r = .90; Ames et al., 2006).

COVID-19 questions. As the studies took place during the COVID-19 pandemic, participants were asked four questions regarding their anxiety about COVID-19, whether they or a loved one has had the virus, and the impact of the pandemic on their income (Appendix L).

Permissions to use measures. Permission was obtained to use the SPEQ, EAQ, NPI-16, MABS, and CRT. The SERS-SF and RQ are in the public domain and therefore do not require permission.

Part two measures

Measures used in the experimental study included the demographic information, SPEQ grandiosity subscale, SERS-SF total scores, COVID-19 questions, and the following tasks:

Mortality Attitudes Personality Survey. The mortality attitudes personality survey was used as the MS prime (Rosenblatt et al., 1989; Appendix M). Participants were asked to write about what they think will happen to them when they die and what emotions they feel when thinking about their death. The control condition asked participants to write about the experience of visiting the dentist and dental pain.

Filler task. The effect of MS is greater when there is a longer delay before completing the dependent variable (Burke et al., 2010). Participants were asked to read "The Growing Stone" passage (Camus, 1957), which is commonly used as a filler task following MS primes (Greenberg et al., 1994). Participants were asked to rate the descriptive qualities of the study and whether they thought the author was male or female (Appendix N).

Public and Patient Involvement

Before the main recruitment, feedback on the acceptability of the studies was gained from three participants via email. This resulted in changing the survey title and removal of a repeated question.[1]

Procedure

Part one

The online survey was hosted on Qualtrics. Interested participants were presented with the study information sheet (Appendix O) and informed consent sheet (Appendix P) on the first page. When consent was given, participants were asked to provide their demographic information (Appendix D) followed by the above questionnaires, of which the orders were randomised. Upon completion, participants were debriefed sheet and given the option of entering the prize draw for a £25 Amazon voucher (Appendix Q). Participants were asked to provide their email address if they consented to being contacted to complete another study. These participants were emailed an anonymous ID number and link to the online experiment two to four weeks later so that their results from both studies could be linked.

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1 The initial title of the survey was confusing and unclear therefore it was changed from "Investigating the relationship between personal characteristics that are associated with how people think about themselves and the world" to "What personal characteristics are associated with holding fixed beliefs?".

Part two

The experiment was hosted on Qualtrics. Participants were provided with an information sheet (Appendix R), informed consent sheet (Appendix P), and the demographic questions (Appendix D). All participants completed the SPEQ grandiosity scale and SERS-SF. Participants were randomised to one of two conditions in which they were either asked to write a short passage about how they feel about their own death (MS condition), or how they feel about visiting the dentist and experiencing dental pain (control condition; Appendix M). Dental pain has been an effective negative control topic in TMT research, as it is argued that the threat of death is qualitatively different to other negative threats (Burke et al., 2010). For some people, dental phobia may be so significant that it triggers thoughts of mortality, which would compound with the MS condition. Therefore, participants were asked at the end, "How much anxiety does visiting the dentist cause you?" on an 8-point Likert scale and participants that scored eight were excluded from the dental control group.

To promote effectiveness of the MS manipulation online, participants were required to write a minimum number of characters before completing the filler task (Appendix N), followed by the SPEQ grandiosity and SERS-SF scales again. Finally, participants were debriefed and invited to enter the prize draw (Appendix S).

Data analysis

Data analysis was conducted using Statistical Package for the Social Sciences (SPSS; Version 25). All data was checked for missing values, errors, duplicate entries, and consistent middle scorers. Missing items on questionnaires were imputed using the case mean substitution method by calculating the mean of the available items on the scale (Raymond, 1986). This is appropriate for small levels of missing data when items are closely related (Fox-Wasylyshyn & El-Masri, 2005). Missing items on the CRT were imputed as a score of

zero and hence counted as an incorrect answer. When complete measures were missing, this was assumed to be random and was accounted for by excluding cases listwise in the regression analyses (Little, 1992; Field, 2009). Participants were excluded if they had less than 80% completed data across all measures or if they completed the study in less than half the median time (to reduce the possibility of people not reading the questions properly). No errors were identified so outliers were not removed as it was assumed they reflected true scores (Field, 2009). Descriptive statistics were calculated for demographic variables and study variables, and reliability was calculated using Cronbach's alpha. As the studies had large sample sizes, the distribution of continuous variables was assessed using the skewness and kurtosis statistics and inspecting the histograms, P-P and Q-Q plots (Field, 2009).

Part one analysis

Hypotheses one and two were tested using two hierarchical multiple regression analyses with grandiosity and paranoia as the outcome variables. Relationships between the variables were explored using Pearson's correlational analyses. None of the predictor variables were significantly highly correlated (> .80) therefore the assumption of multicollinearity was met (Field, 2009). The histograms and P-P plots showed that the residuals were normally distributed, but the scatterplots and trend lines indicated that the assumption of homoscedasticity was violated. Therefore, a natural log transformation of the grandiosity and paranoia outcome variables was computed and used in the regressions (Field, 2009). The data then met the assumptions (Appendix T and U). The impact of COVID-19 was considered by conducting two additional multiple regressions with the COVID-19 variables (Appendix L).

Part two analysis

Hypotheses three and four were tested using two ANCOVAs to assess group differences (MS or dentist control) in changes in grandiose and self-esteem scores (post- minus pre-scores) following experimental manipulation. Pre- grandiose and self-esteem scores were entered as as covariates to investigate how much change in scores post- MS was explained by existing self-esteem or grandiosity. ANCOVA assumptions were met as there was normal distribution of residuals, independence of covariate and treatment effect, and homogeneity of regression slopes (Field, 2009). Two additional ANCOVAs were conducted with the COVID-19 variables as covariates and fixed factors.

Results

Part one

Sample characteristics

A total of 423 participants took part in the survey and the final sample included 327 participants (M = 37.3 years, 70% female). Participants with less than 80% data (n = 93) or whose completion time was less than half the median time (n = 76; only two of these different to those with less than 80% data) were excluded. One participant was judged to have completed the survey twice based on their IP address and demographic data, so their second dataset was removed. The sample was predominantly White British (88.7%), atheist or agnostic (59.3%), and highly educated (55% with a postgraduate qualification and a further 31.8% with a first degree) and living in the UK (93.3%). Sample characteristics are shown in Appendix V.

Missing data

Five complete measures (two CRT, two RQ, and one SPEQ grandiosity scale) were missing across the dataset. There were 56 missing items on the CRT and one missing item on the RQ and EAQ.

Descriptive statistics

Table 1 shows the descriptive statistics of the survey variables. There were no significant differences between completers and non-completers on demographic variables however, completers had significantly higher analytic reasoning scores ($t(354) = 2.61$, $p = .009$; Appendix W).

Table 1.

Descriptive statistics of survey measures

Scale	Participants (*n*)	Cronbach's alpha (α)	Mean	SD
Grandiosity (SPEQ)	326	.84	2.6	3.1
Paranoia (SPEQ)	327	.93	11.6	10.1
Narcissism (NPI-16)	327	.74	2.2	2.4
Existential Anxiety (EAQ)	327	.74	5.1	3.0
Attachment anxiety (RQ)	325	-	-1.3	4.1
Attachment avoidance (RQ)	325	-	0.0	3.9
Religiosity (MABS)	327	.95	25.7	11.6
Atheism (MABS)	327	.76	24.2	5.2
Analytic reasoning (CRT)	325	.70	3.9	2.4
Positive Self-esteem (SERS-SF)	327	.93	46.6	10.7
Negative Self-esteem (SERS-SF)	327	.93	30.9	11.9
COVID-19 anxiety	323	-	5.0	2.3

Correlations

Table 2 shows the correlations between variables. Grandiosity was strongly positively associated with narcissism, and had a positive association with paranoia, religiosity, and positive self-esteem. Grandiosity was negatively correlated with analytic reasoning and negative self-esteem. Paranoia was strongly associated with existential anxiety, attachment anxiety, and negatively associated with positive self-esteem.

Table 2.

Correlations between survey variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1 Grandiosity	1	**.19****	**.51****	-.06	-.11	**.24****	-.10	-.02	**-.11***	**.13***	**-.13***	-.03
2 Paranoia		1	.07	**.41****	**.20****	.09	.02	**.43****	.02	**-.41****	**.52****	.12
3 Narcissism			1	-.10	-.02	-.03	.02	-.08	.09	**.15****	**-.20****	-.10
4 Attachment Anxiety				1	**.15****	.04	-.10	**.44****	**.12***	**-.39****	**.51****	**.12***
5 Attachment Avoidance					1	**-.13***	**.14***	**.12***	**.12***	**-.35****	**.20****	-.08
6 Religiosity						1	**-.67****	.10	**-.29****	.01	.04	.09
7 Atheism							1	-.08	.11	-.01	-.03	-.03
8 Existential anxiety								1	.07	**-.40****	**.60****	**.20****
9 Analytic Reasoning									1	**-.12***	.08	-.01
10 Positive self-esteem										1	**-.50****	-.03
11 Negative self-esteem											1	**.16****
12 COVID anxiety												1

**p < .01, * p < .05

Stability of grandiosity and self-esteem

Participants were emailed the second study between 12 and 27 days after survey completion. Data from 92 participants who completed both studies was linked to assess the stability of grandiosity and self-esteem over time. There was a weak positive correlation between grandiosity scores on the survey and experiment (r = .48, p < .001) and a strong positive correlation between self-esteem scores (r = .91, p <.001).

Multiple regression analyses

Gender was entered as a categorical variable with 28.7% male participants (four participants reported their gender as 'other' or 'self-described' and these were treated as missing data in the regression analyses). Participants were split into either white (88.7%) or other/minority ethnic group which included Black, Asian, mixed or another ethnicity (two participants did not provide their ethnicity and these were treated as missing data).

The first regression analysis was conducted with SPEQ grandiosity log scores as the dependent variable. Age, gender, and ethnicity were entered simultaneously as predictor variables in the first block. The first model was significant (R^2_{adjusted} = .111, p < .001). To control for paranoia, the SPEQ paranoia scores were added into the second block, which improved the model, $F_{change}(1, 314) = 4.88$, p = .03, resulting in an increase in the variance in grandiosity accounted for (R^2_{adjusted} = .122, R^2_{change} = .01). The variables entered in the third block were attachment anxiety, attachment avoidance, existential anxiety, analytic reasoning, positive self-esteem, negative self-esteem, religiosity, atheism, and narcissism. The third block significantly improved the model, $F_{change}(9, 305) = 14.18$, p < .001, R^2_{change} = .256, generating a final, highly significant model, $F(13, 305) = 14.94$, R^2_{adjusted} = .363, p < .001. In the final model, age (β = -.01, p = .032), gender (β = .347, p < .001), ethnicity (β = .336, p = .006), paranoia (β = .134, p = .002), narcissism (β = .129, p < .001), and religiosity (β = .017, p < .001) were significantly associated with grandiosity.

Hierarchical regression was conducted with SPEQ paranoia log scores as the dependent variable. The first model with age, gender, and ethnicity, produced a significant model, (R^2 Adjusted = .094, $p < .001$). SPEQ grandiosity scores were controlled for in the second block which improved the model, $F_{change}(1, 314) = 4.88$, $p = .03$, resulting in an increase in the variance in paranoia accounted for (R^2 Adjusted = .105, R^2 change = .014). The remaining nine independent variables were entered into the third block which significantly improved the model, $F_{change}(9, 305) = 13.24$, $p < .001$, R^2 change = .24.8, generating a final, highly significant model, $F(13, 305) = 13.47$, $R^2_{adjusted} = .338$, $p < .001$. In the final model, age (β = -.01, $p = .001$), grandiosity (β = .22, $p = .002$), attachment anxiety (β = .04, $p = .008$), and negative self-esteem (β = .02, $p < .001$) were significantly associated with paranoia.

COVID-19

Two additional regressions were conducted with the COVID-19 questions entered into the second block (COVID-19 anxiety, self, or family infected, and lost income), after demographics, and none were significantly associated with grandiosity. Being infected with COVID-19 ($n = 51$) was significantly associated with paranoia ($\beta = .028$, $p = .036$).

Part two

Sample characteristics

A total of 525 participants took part in the experiment and the final sample included 421 participants, with 225 randomly assigned to the mortality salience condition and 196 in the control condition. Participants with less than 80% data ($n = 78$), who completed the survey too quickly ($n = 57$; 12 different to those with less than 80% data), scored eight on the dental anxiety question ($n = 13$), and entered text unrelated to the written task ($n = 1$) were excluded. The sample was predominantly white British (87.2%), atheist or agnostic (59.6%), and highly educated (48.5% with a postgraduate qualification and a further 28% with a first

degree) and living in the UK (91.9%). Appendix W shows the experiment sample characteristics.

Missing data

There were five missing items (two on the pre- SERS-SF and post- SERS-SF, and one on the post grandiosity scale).

Descriptive statistics

Table 3 shows the descriptive statistics for the grandiosity and self-esteem scales for each group pre- and post- experimental manipulation. The pre-and post- SPEQ grandiosity scale had good internal consistency (α = .83 and .86, respectively). The pre-and post- SERS-SF scale had good internal consistency (α = .94 and .95, respectively). Inspection of participant's written answers in both conditions showed that there was a high compliance rate (99.8%). There were no significant differences between completers and non-completers on demographic or study variables (Appendix Y).

Table 3

Descriptive statistics of experiment measures

	Mortality salience condition (n = 225)		Dental pain control condition (n = 196)		Total (n = 421)	
	M	SD	*M*	SD	*M*	SD
Pre- Grandiose	3.6	3.7	3.5	3.4	3.6	3.5
Post- Grandiose	3.4	3.8	3.3	3.4	3.3	3.6
Pre- Self-esteem	16.7	18.8	15.6	18.8	16.2	18.8
Post- Self-esteem	17.8	20.0	17.2	20.2	17.5	20.1

ANCOVA

Gender and ethnicity were entered as categorical fixed factors, and 23.5% of participants were male (data missing for six participants) and 87.2% of participants were white (data missing for two participants). ANCOVA was carried out on the grandiose change scores (post- minus pre-scores) using pre- grandiose scores and age as covariates. There was no significant effect of group, $F(1, 403) = 3.27$, $p = .07$, but grandiosity reduced in the dental pain group ($M = -.37$, SE = .11, CI = -.588, -.14) but not in the MS group ($M = .02$, SE = .02, CI = -.25, .30). There was a significant effect of pre-grandiose scores, $F(1, 403) = 5.27$, p = .02, $n_p^2 = .013$, and age, $F(1, 403) = 8.75$, $p < .005$, , $n_p^2 = .021$, as younger participants β = -.01, $p = .003$) and those with a lower baseline grandiosity (β = -.04, $p = .02$) showed greater decreases in grandiosity. There was a significant effect of gender, $F(1, 403) = 4.11$, $p = .04$, $n_p^2 = .01$, as grandiosity significantly decreased in females ($M = -3.65$, SE = .11, CI = -5.88, -.12) but not males ($M = .05$, SE = .17, CI = -.28, .38). There was no significant effect of ethnicity, $F(1, 403) = .36$, $p = .55$. There was a significant interaction between group and gender, $F(1, 403) = 4.09$, $p = .04$, as grandiosity decreased in males in the dental pain group ($M = -.34$, SE = .23, CI = -.80, .12) but not in the MS group ($M = .43$, SE = .24, CI = -.41, .91). There was a significant interaction between group and ethnicity, $F(1, 403) = 4.7$, $p = .03$, as grandiosity decreased in non-white participants in the dental pain group ($M = -.50$, SE = .28, CI = -1.04, .04) but not in the MS group ($M = .305$, SE = .26, CI = -.20, .81). As grandiose scores decreased in both groups, a paired t-test was carried out comparing scores before and after the intervention, which was significant, $t(420) = 4.49$, $p < .001$.

A second ANCOVA was conducted with self-esteem change scores (post- minus pre-scores) and pre- self-esteem scores as a covariate. There was no significant effect of group, $F(1, 403) = .20$, $p = .66$. There was a significant effect of pre- self-esteem scores, $F(1, 403) =$

16.09, $p < .001$, $n_p^2 = .038$, as participants with higher pre- self-esteem scores showed greater increases in self-esteem ($\beta = .05$, $p < .001$). There was no significant effect of age, $F(1, 403) = .06$, $p = .80$, gender, $F(1, 403) = 3.39$, $p = .07$, or ethnicity, $F(1, 403) = .54$, $p = .46$. As self-esteem scores increased in both groups, a paired t-test was carried out comparing scores before and after the intervention, which was significant, $t(420) = -6.50$, $p < .001$.

COVID-19

With changes in grandiosity as the dependent variable, there was a significant effect of family or a close one being infected, $F(1, 341) = 6.18$, $p = .01$, as participants whose family had been infected showed a greater decrease in grandiosity ($M = -.58$, SE = .16, CI = -.90, -.27) compared to those whose family had not ($M = .05$, SE = .15, CI = -.25, .35). There was no effect of COVID-19 variables with changes self-esteem as the dependent variable.

Discussion

This study aimed to test aspects of Knowles et al.'s (2011) model of grandiose delusions (GDs) and the application of Terror Management Theory (TMT) to the development of GDs. Part one investigated factors associated with grandiosity in a non-clinical population using an online survey. The first hypothesis was that higher levels of grandiosity would be associated with insecure attachment, high self-esteem, high existential anxiety, religiosity and atheism, low analytic reasoning, but not narcissism. This was not supported as self-esteem, existential anxiety, analytic reasoning, and insecure attachment were not significantly associated with grandiosity, but higher levels of religiosity and narcissism were. The second hypothesis was that paranoia would be associated with insecure attachment, low self-esteem and analytic reasoning, and high existential anxiety, religiosity, and atheism. This was partially supported as paranoia was significantly associated with high attachment anxiety and negative self-esteem. Additionally, grandiosity and paranoia were

significantly associated with each other. In terms of demographic variables, younger age, male gender, and non-white ethnicity were significantly associated with grandiosity, and younger age was associated with paranoia.

Part two aimed to use a mortality salience manipulation to test the third and fourth hypotheses that participants with higher baseline grandiosity and self-esteem would show a greater attempt to increase their grandiosity and self-esteem after being primed to think about their mortality, compared to an aversive control topic (dental pain). The third hypothesis was not supported as changes in grandiosity did not significantly differ between the groups, and overall grandiosity significantly decreased after both tasks. The fourth hypothesis was not fully supported as self-esteem significantly increased in both groups. However, increases in self-esteem were greater in participants with higher baseline self-esteem in both conditions. Participants that were younger, female, and had lower baseline grandiosity, showed a greater decrease in grandiosity.

The findings support the notion that grandiose beliefs exist on a continuum (Johns & van Os, 2001; Peters et al., 2004), as grandiose tems were endorsed by more than two thirds of both samples. The findings are consistent with past research indicating that paranoia is associated with negative self-esteem (Bentall et al., 2008; Garety et al., 2013; Pickering et al., 2008; Thewissen et al., 2011) and attachment anxiety (Carr et al. 2018; Lavin et al. 2020). Anxious attachment has been associated with paranoia due to the increased pre-occupation and worry about relationships and negative emotions experienced (Mikulincer & Shaver, 2015). Negative views of the self and attachment anxiety appear to mediate the relationship between childhood adversity and paranoia (Fowler et al., 2012; Freeman & Garety, 2014; Pickering et al., 2008; Sitko et al., 2014). There was no relationship between attachment styles and grandiosity. Recently, Wright et al. (2020) found that the relationship between childhood trauma and grandiosity was mediated by hallucinations. Dissociation is a coping

strategy used to avoid traumatic memories and has been associated with hallucinations (Read et al., 2003). It is possible that intrusive memories or images are part of the internal state change that precede GDs (Knowles et al., 2011; Tzemou & Birchwood, 2007). Therefore, other mechanisms, such as dissociation, could be more important than attachment style in mediating the relationship between adverse life experiences and GDs.

Religiosity may be a cultural factor that influences the appraisal of a positive internal state in Knowles et al.'s (2011) model. Higher levels of religiosity were associated with grandiosity which makes sense as religious themes are common in GDs (Ndetei & Vadher, 1984; Smith et al., 2005; Mohr et al., 2010). Suhail & Ghauri (2010) suggest this association could be because religiosity often involves a special connection with a higher power or God, a tendency to take personal credit for good events, and a coping mechanism for negative events. Bortolon et al. (2020) found that grandiosity consisted of four subtypes in a non-clinical sample, and religious subtypes were associated with increased preoccupation and negative impact. Religiosity can be a source of burden, suffering, and rejection (Mohr et al., 2010) as well as a positive coping strategy (Reger & Rogers, 2002; Suhail & Ghauri, 2010) for people experiencing psychosis. Religiosity could be a mechanism of reducing existential anxiety which may explain the lack of association between existential anxiety and grandiosity. The mechanisms in which religiosity may lead to GDs requires further investigation. It may be that in conjunction with other factors, such as paranoia, religiosity becomes a risk factor.

The association between paranoia and grandiosity suggests that the presence of one influences the development of the other (Knowles et al., 2011; Lake, 2008; Ronald et al., 2014), but it remains unclear whether this is through fluctuations in self-esteem. The correlational findings support research in which GDs were associated with higher self-esteem (Moritz et al., 2010; Smith et al., 2006), but self-esteem was not significantly associated with

grandiosity. This does not support the emotion-consistent account which suggests that GDs develop from positive self-views. However, the findings of the second study suggest that aspects of self-esteem are impacted by threats to the self, as self-esteem increased after thinking about aversive experiences.

Whilst the significant association between narcissism and grandiosity was unexpected, it is understandable given the overlaps in the grandiosity and grandiose narcissism literature (Cain et al., 2008; Houlcroft et al., 2012). Grandiose narcissism is characterised by high fragile self-esteem which is contingent on traits in agentic domains that concern individual competition and appearance, rather than communal or moral traits (Bosson et al., 2008; Campbell et al., 2002). It is suggested that people high in narcissism are aware of this and seek out contexts in which they can demonstrate their individual agency and leadership in a functional way (Kuchnykcha & Bosson, 2018). Interestingly, Bortolon et al. (2020) found that grandiose subtypes relating to superiority (inflated self and attraction) were associated with less preoccupation and negative impact, than other subtypes (religiosity and fame). The findings suggest that religiosity may increase how special or important someone feels, but this may involve gaining other's approval, or being a good or virtuous person, rather than superiority over others. As Isham et al. (2019) highlighted, people who experienced GDs described them as providing a sense of purpose and meaning, but not necessarily superiority. Different subtypes of GDs could be associated with different factors, such as narcissism, and various levels of distress and functioning.

Cognitive biases have been associated with GDs (Garety et al., 2013; Knowles et al., 2011), but analytic reasoning was not significantly associated with grandiosity or paranoia, which is consistent with Batty et al.'s (2016) findings. This could be due to the sample being highly educated and completers had significantly higher analytic reasoning than non-completers. Additionally, it was a non-clinical sample and cognitive biases could increase

with delusion severity (Woodward et al., 2009). There was a negative association between analytic reasoning and religiosity, but only religiosity was significantly associated with grandiosity in this study. Mansell & Lam (2006) found that patients with a diagnosis of bipolar disorder were less likely to take on advice and feedback than controls when an elevated mood was induced. Additionally, Alatiq et al. (2010) found that remitted bipolar patients were more fearful of failure and believed they must actively respond when in a good mood. Therefore, analytic reasoning may become poorer when an individual is an elevated mood, and GDs may be more likely to develop then, which would support the affect regulation theory of bipolar (Tzemou & Birchwood, 2007).

The association between demographic variables and grandiosity could indicate potential risk factors for GDs. Consistent with past research (Lincoln & Keller, 2008; Pechey & Halligan, 2011), younger age was associated with higher levels of grandiosity and paranoia. The increased risk of developing delusions during early adulthood may reflect physiological, psychological, and social vulnerabilities at this developmental stage (Fusar-Poli et al., 2017; Verdoux et al., 1998). The significant association between male gender and grandiosity is consistent with other non-clinical (Ronald et al., 2014) and clinical studies (Allan & Hafner, 1989; Gutierrez-Lobos et al., 2001; Kala & Wig, 1982). In many cultures, it is desirable for men to have grandiose attributes (Allan & Hafner, 1989; Tateyama et al., 1998) and Tateyama et al. (1993) found males had significantly more GDs than females in a German sample. However, there were no gender differences in a Japanese sample, suggesting an interaction between gender, culture, and GDs. Being of a non-white ethnicity was also significantly associated with grandiosity. It is acknowledged that people of non-white ethnicity are not a homogenous group and there are issues with categorising participants into either white or non-white groups. Due to this study's low number of non-white participants (n = 35), it was not possible to categorise participants into more specific groups. GDs were more

frequent in Black patients (Liss et al., 2965) and Pakistani patients (Suhail & Cochrane, 2002), compared to white British and British Pakistani patients. Alternatively, Yamada et al. (2006) found GDs were more common in Euro-Americans compared to Latinos. Suhail & Cochrane (2002) proposed that the immediate environment influences delusional content and GDs in Pakistan could reflect wish-fulfilment due to the scarce resources and inequality. This could be applied to the current findings as people from racially minoritized backgrounds often experience social and economic disparities (The Centre for Social Justice, 2020). In the second study, non-white males were the only group whose grandiosity increased in the mortality salience condition. Grandiosity may increase in response to existential threats for some groups. However, this study had very few non-white males (n = 16) therefore future research is needed to investigate this. Models of GDs need to incorporate how aspects of a person's identity and environment influence their belief system and how they respond to different threats.

In the second, experimental study, there was no effect of mortality salience, and self-esteem significantly increased, and grandiosity decreased after participants thought about threatening experiences. It is possible that there was no effect of MS because dental pain was equally as aversive for some participants, but this was controlled for by removing participants with high dental anxiety. There is evidence that MS effects are stronger in studies conducted by the founders of TMT which suggests the phenomenon is less replicable than originally proposed and impacted by researcher bias (Yen & Cheng, 2013). Overall, the results do not support the hypothesis that grandiose beliefs develop due to increases in death or existential anxiety, which is consistent with Raune et al. (2006) who found that GDs were negatively associated with loss events. Threatening experiences may reduce people's sense of specialness and importance, particularly for females. Increases in self-esteem were greater for participants with higher baseline self-esteem, which suggests that self-esteem is protective

against anxiety more generally (Greenberg et al., 1992). Grandiosity also appears to be slightly less stable over time compared to self-esteem.

COVID-19

The inclusion of questions regarding the impact of COVID-19 on participant's anxiety, health, and income, allowed for these to be controlled for in the analyses. In the first study, the COVID-19 variables were not related to grandiosity but previously being infected with the virus was associated with increased paranoia. This is similar to Lopes et al. (2020) who found that a fear of COVID-19 and low political trust was associated with paranoia. This highlights the impact of people's social environment and experiences on paranoia (Stompe et al., 1999; Tateyama et al., 1998).

Strengths and limitations

Strengths of the studies included the large sample sizes and comparisons between non-completers and completers. Despite effort to increase the diversity of samples, they remained predominantly female, Western, educated, and from an industrialised, rich, and democratic country (Henrich et al., 2010) which does not represent the general population. The cross-sectional design means that conclusions cannot be reached about the causal direction of the relationships between the variables in the survey. However, the experimental manipulation study design enabled changes in grandiosity and self-esteem to be assessed and highlighted that these beliefs are influenced by threatening experiences and demographic factors.

The effect of covariates, including baseline grandiosity and self-esteem scores and demographic variables, were investigated and reported, despite finding no significant group effect in the experiment. This analysis approach was utilised to explore any possible effects of the covariates on the dependent variables which could inform future research. However,

there are limitations to this approach as any effects can be influenced by differences in the covariate populations and require different power calculations (Schneider et al., 2015).

Clinical implications and future directions

Religiosity and narcissism may be important factors to consider in assessment and formulations of GDs. Replication in more diverse populations is required. Future research would benefit from analysing the association between subtypes of grandiosity and self-esteem (agentic vs. communal). Narcissism may be related to aspects of grandiosity concerning an inflated sense of self and superiority, which does not necessarily negatively impact the person's life. Whereas religiosity may be involved in the development of GDs about religion or fame, which may provide a sense of purpose and meaning to life but lead to increased preoccupation and negative responses from others. It would also be useful to explore the relationship between grandiosity and paranoia, for example by investigating how someone appraises their grandiosity. Higher baseline self-esteem appeared to buffer against experiences of threat, therefore interventions that foster self-esteem may be beneficial.

Conclusions

The first study investigated factors associated with grandiosity and found that narcissism, religiosity, and paranoia, as well as younger age, male gender, and non-white ethnicity were significantly associated with grandiosity. Younger age, grandiosity, negative self-esteem, and attachment anxiety were significantly associated with paranoia. After thinking about threatening experiences, self-esteem increased, and this was more pronounced for participants with higher baseline self-esteem, whereas grandiosity decreased, primarily in females. Future studies should replicate these findings in clinical populations and extend them by investigating subtypes of GDs.

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Appendices

Appendix A. Ethical Approval

The University Of Sheffield.

Downloaded: 10/11/2020
Approved: 26/02/2020

Sophie Collin
Registration number: 180156988
Psychology
Programme: DClinPsy

Dear Sophie

PROJECT TITLE: Investigating Predictors of Grandiose Beliefs, and the effect of Mortality Salience on Self-esteem Grandiose Beliefs
APPLICATION: Reference Number 031805

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 26/02/2020 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 031805 (form submission date: 17/02/2020); (expected project end date: 31/05/2021).
- Participant information sheet 1074149 version 3 (10/05/2020).
- Participant information sheet 1074150 version 3 (10/05/2020).
- Participant information sheet 1074151 version 1 (20/12/2019).
- Participant information sheet 1074152 version 1 (20/12/2019).
- Participant consent form 1074160 version 2 (17/02/2020).
- Participant consent form 1074161 version 2 (17/02/2020).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Your responsibilities in delivering this research project are set out at the end of this letter.

Yours sincerely

Thomas Webb
Ethics Administrator
Psychology

Appendix B. Online Survey Advert

ONLINE SURVEY

PARTICIPANTS NEEDED

The University Of Sheffield.

What personal characteristics are associated with holding fixed beliefs?

WHAT IS IT ABOUT?

Sometimes people develop fixed beliefs about themselves which are difficult to change, despite contradictory evidence. This can cause distress for the person and people around them. This study aims to investigate different personal characteristics that are associated with the development of fixed beliefs.

WHO CAN TAKE PART?

Anyone aged 18 or over and who can read and understand English.

WHAT DO I HAVE TO DO?

Complete an online survey taking approximately 30 minutes.

This project has been granted ethical approval from the University of Sheffield's Psychology Research Ethics committee.

Researcher contact details:

Sophie Collin (Trainee Clinical Psychologist)

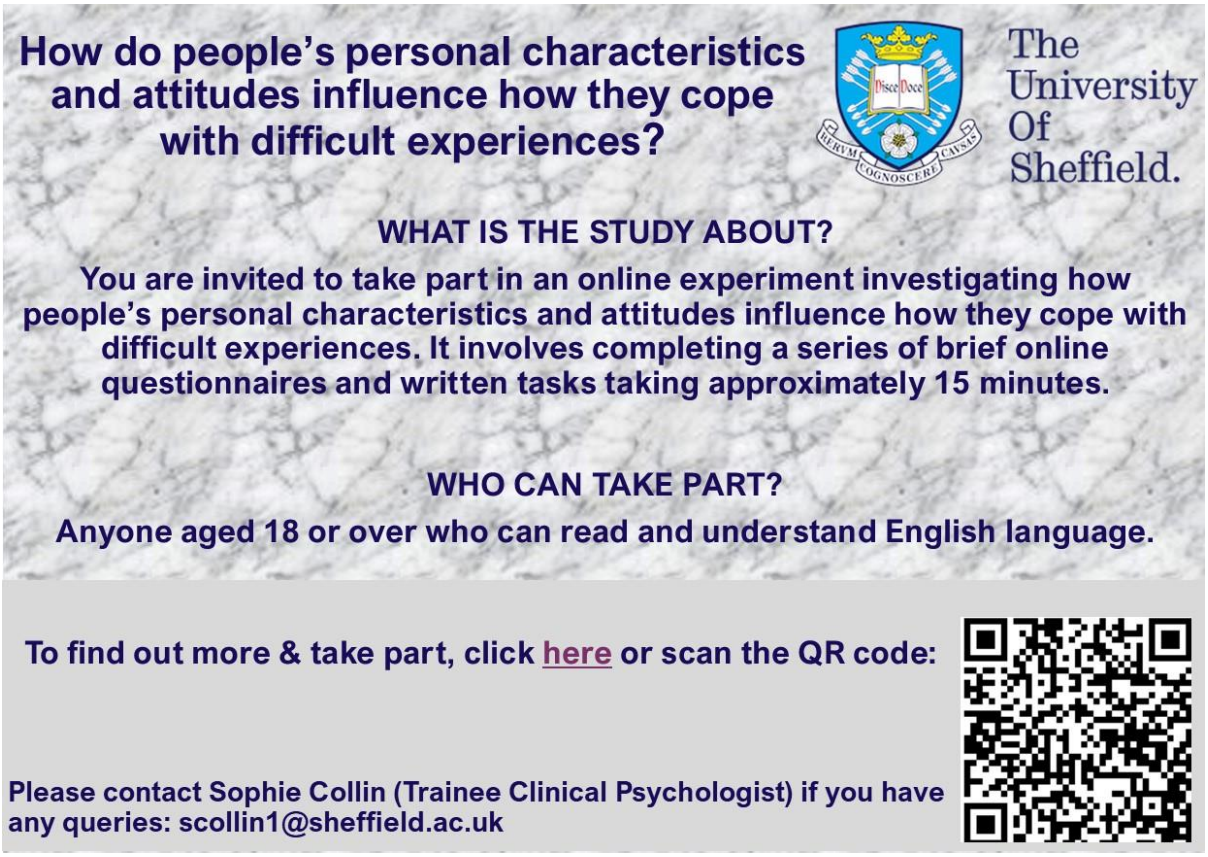
scollin1@sheffield.ac.uk

Amrit Sinha (Research support officer)

a.sinha@sheffield.ac.uk

Supervised by Professor Richard Bentall and Dr Georgina Rowse

Appendix C. Online Experiment Advert



Appendix D. Demographic Information

Age: .....

What country do you currently reside in?.....

What gender do you identify as?

- Male
- Female
- Other
- Prefer not to say
- Prefer to self-describe: ……..

Do you consider yourself to currently live in:

- A city
- A suburb of a city
- A town
- A rural area

Highest qualification:

- No qualifications
- O level/GCSE or similar
- A level or similar
- Technical qualification
- Undergraduate degree
- Diploma
- Postgraduate degree
- Other qualifications

Religious conviction (how would you classify your religious belief now?):

- Christian
- Muslim
- Jewish
- Hindu
- Buddhist
- Sikh
- Atheist
- Agnostic
- Other: ……

What is your ethnic group?

- White
- Mixed or multiple ethnic groups
- Black, Black African, Black Carribean
- Asian or Asian British
- Another ethnic group
- Prefer not to say

Appendix E. Specific Psychotic Experiences Questionnaire (SPEQ)

This measure has been redacted for copyright reasons.

Ronald, A., Sieradzka, D., Cardno, A. G., Haworth, C. M. A., McGuire, P., & Freeman, D. (2014). Characterization of psychotic experiences in adolescence using the specific psychotic experiences questionnaire: findings from a study of 5000 16-year-old twins. Schizophrenia Bulletin, 40(4), 868–877. https://doi.org10.1093/schbul/sbt106

Appendix F. Relationship Questionnaire (RQ)

1. The following are descriptions of four general relationship styles that people often report. Please read each description and **CIRCLE** the letter corresponding to the style that *best* describes you or is *closest* to the way you generally are in your close relationships:

A. It is easy for me to become emotionally close to others. I am comfortable depending on them and having them depend on me. I don't worry about being alone or having others not accept me.

B. I am uncomfortable getting close to others. I want emotionally close relationships, but I find it difficult to trust others completely, or to depend on them. I worry that I will be hurt if I allow myself to become too close to others.

C. I want to be completely emotionally intimate with others, but I often find that others are reluctant to get as close as I would like. I am uncomfortable being without close relationships, but I sometimes worry that others don't value me as much as I value them.

D. I am comfortable without close emotional relationships. It's very important to me to feel independent and self-sufficient, and I prefer not to depend on others or have others depend on me.

2. Please rate each of the following relationship styles according to the *extent* to which you think each description corresponds to your general relationship style.

A. It is easy for me to become emotionally close to others. I am comfortable depending on them and having them depend on me. I don't worry about being alone or having others not accept me.

B. I am uncomfortable getting close to others. I want emotionally close relationships, but I find it difficult to trust others completely, or to depend on them. I worry that I will be hurt if I allow myself to become too close to others.

C. I want to be completely emotionally intimate with others, but I often find that others are reluctant to get as close as I would like. I am uncomfortable being without close relationships, but I sometimes worry that others don't value me as much as I value them.

D. I am comfortable without close emotional relationships. It's very important to me to feel independent and self-sufficient, and I prefer not to depend on others or have others depend on me.

	not at all like me			*some-what like me*			*very much like me*
style A	*1*	*2*	*3*	*4*	*5*	*6*	*7*
style B	*1*	*2*	*3*	*4*	*5*	*6*	*7*
style C	*1*	*2*	*3*	*4*	*5*	*6*	*7*
style D	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Bartholomew, K., & Horowitz, L. (1991). Attachment Styles Among Young Adults: A Test of a Four-Category Model. *Journal of Personality and Social Psychology, 61*(2), 226–244. https://doi.org/10.4324/9781351153683-17

Appendix G. Self-Esteem Rating Scale Short Form (SERS-SF)

This questionnaire is designed to measure how you feel about yourself. It is not a test, so there are no right or wrong answers. Please answer each item carefully and accurately as you can by using the following scale:

1 = Never
2 = Rarely
3 = A little of the time
4 = Some of the time
5 = A good part of the time
6 = Most of the time
7 = Always

1. ___ I feel that others do things much better than I do.
2. ___ I feel confident in my ability to deal with people.
3. ___ I feel that I am likely to fail at things I do.
4. ___ I feel that people really like to talk with me.
5. ___ I feel that I am a very competent person.
6. ___ When I am with other people, I feel that they are glad I am with them.
7. ___ I feel that I make a good impression on others.
8. ___ I feel confident that I can begin new relationships if I want to.
9. ___ I feel ashamed about myself.
10. ___ I feel inferior to other people.
11. ___ I feel that my friends find me interesting.
12. ___ I feel that I have a good sense of humor.
13. ___ I get angry at myself over the way I am.
14. ___ My friends value me a lot.
15. ___ I am afraid I will appear stupid to others.
16. ___ I wish I could just disappear when I am around other people.
17. ___ I feel that if I could be more like other people then I would feel better about myself.
18. ___ I feel that I get pushed around more than others.
19. ___ I feel that people have a good time when they are with me.
20. ___ I wish that I were someone else.
21.

Lecomte, T., Corbière, M., & Laisné, F. (2006). Investigating self-esteem in individuals with schizophrenia: Relevance of the Self-Esteem Rating Scale-Short Form. *Psychiatry Research*, *143*(1), 99–108. https://doi.org/10.1016/j.psychres.2005.08.019

Appendix H. Existential Anxiety Questionnaire (EAQ)

YES NO	1. I often think about death and this causes me anxiety.
YES NO	2. I am not anxious about fate because I am resigned to it. . (R)
YES NO	3. I often feel anxious because I am worried that life might have no meaning.
YES NO	4. I am not worried about nor think about being guilty. . (R)
YES NO	5. I often feel anxious because of feelings of guilt.
YES NO	6. I often feel anxious because I feel condemned.
YES NO	7. I never think about emptiness. . (R)
YES NO	8. I often think that the things that were once important in life are empty.
YES NO	9. I never feel anxious about being condemned. . (R)
YES NO	10. I am not anxious about death because I am prepared for whatever it may bring. . (R)
YES NO	11. I often think about fate and it causes me to feel anxious.
YES NO	12. I am not anxious about fate because I am sure things will work out. (R)
YES NO	13. I know that life has meaning. (R)

(R): Reverse item

Weems, C. F., Costa, N. M., Dehon, C., & Berman, S. L. (2004). Paul Tillich's theory of existential anxiety: A preliminary conceptual and empirical examination. *Anxiety, Stress and Coping*, *17*(4), 383–399. https://doi.org/10.1080/10615800412331318616

Appendix I. Multiple Choice Cognitive Refection Task (CRT)

1. A bat and a ball cost £1.10 in total. The bat costs £1.00 more than the ball. How much does the ball cost?

- 10 pence
- 1 pence
- 5 pence
- 9 pence

2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

- 5 minutes
- 500 minutes
- 100 minutes
- 20 minutes

3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

- 24 days
- 12 days
- 36 days
- 47 days

4. If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together?

- 4 days
- 9 days
- 12 days
- 3 days

5. Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are in the class?

- 29 students
- 1 student
- 15 students
- 30 students

6. A man buys a pig for £60, sells it for £70, buys it back for £80, and sells it finally for £90. How much has he made?

- 30 pounds
- 10 pounds
- 20 pounds
- 0 pounds

7. Simon decided to invest £8,000 in the stock market one day early in 2008. Six months after he invested, on July 17, the stocks he had purchased were down 50%. Fortunately for Simon, from July 17 to October 17, the stocks he had purchased went up 75%. At this point, Simon:

- it cannot be determined
- has broken even in the stock market
- is ahead of where he began
- has lost money

8. If you're running a race and you pass the person in second place, what place are you in?

- 2nd
- 4th
- 3rd
- 1st

9. A farmer had 15 sheep and all but 8 died. How many are left?

- 7
- 6
- 8
- 9

10. How many cubic feet of dirt are there in a hole that is 3' deep x 3' wide x 3' long?

- 0
- 9
- 3
- 27

Alsuhibani, A. (2020). *The Nature of Strong Belief* (Doctoral dissertation, University of Liverpool). https://livrepository.liverpool.ac.uk/3117600/

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic perspectives*, *19*(4), 25-42. https://doi.org/10.1257/089533005775196732

Appendix J. Monotheist and Atheist Beliefs Scale (MABS)

Please rate the extent to which you agree or disagree with the following statements:
1: strongly disagree; 2: disagree; 3: neither agree or disagree; 4: agree; 5: strongly agree.

1. The soul is immortal.
2. A higher power really exists.
3. Religious beliefs will ultimately be replaced by scientific theories.
4. The idea of God is a delusion.
5. God has revealed his plan to us in holy books.
6. We can communicate directly to God by praying.
7. Sometimes it is possible for human beings to feel the presence of God.
8. Belief in gods has been the source of great misery to humankind
9. Moral judgement should be based on respect for humanity rather than religious doctrine.
10. There is nothing in the universe that cannot be explained by scientific laws.
11. God or something divine sometimes interferes in the affairs of human beings.
12. Praying to God is a waste of time.
13. God sometimes reveals his will directly to human beings.
14. There is an afterlife (immortality of the soul, resurrection of the dead or reincarnation).
15. It is wrong to indoctrinate children into a religion.
16. God is aware of everything we do.
17. God hears the prayers of human beings.
18. Our fate in the life hereafter is determined by our deeds on Earth.

Alsuhibani, A. (2020). *The Nature of Strong Belief* (Doctoral dissertation, University of Liverpool). https://livrepository.liverpool.ac.uk/3117600/

Appendix K. Narcissistic Personality Inventory-16 (NPI-16)

Read each pair of statements below and place an "X" by the one that comes closest to describing your feelings and beliefs about yourself. You may feel that neither statement describes you well, but pick the one that comes closest. **Please complete all pairs**.

1. ___ I really like to be the center of attention
   ___ It makes me uncomfortable to be the center of attention

2. ___ I am no better or no worse than most people
   ___ I think I am a special person

3. ___ Everybody likes to hear my stories
   ___ Sometimes I tell good stories

4. ___ I usually get the respect that I deserve
   ___ I insist upon getting the respect that is due me

5. ___ I don't mind following orders
   ___ I like having authority over people

6. ___ I am going to be a great person
   ___ I hope I am going to be successful

7. ___ People sometimes believe what I tell them
   ___ I can make anybody believe anything I want them to

8. ___ I expect a great deal from other people
   ___ I like to do things for other people

9. ___ I like to be the center of attention
   ___ I prefer to blend in with the crowd

10. ___ I am much like everybody else
    ___ I am an extraordinary person

11. ___ I always know what I am doing
    ___ Sometimes I am not sure of what I am doing

12. ___ I don't like it when I find myself manipulating people
    ___ I find it easy to manipulate people

13. ___ Being an authority doesn't mean that much to me
    ___ People always seem to recognize my authority

14. ___ I know that I am good because everybody keeps telling me so
    ___ When people compliment me I sometimes get embarrassed

15. ___ I try not to be a show off
    ___ I am apt to show off if I get the chance

16. ___ I am more capable than other people
    ___ There is a lot that I can learn from other people

Ames, D. R., Rose, P., & Anderson, C. P. (2006). The NPI-16 as a short measure of narcissism. Journal of Research in Personality, 40(4), 440–450. https://doi.org/10.1016/j.jrp.2005.03.00

Appendix L. COVID-19 Questions

1. How anxious are you about the coronavirus COVID-19 pandemic? Please indicate this on a scale of 1 - 10, where 1 = not anxious at all and 10 = extremely anxious.
2. Have you been infected by the coronavirus COVID-19?
    1. No. I have been tested for COVID-19 and the test was negative.
    2. No, I do not have any symptoms of COVID-19.
    3. I have a few symptoms of cold or flu but I do not think I am infected with the COVID-19 virus.
    4. I have the symptoms of the COVID-19 virus and think I may have been infected.
    5. I have been infected by the COVID-19 virus and this has been confirmed by a test.
    6. I may have previously been infected by COVID-19 but this was not confirmed by a test and I have since recovered.
    7. I was previously infected with COVID-19, this was confirmed by a test and I have now recovered.

Coding: No = 1, 2, 3; Yes = 4, 5, 6, 7

3. Has someone close to you (a family member or friend) been infected by the coronavirus COVID-19?
    1. No
    2. Someone close to me has symptoms, but I am not sure if that person is infected.
    3. Someone close to me has symptoms, and I suspect that person is infected.
    4. Someone who is close to me has had a COVID-19 virus infection confirmed by a doctor.

Coding: No = 1; Yes = 2, 3, 4

4. Some people have lost income because of the coronavirus COVID-19 pandemic, for example because they have not been able to work as much or because business contracts have been cancelled or delayed. Please indicate whether your household has been affected in this way.
    1. My household has lost income because of the coronavirus COVID-19 pandemic.
    2. My household has not lost income because of the coronavirus COVID-19 pandemic.
    3. I do not know whether my household has lost income because of the coronavirus COVID-19 pandemic.

Coding: No = 2; Yes = 1

Appendix M. Mortality Attitudes Personality Survey

On the following page are two open-ended questions, please respond to them with your first, natural response. We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

This assessment is a recently developed, innovative personality assessment. Recent research suggests that feelings and attitudes about significant aspects of life tell us a considerable amount about the individual's personality. Your responses to this survey will be content-analysed in order to assess certain dimensions of your personality. Your honest responses to the following questions will be appreciated.

Mortality salience condition (not shown to participant):

1. Please briefly describe the emotions that the thought of your own death arouses in you.
2. Jot down, as specifically as you can, what you think will happen to you as you physically die and once you are physically dead.

Dentist control condition (not shown to participant):

1. Please briefly describe the emotions that the thought of going to the dentist arouses in you.
2. Jot down, as specifically as you can, what the experience of dental pain feels like.

Rosenblatt, A., Greenberg, J., Solomon, S., Pyszczynski, T., & Lyon, D. (1989). Evidence For Terror Management Theory: I. The Effects of Mortality Salience on Reactions to Those Who Violate or Uphold Cultural Values. *Journal of Personality and Social Psychology*, *57*(4), 681–690. https://doi.org/10.1037/0022-3514.57.4.681

Appendix N. Filler Task

Opinion questionnaire: Please read the following short passage from a novel and answer the questions below it.

The automobile swung clumsily around the curve in the red sandstone trail, now a mass of mud. The headlights suddenly picked out in the night—first on one side of the road, then on the other—two wooden huts with sheet metal roofs. On the right near the second one, a tower of course beams could be made out in the light fog. From the top of the tower a metal cable, invisible at its starting point, shone as it sloped down into the light from the car before disappearing behind the embankment that blocked the road. The car slowed down and stopped a few yards from the huts.

The man who emerged from the seat to the right of the driver laboured to extricate himself from the car. As he stood up, his huge, broad frame lurched a little. In the shadow beside the car, solidly planted on the ground and weighed down by fatigue, he seemed to be listening to the idling motor. Then he walked in the direction of the embankment and entered the cone of light from the headlights. He stopped at the top of the slope, his broad back outlined against the darkness. After a moment he turned around. In the light from the dashboard, he could see the chauffeur's black face, smiling. The man signalled and the chauffeur turned off the motor. At once a vast cool silence fell over the trail and the forest. Then the sound of the water could be heard.

The man looked at the river below him, visible solely as a broad dark motion flecked with occasional shimmers. A denser motionless darkness, far beyond, must be the other bank. By looking fixedly, however, one could see on that still bank a yellowish light like an oil lamp in the distance. The big man turned back toward the car and nodded. The chauffeur switched off the lights, turned them on again, then blinked them regularly. On the embankment the man appeared and disappeared, taller and more massive each time he came back to life. Suddenly, on the other bank of the river, a lantern held up by an invisible arm back and forth several times. At a final signal from the lookout, the man disappeared into the night. With the lights out, the river was shining intermittently. On each side of the road, the dark masses of forest foliage stood out against the sky and seemed very near. The fine rain that had soaked the trail an hour earlier was still hovering in the warm air, intensifying the silence and immobility of this broad clearing in the virgin forest. In the black sky misty stars flickered.

How do you feel about the overall descriptive qualities of the story?

1 2 3 4 5 6 7 8 9

not at all very descriptive

Do you think the author of this story is male or female?

_____ male _____ female

Camus, A. (1957). Exile and the kingdom. Modern Library.

Greenberg, J., Pyszczynski, T., Solomon, S., Simon, L., & Breus, M. (1994). Role of Consciousness and Accessibility of Death-Related Thoughts in Mortality Salience Effects. Journal of Personality and Social Psychology, 67(4), 627–637. https://doi.org/10.1037/0022-3514.67.4.627

Appendix O. Part One Participant Information Sheet

The University Of Sheffield.

Participant Information Sheet

You are being invited to take part in a research project. Before you decide whether or to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

What is the purpose of the study?

Sometimes people develop fixed beliefs about themselves which are not amenable to change, despite contradictory evidence. This can cause distress for the person and people around them. This study aims to investigate different personal characteristics that are associated with holding fixed beliefs.

What does it involve?

The study involves completing some brief questionnaires about personal characteristics. It should take approximately 30 to 40 minutes to complete. The study may ask about topics which you find distressing therefore you should ensure you have the required time and privacy to complete the study. You will also be asked some brief questions about the impact of coronavirus (COVID-19) on you. You can exit the study at any time however, your data will only be saved if you complete the study.

What will happen to my data?

If you agree to take part, you will be asked if you would like to provide your email address for the researcher to send you a link to complete a second online experiment approximately 4 weeks later, which is linked to this study. You will also be asked if you would like to enter a prize draw for a £25 Amazon voucher.

If you provide your email address then it will be stored in a secure file which only the main researcher will have access to, and it will be deleted at the end of data collection (approximately December 2020). **No other personal identifiable information will be collected from you in this study.** All the information and data collected will be anonymous and stored confidentially.

The University of Sheffield will act as the Data Controller for this study. This means that the University is responsible for looking after your information and using it properly. To improve the transparency of psychological research, the anonymous data set may be made available for other authorised researchers to use for research purposes.

If you provide your email address and would like to withdraw your data from the research once you have completed the study, you can contact the researchers on the details below. If you do not provide your email address, then it will not be possible to remove your data from the study as the data will be anonymous.

Ethical approval

This project has been ethically approved via the University of Sheffield's Ethics Review Procedure, as administered by the psychology department.

Contact details for further information or questions

This research is being conducted by Sophie Collin, a Trainee Clinical Psychologist, as part of their doctoral training. This is supervised by Professor Richard Bentall and Dr Georgina Rowse (Clinical Psychologist).

You can email Sophie at scollin1@sheffield.ac.uk.
Alternatively, you can email a.sinha@sheffield.ac.uk or leave a telephone message with Amrit Sinha, Research Support Officer on: 0114 222 6650 and he will ask the trainee to contact you.

Please contact me if you have any further questions.
Thank you in advance.

Appendix P. Informed Consent Sheet for Both Studies

Participant Informed Consent Sheet

Please tick the appropriate boxes	**Yes**	**No**
Taking Part in the Project		
I have read and understood the project information sheet or the project has been fully explained to me. (If you will answer No to this question please do not proceed with this consent form until you are fully aware of what your participation in the project will mean.)		
I confirm that I am aged 18 years or above.		
I have been given the opportunity to ask questions about the project.		
I agree to take part in the project. I understand that taking part in the project will include completing a series of questionnaires online.		
I understand that my taking part is voluntary and that I can withdraw from the study at any time before 01/12/2020; I do not have to give any reasons for why I no longer want to take part and there will be no adverse consequences if I choose to withdraw.		
How my information will be used during and after the project		
I understand my personal details such as my email address will not be revealed to people outside the project.		
I understand and agree that other authorised researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.		
I understand and agree that other authorised researchers may use my data in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.		

Appendix Q. Part One Debrief

Thank you for taking part in this study.

The aim of the study was to investigate the role of factors associated with grandiose beliefs, including paranoia, self-esteem, narcissism, existential anxiety, attachment and cognitive reflection.

Grandiose beliefs can be described as fixed beliefs about having a great talent, power, wealth, ability or identity, which is not amenable to change despite conflicting evidence. Sometimes grandiose beliefs can strengthen and lead people to require support as they create distress or impact people's ability to function in day-to-day life. The above factors have been found to be important in the development of other strongly held beliefs. It is of interest to understand how grandiose beliefs develop and how they strengthen so we can better support people who experience difficulties because of them.

If you would like to know more or have any questions following the study, or would like to raise any concerns regarding this study, please contact the researcher, Sophie, or the research support officer on the details below.

The study asked some personal questions which may have been distressing. If you feel you need further support regarding your mental health, you can contact the support services below which are open 24/7.

Samaritans: 116 123
Sheffield Rethink Helpline: 0808 801 0440
NHS 111
You can also make an appointment with your GP.

Thank you for your participation.

Contact details:

You can email Sophie at: scollin1@sheffield.ac.uk.

Alternatively, you can email a.sinha@sheffield.ac.uk or leave a telephone message with Amrit Sinha, Research Support Officer on: 0114 222 6650 and he will ask the researcher to contact you.

A separate online experiment is being conducted. It would help our research if you could complete the experiment too. If you would like to be contacted to hear more about it, please leave your email below. If you take part in both, then your data from the studies will be linked.

If you would like to enter into a prize draw for a £25 Amazon voucher please provide your email address below. Your email address will be stored securely and confidentially and deleted when recruitment has ended.

Appendix R. Part Two Participant Information Sheet

Participant Information Sheet

You are being invited to take part in a research project. Before you decide whether or not to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

What is the purpose of the study?

To explore how people's personal characteristics and attitudes influence how they cope with difficult experiences.

What does it involve?

The study involves completing a series of brief online questionnaires and written tasks taking approximately 15 minutes. The study may ask about topics which you find distressing therefore you should ensure you have the required time and privacy to complete the study. You will also be asked some brief questions about the impact of coronavirus (COVID-19) on you. You can exit the study at any time however, your data will only be saved if you complete the study.

What will happen to my data?

If you provide your email address then it will be stored in a secure file which only the main researcher will have access to, and it will be deleted at the end of data collection (approximately December 2020). If you agree to take part, you will be asked if you would like to enter a prize draw for a £25 Amazon voucher.

No other personal identifiable information will be collected from you in this study; therefore, all the information and data collected will be anonymous and stored confidentially.

The University of Sheffield will act as the Data Controller for this study. This means that the University is responsible for looking after your information and using it properly. To improve the transparency of psychological research, the anonymous dataset may be made available for other authorised researchers to use for research purposes.

If you provide your email address and would like to withdraw your data from the research once you have completed the study, you can contact the researchers on the details below. If you do not provide your email address then it will not be possible to remove your data from the study as the data will be anonymous.

Ethical approval

This project has been ethically approved via the University of Sheffield's Ethics Review Procedure, as administered by the psychology department.

Contact details for further information or questions

This research is being conducted by Sophie Collin, a Trainee Clinical Psychologist, as part of their doctoral training. This is supervised by Professor Richard Bentall and Dr Georgina Rowse (Clinical Psychologist).

You can email Sophie at **scollin1@sheffield.ac.uk**

Alternatively, you can email **a.sinha@sheffield.ac.uk** or leave a telephone message with Amrit Sinha, Research Support Officer on: 0114 222 6650 and he will ask the trainee to contact you.

Please contact me if you have any further questions.
Thank you in advance.

Appendix S. Part Two Debrief

Thank you for taking part in this study.

The aim of the study was to investigate the role of existential anxiety in the development of grandiose beliefs.

Grandiose beliefs can be described as fixed beliefs about having a great talent, power, wealth, ability or identity, which are difficult to change despite conflicting evidence. Sometimes these can strengthen and lead people to require support as they create distress or impact people's ability to function in day-to-day life.

Research suggests that self-esteem and worldview beliefs protect against anxiety about death. Therefore, we aimed to investigate whether there would be a difference in self-esteem and grandiose belief scores after thinking about death for people who have beliefs that are more grandiose. It is of interest to understand how grandiose beliefs develop and how they strengthen in order to better support people who experience difficulties because of them.

If you would like to know more, have any questions, or would like to raise any concerns regarding this study, please contact the researcher on the details below.

The study asked some personal questions, which may have been distressing. If you feel you need further support regarding your mental health, you can contact the support services below which are open 24/7.

Samaritans: 116 123
Sheffield Rethink Helpline: 0808 801 0440
NHS 111
You can also make an appointment with your GP.

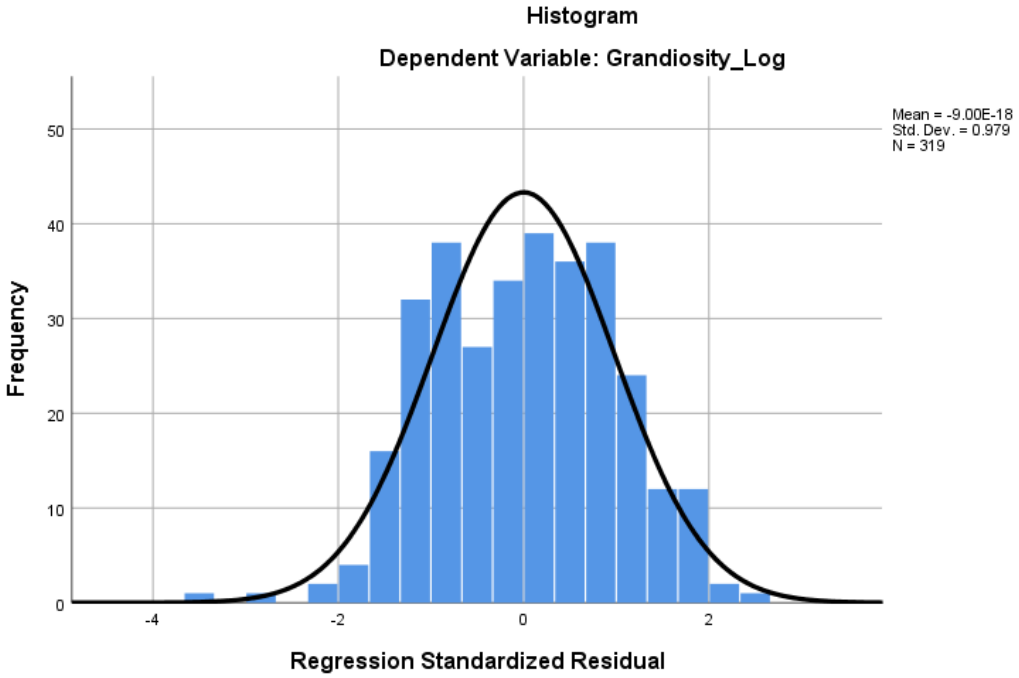
Thank you for your participation.

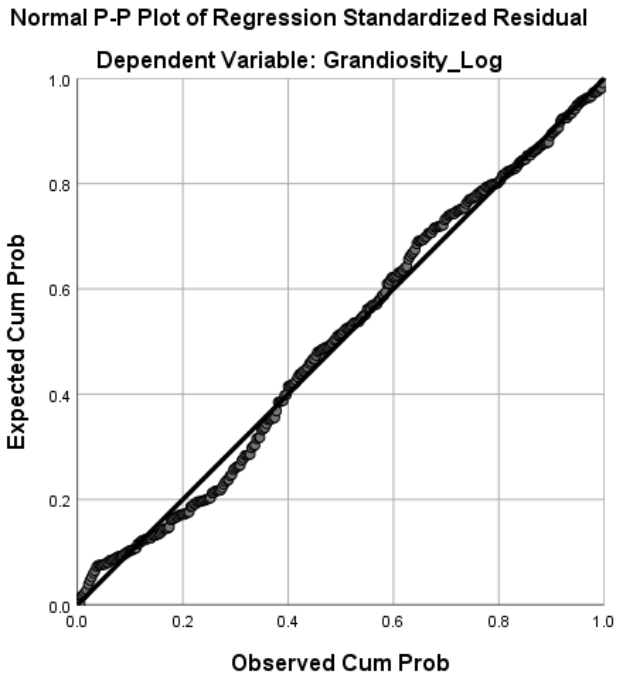
Contact details:
You can email Sophie at **scollin1@sheffield.ac.uk**

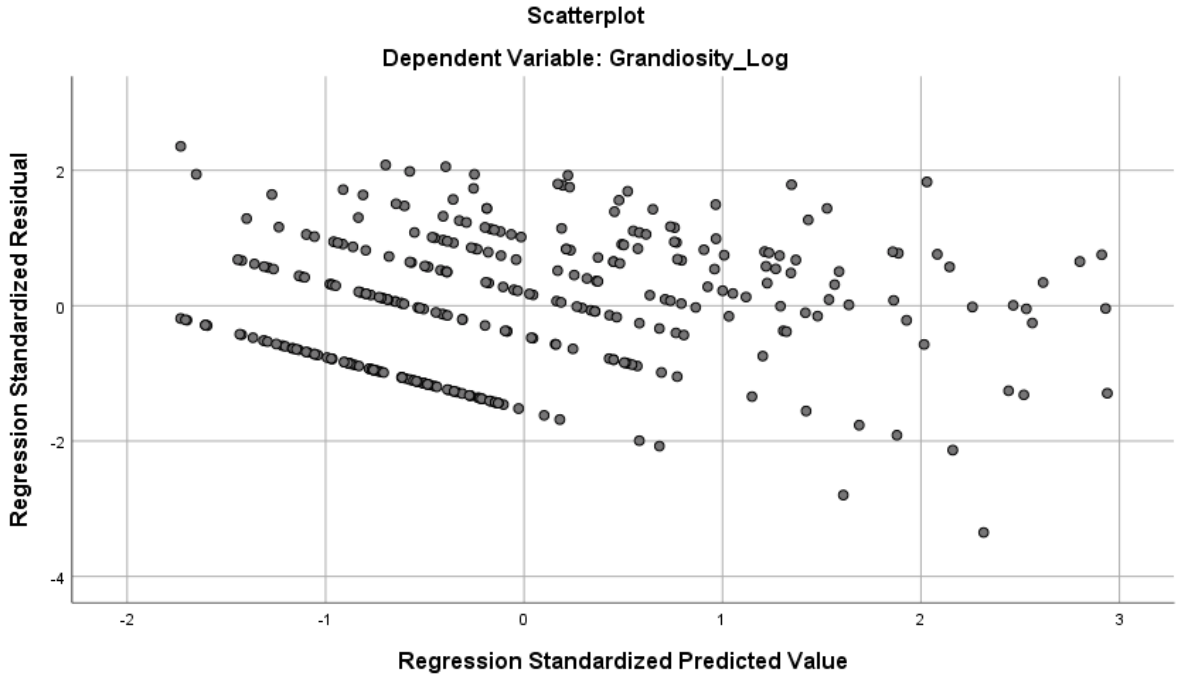
Alternatively, you can email **a.sinha@sheffield.ac.uk** or leave a telephone message with Amrit Sinha, Research Support Officer on: 0114 222 6650 and he will ask the researcher to contact you.

If you would like to enter into a prize draw for a £25 Amazon voucher please provide your email address below. Your email address will be stored securely and confidentially and deleted when recruitment has ended.

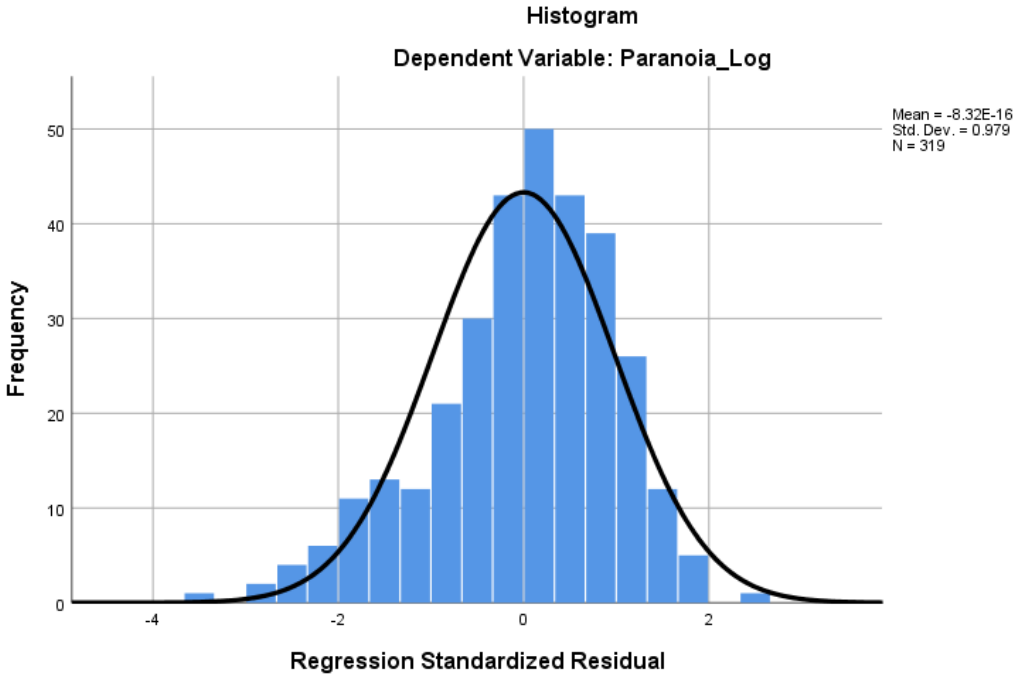
Appendix T. Histogram of standardised residuals, normal P-P plot of standardised residuals, and scatterplot of standardised residuals for Grandiosity (natural logarithm)

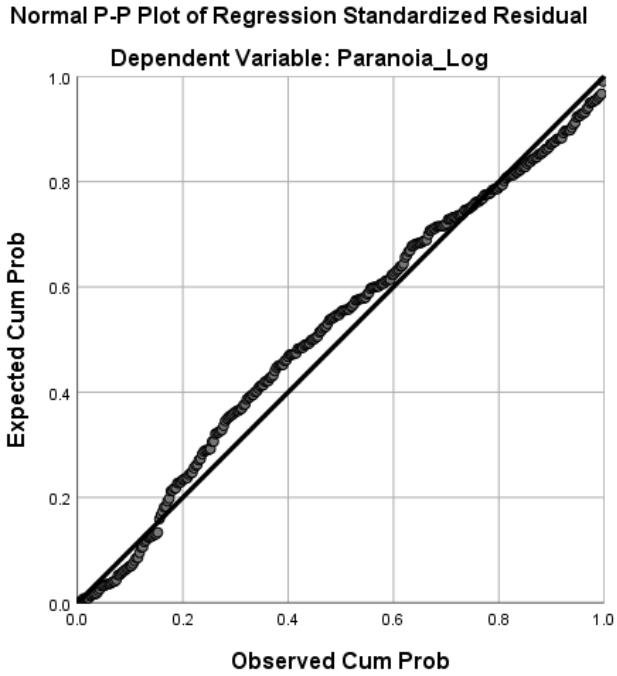


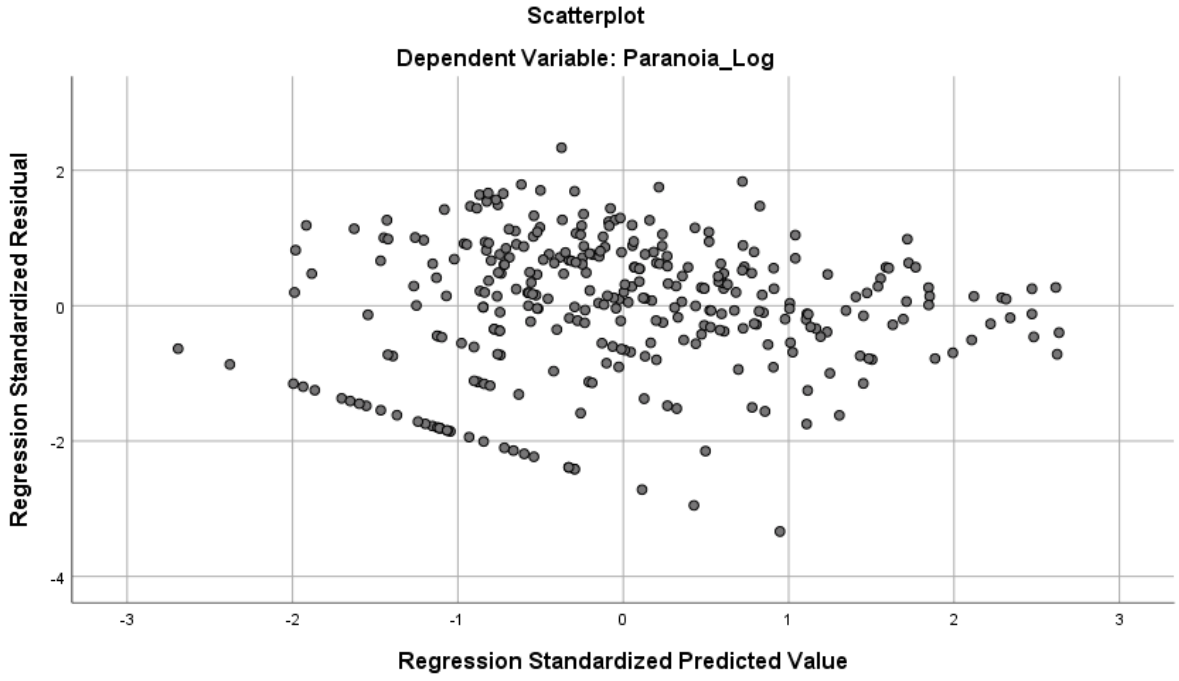



Scatterplot
Dependent Variable: Grandiosity_Log
Regression Standardized Residual
Regression Standardized Predicted Value
2
0
-2
-4
-2
-1
0
1
2
3

Appendix U. Histogram of standardised residuals, normal P-P plot of standardised residuals, and scatterplot of standardised residuals for Paranoia (natural logarithm)






Scatterplot
Dependent Variable: Paranoia_Log
Regression Standardized Residual
2
0
-2
-4
-3
-2
-1
0
1
2
3
Regression Standardized Predicted Value

Appendix V. Part One (survey) Sample Characteristics

Survey sample characteristics (n = 327)

Characteristics	Total, *n* (%)
Age	
Mean (SD)	37.27 (15.46)
Range	18 - 87
Gender	
Female	229 (70%)
Male	94 (28.7%)
Non-binary	3 (0.9%)
Other	1 (0.3%)
Ethnicity	
White	290 (88.7%)
Asian	17 (5.2%)
Mixed	11 (3.4%)
Black	2 (0.6%)
Another	5 (1.5%)
Prefer not to say	2 (0.6%)
Religion	
Atheist	136 (41.6%)
Christian	86 (26.2%)
Agnostic	58 (17.7%)
Muslim	10 (3%)
Hindu	2 (0.6%)
Buddhist	2 (0.6%)
Jewish	1 (0.3%)
Other	31 (9.5%)
Missing	1 (0.3%)
Highest qualification	
Postgraduate	144 (44%)
Undergraduate	104 (31.8%)
A level	32 (9.8%)
Diploma	19 (5.8%)
Technical	12 (3.7%)
GCSE/O level	8 (2.4%)
No qualification	3 (0.9%)
Other	5 (1.5%)
Country of residence	
United Kingdom	305 (93.3%)
France	4 (1.2%)
Australia	3 (0.9%)
China	2 (0.6%)
Greece	2 (0.6%)
Kenya	2 (0.6%)
Canada	1 (0.3%)
Finland	1 (0.3%)
Ireland	1 (0.3%)
Japan	1 (0.3%)

New Zealand	1 (0.3%)
Poland	1 (0.3%)
Romania	1 (0.3%)
Tunisia	1 (0.3%)
Missing	1 (0.3%)
Location type	
City	114 (34.8%)
Suburb of a city	59 (18%)
Town	101 (30.9%)
Rural	53 (16.2%)
Infected by COVID-19	
No	272
Yes	51
Missing	4
Family or close one infected by COVID-19	
No	204
Yes	119
Missing	4
Lost income due to COVID-19	
No	216
Yes	96
Unsure	11
Missing	4

Appendix W. Part One Completers vs. Non-completers Comparisons

A series of chi-square analyses showed that there were no significant differences between completers and non-completers on gender (χ^2 (1) = 2.59, p = .107), ethnicity (χ^2 (1) = 1.6, p = .21), religious identity (χ^2 (35) = 21.28, p = .22), qualification (χ^2 (42) = 34.23, p = .80), location (χ^2 (9) = 8.35, p = .50), or age (t(413) = .12, p = .90). A series of independent samples t-tests showed that there were no significant differences between completers and non-completers on grandiosity (t(350) = -1.67, p = .10), paranoia (t(347) = .13, p = .90), narcissism (t(352) = -.81, p = .42), existential anxiety (t(347) = -1.38, p = .17), attachment anxiety (t(340) = .33, p = .75), attachment avoidance (t(340) = -.34, p = .74), religiosity (t(345) = .29, p = .77), atheism (t(345) = .25, p = .80), positive self-esteem (t(344) = -.04, p = .97), or negative self-esteem (t(344) = .53, p = .59). Completers had significantly higher analytic reasoning scores (M = 3.9, SD = 2.4) than non-completers (M = 2.7, SD = 2.7), (t(354) = 2.61, p = .009).

Appendix X. Part Two (experiment) Sample Characteristics

Experiment sample characteristics (n = 421)

Characteristics	Total, *n* (%)	Group 1 (MS)	Group 2 (dentist control)
Age			
Mean (SD)	36.54 (14.93)	35.95 (14.77)	37.23 (15.11)
Range	18 - 78	18 – 78	18 - 76
Gender			
Female	316 (75.1%)	178 (79.1%)	138 (70.4%)
Male	99 (23.5%)	43 (19.1%)	56 (28.6%)
Prefer not to say	3 (0.7%)	2 (0.9%)	1 (0.5%)
Other	2 (0.5%)	2 (0.9%)	0
Non-binary	1 (0.2%)	0	1 (0.5%)
Ethnicity			
White	367 (87.2%)	194 (86.2%)	173 (88.3%)
Asian	30 (7.1%)	17 (7.6%)	13 (6.6%)
Mixed	12 (2.9%)	6 (2.7%)	6 (3.1%)
Black	5 (1.2%)	4 (1.8%)	1 (0.5%)
Another	5 (1.2%)	4 (1.8%)	1 (0.5%)
Prefer not to say	2 (0.5%)		2 (1%)
Religion			
Atheist	157 (37.3%)	83 (36.9%)	74 (37.8%)
Christian	102 (24.2%)	57 (25.3%)	45 (23%)
Agnostic	94 (22.3%)	46 (20.4%)	48 (24.5%)
Muslim	20 (4.8%)	12 (5.3%)	8 (4.1%)
Buddhist	9 (2.1%)	6 (2.7%)	3 (1.5%)
Hindu	3 (0.7%)	1 (0.4%)	2 (1%)
Jewish	2 (0.5%)	0	2 (1%)
Other	32 (7.6%)	19 (8.4%)	13 (6.6%)
Missing	1 (0.2%)	1 (0.4%)	0
Highest qualification			
Postgraduate	204 (99.8%)	118 (52.4%)	86 (43.9%)
Undergraduate	118 (28%)	61 (27.1%)	57 (29.1%)
A level	57 (13.5%)	29 (12.9%)	28 (14.3%)
Diploma	18 (4.3%)	6 (2.7%)	12 (6.1%)
Technical	6 (1.4%)	2 (0.9%)	4 (2%)
GCSE/O level	6 (1.4%)	3 (1.3%)	3 (1.5%)
No qualification	2 (0.5%)	1 (0.4%)	1 (0.5%)
Other	9 (2.1%)	5 (2.2%)	5 (2%)
Missing	1 (0.2%)	0	1 (0.5%)
Country of residence			
United Kingdom	387 (91.9%)	204 (90.7%)	183 (93.4%)
Greece	5 (1.2%)	2 (0.9%)	3 (1.5%)
USA	4 (1%)	3 (1.3%)	1 (0.5%)
France	3 (0.7%)	1 (0.4%)	2 (1%)
Germany	3 (0.7%)	3 (1.3%)	0
Canada	2 (0.5%)	1 (0.4%)	1 (0.5%)
Italy	2 (0.5%)	1 (0.4%)	1 (0.5%)

Australia	1 (0.2%)	0	1 (0.5%)
Bosnia	1 (0.2%)	1 (0.4%)	0
Indonesia	1 (0.2%)	1 (0.4%)	0
Ireland	1 (0.2%)	1 (0.4%)	0
New Zealand	1 (0.2%)	1 (0.4%)	0
Philippines	1 (0.2%)	1 (0.4%)	0
Serbia	1 (0.2%)	1 (0.4%)	0
Singapore	1 (0.2%)	0	1 (0.5%)
Spain	1 (0.2%)	1 (0.4%)	0
Sweden	1 (0.2%)	0	1 (0.5%)
Thailand	1 (0.2%)	1 (0.4%)	0
Tunisia	1 (0.2%)	1 (0.4%)	0
Missing	2 (0.5%)	1 (0.4%)	1 (0.5%)
Location type			
City	163 (38.7%)	93 (41.3%)	70 (35.7%)
Town	118 (28%)	56 (24.9%)	62 (31.6%)
Suburb of a city	91 (21.6%)	51 (22.7%)	40 (20.4%)
Rural	49 (11.6%)	25 (11.1%)	24 (12.2)
Infected by COVID-19			
No	351	190	161
Yes	69	34	35
Missing	1	1	0
Family or close one infected by COVID-19			
No	252	138	114
Yes	168	86	82
Missing	1	1	0
Lost income due to COVID-19			
No	269	145	124
Yes	132	66	66
Unsure	19	13	6
Missing	1	1	0

There were no significant differences in demographic variables between the groups

Appendix Y. Part Two Completers vs. Non-completers Comparisons

Chi-Square analyses showed that here were no significant differences between completers and non-completers on gender (χ^2 (1) = 1.49, p = .22), ethnicity (χ^2 (1) = 1.06, p = .30), religious identity (χ^2 (35) = 26.38, p = .85), qualification (χ^2 (24) = 30.45, p = .17), location (χ^2 (9) = 7.01, p = .64), or age (t(475) = -1.8, *p* = .073). Independent sample t-tests showed that completers and non-completers did not significantly differ on pre- grandiose (t(501) = 1.04, *p* = .30), or pre- self-esteem scores (t(473) = .543, *p* = .59).

Appendix Z. Two-way Analysis of Variance (ANOVA)

A two-way ANOVA was conducted with grandiosity scores (pre-vs. post-) as the within-subject variable and group (MS vs. dental pain control) as the between-subject variable, with gender (male vs. female), ethnicity (white vs. other) and age as covariates. There was no effect of group, $F(1, 410) = 2.63$, $p = .106$, or time $F(1, 410) = 1.78$, $p = .186$. The interaction between group and time was also non-significant, $F(1, 410) = 2.71$, $p = .1$. There was a significant effect of gender, $F(1, 410) = 11.69$, $p < .005$, in which males had higher levels of grandiosity ($M = 5.25$) than females ($M = 3.29$), $F(1, 404) = 11.69$, $p < .001$. There was a significant effect of ethnicity, $F(1, 410) = 5.08$, $p < .05$, in which participants with a non-white ethnicity had higher levels of grandiosity ($M = 4.93$) compared to white participants ($M = 3.61$). There was no significant effect of age, $F(1, 410) = 3.12$, $p = .078$.

A two-way ANOVA was also conducted with self-esteem scores as the within-subject variable (pre-vs post-) and group (MS vs. dental control) as the between-subject variable, with gender (male vs. female), ethnicity (white vs. other), and age as covariates. There was no effect of group, $F(1, 410) = 1.19$, $p = .275$, or time $F(1, 410) = 1.4$, $p = .237$. The interaction between group and time was also non-significant, $F(1, 410) = 0.45$, $p = .832$. There was a significant effect of age, $F(1, 410) = 18.89$, $p < .001$, in which older participants showed a greater increase in self-esteem. There was no significant effect of gender, $F(1, 410) = 0.26$, $p = .607$, or ethnicity, $F(1, 410) = 0.69$, $p = .407$.