INVESTIGATING THE ROLE OF SELF-ESTEEM AND SOCIAL RANK IN SUBCLINICAL PARANOIA

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Declaration Page

This work has not been submitted for any other degree or to any other institution.

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Abstract

There is a developing literature advocating a social rank approach to understanding psychotic experiences. A systematic review of the research in this area found suggestive evidence for associations between low social rank and important outcomes in psychosis including voice-distress, persecutory ideation and comorbid anxiety and depression. It has been difficult to separate out the effects of existing low rank from 'down-ranking' that may occur in response to experiences of psychosis and patienthood. Studying non-clinical groups is one way to minimise the impact of reactive changes of this kind.

This study used a cross-sectional internet survey design to explore associations between self-esteem, social comparison and two dimensions of persecutory ideation (Persecution and Deservedness) in a large university sample ($N = 534$). Self-esteem and social comparison variables added significantly to the prediction of persecution and deservedness, after controlling for the effects of anxiety and depression. Negative self-esteem showed the strongest correlation with paranoia, and was also the strongest predictor in the regression models. Correlations between social comparison dimensions and paranoia were smaller in magnitude. In the multiple regression, Persecution was predicted by low social attractiveness and group fit, but high social rank. 'Poor me' and 'bad-me' paranoid groups were identified and compared. 'Bad-me' paranoia was associated with lower positive and higher negative self-esteem, lower social rank and lower social attractiveness.

Persecutory ideation appears to be related to both low self-esteem and inferior social comparisons. The findings support the targeting of negative self-evaluations within interventions for psychosis.

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SOCIAL RANK EXPLANATIONS FOR DISTRESS IN PSYCHOSIS

A LITERATURE REVIEW

Abstract

Purpose. Social rank has been well researched in depression, but there is relatively less known about its role in psychosis. The aim of this review was to evaluate the evidence for a social rank approach to understanding psychological distress caused by psychotic experiences.

Methods. A systematic search of the literature databases PSYCINFO and MEDLINE identified 23 studies where social rank constructs were included in the investigation of psychosis symptoms, in both clinical and non-clinical populations.

Results.

There is evidence that voice hearers relate to their voices as subordinates, with the power and dominance of the voice predicting levels of distress and depression, and likelihood of complying with voice commands. In non-clinical samples, low social rank has been associated with increased paranoia. The experience of living with psychosis is stigmatising and likely to lead to perceived or actual loss of rank. Loss of rank may explain comorbid problems such as depression and social anxiety.

Conclusions. Perceptions of low social rank predict increased distress and comorbid problems in psychosis. In patient groups, it is difficult to separate the effects of existing low rank from 'down-ranking' in response to the experience of psychosis. Further prospective studies and studies of non-clinical groups are needed to address this issue.

Introduction

In recent decades, there has been increasing interest in social rank as an explanatory framework for understanding psychological distress. Social rank theory brings together evolutionary, social and cognitive levels of explanation. The theory proposes that particular social contexts activate biological potentialities to enact dominant and subordinate roles. These modes of relating can become entrenched over time, influencing self-evaluations and future behaviour, and contributing to distress. This paper includes a discussion of social rank theories and a critical review of the literature pertaining to social rank explanations of psychosis.

Social Rank Theories of Psychological Disorders

Taking an evolutionary perspective, based on the social rank hierarchies observed in animal studies, Gilbert (1992, 1993, 2000) has developed a social rank theory to explain various kinds of psychological dysfunction. For humans also, gaining and maintaining rank or status is important for securing valuable resources. Social alliances are crucial for survival and success, and so individuals also compete to belong and to be valued as part of a group (Gilbert, 2005). Our well-developed cognitive abilities to make social comparisons enable us to determine our own rank, attractiveness and group fit relative to others.

An individual's perception of their social rank in relation to others is predicted to influence how they will respond to anticipated and actual social threats. When an individual perceives themselves to be under threat from more dominant others, and judges themselves as unable to compete, submissive defences of withdrawal, avoidance, submission and appeasement are likely to be activated. These postulated biologically-programmed defence systems are thought to be evolutionarily adaptive, because they

prevent subordinates from pursuing competitive interactions that they are unlikely to win. However, it is suggested that psychological dysfunction including depression and social anxiety can result when these defences remain active for prolonged periods (Gilbert, 2001).

Social rank theory predicts that occupying a low-rank position (or perceiving oneself to be low in rank) will be associated with negative self-evaluations, behaviours of submission and avoidance, and affective experiences of depression, anxiety, humiliation and entrapment (Birchwood, Meaden, Trower, & Gilbert, 2002). Interestingly, holding high rank is thought to also confer vulnerability for different reasons. Very dominant individuals may be rejected by the group, and are likely to face threats to their social position from below (Gilbert, 2005).

Gilbert (1992) proposes that the submissive defences that evolved for dealing with competitors can also become activated when we are attacking and critical to ourselves, producing the thoughts, affects and behaviours typical of depression. Critical thoughts are experienced as an internal 'dominant other' that is attacking and humiliating towards the self. The experience of being attacked by one's own critical thoughts has been linked to behavioural inhibition and beliefs of low self-worth (Gilbert, 1992, 2000)

In evolutionary terms, the function of depression is to inhibit exploratory and competitive behaviour, and also to signal withdrawal from the social arena (Gilbert 1992; 1993). In the short term, depressed states help subordinate individuals to accept social defeats and 'down-rank' instead of retaliating. In the longer term, feeling defeated and entrapped by circumstances is associated with more severe, dysfunctional depression.

Social anxiety is thought to be an adaptive mechanism to inhibit subordinates from competing in social arenas where they are likely to encounter defeats and conflict

(Gilbert, 2001). Self-monitoring and behavioural inhibition are characteristic of the disorder, and have similarities to the submissive behaviours seen in subordinate animals (Sloman, Farvolden, Gilbert, & Price, 2006). Research has found that socially anxious individuals are more likely to perceive social encounters as competitive, and will usually appease the other rather than trying to compete with them (Hope, Sigler, Penn, & Meier, 1998).

Social Rank Theories of Psychosis

There is a small but growing literature applying social rank ideas to psychosis. Recent research in psychosis has advocated a symptom-based approach in preference to the broad diagnostic category of schizophrenia (Bentall, 2003). Voice hearing and persecutory delusions (or paranoia) are two symptoms of psychosis that can readily be understood within a social rank framework. As for critical thoughts in depression, it is proposed that hearing voices will cause most distress when the voice is perceived as critical and controlling, and related to as a dominant other (Birchwood, Meaden, Trower, Gilbert, & Plaistow, 2000). The content of persecutory delusions concerns fears about becoming an outsider and about threat of harm from others. Hypervigilence and suspiciousness are likely reactions if an individual perceives themselves as powerless within a hostile social environment. Depression and social anxiety are common comorbid disorders in psychosis (Karatzias, Gumley, Power, & O'Grady, 2007), and may result from perceptions of low social rank and an increased sensitivity to social threat.

Aims of this Review

The current review aims to evaluate the evidence for a social rank understanding of psychosis and highlight avenues for future research in this area. There are no existing reviews of social rank research that focus on psychosis.

The review begins by discussing studies that view social rank as a predictor or risk factor for psychosis. Perceptions of low social rank have been associated with increased distress and compliance in voice-hearing, and with subclinical paranoia.

The review goes on to discuss social rank in relation to comorbid problems of depression, social anxiety, suicidality and hopelessness, in psychosis populations. These studies claim that the experience of psychosis leads to a fall in social rank, which triggers or exacerbates comorbid affective disorders. Finally, the review considers studies of social-rank-informed interventions for psychosis.

Although this review groups studies according to these two approaches, investigating low social rank as a primary factor in the development and maintenance of psychosis, and as a further outcome of psychosis associated with comorbid affective symptoms, it is not suggested that these are competing theories. Instead, it is assumed that the relationships between constructs are likely to involve complex feedback mechanisms interacting over time. Most studies have used cross-sectional designs, which preclude a clear separation of social rank as cause and effect.

Conceptualisation of Social Rank Constructs

Various rating scales have been developed to measure the constructs considered to be important within social rank models (see Table 1). These are all self-report measures that capture subjective perceptions rather than measuring actual social behaviour.

The Social Comparison Scale (SCS, Allan & Gilbert, 1995) includes items for rating oneself in relation to others on dimensions of 'social rank', 'social attractiveness' and 'group fit'. Overall score is used as a measure of social rank. An adapted version has been used to assess social rank in relation to voices (Voice Rank Scale – VRS, Birchwood et al., 2000). The Voice Power Differential Scale (VPD, Birchwood et al. 2000) assesses voice hearers' perceived power in relation to their voice. An adapted version has been used to measure power in relation to general others (Social Power Differential Scale –SPD, Birchwood et al., 2000).

Rating scales have also been designed to measure the following rank-related constructs: in voices, desire to fight the voice, desire to escape from the voice and feelings of entrapment by the voice (Fight, Flight and Entrapment scales, Gilbert et al., 2001); subjective feelings of being defeated and entrapped by events (Defeat and Entrapment scales, Gilbert & Allan, 1998); experiences of being shamed by others (Other as Shamer, OAS, Goss, Gilbert, & Allan, 1994); submissive behaviours (Submissive Behaviour Scale, SBS, Allan & Gilbert, 1997). The Personal Beliefs about Illness Questionnaire (PBIQ, Birchwood, Mason, Macmillan, & Healey, 1993) measures appraisals about psychosis, with subscales identified as analogous to the constructs of loss, shame, humiliation and entrapment.

TABLE 1

Main Self-report Measures of Rank-related Constructs

Scale	**Author**	**Constructs (number of items)**	**Example items**
Social Comparison Scale	Allan & Gilbert, 1995	Social rank (11)	In relationship to others I generally feel…
		Social rank (5)	Inferior ----- Superior
		Attractiveness (3)	Unlikeable ----- Likeable
		Group fit (3)	Left out ----- Accepted
Voice Rank Scale	Birchwood et al., 2000	Voice rank (11)	In relationship to my voice I generally feel…
Social Power Differential scale	Birchwood et al., 2000	Social power (6)	In relation to others… I respect others more than they respect me ----- others respect me more than I respect others
Voice Power Differential scale	Birchwood et al., 2000	Voice power (6)	In relation to my voice…
Fight, flight and entrapment scales	Gilbert et al., 2001	Desire to fight voice (5)	I wish I could get my hands on my voices
		Desire to flee from voice (5)	I want to run away from my voices
		Entrapment by voice (5)	I feel closed in by my voices
Defeat scale	Gilbert & Allan, 1998	Perceptions of defeat (16)	I feel that I am one of life's losers
Entrapment scale		Entrapment by events (16)	I feel trapped inside myself
Other as Shamer scale	Goss et al., 1994	External shame (18)	Other people put me down a lot
Submissive Behaviour Scale	Allan & Gilbert, 1997	Submissive behaviours (16)	I agreed I was wrong even though I knew I wasn't
Personal Beliefs about Illness Questionnaire	Birchwood et al., 1993	Appraisals of psychosis	
		Loss (3)	I am capable of very little as a result of my illness
		Shame (3)	I am embarrassed by my illness
		Humiliation (2)	People like me must be controlled by psychiatric services
		Entrapment (4)	I am powerless to influence or control my illness

Method

Inclusion Criteria

Inclusion criteria for studies were that they a) were original research articles published in peer-reviewed journals, b) were written in English, c) were published between 1990 and the present day, d) included a measure of one or more constructs relating to social rank, e) sampled from groups with psychosis, or included a measure of psychotic symptoms. The search was limited to 1990 onwards because this was when social rank theory first gained prominence. Case studies were not included due to associated methodological issues.

All the studies identified used quantitative methods.

Search Strategy

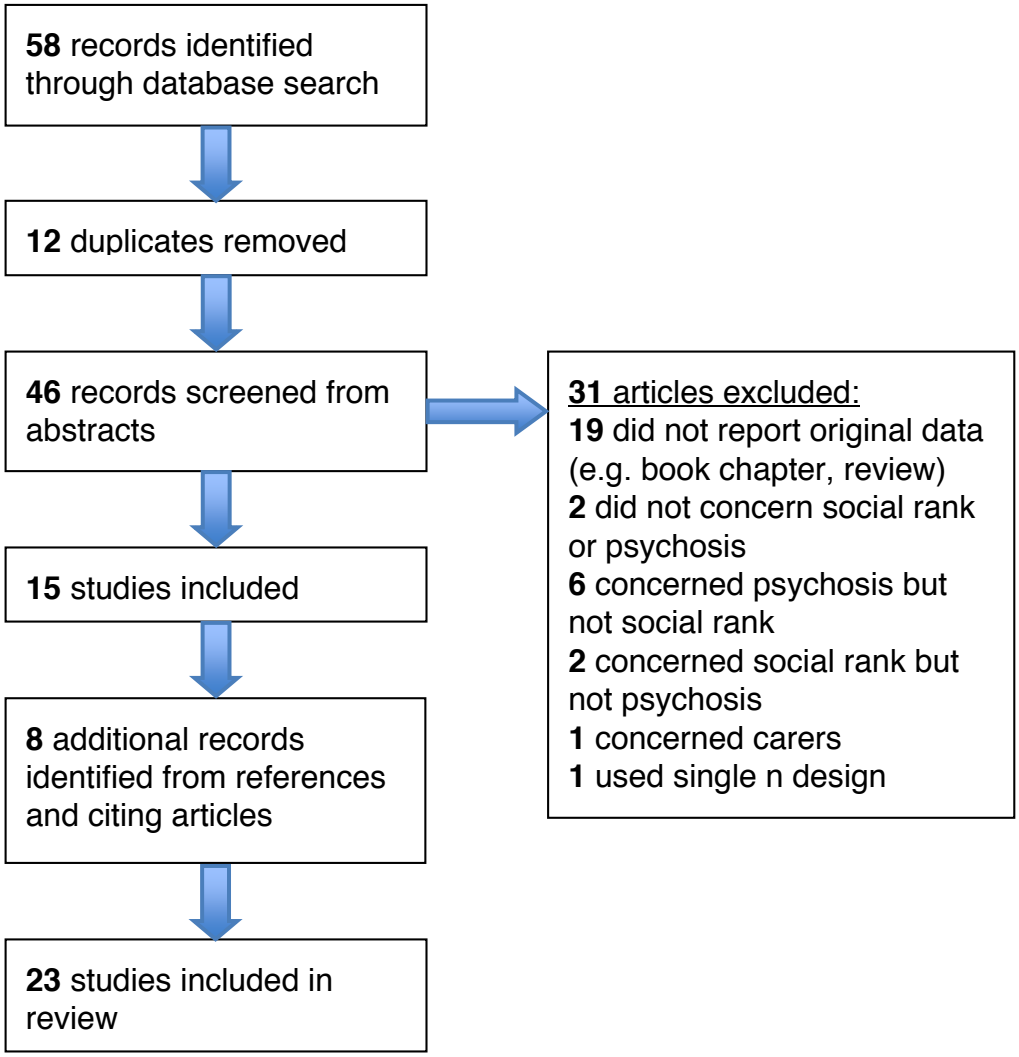
A search for relevant studies was carried out on 17th October 2011 using the electronic databases MEDLINE and PSYINFO. Search terms for psychosis were: 'psychosis'; 'psychotic'; 'schizo*'; 'hallucin*'; 'delusion*'; 'paranoi*'; the MEDLINE subject headings 'Schizophrenia' and 'Psychotic Disorders'; the PSYCINFO subject headings 'Psychosis', 'Schizophrenia, 'Paranoia', 'Paranoia (Psychosis)', 'Hallucinations' and 'Delusions'. These were searched for in combination with the following social rank terms: 'social comparison*'; 'social rank*'; 'social power'; 'social evaluation'; the PSYCINFO subject heading 'Social Comparison'. This search produced 58 articles, of which 12 were duplicates. Figure 1 shows a flow-chart of the selection process.

From screening of titles and abstracts, 15 separate studies were identified which met the inclusion criteria. Reasons for the exclusion of the other 31 papers are listed in Figure 1. A search through the references and citing articles of these 15 studies

identified a further 8 studies which met the inclusion criteria. The final number of studies included was therefore 23.

FIGURE 1

Flow-chart of Selection Process for Inclusion in Review



Quality Assessment

A checklist was designed to assess the quality of the studies. A recent systematic review concluded that currently there is no quality assessment tool recommended for widespread use for epidemiological studies (Sanderson, Tatt, & Higgins, 2007). It was therefore decided to construct a checklist specifically for this review using three existing checklists (Downs & Black, 1998; Fowkes & Fulton, 1991; Vandenbroucke et al., 2007). Appendix K gives details of the checklist and its development.

Results

Overview of Studies

Except for two prospective and two intervention studies, all studies were cross-sectional. Twenty-one studies concerned clinical psychosis samples, although there was variation in the populations studied and inclusion criteria employed; two studies concerned non-psychosis samples. Two studies coded interview data for frequencies of different types of social comparisons; all other studies used self-report questionnaires to measure social rank constructs.

Table 2 compares studies using the devised checklist for assessing study quality. The methodological quality of the studies was variable. Several articles did not provide descriptive statistics broken down by group, making it difficult to judge the importance of group differences. Issues of suspected bias were identified for several studies, in most cases concerning biased representation within the sample or inadequate analysis of known confounders.

Table 3 gives details of the nine studies that investigate social rank as a predictor of psychosis.

TABLE 2

Assessment of Study Quality.

	Birchwood et al., 2000	Gilbert et al., 2001	Birchwood et al., 2004	Thomas et al., 2009	Fox et al., 2004	Barrowcliff & Haddock, 2010	Reynolds & Scragg, 2010	Gilbert et al., 2005	Freeman et al., 2005	Franz et al., 2000	Finlay et al., 2001	Birchwood et al., 1993	Rooke & Birchwood, 1998	Iqbal et al., 2000	Birchwood et al., 2005	Gumley et al., 2004	Karatzias et al., 2007	White et al., 2007	Birchwood et al., 2006	McLeod et al., 2009	Taylor et al., 2010	Trower et al., 2004	Laithwaite et al., 2009
Methodology																							
Are the study aims clearly stated?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Is the choice of design appropriate to the aims?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are inclusion criteria clearly stated?	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	N	Y	Y	Y	Y	Y	Y	P	Y	Y	Y	Y	Y
What is the study size (Total *N*)?	59	116	125	35	32	49	32	71	1202	218	14	84	47	70	26	38	138	100	79	70	78	38	18
Statistical testing																							
Are appropriate statistical tests used for the main analyses?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	P	Y	Y	Y	Y	P	Y	Y	Y	Y	Y
Are estimates of random variability within the data given?	P	Y	Y	Y	P	P	Y	Y	P	N	NA	Y	Y	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y
Are exact probability (*p*) values given?	N	N	N	Y	N	Y	Y	Y	Y	P	NA	N	N	N	N	N	Y	Y	N	Y	P	Y	Y

	Birchwood et al., 2000	Gilbert et al., 2001	Birchwood et al., 2004	Thomas et al., 2009	Fox et al., 2004	Barrowcliff & Haddock, 2010	Reynolds & Scragg, 2010	Gilbert et al., 2005	Freeman et al., 2005	Franz et al., 2000	Finlay et al., 2001	Birchwood et al., 1993	Rooke & Birchwood, 1998	Iqbal et al., 2000	Birchwood et al., 2005	Gumley et al., 2004	Karatzias et al., 2007	White et al., 2007	Birchwood et al., 2006	McLeod et al., 2009	Taylor et al., 2010	Trower et al., 2004	Laithwaite et al., 2009
Issues of Confounding/bias																							
What is the response rate (%)?	100	NR	NR	42	NR	65	41	NR	NR	62	88	99	96	NR	84	NR	NR	98	77	NR	NR	55	NR
Are the sample representative of the target population?	-	-	-	+	+	+	+	+	++	+	-	-	-	+	NA	-	-	-	-	-	-	+	++
Are measures used reliable and valid?	-	-	-	-	+	+	-	-	-	+	-	-	-	-	NA	-	-	-	-	-	-	-	-
Is missing data reported and treated appropriately?	-	-	-	-	-	-	-	-	-	+	NA	-	-	+	NA	-	-	-	-	-	-	-	-
Are distributions of key confounding variables described?	+	+	-	-	+	-	-	-	-	-	NA	-	-	-	NA	-	-	+	-	-	-	-	-
Are confounders adjusted for in the main analyses?	-	-	-	-	+	-	+	+	+	+	NA	-	-	-	NA	-	-	-	-	+	-	-	-
Have all possible explanations of effects been considered?	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-

Note. Rating codes are: 'Y' yes; 'N' no; 'P' partially; '-' no issues identified; '+' minor issue identified; '++' major issue identified; 'NR' not reported; 'NA' not applicable. For Birchwood et al. 2005, several items did not apply as this was preliminary data, not fully reported in the paper.

TABLE 3

Social Rank as a Predictor of Psychotic experience - Comparison of Study Characteristics

	Sample characteristics				Social rank variables		
Study	**Population**	**Gender % F**	**Mean age (range)**	***N***	**Construct**	**Measure**	**Main outcomes**
				Voice hearing			
Birchwood et al., 2000	Voice hearers (voices >2yrs)	34%	34	59	Voice power Social power Voice rank Social rank	VPD SPD VRS SCS (5 items)	Depression (BDI) Voice-related distress (H&H)
Gilbert et al., 2001	Voice hearers Depressed (inpatients)	30% 48%	33.2 41.9	66 50	Voice power Voice rank Social rank Fight Flight Entrapment	VPD VRS SCS Fight, flight and entrapment to voices scale	Depression (BDI)
Birchwood et al., 2004	Voice hearers	32%	33.7	125	Voice power Social power Voice rank Social rank	VPD SPD VRS SCS (5 items)	Depression (BDI) Voice-related distress (H&H)
Thomas et al., 2009	Voice hearers	37%	34.9 (19-54)	35	Hostility-affiliation Control-submission	SASB	Voice-related distress (POMS)
Command hallucinations							
Fox et al., 2004	Command Hallucinations - Forensic - Non-forensic	31%	37.2	Total: 32 13 19	Voice power Social rank: Inferiority and Superiority	CAV – power item. EBS - 2 factor solution	Compliance

	Sample characteristics				Social rank variables		
Study	**Population**	**Gender % F**	**Mean age (range)**	***N***	**Construct**	**Measure**	**Main outcomes**
Barrowcliff & Haddock, 2010	Command Hallucinations	41%	36.7	49	Social rank	SCS	Compliance
Reynolds & Scragg, 2010	Command Hallucinations (forensic)	0%	34.2 (18-56)	32	Voice power Voice rank Social rank	VPD VRS SCS	Compliance
			Paranoid ideation				
Gilbert et al., 2005	Mixed clinical (non-psychotic)	49%	40.9 (16-69)	71	Social rank Submissive behaviour Social power	SCS SBS SPD	Paranoid ideation (PS)
Freeman et al., 2005	University	69%	23 (17-61)	1202	Social rank Submissive behaviour	SCS SBS	Paranoid ideation (PC)

Note. VPD, Voice Power Differential scale; SPD, Social Power Differential scale; VRS, Voice Rank Scale; SCS, Social Comparison Scale; BDI, Beck Depression Inventory; H&H, Hustig and Hefner scales; SASB, structural analysis of social behaviour, Intrex long form; POMS, Profile of Mood States; CAV, Cognitive Assessment of Voices; EBS, Evaluative Beliefs Scale; PS, Paranoia Scale (Fenigstein &Vanable, 1992); PC, Paranoia Checklist (developed specifically for the study).

Social Rank Models of Voice Hearing

According to social rank theories of voice hearing, voice activity becomes distressing when it is experienced as a down-rank attack (that is, as powerful, hostile and shaming) and the hearer perceives themselves as subordinate to their voice (Gilbert, 2000). Voice hearers are thought to have anomalous interpersonal schemata that predispose them to perceive social interactions, including with their voices, in rank-related terms (Birchwood et al., 2004). These anomalous interpersonal schemata may have a basis in early relationships where others were intimidating or controlling (Birchwood et al., 2002). This theory differs to previous cognitive models of voice hearing, which were concerned with general appraisals about the voice, such as its intentions and identity (Birchwood & Chadwick, 1997). From a social rank approach, it is specifically *interpersonal* appraisals about their relationship with the voice that determine how the hearer responds to the experience (Birchwood et al., 2002).

Studies of Voice Hearing

Three studies by Birchwood, Gilbert and colleagues sought evidence that voice-hearers perceive their voices as being of higher social rank than themselves, that the same social rank differential is also found within their other relationships, and that the size of the social rank differential determines the level of distress experienced.

Birchwood et al. (2000) measured social rank and social power in relation to 'others' and in relation to the dominant voice. Voice hearers rated themselves as less powerful and less dominant than their voices, and this differential was paralleled within their other relationships. High voice power and voice rank were associated with lower social power and social rank.

Gilbert et al. (2001) measured voice power, voice rank and social rank in a separate sample of voice hearers. This study also measured desire to fight and escape

the voice, and perceived entrapment by the voice. This study replicated the correspondence between perceived low rank in relation to the voice and in relation to others. Low rank and power were associated with desire to engage in fight and flight defences and affective experiences of entrapment and depression. Interestingly, a similar pattern of findings emerged when inpatients with depression completed the same measures in relation to their critical thoughts. This supports the idea of a common mechanism of involuntary subordination that underlies both depression and voice hearing (Gilbert et al., 2001).

A further study (Birchwood et al., 2004) appears to combine the data from the two earlier studies to obtain a larger sample. This enables the statistical testing of three competing models of the causal pathways between social rank, voice appraisals and distress. Findings for the combined sample replicated those of Gilbert et al. (2001). High voice power and rank were associated with low social power and rank, and increased depression and distress.

Structural equation modelling accepted the hypothesised model (interpersonal schemata as primary) as accounting best for the pattern of data obtained. Two alternative models with depression and psychosis symptoms as primary were rejected. Path analysis revealed significant pathways from social rank to voice frequency and depression, and from social power to perceived voice power and depression. The pathway from voice power to voice frequency was also significant.

One study (Thomas, McLeod, & Brewin, 2009) used a different interpersonal framework to assess social rank differentials between voice and hearer. Participants completed a 144-item questionnaire based on Benjamin's Structural Analysis of Social Behaviour model (SASB - Benjamin, 1974). Interpersonal behaviours of voice and voice hearer were analysed along two dimensions, hostility-affiliation and control-submission. The control-submission dimension is broadly analogous to the dominant-

subordinate mode of relating described in social rank theories. If voices are experienced in social rank terms, as powerful and attacking dominants, voice behaviours should score highly on hostility and control, with hearer behaviours scoring highly on submission.

Results were partially in line with the predicted pattern, although it was voice hostility that was most predictive rather than voice control (dominance). The expected correspondence between voice dominance and hearer submission was not observed. Voice hearers with clinical depression rated their voices as more hostile and controlling, and responded to them with greater hostility, but surprisingly did not respond to them with any greater submission.

Comment

These studies provide some support for the application of social rank models to voice hearing and suggest that there may be common mechanisms underlying voice hearing and depression. Voices seem to be experienced in a similar way to critical others in the social world. Social rank and power may act as primary organising schemata, which influence the social experience of relating to a voice, and consequent distress and depression. However, the expected dominant-subordinate relating pattern was only partially supported using the SASB relating framework. Also, while using structural equation modelling goes some way towards establishing the direction of causality, the cross-sectional design of these studies mean that apparent associations may be accounted for by other factors. For example, these studies did not control for the severity of psychotic symptoms. When cross-correlating numerous variables, there is an inflated risk of Type-1 errors, and so putative associations require replicating across samples. The Birchwood et al. (2004) study appears to have used the datasets from the earlier two studies, and so does not demonstrate an independent replication of

the findings. To corroborate these findings, further studies are needed from independent research groups and using longitudinal or experimental designs.

Studies of Command Hallucinations

Commands are reported by 39-88% of voice hearers; command hallucinations are associated with elevated risk and distress and are often resistant to drug treatments (Braham, Trower, & Birchwood, 2004). Three studies looked at the relationship between social rank and compliance with commands. Compliance is predicted to be most likely when the voice is experienced as dominant and controlling (Byrne et al., 2003). Attempts to comply with or appease the voice are understood to be defensive strategies employed by hearers who feel inferior and powerless against their voices.

In a small-scale preliminary study, Fox, Gray and Lewis (2004) compared voice hearers who generally complied with violent commands with voice hearers who generally did not comply. In addition, hearers of self-harm commands were compared to hearers of harm-others commands, producing four groups. An adapted version of the Evaluative Beliefs Scale (EBS, Chadwick & Trower, 1993) was used to measure social rank; two subscales for Inferiority and Superiority were derived from factor analysis. Perceived voice power was measured using a single item rating scale.

The direction of the relationship between social rank and compliance appeared to depend on the type of command. Compliers rated their voices as more powerful than non-compliers, with harm-other compliers rating their voices as the most powerful. Self-harm compliers were higher on Inferiority, while Harm-Other compliers were higher on Superiority. The finding that compliance with harm-other commands was actually associated with perceptions of high rank can be explained within social rank theory. The belief that their high rank is under threat may lead these individuals to reassert their dominance by harming others (Fox et al., 2004).

The other two studies of command hallucinations measured rank in relation to the voice. In Barrowcliff and Haddock (2010), there was an association between perceived inferiority to the voice and compliance, although this association did not reach the strict significance level set by the study. Another study included only harm-other commands within a male forensic sample (Reynolds & Scragg, 2010). Compared with non-compliers, compliers reported higher voice power and voice superiority to self. In this study, social rank did not differ between complier and non-complier groups. The apparent relationship between high social rank and harm-other compliance found by Fox et al. (2004) was not replicated.

Comment

The conflicting results across these three studies may be because different populations were sampled (forensic, non-forensic and mixed) and different measures of social rank were used. The EBQ may not be a balanced measure of social rank; all items are worded in terms of own or others' inferiority, none in terms of positive perceptions of self, and the factor solution used produced unevenly weighted subscales.

There are other issues with methodological quality that mean less weight should be given to these findings. In all three studies, rates of compliance were high. The small cell sizes for non-complier groups reduce the robustness of statistical tests. Another issue concerns the methods used to categorise participants as compliers or non-compliers, and their commands as self-harm or harm-other. In reality, these are not discrete categories and there may be important differences between 'compliers' who always comply and those who often manage to resist. These studies were all retrospective, which could introduce bias from inaccurate reporting. Barrowcliff and Haddock (2010) limited their study to commands heard within the last month, while

Fox et al. (2004) and Reynolds and Scragg (2010) apply no cutoff and do not report the exact timeframes involved.

Social Rank Models of Paranoia

Freeman, Garety, Kuipers, Fowler and Bebbington (2002) have conceptualised paranoia as primarily a threat-related anxiety. Paranoia may result from evolved threat sensitivities and the defensive behaviours employed by subordinates to avoid future threats (Gilbert et al., 2005). Studies in monkeys have observed that subordinates are hypervigilent to threats from dominants (Shively, 1998). Paranoia is thought to build on ordinary interpersonal concerns causing mistrust and suspicion (Freeman et al., 2005). In an epidemiological study, Freeman et al. (2011) found that paranoid ideation was associated with reduced social functioning, lack of social support and lack of social cohesion, factors which will have a bearing on perceived social standing.

Paranoia is predicted to occur in both low and high rank individuals depending on social context (Gilbert et al., 2005). Low-ranking individuals need to be vigilant to the behaviour of dominant individuals around them, to avoid engaging in conflicts where they stand to lose. The highest-ranking individuals stand to lose most if they let their guard down. To maintain their status, they must be vigilant to potential threats from below.

Studies of Paranoid Ideation

Two studies investigated social rank and paranoid ideation in non-clinical groups. Research has supported a continuum approach to psychotic phenomena (Bentall, Claridge, & Slade, 1989). Hallucinations and paranoia are found to occur in a significant minority of the general population. Level of resulting distress seems to distinguish these subclinical individuals from patient groups (Van Os et al., 1999). It is

assumed that studying subclinical paranoia will provide insights into the mechanisms involved in paranoid disorders.

Gilbert et al. (2005) investigated the role of social rank, social power and submissive behaviour in paranoid ideation. In a hierarchical multiple regression, social rank variables predicted paranoid ideation after controlling for the effects of depression. Submissive behaviour was the strongest predictor of paranoia. Social power was a significant but weaker predictor acting in the opposite direction, with higher social power predicting increased paranoia. Social rank was not significant within this model. The authors conclude that once the prevalent 'low-rank' type of paranoia, associated with submissiveness and depression, is accounted for within the model, an opposing pattern of paranoia is revealed associated with high social power. It is unclear why this pattern of 'high-rank' paranoia would be seen for social power but not social rank.

Freeman et al. (2005) explored the relationship between social rank and paranoid ideation as part of a large internet study with a university population. Increased submissive behaviour and lower social rank were associated with increased paranoia frequency, conviction and distress, with small to medium effect sizes ($.19 > r < .40$). Of the five SCS items included, the group fit item 'left out-accepted' showed the strongest relationship with paranoia, suggesting that feelings of being excluded by others may be a key element of paranoia.

While these studies provide some evidence for the importance of social rank in subclinical paranoia, the findings pertain to very specific populations and cannot be assumed to generalise to patient groups. Gilbert et al.'s (2005) sample were characterised by a particular clinical profile (outpatients with anxiety/depression), while Freeman et al.'s (2005) sample were characterised by a university demographic. Some of the effect sizes reported by Freeman et al. are very small and so have limited clinical significance. If paranoia is elevated in both low and high rank individuals, as Gilbert et

al. suggest, then using linear models may not be appropriate for investigating these relationships.

Impact of Psychosis on Social Rank

A diagnosis of schizophrenia is associated with poor social and work outcomes (Thornicroft et al., 2004), discrimination and stigma, and the possibility of compulsory treatment and hospitalisation (Taylor, Gooding, Wood, & Tarrier, 2011). Perceptions of loss of valued roles and social status are therefore likely.

Ten studies explored the covariates of low social rank in groups diagnosed with psychosis. Table 4 gives details of study characteristics. Studies reported associations between low social rank and depression, social anxiety, hopelessness and suicidal ideation. Two studies considered a contrasting theory of stigma in schizophrenia, which proposes that individuals mitigate any loss of social standing by selectively comparing themselves with more unfavourable groups (Wills, 1981).

TABLE 4

Social Rank as a Predictor of Comorbidity - Comparison of Study Characteristics

	Sample characteristics				Social rank variables		Main outcomes
Study	**Population**	**Gender % F**	**Mean age (range)**	***N***	**Construct**	**Measure**	
			Depression				
Birchwood et al., 1993	Schizophrenia Bipolar	18% 60%	42.1 54.0	49 35	Psychosis appraisals	PBIQ	Depression (BDI)
Rooke & Birchwood, 1998	Schizophrenia	19%	42.1	47	Psychosis appraisals	PBIQ	Depression (BDI)
Iqbal et al., 2000	Schizophrenia - PPD - Non-PPD	Not reported	33.5 (18-65)	Total: 70 2842	Working self-concept (low vs high status self-representations) Psychosis appraisals	Possible selves questionnaire PBIQ	PPD (CDSS)
Birchwood et al., 2005, Study 3	First-episode schizophrenia	Not reported	Not reported	26	Psychosis appraisals	PBIQ	PPD (CDSS)
Karatzias et al., 2007	Schizophrenia	28%	36.5	138	Psychosis appraisals	PBIQ	Comorbid affective disorders

	Sample characteristics				Social rank variables		Main outcomes
Study	**Population**	**Gender % F**	**Mean age (range)**	***N***	**Construct**	**Measure**	
				Social Anxiety			
Gumley et al., 2004	Schizophrenia			Total: 38	Psychosis appraisals	PBIQ	Social anxiety
	- With SA	26%	33.6	19			
	- Controls matched for gender and diagnosis	26%	35.1	19			
Birchwood et al., 2006	First-episode psychosis			Total: 79	Psychosis appraisals	PBIQ	Social anxiety
					External shame	OAS	
	- With SA (*n*=23)	26%	23.8	23	Social rank	SCS	
	- Without SA	21%	22.7	56			
				Hopelessness/Suicidality			
White et al., 2007	Schizophrenia	22%	39.4	100	Psychosis appraisals	PBIQ	Hopelessness (BHS)
Taylor et al., 2010	Psychosis	29%	42.5	78	Entrapment/ Defeat	Entrapment and Defeat Scales (combined)	Suicidal ideation (BSIS)
				Insight			
McLeod et al., 2009	Schizophrenia	9%	40.8	70	Social rank	SCS (combined general and keyworker)	Insight (Insight Scale)

	Sample characteristics				Social rank variables		Main outcomes
Study	**Population**	**Gender % F**	**Mean age (range)**	***N***	**Construct**	**Measure**	
			Shifts in social comparisons				
Franz et al., 2000	Schizophrenia inpatients			Total: 218	Social comparisons; direction, object	Standardised interview questions; coded categories	
	- Long-stay	45%	60.0	75			
	- Short-stay	38%	36.3	73			
	Non-clinical control group	74%	36.9	70			
Finlay et al., 2001	Schizophrenia	14%	33 (21-60)	14	Social comparisons; direction, object, domain	Semi-structured interview data; coded frequencies	

Note. PBIQ, Personal Beliefs about Illness Questionnaire; BDI, Beck Depression Inventory; PPD, post-psychotic depression; CDSS, Calgary Depression in Schizophrenia Scale; OAS, Other as Shamer scale; SCS, Social Comparison Scale; BHS, Beck Hopelessness Scale; BSIS, Beck Suicidal Ideation Scale.

Comorbid Depression

Within a social rank approach, depressive reactions are a way of 'down-ranking' in response to psychosis, which is viewed as a major life event entailing loss and social shame (Iqbal, Birchwood, Chadwick, & Trower, 2000).

Two studies have studied the relationship between depression and appraisals of psychosis prospectively in patients with schizophrenia. Rooke and Birchwood (1998) reassessed the sample from Birchwood et al. (1993) 2.5 years later. Multiple regression analyses found that increased depression over time was predicted by higher initial feelings of entrapment, and increasing entrapment over time, when controlling for initial depression level. Appraisals of entrapment and loss of status discriminated depressed from non-depressed groups. However, humiliation and shame appraisals did not show the expected association with depression.

Iqbal et al. (2000) explored the role of social rank in the development of post-psychotic depression (PPD), which affects 36% of individuals with psychosis. Patients presenting with an acute episode were assessed at admission, on discharge and at 4, 8 and 12 month follow up. Those who developed depression were compared with those who remained depression free, at time points immediately before and after depression emerged. The groups were compared for differences in appraisals about psychosis (PBIQ) and in self-concept (Possible Selves Questionnaire, PSQ). The PSQ asks participants to rate how well personality descriptors, classified as either 'low-rank' or 'high rank', match their self-concepts of their present self, probable future self, and ideal self.

Loss, humiliation and entrapment to psychosis were higher in the depressed group both prior to and during depression, while shame was only higher once depression was present. On self-concept, the groups differed only in their belief in a probable 'low-rank' future self. As expected, a low-rank future self was endorsed more

strongly by those with depression, even when controlling for current depressive symptom levels.

Birchwood, Iqbal, and Upthegrove (2005) report the results of a small preliminary study of first-episode schizophrenia, in which appraisals of psychosis as involving loss, shame and entrapment were associated with the presence of clinical depression.

Karatzias et al. (2007) compared appraisals of psychosis in schizophrenia patients with and without comorbid affective disorders (depression and/or anxiety). Comorbidity was associated with appraisals of entrapment, shame and humiliation, but not appraisals of loss. Entrapment was the only independent predictor of comorbidity in a multiple logistic regression.

These findings provide some evidence that appraisals of psychosis as conferring low rank may cause depression. However, with the exception of entrapment, associations between depression and the PBIQ subscales were not consistently demonstrated. The two prospective studies support the claim that appraisals have a causal role in producing and exacerbating depression in psychosis.

Comorbid Social Anxiety

In psychosis, social anxiety may develop from a fear of being allocated a low social rank if the stigmatised identity is discovered (Birchwood et al., 2006).

Gumley, O'Grady, Power, and Schwannauer (2004) compared appraisals of psychosis in schizophrenia patients with and without comorbid social anxiety. Social anxiety was associated with appraisals of entrapment and shame, and these differences remained after controlling for depression. Appraisals of loss and humiliation did not differ between the groups.

Birchwood et al., (2006) compared groups with and without social anxiety on appraisals of psychosis, social rank and external shame. The social anxiety group reported more appraisals of loss, humiliation, shame and entrapment, experienced more external shame and perceived themselves as lower in social rank. Importantly, social anxiety did not relate to psychotic symptom levels or pre-morbid interpersonal functioning, supporting the idea that psychosis precedes the emergence of social anxiety.

Hopelessness and Suicidality

Hopelessness is an important indicator of the risk of suicidal behaviour in individuals with schizophrenia (Taylor et al., 2010). White et al. (2007) found associations between appraisals of loss, shame and entrapment (PBIQ subscales) and clinical hopelessness, which were independent of the effects of depression.

Taylor et al. (2010) used structural equation modelling to demonstrate that the relationship between psychosis symptom severity and suicidal ideation was fully mediated by appraisals of defeat and entrapment. All paths remained significant after controlling for depression and hopelessness.

Insight and Awareness of Loss

Lack of insight may protect individuals from becoming aware of the negative impact of psychosis on their social standing. McLeod, Coertze and Moore (2009) found that perceptions of low social rank were associated with increased illness awareness. Iqbal et al. (2000) found illness awareness was elevated during post-psychotic depression. Birchwood et al. (2006) report a trend for elevated illness awareness in individuals with social anxiety. Clinicians need to consider that developing insight may be unhelpful if this leads to expectations of an unalterable loss of social status.

Summary

There is some evidence that individuals who develop comorbid affective disorders have internalised the subordinate status conferred on psychosis patients in society. The strongest evidence comes from two prospective studies showing that appraisals of defeat and entrapment precede a worsening of depressive symptoms. The evidence for outcomes other than depression is weaker. No studies have controlled for the possibility that perceptions of low social rank might precede the onset of psychosis, rather than being a reaction to acquiring a psychosis identity.

These studies demonstrate the importance of considering comorbid difficulties, particularly depression and anxiety, when modelling the mechanisms underlying psychosis. Studies should include these variables routinely so that possible confounding effects and interactions can be usefully interpreted.

Shifts in Social Comparisons

It has been suggested that individuals cope with threatening circumstances by engaging in more 'downward' social comparisons, thus protecting their sense of self-worth (Wills, 1981). Two studies used content analysis to assess shifts towards downward comparisons in hospitalised schizophrenia patients.

Franz, Meyer, Reber, and Gallhofer (2000) used standardised interviews to compare the social comparisons made by patients hospitalised for short-term (up to 3 months) and long-term (over 2 years) durations. Social comparisons within the life domains of health and family were categorised according to direction of comparison ('upward', 'downward' or 'lateral') and object of comparison ('fellow inpatient' or 'other').

Stigma theory predicts that longer-term patients will compare themselves with other patients and make mainly downward (favourable) or lateral comparisons, as a

means of accommodating to their stigmatised identity. In support of the expected comparison shift, more long-term patients compared themselves with other inpatients, and, in the family domain, more long-term patients made lateral comparisons. However, long-term patients also made fewer downward comparisons, which does not fit the expected pattern. Methodological limitations reduce the confidence that can be placed in these findings. The groups differed in age and education, which may have accounted for the differences observed. For long-term patients, comparing themselves to other patients is not necessarily an adaptation to stigma, but may simply reflect the people they are in social contact with.

Finlay, Dinos, and Lyons (2001) analysed the direction and object of social comparisons made spontaneously during semi-structured interviews. They were interested to see whether the identity of 'schizophrenia patient' would emerge as salient in the comparisons made. Although the majority of comparisons were downward or lateral as predicted, targets were more likely to be other groups or people in general, not the patient in-group. The authors conclude that individuals with schizophrenia have resources for construing themselves positively separate from their mentally ill identity.

These studies suggest that individuals may select the kinds of social comparisons they attend to in order to maintain a positive self-identity. The flexibility to hold multiple self-comparisons across different dimensions may be protective against the full negative impact of a loss in status. Measures of global social rank, as used by most of the studies reviewed, are unable to capture this complexity.

Intervention Studies

Cognitive therapies for voice hearing have begun to focus on the interpersonal experience of relating with the voice, including appraisals of relative social rank. Two studies evaluated interventions for psychosis informed by a social rank approach. Table

5 gives details of study characteristics. In both studies, therapy led to improved perceptions of own relative ranking, with associated improvements in distress.

A single-blind randomised controlled trial compared cognitive therapy for command hallucinations (CTCH, Byrne et al., 2003) with treatment as usual (TAU) in patients who had recently complied with a serious command hallucination (Trower et al., 2004). CTCH aims to challenge belief in the voice's power and social rank superiority, and thereby reduce belief in the need to comply with commands.

Compliance reduced in both groups post-treatment, but this reduction was significantly greater for the CTCH group, with a large pre-post effect size (d = 1.1). Perceptions of voice power reduced in the intervention group and this improvement was maintained at 12-month follow-up. The effect of CTCH on compliance was no longer significant once voice power was controlled for, supporting the contention that this intervention acts on the power differential between voice and hearer.

Laithwaite et al. (2009) conducted a pilot pre-post study on the Recovery After Psychosis Programme (RAPP), a 10-week compassion-focussed group intervention for forensic populations, based on Compassionate Mind Training (Gilbert & Irons, 2005). Participants were males with longstanding psychosis from a high-security ward. The therapy aimed to improve perceived social rank by teaching participants to generate compassionate responses to their difficulties.

Outcomes were measured at the beginning, middle and end of the programme and at 6-week follow up. Perceived social rank was significantly improved by the end of therapy, and this difference was maintained at follow up (with a medium effect size, r = .36). Depression, external shame and self-esteem also showed significant improvements. This study did not include a control group, and so improvements may have been due to natural recovery over time.

These findings are based on small samples and so must be viewed as preliminary. Larger controlled trials are needed to establish the efficacy of these interventions.

TABLE 5

Interventions Targeting Social Rank - Comparison of Study Characteristics

	Sample characteristics				Social rank variables		Main outcomes
Study	**Population**	**Gender % F**	**Mean age (range)**	***N***	**Construct**	**Measure**	
Trower et al., 2004	Command hallucinations Mixed forensic/ non-forensic	37%	35.5 (17-60)	Total: 38 CTCH: 18 TAU: 20	Voice power	VPD	Compliance Psychotic symptoms (PANSS)
Laithwaite et al., 2009	Psychosis Forensic	0%	36.9	18	Social rank External shame	SCS OAS	Depression (BDI) Psychotic symptoms (PANSS)

Note. VPD, Voice Power Differential scale; PANSS, Positive and Negative Syndrome Scale; CTCH, Cognitive Therapy for command hallucinations; TAU, treatment as usual; SCS, Social Comparison Scale; OAS, Other as Shamer scale; BDI, Beck Depression Inventory.

Conclusions

This review found a small body of evidence for associations between low social rank and a wide range of clinical outcomes in psychosis. Social rank appears to be related to primary problems of voice-related distress and paranoid anxiety and secondary affective problems, with the strongest weight of evidence being for a link with comorbid depression. This developing evidence base suggests that applying the social rank ideas developed from depression research may provide new insights into the mechanisms underlying psychosis.

There are however some inconsistencies and gaps in the current literature. Two studies found that high rather than low rank was associated with negative outcomes, compliance and paranoia respectively, suggesting that relationships may be non-linear. Various psychological mechanisms have been invoked to explain perceptions of low rank, including biased appraisals, increased insight, and internalised stigma. However, no studies have used objective measures of social standing, and so the accuracy of subjective appraisals cannot be known. Appraisals of loss and entrapment following psychosis may reflect real changes in circumstances, such as the loss of work and relationships.

From the assessment of study quality, quality was high across the studies of social rank in voice-hearing and paranoia. Quality was also high across the studies of social rank and comorbid affective problems. Studies within other areas were found to be of less good quality. The three studies of command hallucinations had methodological issues with small sample sizes, low response rates and reliable measurement of compliance. Of the two studies into shifting social comparisons, one study had several methodological flaws, and the other had a very small sample size. Quality intervention studies were also lacking, with only two studies, both with small samples from very specific populations.

Much of the evidence reviewed comes from studies conducted by related research groups. In two cases, one study was a follow-up of a previous study using the same dataset (Birchwood et al., 2004; Rooke & Birchwood, 1998). This means that there are few instances of independent replication for the key findings discussed.

Weighing up the strength of the evidence, including the number of independent significant findings and study quality, the strongest evidence is for associations between social rank and both voice-related distress and comorbid depression. The next stage for social rank research in psychosis will be to demonstrate replication across a greater range of populations and research sites.

Without evidence from longitudinal and experimental studies, it remains debatable whether low rank is a cause or consequence of psychosis, or both. There are theoretical arguments for a relationship in both directions. Longitudinal studies measuring a wide range of relevant constructs are needed. Comprehensive models are needed of the different causal pathways involved and their interactions over time.

A possible limitation of this review is that the search strategy may have been biased towards studies employing a social rank theoretical framework. Studies conceptualising the same associations in alternative ways, using different terminology, were unlikely to be identified. Because the studies were so heterogeneous in terms of the populations sampled and the range of constructs included, it was unfortunately not possible to formally compare equivalent analyses across studies.

Implications for Future Research

Future studies should be directed at addressing the methodological limitations discussed. In particular, experimental and longitudinal designs are needed to separate out cause and effect. For many of the reported associations, there is a need for replication with larger samples that are comparable in terms of setting and symptom

severity. Research with subclinical and first-episode groups will be valuable for separating out existing risk factors from the impact of stigma. Research is needed to clarify the possible negative outcomes associated with high social rank.

Studies have measured different combinations of social rank constructs. These constructs are assumed to be distinct and of independent importance, but this is difficult to verify when measures share overlap. It will be important to establish which constructs have the greatest clinical utility and predictive power. A related issue is the overlap between social rank and other self-evaluations such as self-esteem. It needs to be demonstrated that social rank is adding something meaningful to models of psychosis, and not just serving as a proxy measure of self-esteem.

Clinical Implications

Placing greater emphasis on rank-related cognitions could enhance the effectiveness of cognitive therapies for psychosis. It will be important that interventions also address secondary psychological problems that might arise from a loss of social standing.

Social and environmental interventions have a clear role to play in overcoming stigma and enhancing social power in those with psychosis. Because the experience of coercive treatment settings can be undermining of social rank, clinicians need to focus on ways of empowering their patients.

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INVESTIGATING THE ROLE OF SELF-ESTEEM AND SOCIAL RANK IN SUBCLINICAL PARANOIA

Abstract

Objectives. This study explored associations between self-esteem, social comparison and two dimensions of persecutory ideation (Persecution and Deservedness). Models of paranoia have proposed that persecutory ideation functions as a defence against negative self-evaluation. If so, 'poor-me' paranoia should be associated with low implicit and high explicit self-esteem.

Design. This study used a cross-sectional internet survey design and recruited a university sample ($N = 534$).

Methods. Participants completed the Persecution and Deservedness Scale as well as measures of implicit self-esteem (initial and birthdate preference), explicit self-esteem, social comparison, anxiety and depression. Hierarchical multiple regression models investigated the influence of self-esteem and social comparison on Persecution and Deservedness, controlling for the effects of anxiety and depression. 'Poor me' and 'bad-me' paranoid groups were identified and compared.

Results. Self-esteem and social comparison variables added significant predictive power to the models. There was strong evidence for the association with negative self-esteem. Associations with social comparison were weaker, with small but significant effects. In the regression model, Persecution was predicted by low social attractiveness and group fit, but high social rank. Compared to the 'poor-me' group, 'bad-me' paranoia was associated with lower positive and higher negative self-esteem, lower social rank and lower social attractiveness. Initial and birthdate preference were

unrelated to persecutory ideation, and appeared to lack validity as a measure of implicit self-esteem.

Conclusions. Persecutory ideation appears to be linked with both explicit self-esteem and social comparison. The findings support the targeting of negative self-evaluations within interventions for psychosis.

Introduction

Definitions and Phenomena

Persecutory delusions, unfounded beliefs that others intend to cause oneself harm, are a common feature of psychosis, occurring in nearly 50% of cases (Freeman, 2007). Research into the mechanisms underlying persecutory ideation, or paranoia, has found evidence for the involvement of multiple social-cognitive processes, including self-esteem, attributional biases and theory of mind (Bentall et al., 2009).

Research has supported a continuum approach to understanding paranoia, where persecutory delusions represent an extreme on a continuum with more ordinary thought processes. This view is supported by the finding that persecutory ideation is reported by up to 30% of individuals from nonclinical populations (Freeman et al., 2005). Milder subclinical paranoia is associated with significant emotional distress and may represent a risk factor for the later development of psychosis (Freeman, 2007).

The same social-cognitive processes that predict paranoia in patient groups have also been identified in sub-clinical paranoia. It has been suggested that there is a hierarchy of paranoia, with more unusual and extreme suspicions developing from ordinary interpersonal concerns (Freeman et al., 2005).

Self-esteem and Paranoia

It has been proposed that individuals with persecutory beliefs have an exaggerated self-serving attributional bias, which functions to protect them from becoming aware of negative self-beliefs (Bentall, Corcoran, Howard, Blackwood, & Kinderman, 2001). In support of this model, some studies have found normal or high levels of self-esteem in individuals with persecutory delusions (Kinderman & Bentall, 1996; Lyon, Kaney, & Bentall, 1994). However, other studies have obtained the

opposite result, finding persecutory delusions or beliefs to be associated with low self-esteem, both in clinical samples (Freeman et al., 1998) and non-clinical samples (Combs & Penn, 2004; Ellett, Lopes, & Chadwick, 2003; Martin & Penn, 2001).

To account for these mixed findings, Bentall et al. (2001) propose that persecutory beliefs are a fragile defence against low self-esteem, which at times breaks down, producing fluctuating levels of self-esteem. In support of this idea, Thewissen, Bentall, Lecomte, van Os, and Myin-Germeys (2008) found that instability in self-esteem over time was more closely related to paranoia than global self-esteem level. Longitudinally, momentary decreases in self-esteem have been found to precede the onset of a paranoid episode (Thewissen et al., 2011). If low or unstable self-esteem represents a risk factor for later paranoia, self-esteem would be an important focus for preventative interventions.

Social rank and Paranoia

Other studies have investigated how social rank might influence paranoia. Evolutionary accounts view paranoia as an adaptive defence strategy, which evolved to help individuals to anticipate and avert social threats (Gilbert, Boxall, Cheung, & Irons, 2005). Other accounts have viewed paranoia as more directly connected to anxiety, sensitivity to threat and interpersonal worry (Freeman, Gittins, et al., 2008; Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002). There is evidence that paranoid ideation is related to social anxiety and avoidance, self-monitoring and fear of negative evaluation (Martin & Penn, 2001).

Social rank hierarchies exist in both human and animal social groups, and are a means of negotiating the competition between individuals for resources. For humans, social rank is not just about power and dominance, although this is one component. We also procure status and resources by being attractive to others (if others admire you,

they will confer status on you) and from belonging to social groups (Allan & Gilbert, 1995). The cognitive ability to make social comparisons allows individuals to assess their own standing relative to others. Appraisals of relative rank, social attractiveness and group-fit are presumed to influence an individual's immediate social behaviour, and over time become incorporated into their internalised sense of self (Gilbert, 1992). It is expected that appraisals of social rank, attractiveness and group fit will also correlate with other types of self-evaluation such as self-esteem.

According to social rank theory, individuals who perceive themselves to be low in rank engage in defences of 'fight', 'escape' and 'withdrawal' (Gilbert, 1992). These defences evolved as a means for subordinate individuals to protect themselves from social threats. Chronic activation of these defences is thought to increase sensitivity to threats, and produce clinical disorders including depression, social anxiety and paranoia (Gilbert, 1993).

When facing hostile social environments where threats are anticipated, hypervigilence and suspicion are adaptive responses that can successfully avert harm, but when adopted in a non-discriminating fashion, this suspicious mindset may lead to paranoia. Paranoid thinking is thought to serve different functions in dominant and subordinate individuals, who face different kinds of social threat (Gilbert, 2005). Low-ranking individuals need to be vigilant to threats from above, so they do not engage in conflicts where they stand to lose. High-ranking individuals must put energy into maintaining their status by discouraging challenges from below.

Allan and Gilbert (1995) developed a measure of social rank, the Social Comparison Scale (SCS). This scale includes items measuring social rank, social attractiveness and group fit. In their validation study, perceived inferior social rank was associated with higher scores on nearly all psychopathology subscales from the Symptom Checklist (SCL-90, Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974).

Few studies to date have investigated social rank in paranoia. In Allan and Gilbert's (1995) validation study, the psychoticism subscale of the SCL-90 was most strongly related to the group-fit items of the Social Comparison Scale (SCS). A study of paranoia in a non-psychotic clinical sample found that paranoia was predicted by increased submissive behaviour, but also by increased social power (Gilbert et al., 2005). In this study, social rank was not a significant predictor after controlling for depression. The finding that submissiveness and social power exerted opposite effects was interpreted as evidence for separate types of paranoia associated with low and high rank.

Another study found that both submissive behaviour and lower social rank were associated with higher levels of paranoia (Freeman et al., 2005). This was an internet study with a large student sample and although associations were statistically significant, effect sizes were only small to medium.

Interventions for psychosis that incorporate ideas from social rank theory are beginning to be developed. Cognitive Therapy for Command Hallucinations (CTCH, Byrne, Trower, Birchwood, Meaden & Nelson, 2003) targets hearers' beliefs in their low status and powerlessness in relation to their voices. A randomised controlled trial has supported the effectiveness of this intervention (Trower et al., 2004).

Explicit and Implicit Self-esteem

Some studies have compared explicit measures of self-esteem with implicit measures that attempt to tap into automatic, unconscious self-evaluations. According to Bentall et al.'s (2001) paranoia-as-defence model, a discrepancy between explicit and implicit self-esteem should be apparent in paranoid individuals. Explicit measures would capture positively biased defensive self-evaluations, whereas implicit measures should detect the underlying low self-esteem. While some studies have found the

expected pattern of normal explicit and low implicit self-esteem in paranoid groups (McKay, Langdon, & Coltheart, 2007; Moritz, Werner, & von Collani, 2006), results have been mixed (Freeman et al., 2002).

A complication when using implicit measures of self-esteem is the reported poor convergence between different measures (Rudolph, Schroder-Abe, Schutz, Gregg, & Sedikides, 2008; Bosson et al., 2000). This suggests that different measures may be tapping into different components of self-esteem, meaning that results obtained from a particular measure may not be replicable using a different one.

A comparison of the psychometric properties of different implicit self-esteem measures (Bosson et al., 2000) favoured the Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 2008) and the name-letter task (Nuttin, 1985). The name-letter effect is the tendency for individuals to prefer the letters in their name to non-name letters. The effect is strongest for initial letters (LeBel & Gawronski, 2009), and can also be demonstrated for the numbers in an individual's birthdate (Kitayama & Karasawa, 1997). Variations of the name-letter task have been successfully used as a measure of implicit self-esteem in several studies (e.g. Koole, Dijksterhuis, & van Knippenberg, 2001; Koole, Smeets, van Knippenberg, & Dijksterhuis, 1999; Verplanken, Friborg, Wang, Trafimow, & Woolf., 2007). The current study uses the initial-preference and birthdate-preference tasks, variations of the original name-letter task, using the procedure from Bosson et al. (2000).

Bad-me and Poor-me Paranoia Subtypes

Trower and Chadwick (1995) have suggested a distinction between 'poor-me' delusions, where persecution is experienced as undeserved, and 'bad-me' delusions, where the individual feels deserving of persecution. In clinical groups, reported rates of poor-me paranoia range from 50 to 93% (Fornells-Ambrojo et al., 2009). It has been

suggested that bad-me paranoia is more prevalent in chronic psychosis, with beliefs about deservedness developing in reaction to the experience of psychosis itself (Fornells-Ambrojo et al., 2009). Some authors have suggested that deservedness is better conceptualised as a continuous dimension of paranoia, rather than dichotomous poor-me and bad-me subtypes (Freeman, 2007).

Melo, Corcoran, Shryane, and Bentall (2009) have developed the Persecution and Deservedness Scale (PADS), which has separate persecution and deservedness subscales. The deservedness subscale can be used to define poor-me (low deservedness) and bad-me (high deservedness) paranoia groups, or can be analysed as a continuum. Using this measure, Melo et al. found that persecutory beliefs tended more towards bad-me in non-clinical groups, and more towards poor-me in a group with psychosis.

Compared to poor-me paranoia, bad-me paranoia has been found to be associated with lower self-esteem and increased depression (Chadwick, Trower, Juusti-Butler, & Maguire, 2005; Freeman, Garety, & Kuipers, 2001). Pickering, Simpson, and Bentall (2008) used the PADS to measure deservedness as a continuum in a student sample. Deservedness was predicted by severity of persecutory beliefs, higher negative self-esteem and lower positive self-esteem, but was not related to depression. In another study, deservedness was predicted by depression but the relationship was mediated by the coping responses 'substance use' and 'active coping' (Melo & Bentall, 2010).

Bentall et al. (2001) have argued against poor-me and bad-me as stable subtypes of paranoia. Instead, they argue that beliefs in deservedness will fluctuate over time, with poor-me persecutory delusions serving to defend against low self-esteem, and bad-me delusions corresponding to times when this defence breaks down. In support of this

hypothesis, some patients with persecutory delusions have been found to switch between poor-me and bad-me paranoia over time (Melo et al., 2006).

From Bentall et al.'s (2001) model, predictions follow for the relationship between implicit and explicit self-esteem. Lowered explicit self-esteem would be expected only in bad-me paranoia, whereas lowered implicit self-esteem would be expected in both types. I. Grey obtained this pattern from a clinical sample, split into poor-me and bad-me groups using a cut-off score of deservedness on the PADS (personal communication, September 14, 2009). In this study, implicit self-esteem was measured using the IAT.

Emotional Processes and Paranoia

Recent models of paranoia have highlighted the role of emotional processes, particularly anxiety and depression (Bentall et al., 2009; Kuipers et al., 2006). Comorbid depression is common in psychosis (Birchwood, 2003) and anxiety has been found to predict paranoia both cross-sectionally (Freeman, Pugh, et al., 2008) and longitudinally (Thewissen et al., 2011).

Bentall et al. (2009) conducted a large-scale study modelling a wide range of constructs implicated in paranoia. They identified an emotional processing factor termed 'pessimistic thinking style', which included depression, anxiety and low self-esteem. These are the underlying negative emotions that paranoia is believed to defend against in Bentall et al.'s (2001) paranoia-as-defence model. Other models view paranoia as a type of anxious fear with similarities to social anxieties (Freeman, Gittins, et al., 2008). Paranoid and social anxieties are both related to perceived social threats and are both associated with symptoms of depression and anxiety.

Depression and anxiety may moderate associations between paranoia and self-esteem, and so should ideally be controlled for when investigating these relationships

(Martin & Penn, 2001). Consideration should be given to the directionality of the underlying causal relationships and possible interactions between variables over time. While paranoid thoughts may be triggered by depression or low self-esteem, they are also likely to lead to further increases in depression and decreases in self-esteem (Freeman, 2007). In psychosis groups, experiences of stigma and the loss of valued roles are likely to reinforce existing beliefs in low self-worth and inferior rank (Birchwood et al., 2006).

Current Study

This study extends previous research on self-esteem and social rank in persecutory delusions. Both implicit and explicit self-esteem are investigated, together with three domains of social comparison; social rank, social attractiveness and group fit. By using an internet survey method, a large sample was obtained, allowing for smaller effects to be detected and for comparisons between different sub-groups. We believe this is the first study of paranoia to measure self-esteem and social rank together to determine their relative importance and the relationship between them.

Aims

This study aims to increase our understanding of the role of social-cognitive processes in predicting persecutory beliefs. The study investigates whether self-esteem and social comparison are associated with persecutory ideation in a non-clinical sample. Anxiety and depression are controlled for, as both are found to co-occur with persecutory ideation. The study attempts to replicate the pattern of implicit and explicit self-esteem in poor-me and bad-me groups found by I. Grey (personal communication, September 14, 2009) but in a non-clinical sample using a different measure of implicit self-esteem.

Research Questions and Hypotheses

Question 1. Do self-esteem and social rank predict level of persecutory belief? It is predicted that low self-esteem and low social rank will be associated with increased paranoia.

Question 2. Do self-esteem and social rank predict whether persecution is felt to be deserved? When deservedness is treated as a continuum, it is predicted that low self-esteem and low social rank will be associated with increased belief that persecution is deserved.

Question 3. Are self-esteem and social rank predictive of persecution and deservedness, after controlling for anxiety and depression? Depression and anxiety are expected to partially account for variations in reported paranoia, but it is expected that self-esteem and social rank will still exert independent effects.

Question 4. Do poor-me and bad-me paranoia show a different pattern of explicit and implicit self-esteem? It is predicted that poor-me and bad-me paranoia groups will have similar implicit self esteem, but differ in explicit self-esteem, with bad-me paranoia associated with lower explicit self-esteem, following the pattern of results obtained by I. Grey (personal communication, September 14, 2009).

Question 5. Are there differences in self-esteem and social rank in poor-me and bad-me paranoia? From previous research, it is predicted that when deservedness is classified into dichotomous groups, bad-me paranoia will be associated with lower explicit self-esteem and lower social rank.

Method

Design

The study used a cross–sectional design to investigate paranoia in a non-clinical sample. Participants completed a series of self-report questionnaires as an internet survey.

See Appendix A for letter of scientific and ethical approval from the research governance sponsor.

Participants

An invitation email (Appendix B) was sent out to all recipients on a volunteers list held by the University of Sheffield, estimated to contain 7208 recipients. Members of this list are predominantly current or past students and staff in all positions of the university.

When using an internet survey, there is a risk that an individual will submit more than one set of responses. Therefore, a check was made on participants' initials and date of birth (provided as part of the survey), to ensure that there were no exact matches. IP addresses were also checked for implausible numbers of duplications (due to participants using shared university computers, some duplications were expected).

Measures

Implicit self-esteem - Initial-preference and birthdate-preference tasks (IPT/BPT, Bosson et al., 2000, Appendices E and F). These tasks are a variation on Nuttin's Name-Letter task (Nuttin, 1985) and were based on the procedure used by Bosson et al., (2000). An individual's relative preference for their initial letters and birthdate numbers is used as a measure of implicit self-esteem. Participants rated their liking of letters (A-Z) and numbers (0-35) on a 7-point Likert scale from 1 (I dislike this

letter/number very much) to 7 (I like this letter/number very much). To deter participants from giving a logically reasoned response, written instructions for participants emphasised that preference ratings should be made on the basis of immediate feeling. Capital letters were presented in an alphabetically ordered list across two pages. Numbers were presented in numerical order as a list across two pages. Numbers included zero and 32-35 to disguise the connection with days of the month.

In a comparison of several measures of implicit self-esteem, Bosson et al. (2000) identified the Implicit Association Test (IAT) and Name-Letter task as having the most satisfactory psychometric properties. The Name-Letter task was used in this study because it was easier to adapt for remote internet administration than the IAT. Bosson et al. report an internal consistency of .57 between first and last initial rating score, and a test-retest reliability of .60. Although fairly low, these reliability estimates are considered reasonable for an implicit measure with only two items. Name-letter preference has been found to correlate positively but non-significantly with measures of explicit self-esteem. (Bosson et al., 2000; Koole et al., 2001).

Calculation of initial and birthdate preference scores. Preference scores were calculated using an ipsatised algorithm, which is considered to be psychometrically optimal (LeBel & Gawronski, 2009). The ipsatised algorithm controls for two sources of systematic error variance; individual differences in baseline response tendencies, and differences in baseline letter/number favourability. For letters, it is computed by centering each participant' ratings around their mean rating for non-initial letters. Difference scores are then computed between the ipsatised ratings for first and last initials, and the mean (ipsatised) rating for that letter by participants who do not have that initial letter. Positive scores indicate a relative over-evaluation of one's own initials or birthdate numbers, while negative scores indicate a relative under-evaluation.

Ratings given for the filler items (numbers zero and 32-35) were not included when calculating mean ratings. To improve reliability, preference scores were averaged for first and last initial and for birthdate day and month to produce overall initial-preference and birthdate-preference scores.

Social Rank - Social Comparison Scale (SCS - Allan & Gilbert, 1995, Appendix G). This 11-item self-report measure includes items relating to perceived social rank (5 items), social attractiveness (3 items) and social acceptance/group fit (3 items). These three domains are conceived of as distinct on the basis of their clinical relevance and proposed evolutionary basis. Factor analysis supported the existence of two clear factors of social rank and group fit, with social attractiveness items loading on both factors (Allan & Gilbert, 1995). Each item consists of a 10-point scale with descriptive anchors (e.g. inferior-superior). Participants are required to rate how they see themselves in relation to others from 1 to 10. The reported Cronbach alpha of .91 suggests high internal reliability (Gilbert et al., 2005). In this study, mean scores were calculated separately for subscales (SCS-rank, SCS-attractiveness and SCS-group fit) and overall social comparison (SCS-Total). The three subscale scores were entered in the regression analyses.

Anxiety and Depression - Hospital Anxiety and Depression Scale (HADS – Zigmond & Snaith, 1983, Appendix H). This measure consists of 14 questions, seven measuring anxiety and seven measuring depression. Items are scored from 0 to 3, with higher scores representing greater frequency or intensity of symptomatology. Total scores on each scale range from 0 to 21. A total score of 8 is widely accepted as the cutoff for possible caseness, and a score of 11 is indicative of probable caseness. Bjelland, Dahl, Haug and Neckelmann (2002) reviewed the psychometric properties of the HADS across 747 studies. HADS showed good internal reliability (mean Cronbach

alpha of .83 for anxiety and .82 for depression) and good convergent validity with other commonly used measures (correlations between .49 and .83).

Persecution and Deservedness Scale (PADS-10 – Melo et al., 2009, Appendix I). The PADS-10 contains two scales measuring the degree of respondents' persecutory beliefs (PADS-P) as well as the perceived deservedness of persecution (PADS-D). Ten pairs of items are rated on a 5-point Likert scale from 0 to 4. The first item of each pair describes a persecutory belief, rated as 'certainly false' (0) to 'certainly true' (4). This is followed by a question about whether that persecution feels deserved, rated from 'not at all' (0) to 'certainly true' (4). The second item is only completed if the first score is 2 ('unsure') or higher. Mean scores for persecution items and applicable deservedness items are used.

For PADS-P, Melo et al. (2009) report good internal reliability (α = .84) and convergent validity with an established paranoia measure, the Paranoia Scale (Fenigstein & Vanable, 1992; r_s = .78). For PADS-D, because only applicable items are answered, Cronbach's alpha cannot be calculated. However, Melo et al. report an intra-class correlation of 0.38 for PADS-D and 0.32 for PADS-P, suggesting that the two scales are comparable in their reliability. The validity of PADS-D as a measure of deservedness is not yet established, as it is the first scale of this kind, however Melo et al. report a moderate correlation with the Paranoia Scale (r_s = .28).

Explicit Self-Esteem - Self-Esteem Rating Scale (Short Form) (SERS-SF – Lecomte, Corbiere, & Laisne, 2006, Appendix J). The 20-item SERS-SF was derived from a factor analysis of the original 40-item version (Nugent & Thomas, 1993**)**. The scale measures the levels of both negative and positive self-esteem, with 10 items measuring each factor. Confirmatory factor analysis supported a model where positive and negative self-esteem are separate factors (Lecomte et al., 2006). Individual items tap into aspects of self-worth, competence and comparison with others.

Participants rate each item on a 7-point Likert scale from 'never' to 'always'. Ratings are summed to produce overall positive (SERS-P) and negative (SERS-N) scores. Lecomte et al. (2006) report that both the positive and negative scale demonstrated good internal consistency (respective Cronbach alpha of .91 and .87), test-retest reliability (r = .90, r = .91) and convergent validity with the commonly used Rosenberg Self Esteem Scale (r = .72, r = -.79; Rosenberg, 1965).

Procedure

The initial email invited recipients to take part in the current study and another trainee's study that was using some of the same measures. Participants who opted to take part in both studies completed the measures for this study first, in a different version of the online survey. Presentation of the measures was identical between the two versions, although there were some minor differences in the introductory information and the demographic questions (see Appendices C and D).

Measures were administered in the order listed above, with participants only being able to navigate forwards through the survey. The initial-letter and birthdate-number tasks were completed first so that other measures would not jeopardise the implicit nature of responding, since the order of administration has been found to influence responding when measuring explicit and implicit self-esteem together (Bosson et al., 2000; Krizan & Suls, 2008).

Participants had to confirm that they were over 18 and confirm their consent to take part. Throughout the survey, participants were required to answer every item on the measures in order to progress to the next page. Data were only used for participants who completed all parts of the survey.

As well as the measures listed above, participants were asked to provide the following demographic information: gender, age, ethnicity, employment status. They

were also asked whether they had ever received help for a mental health problem. This question was included as a check to find out what proportion of participants might come from a clinical population, since university samples are generally assumed to be non-clinical. After completing the initial-preference and birthdate-preference tasks, participants were asked for their initials and date of birth, supposedly for the purpose of identifying responses. The second purpose for obtaining this information was to calculate the initial-preference and birthdate-preference effect scores.

Participants were given only general information about the research, with no mention made of paranoia or self-esteem. It was important that participants were unaware of what was being tested, so that the implicit measure of self-esteem remained implicit. Participants were invited to contact the researchers if they wanted further information.

Statistical Analyses

Raw data was exported from the online survey platform (SurveyMonkey) as an Excel spreadsheet. In Excel, participants were given ID numbers and scores for all of the measures were calculated. For confidentiality and data security purposes, potentially identifiable data (initials, date of birth, email address and IP address) were transferred into a separate spreadsheet, linked by Participant ID. Scores were imported into the statistical package PASW Statistics 18.0, which was used for all analyses.

After data screening and checking of assumptions, correlational analyses were carried out to assess the relationships between the different variables. Hierarchical multiple regression was then used to model the prediction of persecution and deservedness from self-esteem and social comparison variables. Age, gender, depression and anxiety were entered as a first block to control for any moderating effects of these variables. Persecution was entered as a second block in the regression

on deservedness. Previous studies have suggested that deservedness varies according to paranoia severity (Fornells-Ambrojo et al., 2009) and, because of the inherent dependency between the paired items on the PADS, scores on persecution and deservedness were expected to correlate.

To compare 'poor-me' and 'bad-me' paranoia, low and high deservedness groups were defined based on PADS Deservedness score and the two groups compared for differences on all other measures.

Listwise deletion was used for all analyses; only participants with valid data on all of the relevant variables were included in each statistical test. Sample size therefore varied according to the variables under test.

Power Analysis (using G*Power 3.1, Faul, Erdfelder, Buchner, & Lang, 2009)

For the hierarchical multiple regression analyses, assuming a 'medium' effect size of $f^2 = .15$, a significance level of $\alpha = .05$, 4 predictors in Block 1 and 7 predictors in Block 2, a sample size of 104 is required to achieve 80% power for testing the increase in R^2. Minimum sample sizes were in fact 411 for persecution (PADS-P) and 251 for deservedness (PADS-D).

For two-tailed t-tests comparing poor-me and bad-me groups, assuming a 'medium' effect size of $d = .5$ and a significance level of $\alpha = .05$, a sample size of 64 is required for each group to achieve 80% power. Group size was in fact 65.

Results

Sample Sizes and Missing Data

Out of 731 individuals recruited to the online questionnaires, 195 exited the survey part-way through and 2 did not confirm their consent, resulting in a final sample size of 534, a response rate of 7.4%. Sample sizes for the following variables were reduced due to missing data (see flow diagram in Figure 1).

Age. Fourteen participants did not give their age, giving a sample size of 520 for Age data.

PADS Deservedness Scale. Because of the way the PADS is constructed, considerable missing data was expected on the Deservedness scale. Following the procedure of Melo et al. (2010), deservedness scores were only analysed for participants with valid scores on 3 or more of the 10 items. Participants endorsing only 1 or 2 persecutory thoughts are excluded on the basis that a certain level of persecution must be experienced for deservedness to be a meaningful concept. This gave a sample size of 320 participants (59.9%) for Deservedness data.

Initial and birthdate preference tasks. Initial-preference and birthdate-preference cannot be meaningfully calculated using the ipsatised algorithm unless there is some variation in a participant's ratings. 56 participants (10.5%) showed no variation in their liking either for letters or for numbers. A further 20 participants (3.7%) showed some variation in their liking for letters but not numbers, and another 20 participants (3.7%) showed the opposite pattern. In accordance with the protocol for the ipsatised algorithm (LeBel & Gawronski, 2009), these cases were excluded from analyses of the relevant measure. Sixteen participants did not give valid initials (responses were either a single letter or 5+ letters) and one participant did not give their date of birth. These

participants were also excluded from analyses of the relevant measure. Final sample sizes were 442 for initial-preference and 457 for birthdate-preference.

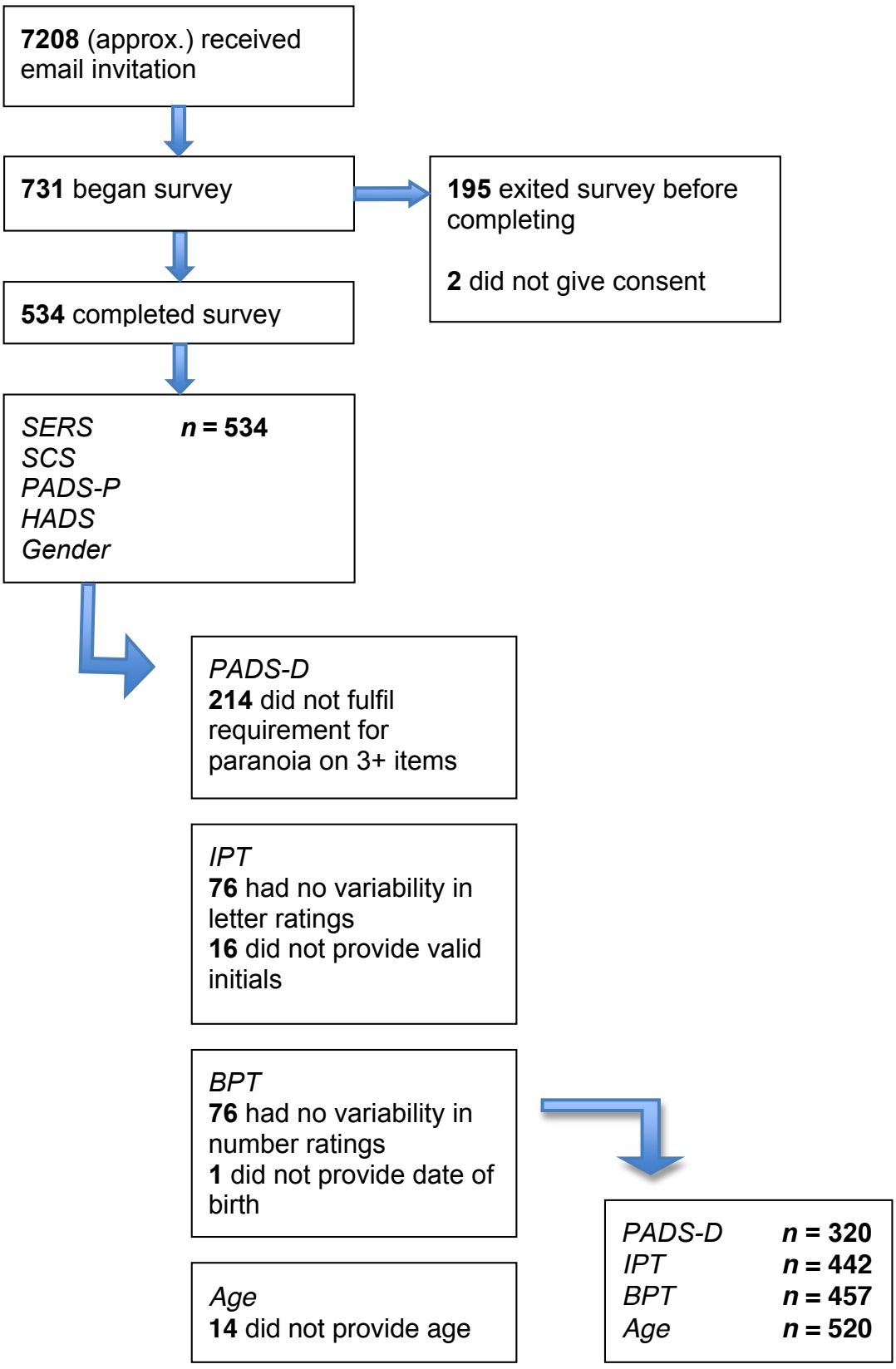
A series of Mann Whitney U tests were carried out to determine if participants with invalid initial-preference or birthdate-preference scores differed to the rest of the sample on any of the other measures (see Appendix M for details). Non-parametric tests were indicated because on inspecting histograms, most of the variables appeared to show departures from normality in their distribution.

For both initial-preference and birthdate-preference, there were significant differences between groups in anxiety (HADS-A), depression (HADS-D), negative self-esteem (SERS-N) and persecution (PADS-P), with small effect sizes. In both cases, the group with invalid scores were less anxious, less depressed, had less persecutory ideation and were lower on negative self-esteem.

These results show that for initial-preference and birthdate-preference analyses, excluding those participants who liked all letters and numbers the same has introduced unintended biases. The resulting samples are unrepresentative in important ways, although these differences are small.

FIGURE 1

Flowchart of Obtained Sample Sizes



Descriptive Statistics

Distribution of scores. Inspection of histograms revealed that the distribution of several variables showed some deviations from normality (see Appendix L for skew and kurtosis statistics). For the PADS, SERS and HADS (depression subscale only), scores were skewed towards the non-pathological end of the scale, which is not surprising for data from a non-clinical sample. In large samples, tests for significant deviations from normality are not particularly informative, as even very slight skew will be statistically significant (Field, 2009). Absolute skew values were all below 1, which was considered acceptable for conducting Pearson correlations and multiple regressions. Given the large sample size, it was considered that these tests would be robust to any slight violations of assumptions (Field, 2009).

Sample demographics are given in Table 1.

TABLE 1

Demographics for the Total Sample, N=534

Age (median, range)	22, 18-63
Gender	%
Male	30.1
Female	69.9
Occupation	%
Student	75.8
Employed	22.3
Homemaker	0.6
Unemployed	0.6
Retired	0.6
Other	0.2
Ethnic group	%
White	83.9
Asian	10.5
Other	2.2
Black	1.7
Mixed	1.5
Have you ever received help for a mental health problem?	%
Yes	18.9
No	76.4
Prefer not to answer	4.7

Depression and anxiety (HADS). In this sample, scores ranged from 0 to 21 on the anxiety subscale, and from 0 to 15 on the depression subscale. The mean depression score (HADS-D) was 4.04 (*SD* = 3.03), and the mean anxiety score (HADS-A) was 8.10 (*SD* = 4.01). Using Zigmond and Snaith's (1983) suggested cutoffs of 8 and 11 for possible and probable clinically relevant symptoms, rates for possible caseness were 13.2% for depression and 53.2% for anxiety. Rates for probable caseness

were 2.3% for depression and 27.7% for anxiety. The level of anxiety symptoms reported appears to be relatively high for a non-clinical sample. It has been observed that Internet administration tends to produce inflated reports of psychological distress, and this is thought to be due to increased self-disclosure and reduced social desirability effects (Buchanan, 2003). The rates of caseness observed in this sample are comparable to those for a non-clinical control group in a study by McCue, Buchanan and Martin (2006), which investigated the psychometric properties of the HADS when used as an online screening tool in chronic fatigue syndrome.

Implicit self-esteem (initial-preference and birthdate-preference). The expected positivity bias (preference) for initial letters and birthdate numbers was obtained. The mean relative over-evaluation of initials in units on a 1-7 scale, averaged across first and last initials, was 1.11 (*SD* = 1.10). Mean over-evaluation of birthdate numbers, averaged across day and month, was 0.57 (*SD* = 1.05). Single sample t-tests confirmed that both effects were significantly different from zero (ILE, $t_{(441)} = 21.22$, $p < .001$, $d = 1.01$; BNE, $t_{(456)}=11.55$, $p < .001$, $d = .54$). The current effect size for initial-preference of 1.01 is of similar magnitude to the amalgamated effect size of 1.17 reported by LeBel and Gawronski (2009), weighted across 18 samples.

Explicit self-esteem (SERS). Mean scores were 36.54 for positive self-esteem (*SD* = 10.97) and 20.40 for negative self-esteem (*SD* = 11.72). These are comparable to the mean scores of 41.3 (*SD* = 8.7) and 17.8 (*SD* = 9.8) reported by Lecomte et al. (2006) for their combined English and French student sample (scores adjusted for differences in scale).

Social rank (SCS). Mean scores on the three subscales were 5.49 (*SD* = 1.53) for Social Rank, 5.02 (*SD* = 1.71) for Social Attractiveness and 4.89 (*SD* = 1.69) for Group Fit. Mean overall social rank (SCS-Total) was 5.20 (*SD* = 1.40), which was

comparable to the mean score of 5.88 (*SD* = 1.06) reported by Allan and Gilbert (1995) for a student sample.

Persecution and deservedness (PADS). Mean scores were 1.33 (*SD* = 0.90) for Persecution and 1.21 (*SD* = 0.87) for Deservedness. These are comparable to the mean scores of 1.18 (*SD* = 0.78) and 1.14 (*SD* = 0.87) reported by Melo et al. (2009) for their UK university sample.

Internal Reliability. Internal reliability was adequate for all measures for which Cronbach's alphas could be calculated (see Table 2). Internal consistency of initial-preference and birthdate-preference was assessed using the correlations between preference scores for first and last initials, and day and month of birth. Consistency was reasonable for the initial letter preference at *r* = .35, which compares well to the average inter-item correlation of .34 reported in LeBel and Gawronski's (2009) reanalysis of 18 datasets. Consistency for birthdate preference was poorer at *r* = .13.

TABLE 2

Sample size and Internal Validity for Main Variables

Measure	***N***	**Cronbach's α**
HADS-Anxiety	534	.82
HADS-Depression	534	.74
SCS-Rank	534	.87
SCS-Attractiveness	534	.86
SCS-Group Fit	534	.78
SCS-Total	534	.91
SERS-Positive	534	.94
SERS-Negative	534	.92
IPT	442	
BPT	457	
PADS-Persecution	534	.88
PADS-Deservedness	320	

Note. HADS, Hospital Anxiety and Depression Scale; SCS, Social Comparison Scale; SERS, Self-esteem Rating Scale; IPT, initial-preference task; BPT, birthdate-preference task; PADS, Persecution and Deservedness Scale. Cronbach alpha cannot be calculated for IPT, BPT and PADS-D.

Inferential Statistics to address Research Questions

Correlational analysis. Pearson correlations between all variable pairs are presented as a matrix in Table 3.

Interestingly, neither initial nor birthdate preference were associated with paranoia, although initial-preference was weakly correlated with explicit self-esteem and social rank. Initial and birthdate preference should be correlated if both are measuring implicit self-esteem. The correlation between them was significant but small (r = .15), suggesting a lack of convergent validity. Previous studies have generally found a stronger and more consistent name letter effect for the first initial than the last

initial (LeBel & Gawronski, 2009). Looking at the first initial preference separately, this measure was weakly correlated with deservedness but not with persecution. Overall, the expected relationships between implicit self-esteem and the other measures were not evident other than for the three weak relationships mentioned. Given the number of comparisons made, these suggestive effects may be spurious, although they were in the predicted direction.

As predicted, explicit self-esteem and social comparisons were associated with both persecution and deservedness. However, relationships were stronger for self-esteem variables than for social comparison variables. Higher persecution and deservedness were associated with lower explicit self-esteem and lower social rank, attractiveness and group fit. Anxiety and depression were associated with paranoia, explicit self-esteem and social rank. This supports the decision to control for the influence of anxiety and depression within the hierarchical regressions.

TABLE 3
Correlations Between Variables (Pearson's r)

	HADSD	SCS-R	SCS-A	SCS-GF	SERS-P	SERS-N	IPT	IPT-FI[a]	BPT	PADS-P	PADS-D
HADS-Anxiety	.548***	-.323***	-.294***	-.352***	-.410***	.555***	-.007	.010	.033	.581***	.222***
HADS-Depression		-.228***	-.238***	-.270***	-.385***	.454***	-.026	-.045	-.003	.461***	.210***
SCS-Rank			.731***	.486***	.646***	-.667***	.120*	.101*	-.013	-.385***	-.413***
SCS-Attractiveness				.635***	.668***	-.582***	.079	.068	-.002	-.443***	-.322***
SCS-Group Fit					.646***	-.465***	.048	.080	-.052	-.450***	-.200***
SERS-Positive						-.694***	.134**	.095*	-.017	-.561***	-.382***
SERS-Negative							-.096*	-.063	-.018	.680***	.473***
IPT									.151**	-.068	-.100
IPT-First Initial									.176***	-.069	-.129*
BPT										.019	-.047
PADS-Persecution											.348***

Note. HADS, Hospital Anxiety and Depression Scale; SCS, Social Comparison Scale; SERS, Self-esteem Rating Scale; IPT, initial-preference task; BPT, birthdate-preference task; PADS, Persecution and Deservedness Scale.
[a] initial preference based on first initial only.
* $p < .05$ ** $p < .01$ *** $p < .001$

Question 1. Do self-esteem and social rank predict level of persecutory belief?

To answer this question, a multiple hierarchical regression was carried out with PADS-P as the outcome variable. To control for the expected effects of demographic and affective variables, gender, age, depression (HADS-D) and anxiety (HADS-A) were entered together in a first block. Self-esteem and social rank variables were entered together in a second block. This block included positive and negative explicit self-esteem (SERS-P, SERS-N), implicit self-esteem (IPT, BPT) and social rank subscales (SCS; rank, attractiveness and group-fit).

One multivariate outlier was identified; this case had a leverage of over 3 times the average and a Mahalonobis distance of over 25 (40.68), both of which are considered cause for concern according to Field's procedures (Field, 2009). This case was excluded from the analysis, leaving a sample size of 411[1].

Averaged initial and birthdate preference scores were not significant predictors of persecution (initial-preference, B = -.018, $SE\ B$ = .028, beta = -.021, t = -0.630, p = .529; birthdate-preference, B = .012, $SE\ B$ = .029, beta = .014, t = 0.416, p = .678). The regression model was re-run using the preference score for first-initial only, which was also non-significant. Therefore, the regression was re-run without the implicit self-esteem measures, to see how this affected the rest of the model. Removing the implicit self-esteem measures allowed the larger sample size of N = 519 to be included, as the participants for whom valid letter/number preference data was not available could be reinstated. This reduced the potential for bias from excluding an unrepresentative subset of the sample.

Details of the final model are presented in Table 4 (see Appendix N for details of initial model, N = 411). The first block was highly significant (adjusted R^2 = .403, $F_{(4, 514)}$ = 88.276, p < .001), and the addition of the second block significantly improved

[1] Excluding this outlier did not change the significance of predictors in the model, other than for gender, which was no longer significant.

the model (adjusted R^2 =. 568, F change$_{(5, 509)}$ = 40.285, p < .001). In combination, the two blocks of predictors accounted for 56.8% of the variability in Persecution. Self-esteem and social rank predictors accounted for an additional 16.5% of variability over and above that accounted for by age, gender, depression and anxiety.

A higher level of persecutory beliefs was predicted by younger age, higher depression and anxiety scores, more negative self-esteem, higher social rank (an effect in the opposite direction to that predicted), lower social attractiveness and lower group fit. Squared semi-partial correlations revealed that negative self-esteem and anxiety were the strongest predictors of persecutory beliefs, uniquely accounting for 7.2% and 3.6% of variability in persecution respectively. Social rank uniquely accounted for 1.4% of variability. The remaining predictors, although significant within the model, uniquely accounted for less than 1% of variability in persecution.

The meaning of the positive beta weight for social rank requires further consideration. The beta weight is significant but is of opposite sign to the significant zero-order correlation between social rank and persecution. In regression, interpretations from beta weights are specific to the exact combination of predictors used, and assume that the model is fully specified (Courville & Thompson, 2001). To interpret regression coefficients accurately, they need to be considered together with the corresponding zero-order correlations. This is especially so when a set of predictors are intercorrelated and likely to share explanatory ability, as is the case here (Courville & Thompson, 2001). In this case, low social rank is associated with persecution, but there is a suppressor effect from the presence of the other predictors that changes the direction of the relationship within the regression model.

TABLE 4.

Final Regression Model for Persecution

Variable	*B*	*SE B*	*β*	*t*	*p*	*sr*
Block 1						
Age	-.015	.003	-.158	-4.623	<.001	-.157
Gender	-.092	.068	-.047	-1.351	.177	-.046
Anxiety	.107	.009	.479	11.638	<.001	.395
Depression	.059	.012	.197	4.807	<.001	.163
Block 2						
Age	-.008	.003	-.083	-2.762	.006	-.080
Gender	-.084	.060	-.042	-1.392	.164	-.040
Anxiety	.057	.009	.256	6.578	<.001	.190
Depression	.022	.011	.072	1.972	.049	.057
Positive self-esteem	-.007	.004	-.083	-1.655	.099	-.048
Negative self-esteem	.035	.004	.456	9.313	<.001	.269
Social rank	.119	.029	.200	4.148	<.001	.120
Social attractiveness	-.062	.026	-.118	-2.423	.016	-.070
Group fit	-.048	.023	-.089	-2.106	.036	-.061

Note. Block 1 adjusted R^2 = .403; Block 2 adjusted R^2 = .568. *sr*, semi-partial (part) correlation.

Question 2. Do self-esteem and social rank predict level of belief that persecution is deserved?

To answer this question, a multiple hierarchical regression was carried out with PADS-D as the outcome variable. As before, gender, age, depression and anxiety were entered together in a first block, but this time persecution scores were also entered as a second block. Self-esteem and social rank variables were entered together in a third block.

The same case was again identified as a multivariate outlier; for deservedness, this case had a leverage value over 3 times the average and a Mahalonobis distance of

over 25 (40.73). This case was again excluded from the analysis, leaving a sample size of 251[2].

As for persecution, neither initial nor birthdate preference were significant predictors of deservedness (initial-preference, B = -.019, $SE\ B$ = .042, beta = -.025, t = -0.444, p = .658; birthdate-preference, B = -.055, $SE\ B$ = .045, beta = -.069, t = -1.224, p = .222).

When the model was re-run using first-initial preference score, this measure was also non-significant. As before, the regression was re-run without the implicit self-esteem measures, which allowed the larger sample size of N = 308 to be included.

Details of the final model are presented in Table 5 (see Appendix O. for details of initial model, N = 251). The first block was highly significant (adjusted R^2 = .113, $F_{(4, 303)}$ = 10.785, p < .001). The addition of the second block significantly improved the model (adjusted R^2 = .144, F change$_{(1, 302)}$ = 12.116, p = .001) and the addition of the third block further improved the model (adjusted R^2 = .238, F change$_{(5, 297)}$ = 8.386, p < .001). In combination, the three blocks of predictors accounted for 23.8% of the variability in Deservedness. Self-esteem and social rank predictors accounted for an additional 9.4% of variability over and above that accounted for by age, gender, depression, anxiety and persecution.

A higher level of deservedness (or 'bad me' paranoia) was predicted by younger age, and more negative self-esteem, each uniquely accounting for 1.9% of the variability in deservedness. The SCS rank subscale approached significance (p = .053), with a trend for lower rank to predict higher deservedness. Anxiety and depression were significant predictors in the first block. Anxiety became non-significant after the addition of persecution in Block 2. Persecution and depression were significant

[2] Excluding this outlier did not change the significance of any predictors in the model, other than for age, which became significant within Block 3.

predictors in Block 2 but became non-significant after the addition of self-esteem and social rank variables.

Testing assumptions. Multicollinearity between predictors was within acceptable limits for both regression models (the lowest tolerance was .33 for persecution and .34 for deservedness). However, in both models the average variance inflation factor (VIF, the reciprocal of tolerance) was greater than 1 which may indicate bias due to multicollinearity (persecution, 2.14; deservedness, 1.79; Field, 2009). This suggests that there may be issues with the variables within the model being all closely related to each other, even though none of the bivariate correlations approached unity.

From inspection of residual plots (see Appendix P.), the assumptions of normality and linearity of residuals appeared to be met. However, there was some heteroscedasticity in residuals, with the variance of residuals increasing for larger values of predicted persecution or deservedness. Heteroscedasticity weakens rather than invalidates the regression model (Tabachnick & Fidell, 2007), and so the models can still be interpreted but may have reduced generalisability to other samples (Field, 2009).

TABLE 5

Final Regression Model for Deservedness

Variable	***B***	***SE B***	***β***	***t***	***p***	***sr***
Block 1						
Age	-.021	.005	-.217	-4.008	<.001	-.215
Gender	.074	.103	.040	0.717	.474	.039
Anxiety	.034	.014	.153	2.374	.018	.128
Depression	.049	.018	.172	2.702	.007	.145
Block 2						
Age	-.017	.005	-.183	-3.381	.001	-.178
Gender	.076	.101	.041	0.747	.456	.039
Anxiety	.015	.015	.066	0.974	.331	.051
Depression	.040	.018	.139	2.197	.029	.116
Persecution	.264	.076	.215	3.481	.001	.184
Block 3						
Age	-.014	.005	-.145	-2.764	.006	-.138
Gender	-.019	.100	-.010	-0.186	.853	-.009
Anxiety	-.003	.015	-.011	-0.168	.867	-.008
Depression	.026	.018	.092	1.500	.135	.075
Persecution	.094	.080	.077	1.176	.240	.059
Positive self-esteem	-.008	.006	-.105	-1.307	.192	-.065
Negative self-esteem	.017	.006	.233	2.796	.006	.139
Social rank	-.088	.045	-.166	-1.944	.053	-.097
Social attractiveness	.022	.040	.045	0.542	.588	.027
Group fit	.020	.039	.037	0.517	.605	.026

Note. Block 1 adjusted R^2 = .113; Block 2 adjusted R^2 = .144; Block 3 adjusted R^2 = .238. *sr*, semi-partial (part) correlation.

Question 3. Are self-esteem and social rank predictive of persecution and deservedness, after controlling for anxiety and depression?

For both persecution and deservedness, the addition of self-esteem and social rank variables significantly improved the predictive power of the model. This demonstrates that the associations between self-esteem, social rank and paranoia are not simply due to the association of all these variables with depression and anxiety. Indeed, for deservedness, anxiety and depression were no longer significant predictors when entered alongside self-esteem and social rank variables. This suggests that the apparent associations between affective symptoms and paranoia may in fact be mediated by self-esteem.

Question 4. Is Poor-Me paranoia associated with higher explicit, but not higher implicit self-esteem?

This pattern would be predicted if paranoia functions as a defence against low self-esteem. However, it was not possible to test this prediction in the current sample, because of the poor performance of the initial-preference and birthdate-preference scores as a measure of implicit self-esteem. There was insufficient evidence that these measures were reliably capturing anything of importance. The only significant associations were between initial preference and both positive self-esteem and social rank, and between first-initial preference and Deservedness. However, these relationships were so weak as to be of little clinical importance, if they are indeed true effects and not spurious. A reliable and valid measure of implicit self-esteem would be expected to show clear associations with depression, anxiety and explicit self-esteem, in line with theory and previous findings (Bosson et al., 2000). It is concluded that the initial and birthdate preference tasks lacked validity in this particular sample.

Question 5. Are there differences in self-esteem and social rank between Poor-Me and Bad-Me paranoid groups?

A 'paranoid' group was defined using a cut-off score of 2 for persecution score (see Figure 2a). This cut-off was chosen to correspond with the mid-point of the rating scale for each persecution item ("Unsure"). The 'paranoid' group is therefore characterized by the experience of some persecutory thoughts, ranging from mild to more severe paranoid ideation. On inspecting the distribution of deservedness scores within this group deservedness appears to be a continuous variable (see Figure 2b). There is a cluster of higher scores around 2.5 which could fit with there being separate but overlapping underlying distributions for 'poor me' and 'bad me' paranoia. However, scores range from low to high with no clear demarcation between poor-me and bad-me groups. Therefore, participants were allocated into 'poor-me' and 'bad-me' groups based on a median split on deservedness scores (split point 1.29, $n = 65$ for each group).

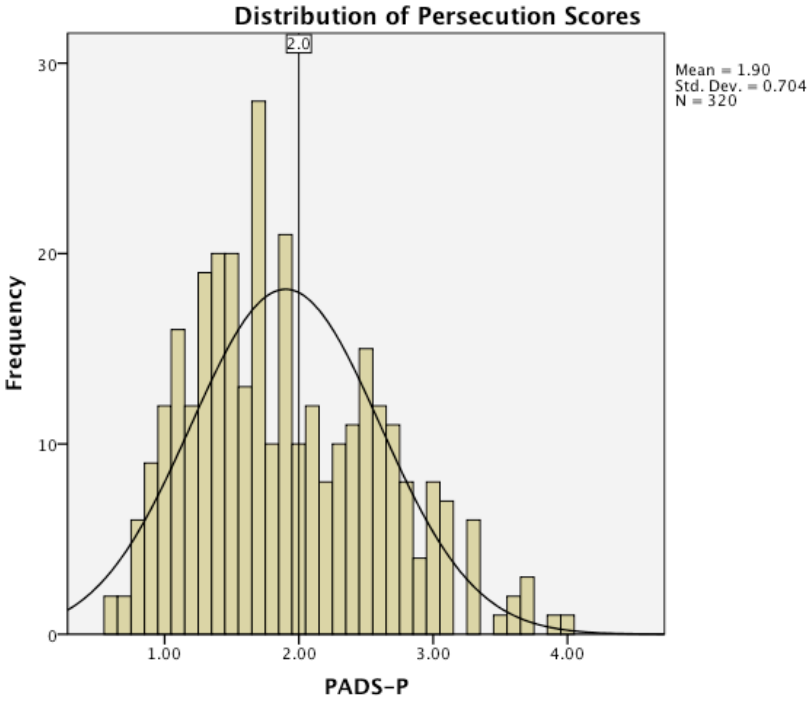
Distributions of scores by group were inspected for normality. Because most of the variables appeared to show departures from normality (Shapiro-Wilks statistics significant at $p < .05$), differences were tested using non-parametric statistics (Mann-Whitney U tests). Differences between 'poor-me' and 'bad-me' paranoia were highly significant for both types of explicit self-esteem (positive self-esteem: PM 31.00, BM 24.00, $U = 1395.5$, $z = -3.34$, $p = .001$, $r = -.29$; negative self-esteem: PM 27.00, BM 36.00, $U = 1216.5$, $z = -4.17$, $p < .001$, $r = -.37$). The groups also differed significantly on social rank (PM 4.80, BM 4.60, $U = 1573.5$, $z = -2.51$, $p = .012$, $r = -.22$), social attractiveness (PM 4.00, BM 3.00, $U = 1572.0$, $z = -2.52$, $p = .012$, $r = -.22$) and anxiety (PM 11.00, BM 12.00, $U = 1568.5$, $z = -2.54$, $p = .011$, $r = -.22$). Compared to poor-me paranoia, bad-me paranoia was associated with lower social rank and attractiveness and positive self-esteem, and higher anxiety and negative self-esteem. The 'bad-me' paranoid group had a higher level of persecutory beliefs, which may account for some

of the other differences found between the groups (PM 2.50, BM 2.60, $U = 1588.0$, $z = -2.45$, $p = .014$, $r = -.21$). Gender is a potential confounding factor in these effects, as there was a higher proportion of males in the poor-me group. Differences between the groups on depression and group fit were not significant. Details of group comparisons are given in Table 6.

FIGURE 2

Histograms Showing Distribution of Persecution and Deservedness Scores

a. Distribution of Persecution scores for participants with a valid Deservedness score. Vertical line shows cutpoint for defining paranoia group.



b. Distribution of Deservedness scores for paranoia group. Vertical line shows cutpoint for median split into 'poor-me' and 'bad-me' paranoia groups.

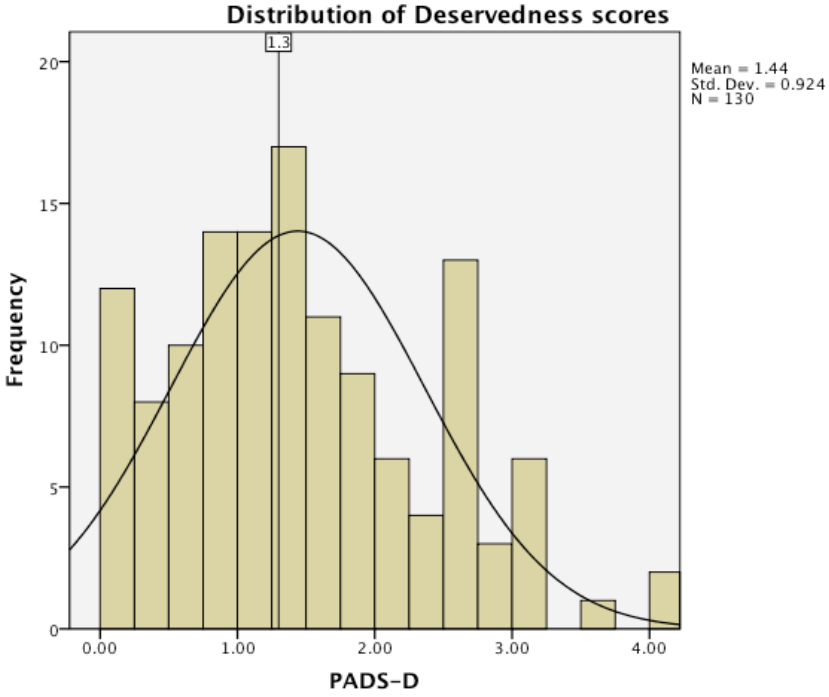


TABLE 6

Descriptive Statistics for 'poor-me' and 'bad-me' Paranoia Groups and Mann-Whitney U tests for Significant Differences

Variable	**Paranoia group**						**Difference (Mann-Whitney *U*)**			
	Poor-me (n = 65)			Bad-me (n = 65)						
Gender	Female	40	62%	Female	50	77%				
	Male	25	38%	Male	15	23%				
	Median		***IQR***	**Median**		***IQR***	***U***	***z***	***p* (2-tailed)**	**Effect size *r***
Age	21		6	20		4				
HADS-Anxiety	11.00		5.00	12.00		4.00	1568.5	-2.54	.011	-.22
HADS-Depression	5.00		5.00	6.00		4.50	1863.0	-1.17	.242	-.10
SERS-Positive	31.00		12.50	24.00		18.00	1395.5	-3.34	.001	-.29
SERS-Negative	27.00		12.50	36.00		17.50	1216.5	-4.17	<.001	-.37
SCS-Rank	4.80		2.50	4.60		2.40	1573.5	-2.51	.012	-.22
SCS-Attractiveness	4.00		3.00	3.00		3.00	1572.0	-2.52	.012	-.22
SCS –Group Fit	4.00		2.67	3.33		2.33	1791.5	-1.50	.134	-.13
PADS-Persecution	2.50		0.50	2.60		0.60	1588.0	-2.45	.014	-.21

Note. HADS, Hospital Anxiety and Depression Scale; SERS, Self-esteem Rating Scale; SCS, Social Comparison Scale; PADS, Persecution and Deservedness Scale; IQR, interquartile range.

Discussion

Paranoia and Low Self-esteem

Negative self-esteem was a main predictor of both persecution and deservedness, whereas there were no significant independent associations observed for positive self-esteem. It is not surprising that only one of the self-esteem subscales was a significant predictor within the models, as negative and positive self-esteem are likely to account for the same shared variance. The finding that negative self-esteem was more closely associated with paranoia than positive self-esteem supports the emphasis placed on negative self-evaluations in models of paranoia (Kuipers et al., 2006).

These findings provide further support for a pattern of low self-esteem in subclinical paranoia, as reported by previous studies (Combs & Penn, 2004; Ellett, Lopes, & Chadwick, 2003; Martin & Penn, 2001). In general, paranoid individuals were aware enough of their negative self-evaluations to report above average levels of negative self-esteem. This appears at odds with a strong version of Bentall et al.'s (2001) paranoia-as-defence model. However, a weaker paranoia-as-defence model may still be compatible with the current results. It is possible that paranoia does act as a defence against low self-esteem in some individuals at some points in time, but this defence is not widespread or effective enough to completely obscure the underlying link between low self-esteem and paranoia.

Paranoia and Inferior Social Comparisons

Persecutory ideation was moderately correlated with inferior comparisons on dimensions of social rank, social attractiveness and group fit. However, in the regression model, a more complex picture of associations emerged. Persecutory ideation was predicted by lower attractiveness and lower group fit, as expected, but was

predicted by higher rather than lower rank. All three subscales were highly significant predictors statistically, due to the very large sample size, yet individually each subscale only accounted for a very small amount of the variance in persecution scores. These effects, although of theoretical interest, are probably too slight to be of any real clinical significance. Deservedness was also moderately correlated with social rank and attractiveness; the relationship between deservedness and group fit was somewhat weaker. None of the social comparison scales were significant predictors of deservedness in the regression model.

That the social rank subscale should act in an opposite way to social attractiveness and group fit was unexpected. Gilbert et al. (2005) have also found discrepancies of this kind between different social rank variables. In their hierarchical multiple regression, after controlling for depression, paranoia was predicted by submissive behaviour (which should reflect low rank), but also by social power (which should reflect high rank). Social rank (SCS total score) was also included in their model but was not significant.

The meaning of the discrepancy between subscales is unclear, and requires further investigation. It appears that there is a suppressor effect operating, whereby the presence of other variables within the model has changed the direction of the relationship between social rank and persecution. All the self-esteem and social comparison variables were added into the regression model together in the same step, and therefore it is difficult to determine which of the other variables are responsible for the suppressor effect.

All of the self-esteem and social comparison variables were inter-correlated. It seems probable that social rank and self-esteem are closely related and therefore are accounting for the same shared variance within the model. From the size of the coefficients, negative self-esteem is stronger as a predictor of paranoia than any of the

social comparison subscales, although this finding may be specific to the particular combination of measures included.

It is interesting that due to the suppressor effect, the SCS rank subscale accounted for additional variance within the model in the opposite direction to the other two SCS subscales. If the combined score alone had been used instead of the three subscales, these opposing relationships would have cancelled each other out, giving an impression of there being no relationship at all. In fact, a re-run of the multiple regressions with SCS-total replacing the three subscales found that this was indeed the case; overall social comparison score was not related to persecution in either direction. This issue may help to explain the lack of a significant effect for SCS-total in the Gilbert et al. (2005) study.

As explained in the introduction, there is some theoretical basis for expecting paranoia to emerge as a strategy in both low and high ranking individuals. Gilbert et al. (2005) conclude that in their study, a 'low rank' pattern of paranoia associated with submissiveness was the most prevalent. However, once this pattern of paranoia was accounted for within the regression model, an opposing pattern of 'high rank' paranoia was revealed, associated with high social power (Gilbert et al., 2005). If paranoia can be a feature of both low and high social rank, one possibility is that these represent separate subtypes of paranoia with distinctive profiles. Alternatively, there may be a non-linear component to the relationship between social rank and paranoia, which is not adequately described by linear regression models.

Deservedness and Bad-me Paranoia

In the regression analysis, the PADS-D score was treated as a continuous dimension (low to high) rather than a dichotomy (poor-me or bad-me). Taking this approach, negative self-esteem predicted increased belief that persecution was deserved,

whereas positive self-esteem and the three social comparison subscales were not related to deservedness. The complete regression model accounted for only 23.8% of the variance in deservedness, compared to 56.8% when the same predictors were regressed on persecution scores. This means that although the combination of predictors chosen produced a statistically significant model, this combination of predictors were not very good at predicting deservedness.

In this non-clinical sample, the distribution of deservedness scores did not suggest a dichotomous classification into poor-me and bad-me paranoia, and so 'poor me' and 'bad me' groups were specified using a median split. Using this method, 'bad me' was associated with lowered self-esteem, social rank and social attractiveness, and with increased levels of anxiety and persecutory ideation.

These differences are in line with Bentall et al.'s (2001) model, which proposes that bad-me paranoia results from fragile self-esteem. The findings also support the idea that bad-me paranoia is a reaction to more severe paranoid anxieties (Fornells-Ambrojo & Garety, 2009). In the bad-me group, high anxiety may exacerbate paranoid thinking, while negative self-evaluations lead to beliefs that they deserve to be rejected and attacked. It is interesting that the bad-me group perceived themselves as more inferior and less attractive, but did not differ in their sense of group belonging.

Measurement of Implicit Self-esteem

The predicted discrepancies between explicit and implicit self-esteem could not be tested because of methodological problems with the initial and birthdate preference tasks. The expected positivity bias for initials and birthdate numbers was convincingly demonstrated, but there was little evidence that the size of the bias varied as a function of self-esteem. There is an issue with implicit measures being generally less reliable than explicit measures (LeBel & Gawronski, 2009). In this case, the convergence

between first and last initial preference was reasonable (r = .35) but the convergence between birth date and month was poor (r = .13), as was the convergence between mean initials and mean birthdate preference (r = .15).

Initial and birthdate preference did not add any predictive power to the regressions, and so were removed from the final models in order to maximise sample size. An additional issue was that scores were invalid for a substantial proportion of the sample (around 15%), who gave the same rating for all letters and/or numbers, meaning that a preference score could not be calculated. This pattern of responding has been encountered by other researchers and is usually treated as non-compliance. However, the current study had an unusually high rate of participants who responded in this way, compared to a previously reported rate of 4.4% across 18 samples (LeBel & Gawronski, 2009). It could be that the internet survey format encouraged this kind of responding by presenting items in a block, as a list of radio buttons, and requiring an answer to each question. Participants who did not want to complete the task seriously might have quickly clicked down one column in order to 'skip' through.

Unfortunately, the excluded participants were an unrepresentative subset of the sample, which introduced some unintended bias. It is not clear why these participants should have differed in their scores on the other measures. It may be that these are a group of people who are generally less suggestible to endorsing lists of experiences presented to them within a survey of this kind.

On the basis of all these factors, it was concluded that initial and birthdate preference scores were either measuring something other than implicit self-esteem, or were otherwise invalid in their measurement. Buhrmester, Blanton, and Swann (2011) have argued that name-letter tasks measure a more general self-preferential bias rather than self-esteem. Psychometric limitations of the initial preference task have been highlighted by several previous studies (Bosson et al., 2000; Krizan & Suls, 2008;

LeBel & Gawronski, 2009; Rudolph et al., 2008). It is not unusual when using this measure to obtain low convergences with other implicit and explicit self-esteem measures, and with known covariates of self-esteem.

Understanding the Role of Age, Depression and Anxiety

Age was a significant predictor of both persecution and deservedness, with younger participants feeling more persecuted and being more likely to believe that this was deserved. In their regression model, Melo et al. (2010) also found that younger age predicted higher scores for persecution (PADS-P), but not for deservedness (PADS-D). Their study also used a university sample recruited through the internet, so this effect may be specific to younger samples. Lincoln and Keller (2008) report higher rates of delusions in student populations compared to the general population, a difference that was largely accounted for by younger age.

Anxiety and depression were both predictors of persecution, with anxiety being the second strongest predictor after negative self-esteem. These effects were expected on the basis of previous findings, and confirm the importance of considering affective as well as social-cognitive determinants of paranoia. It was expected that anxiety would be more strongly related to paranoia than depression, as paranoia is essentially a type of anxious thinking (Freeman, Gittins, et al., 2008).

Although age, depression and anxiety accounted for some of the variation in both persecution and deservedness, the social-cognitive variables under study remained an important set of predictors. In fact, for deservedness, anxiety and depression were no longer significant once self-esteem and social comparison were introduced into the model.

Unaccounted Variance Within Regression Models

For both persecution and deservedness regression models, there was a considerable proportion of variance unexplained by the set of predictors. This suggests that there are other important predictors of paranoia that were not included in this study. Variables that have been considered by other studies as relevant to paranoia, and may account for some of the unexplained variance, are: the presence of unusual perceptual experiences (including hallucinations); differences in coping style; differences in reasoning style (including cognitive flexibility and tendency to make reasoning biases). Other variance may be explained by differences in lifestyle factors, such as current life stressors and level of social support.

Methodological Critique

Studying paranoia in a non-clinical population made it possible to sample across the full continuum of persecutory belief, from ordinary low-level suspicions to stronger delusions of persecution. It is important to establish if the same mechanisms underlie paranoia across the continuum of severity. Subclinical paranoia is an important phenomenon clinically, as it may confer vulnerability for future psychosis or for other psychological problems. Subclinical populations can also tell us about the differences between paranoia that is dysfunctional, and paranoia that may be an adaptive response to threat.

The limitation of studying a predominantly non-clinical population is that findings cannot be assumed to generalise to specific clinical groups or individuals with very severe paranoia. Also, the cross-sectional design means that the putative direction of effects cannot be tested. However, there are no obvious reasons why these results would not be transferable to other samples. Following a continuum approach, relationships among variables are expected to apply across the full spectrum of severity.

There was a wide range of paranoia severity represented within the current sample, and a significant proportion of participants had a history of mental health problems.

Selecting a non-clinical sample avoids many potential issues when working with patients, such as the influences of hospitalisation, medication and concurrent symptoms. Furthermore, with patient groups there is the complication of reactive changes to the experience of having psychosis over time, which make it difficult to determine which phenomena are primary.

The internet survey method used was a convenient means to collect large quantities of data. This format has the advantage of being discrete, anonymous and non-pressurising, which should encourage more honest responding. The main limitation of using this method is that the sample is self-selected and represents only a small proportion of the target population. This may introduce bias and limits the generalisability of the results. It was also not possible to monitor compliance, which could explain the unusual patterns of responding seen for the initial and birthdate preference tasks. Other studies have reported inflated scores on the HADS when using online administration. McCue et al. (2006) reported elevated levels of both anxiety and depression in their non-clinical control group, compared to normative data from paper administrations. In the current study, fairly high rates of caseness were observed for anxiety and depression using the established cutoffs for the HADS (Zigmond & Snaith, 1983). This may be an accurate reflection of the levels of distress in this particular self-selected sample, or it may be a result of the administration method used. It must be considered that scores on the other questionnaires may also have been inflated by the online administration method.

The large sample meant that there was sufficient statistical power to model the combined predictiveness of several variables, and to compare poor-me and bad-me paranoia subtypes. However, the presence of some multicollinearity between predictors

and heteroscadasticity of residuals may have weakened the predictive power of the regression models.

There are various issues with using a self-selected university sample that may have influenced the results obtained. Participants were from a particular demographic, being mostly of young age and female, and presumably with a high level of education. This makes the sample unrepresentative of the general population. There are reasons to suspect that social rank might be distributed differently in the particular population studied. Perceived rank was lower in females and younger participants in the current data, suggesting that rank does vary according to demographic. High educational attainment would suggest that objective social rank in this group should be high. However, this may not translate into subjective perceptions of high rank. Perceptions of social rank will also depend on the chosen point of comparison, people in general or one's own peers.

Areas for Future Research

There are ways in which the current study could have been developed further, if additional research time had been available. Firstly, there are other multiple regression analyses that could be conducted to explore which variables are the strongest predictors of paranoia. One idea would be to conduct hierarchical multiple regressions where social rank variables are entered in a separate step following self-esteem variables, and vice versa, to test whether social rank explains additional variance beyond that accounted for by self-esteem. Another option would be to try removing some of the variables with the strongest intercorrelations, with the aim of producing a model that is more parsimonious and less affected by multicollinearity. A further possibility would be to investigate the observed suppressor effect through a series of regressions where the SCS social rank subscale is entered first followed by another variable. It would be

interesting to see which variables, if any, change the direction of the relationship between social rank and persecution when added in isolation.

The current study was unable to compare implicit and explicit self-esteem as planned, because of the unsatisfactory performance of the initial and birthdate preference measures. There are some changes that could be made to the administration of this task to improve its utility as a measure. To address the issue of participants rating all letters/numbers the same, the task could be adapted so that instead of assigning ratings, participants have to assign rank order preferences. An article published after data collection for this study has analysed different administration methods for the Name Letter Task and made recommendations for maximizing reliability (Stieger, Voracek, & Formann, 2011). These authors recommend that first and last letter preferences are analysed separately, that a duplicate administration is used, and that ratings are collected both for likeability and attractiveness.

Future research should consider using an alternative measure of implicit self-esteem. The IAT is a promising candidate, but unfortunately this task could not be used in the current study because of the resources needed to develop an online IAT application. A future study could take place in a research laboratory so that the IAT could be included, with the drawback that this would reduce the number of participants that could be realistically recruited.

The current study has revealed interesting and complex associations between self-esteem, social rank and paranoia. There is now a need to carry out longitudinal and experimental studies, in order to establish the causal pathways that account for the interaction of these factors over time.

In terms of methodology, studies are needed which can capture possible non-linear relationships between social rank and paranoia. Alternatively, researchers could try to separate out low and high rank paranoia to see if there is evidence for a model

with two separate subtypes. Another potential area for future research is the relationship between paranoia and other constructs related to social rank, such as social power, submissive behaviour and shame. These factors have received more attention in relation to other areas of psychopathology, including voice hearing, but may also be relevant to the study of paranoia.

Clinical Implications

These findings add further support for the key role of negative self-evaluations in the development of persecutory beliefs. Interventions for persecutory delusions should aim to address negative self-esteem in particular, but may also benefit from considering negative social comparisons within a social rank framework. Paranoid individuals are likely to perceive themselves as having inferior social rank, as lacking in social attractiveness and as being a social outsider. However, it appears that some individuals with paranoia may actually consider themselves to be high in social rank. This finding suggests that paranoia can present in different ways, and emphasizes the need to be guided by individual formulations. While interventions to enhance social rank and self-esteem will be of value for many, such an approach may not be indicated for all patients.

This study confirms the co-occurrence of negative self-evaluations with both paranoid ideation and emotional experiences of anxiety and depression. There is a need for broad interventions for delusions that are able to alleviate associated anxiety and depression, and address a range of possible cognitive, emotional and interpersonal vulnerabilities.

Summary of Findings

Correlational analyses found associations between low explicit self-esteem, inferior social comparisons, persecutory ideation and beliefs that persecution is deserved. Anxiety and depression were covariates of paranoia, low self-esteem and inferior social comparisons. Self-esteem and social comparison scales appeared to be measuring related but distinct aspects of self-evaluation. Scores on an implicit self-esteem task were not reliably associated with any other measure and so were not included in the regression analysis.

In a hierarchical multiple regression, persecution was predicted by negative self-esteem, inferior comparisons on the dimensions of social attractiveness and group fit, superior comparisons on the dimension of social rank, younger age, anxiety and depression. Of all these predictors, negative self-esteem and anxiety showed the strongest independent effects. After accounting for the influence of all the other variables, it was high rather than low social rank that predicted persecution. Theories of threat monitoring in dominants can help to explain this apparent discrepancy.

For deservedness, the only significant predictors were younger age and negative self-esteem. Anxiety, depression and persecution were no longer associated with deservedness after accounting for the variance explained by self-esteem. Although both regression models were highly significant, many variables exerted only a very small incremental effect when evaluated in combination.

In line with previous research into differences between poor-me and bad-me paranoia, bad-me paranoia was associated with lower social rank and attractiveness, lower positive self-esteem, higher negative self-esteem, higher anxiety and more severe persecutory ideation.

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APPENDIX A. Letter of approval from ethics committee

The University Of Sheffield.

Research & Innovation Services.

A Section of Academic Services

Jennifer Neubert
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21 September 2010

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Project title: Social cognition in paranoia: Self-esteem and social comparison as predictors of persecutory beliefs
6 digit URMS number: 128651

Dear Jennifer

LETTER TO CONFIRM THAT THE UNIVERSITY OF SHEFFIELD IS THE PROJECT'S RESEARCH GOVERNANCE SPONSOR

Research and Innovation Services has reviewed the following documents:

1. A University approved URMS costing record;
2. Signed, dated confirmation of scientific approval;
3. Signed, dated confirmation of ethics approval.

All the above documents are in place. Therefore, the University now **confirms** that it is the project's research governance sponsor and, as research governance sponsor, **authorises** the project to commence research activities.

You are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Good Research Practice Standards: www.shef.ac.uk/ris/gov_ethics_grp. You are also expected to publish a lay summary of the project on the website of the National Research Ethics Service (NRES), as it appears in the research ethics application.

Your Supervisor, with your support and input, is responsible for monitoring the project on an ongoing basis. Your Head of Department is responsible for independently monitoring the project as appropriate. The project may be audited during or after its lifetime by the University. The monitoring responsibilities are listed in **Annex 1**.

Yours sincerely

T. Swift

Dr Tracey Swift
Head of Development
Research and Innovation Services
University of Sheffield

cc. Supervisor: Dr Georgina Rowse
Head of Department/School: Professor Graham Turpin

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To access the University's research governance website go to:
www.shef.ac.uk/ris/gov_ethics_grp/governance/gov.html

Monitoring responsibilities of the Supervisor:

The primary responsibility for project monitoring lies with the Supervisor. You agree to:

1. Establish a **site file** before the start of the project and ensure it remains up to date over the project's entire lifetime:
   www.shef.ac.uk/ris/gov_ethics_grp/governance/rgp/rg-forms.html
2. Provide **progress reports/written updates** to the Head of Department at reasonable points over the project's lifetime, for example at:
   a. three months after the project has started; and
   b. on an annual basis (only if the project lasts for over 18 months); and
   c. at the end of the project.
   See: www.shef.ac.uk/ris/gov_ethics_grp/governance/rgp/rg-forms.html
3. Report **adverse events**, should they occur, to the Head of Department:
   www.shef.ac.uk/ris/gov_ethics_grp/governance/rgp/rg-forms.html
4. Provide progress reports to the research funder (if externally-funded).
5. Establish appropriate arrangements for recording, reporting and reviewing significant developments as the research proceeds – i.e. developments that have a significant impact in relation to one or more of the following:
   - the safety or physical or mental integrity of the participants in the project;
   - the project's scientific direction;
   - the conduct or management of the project.

   The Head of Department should be alerted to significant developments in advance wherever possible.

****

Monitoring responsibilities of the Head of Department

You agree to:

1. Review the **standard monitoring progress reports**, submitted by the Supervisor, and follow up any issues or concerns that the reports raise with the Supervisor.
2. Verify that **adverse events**, should they occur, have been reported properly and that actions have been taken to address the impact of the adverse event(s) and/or to limit the risk of similar adverse event(s) reoccurring.
3. Verify that a project is complying with any **ethics conditions** (e.g. that the information sheet and consent form approved by ethics reviewers is being used; e.g. that informed consent has been obtained from participants).
4. Introduce a form of **correspondence** (e.g. regular email, annual meeting) with a project's Supervisor, that is **proportionate to the project's potential level of risk**, in order to verify that a project is complying with the approved protocol and/or with any research funder conditions. Whatever correspondence is chosen the Head of Department should, as a minimum, ensure that s/he is informed sufficiently in advance about significant developments wherever possible.

APPENDIX B. Email invitation to take part in this study and another trainee's study

Sent to the 'volunteers' mailing list of University of Sheffield on 18th October 2010.

Research Participants Needed

Hello,

We are trainee Clinical Psychologists at the University of Sheffield. We are contacting you to tell you about two research projects and invite you to participate in either one or both of these studies. Both studies require filling an online questionnaire where you'll be asked some questions about your thoughts and feelings.

STUDY 1: For women only and is looking at changes over the menstrual cycle. We would therefore ask you to complete a ten minute online questionnaire each week for four weeks (we would send you a friendly reminder email each week). For this study we need women aged 18-45 who menstruate regularly.

STUDY 2: The other study is open to anyone, both men and women. For this study, you would need to complete a one-off questionnaire which takes 15 to 20 minutes.

If you are a woman and would like to take part in both studies, you would complete the longer one-off questionnaire first, and then on subsequent weeks you would only need to complete the shorter questionnaire.

IF YOU ARE INTERESTED IN TAKING PART in the studies click here or paste the link below into your web browser:

Both studies: https://www.surveymonkey.com/s/WR3JLYK

Just study 1 https://www.surveymonkey.com/s/NJWWXFN

Just study 2 https://www.surveymonkey.com/s/NCPSJPJ

The study has received ethics approval from the Department of Psychology Ethics
Sub-Committee. In accordance with ethical guidance, all information you provide will remain entirely confidential, and you are free to withdraw at any time.

If you have any further queries please do not hesitate to email us at pcp08rh@sheffield.ac.uk (Rosalind Hall), or pcp08jmn@sheffield.ac.uk (Jenny Neubert).

Many thanks

Rosalind Hall and Jenny Neubert

Researchers:

Rosalind Hall
Jenny Neubert
Trainee Clinical Psychologists

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Clinical Psychologist
University of Sheffield

Dr Rebecca Knowles
Clinical Psychologist & Clinical Lecturer
University of Sheffield

Professor Pauline Slade
Professor of Clinical Psychology
University of Sheffield

APPENDIX C. Online survey for participants completing only this study

Study 2

1. Information page

Thank you for your interest in this research study. Please read the information below carefully before deciding whether you want to take part.

What are the study purposes?
Previous research has found that the way people think about themselves and others can predict some of the beliefs that they hold. This study aims to find out more about what makes people hold certain beliefs.
The study has been ethically approved through the ethics review procedure of the Clinical Psychology Unit, University of Sheffield. Although you will not receive any immediate personal benefits from taking part, it is hoped that this research will help people who experience psychological problems in the future.

What does the study involve?
You will be asked to complete a questionnaire online. The questions relate to how you think and feel about yourself and others. The questionnaire takes about 15-20 minutes to complete.

Do I have to take part?
It is entirely up to you to decide whether or not to take part. You can exit this online survey at any point and your answers will not be saved. After you submit your answers, you can withdraw by contacting the researchers on the details given below.

Will my answers be confidential?
All information collected will be stored securely. Passwords are used so that only the researchers can access the data. You will be asked to give your initials and date of birth in order to identify your answers. This means that you can withdraw from the study later if you change your mind. Your initials and date of birth will not appear anywhere in the write-up. You will not be able to be identified in any reports or publications.

What will happen to the results of the study?
The results of the study are likely to be published in academic journals. If you would like to receive a summary of the results, please contact the researchers on the details below.

You must be 18 years old or over to take part in the study.

If you have any questions or concerns about the study, you can contact one of the researchers, Jenny Neubert, by email on pcp08jmn@sheffield.ac.uk

2. Consent page

If you have read the information provided and you would still like to take part, can you please confirm the following details

*** I confirm that am 18 years old or over**

- ◯ Yes
- ◯ No

Study 2

*** I have read the information provided, and hereby give my consent for the information that I provide to be used for the research purposes described**

- ◯ Yes
- ◯ No

3. Consent needed

You have selected 'no' as your response to the question about consenting to take part.

Sorry, you can only continue the survey once you confirm that you consent.

If you selected 'no' by mistake, click next to go back to the consent page

Otherwise, please exit the survey

4. Information about yourself

Please answer the following questions about yourself

What is your gender?

- ◯ Male
- ◯ Female

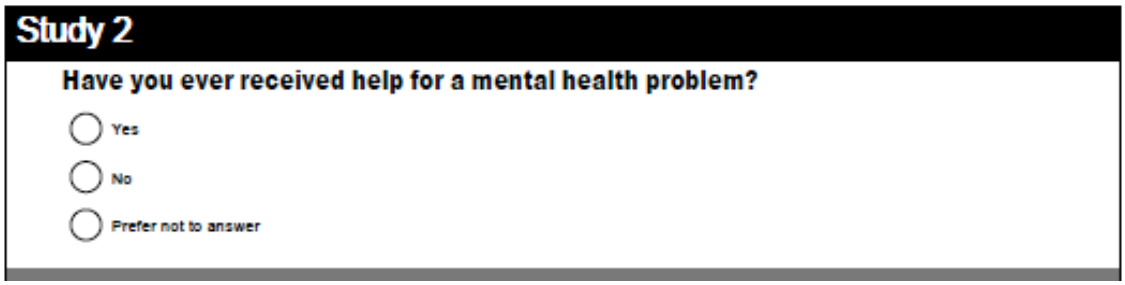
What is your age in years?

What is your current occupational status?

- ◯ Student
- ◯ Homemaker
- ◯ Employed
- ◯ Unemployed
- ◯ Retired
- ◯ Other

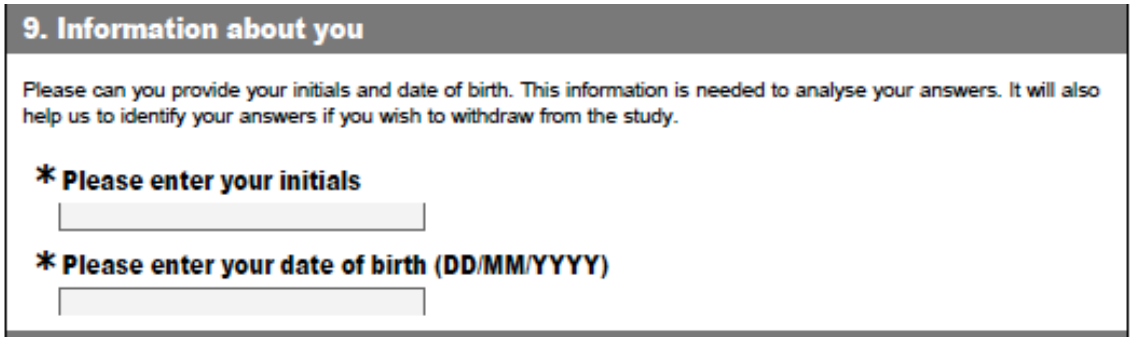
What is your ethnic group?

- ◯ White
- ◯ Mixed
- ◯ Asian
- ◯ Black
- ◯ Other



[Initial Preference Task - IPT]

[Birthdate Preference Task - BPT]

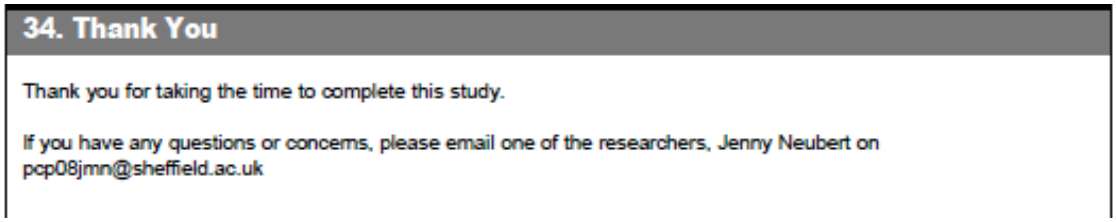


[Social Comparison Scale – SCS]

[Hospital Anxiety and Depression Scale – HADS]

[Persecution and Deservedness Scale – PADS]

[Self-esteem Rating Scale, Short form – SERS]



APPENDIX D. Online survey for participants completing both this study and other trainee's study

Joint survey first part

1. Information page

Thank you for your interest in our research studies. The information below describes the studies. Please read it carefully before deciding whether you want to take part.

What are the study purposes?
Previous research has found that the way people think about themselves and others can predict some of the beliefs that they hold. Study 1 aims to find out about how people's thoughts and beliefs change during their menstrual cycle. Study 2 aims to find out more about what makes people hold certain beliefs.
Both studies have been ethically approved through the ethics review procedure of the Clinical Psychology Unit, University of Sheffield. Although you will not receive any immediate personal benefits from taking part, it is hoped that this research will help people who experience psychological problems in the future.

What does the study involve?
You will be asked to complete a series of questionnaires online. The questions relate to how you think and feel about yourself and others. The initial questionnaire takes about 10 minutes and includes questions just for study 2. When you have completed that part you will be asked to click on a link that will take you to the second part of the study which includes questions for both studies 1 and 2 and takes about 10 to 15 minutes to complete.
As part of study 1, we will then send you weekly emails for four weeks, reminding you to log in and complete the questionnaire.

Do I have to take part?
It is entirely up to you to decide whether or not to take part, You can exit this online survey at any point and your answers will not be saved. After you submit your answers, you can withdraw by contacting the researchers on the details given below.

Will my answers be confidential?
All information collected will be stored securely. Passwords are used so that only the researchers can access the data. You will be asked to give your initials and date of birth in order to identify your answers. This means that you can withdraw from the study later if you change your mind. Your initials and date of birth will not appear anywhere in the write-up. You will not be able to be identified in any reports or publications.

What will happen to the results of the study?
The results of the study are likely to be published in academic journals. If you would like to receive a summary of the results, please contact the researchers on the details below.

You must be female and between 18 and 45 years old to take part in the study.

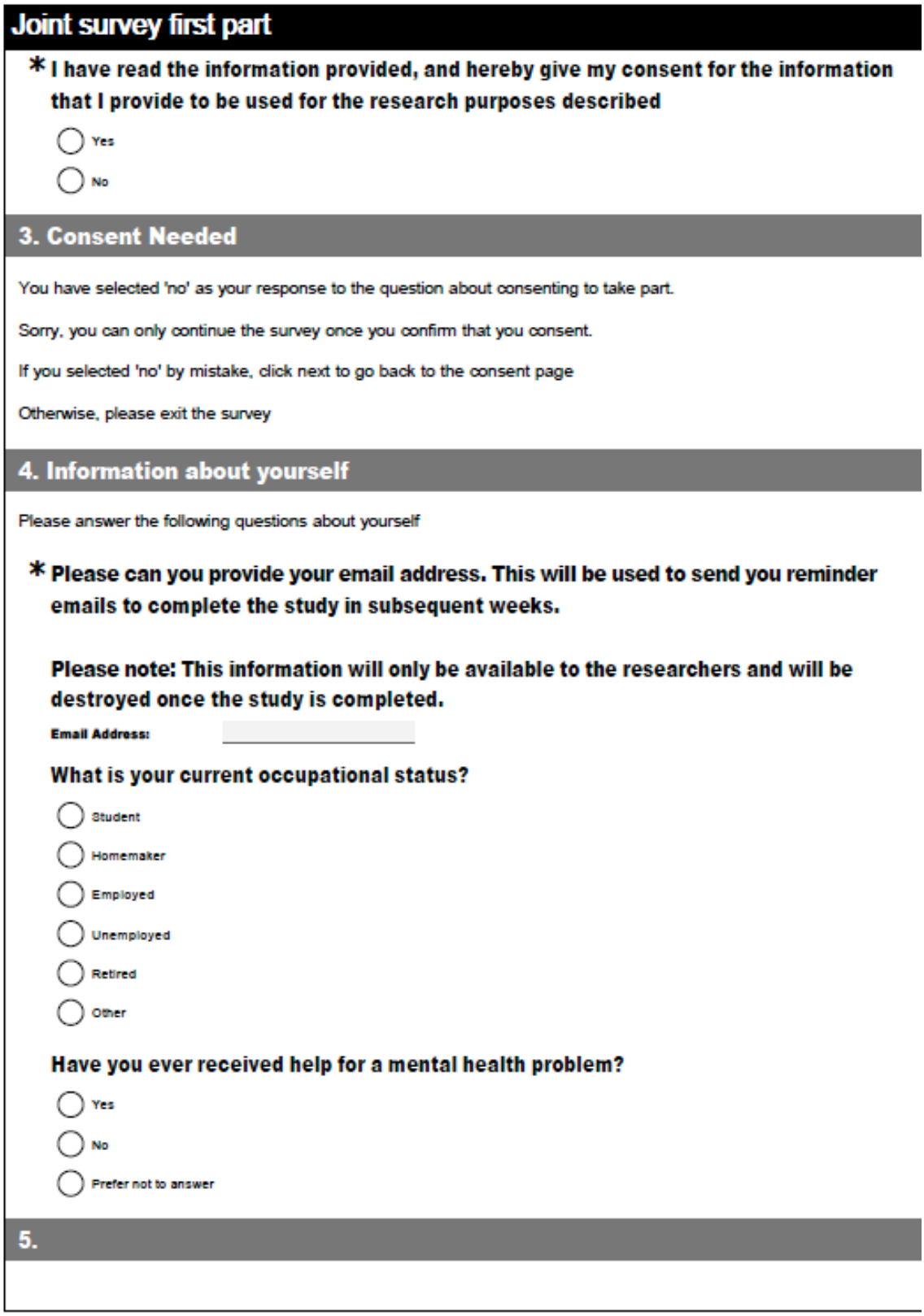
If you have any questions or concerns about the study, you can contact the researchers by email. Study 1: Rosalind Hall, pcp08rh@sheffield.ac.uk, Study 2: Jenny Neubert, pcp08jmn@sheffield.ac.uk

2. Consent page

If you have read the information provided and you would still like to take part, can you please confirm the following details

*** I confirm that am between 18 and 45 years old**

◯ Yes
◯ No



Joint survey first part

*** I have read the information provided, and hereby give my consent for the information that I provide to be used for the research purposes described**

- ◯ Yes
- ◯ No

3. Consent Needed

You have selected 'no' as your response to the question about consenting to take part.

Sorry, you can only continue the survey once you confirm that you consent.

If you selected 'no' by mistake, click next to go back to the consent page

Otherwise, please exit the survey

4. Information about yourself

Please answer the following questions about yourself

*** Please can you provide your email address. This will be used to send you reminder emails to complete the study in subsequent weeks.**

Please note: This information will only be available to the researchers and will be destroyed once the study is completed.

Email Address: _____

What is your current occupational status?

- ◯ Student
- ◯ Homemaker
- ◯ Employed
- ◯ Unemployed
- ◯ Retired
- ◯ Other

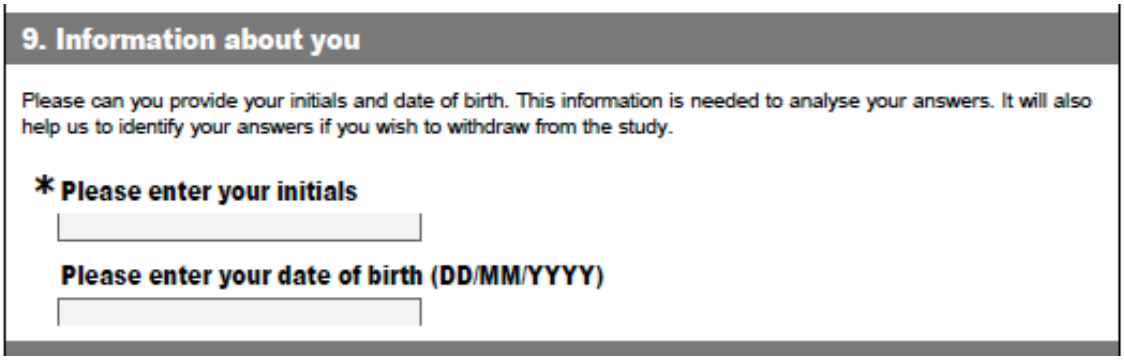
Have you ever received help for a mental health problem?

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

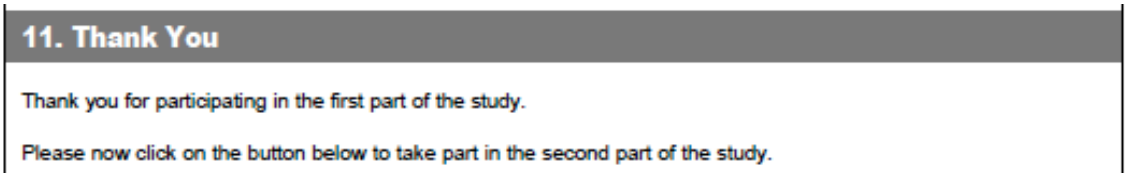
5.

[Initial Preference Task – IPT]

[Birthdate Preference Task – BPT]



[Social Comparison Scale – SCS]



Menstrual Cycle Study Week 1

1. Information Page

THANK YOU for your interest in this study. Please read the following information carefully before deciding whether you want to take part in this piece of research.

This study is going to look at how people think and feel at different points in their menstrual cycle. We hope to increase our understanding and inform interventions for people who are affected by the menstrual cycle. We also hope to develop our understanding of how thoughts, beliefs and feelings interact in general.

You will be asked some questions about your menstrual cycle, then about some of your thoughts and experiences over the last week. This will take about ten minutes.

*You must be **18 to 45 years old** to take part in the study*

*You must be **female and menstruating regularly***

Because the study is interested in how people change over their cycle, you will be asked to complete this questionnaire **every week for four weeks**.

You will therefore be asked to provide your email address so that we can send you friendly reminder emails with the link to the next week of the study. Your email will only be used for this purpose and to link your responses together. It will not be linked to the data during analysis and will be destroyed as soon as the study is completed.

All of your answers will be **completely confidential**, and you are free to withdraw at any point. You can exit this survey at any point and your answers will not be saved. After you submit your answers, you can withdraw by contacting the researchers on the details given below.

All information collected will be stored securely. Passwords are used so that only the researchers can access the data.

The information that you provide will be used as part of my thesis, and may be submitted for publication.

If you would like to receive a summary of the results, please contact the researchers on the details below.

If you have any **questions or concerns** about the study, you can contact the researcher by email: Rosalind Hall, pcp08rh@sheffield.ac.uk.

This study has received **ethical approval** from the University of Sheffield Department of Psychology ethics committee.

2. Consent Page

If you have read the information provided and you would still like to take part, can you please confirm the following details

*** I confirm that I am between 18 and 45 years of age**

◯ Yes ◯ No

*** I confirm that I experience regular periods**

◯ Yes ◯ No

Menstrual Cycle Study Week 1

*** I have read the information provided, and hereby give my consent for the information that I provide to be used for the research purposes described**

◯ Yes ◯ No

3. Consent needed

You have selected 'no' as your response to the question about consenting to take part.

Sorry, you can only continue the survey once you confirm that you consent.

If you selected 'no' by mistake, click next to go back to the consent page

Otherwise, please exit the survey

4. Information about you

Please answer the following questions about yourself

*** Please can you provide your email address. This will be used to link your responses together and to send you reminder emails to complete the study in subsequent weeks.**

Please note: this information will only be available to the researchers and will be destroyed once the study is complete.

Email Address:

*** What is your age in years?**

What is your ethnic group?

◯ White
◯ Mixed
◯ Asian
◯ Black
◯ Other

Are you currently using hormonal contraception (including the pill, mini-pill, coil, patch or implant)?

◯ Yes
◯ No

If yes, can you tell us which one?

Menstrual Cycle Study Week 1

If the first day of your period is day 1, how long has it been since your last period?

If you aren't sure, don't worry, but please keep a record when you do start your next period so that you can enter it later in the study.

- ◯ 0 - 3 days
- ◯ 4 -10 days
- ◯ 11 - 17 days
- ◯ 18 - 24 days
- ◯ 25 - 33 days
- ◯ Unsure

How long is your average menstrual cycle? (e.g.28 days)

Is the length of your cycle variable, and if so can you give us an estimate of by how much? (e.g. by 3-5 days)

[Hospital Anxiety and Depression Scale – HADS]

[Persecution and Deservedness Scale – PADS]

[Self-esteem Rating Scale, Short form – SERS]

28. Thank you

Thank you very much for participating in this study.

We hope this study will increase our understanding and inform interventions for people who are affected by the menstrual cycle. We also hope to develop our understanding of how thoughts, beliefs and feelings interact in general.

We will email you again a week from now to remind you to complete the next part of the questionnaire.

If you have any questions regarding this study, please contact Rosalind Hall on pcp08rh@sheffield.ac.uk.

If the content of this survey has caused you any concern then you can seek support from your GP, or if you are a student at the University of Sheffield, you can contact the University counselling service (details below).

University of Sheffield Counselling Service
36 Wilkinson Street
Sheffield
S10 2GB

Tel: 0114 2224134

APPENDIX E. Initial Preference Task – IPT

Note. Removed to conform to copyright legislation.

APPENDIX F. Birthdate Preference Task – BPT

Note. Removed to conform to copyright legislation.

APPENDIX G. Social Comparison Scale – SCS

Note. Removed to conform to copyright legislation.

APPENDIX H. Hospital Anxiety and Depression Scale – HADS

Note. Removed to conform to copyright legislation.

APPENDIX I. Persecution and Deservedness Scale – PADS

Note. Removed to conform to copyright legislation.

APPENDIX J. Self-esteem Rating Scale, short form – SERS

Note. Removed to conform to copyright legislation.

APPENDIX K. Development of quality assessment tool

Influences

1) Downs & Black, 1998. Checklist for measuring study quality (D&B)

2) Fowkes & Fulton, 1991. Guidelines for appraising a medical article (F&F)

3) STROBE statement, checklist of items that should be included in reports of cross-sectional studies. Vandenbroucke et al., 2007 (STROBE)

Quality assessment questions *(source(s) adapted from in parentheses)*

Methodology

Are the study aims clearly stated? *(D&B) (STROBE)*

Is the choice of design appropriate to the aims? *(F&F)*

Are inclusion criteria clearly stated? *(D&B)*

What is the study size (Total *N*)?

Statistical Testing

Are appropriate statistical tests used for the main analyses? *(D&B)*

Are estimates of random variability within the data given? (D&B)

Are exact probability (*p*) values given? *(D&B)*

Issues of Confounding/Bias

What is the response rate (%)?

Are the sample representative of the target population? *(F&F) (D&B)*

Are measures used reliable and valid? *(F&F) (D&B)*

Is missing data reported and treated appropriately? (F&F)

Are distributions of key confounding variables described? *(D&B)*

Are confounders adjusted for in the main analyses? (F&F) (D&B)

Scoring with comments for example study (Barrowcliff & Haddock, 2010)

Methodology

Are the study aims clearly stated? *Yes*

Is the choice of design appropriate to the aims? *Yes*

Are inclusion criteria clearly stated? *Yes*

What is the study size (Total *N*)? *49*

Statistical Testing

Are appropriate statistical tests used for the main analyses? *Yes*

Are estimates of random variability within the data given? *Partially – only for significant comparisons.*

Are exact probability (*p*) values given? *Yes, exact p given unless p < .001*

Issues of Confounding/Bias

What is the response rate (%)? *65%*

Are the sample representative of the target population? *Minor issue identified (+), high refusal rate.*

Are measures used reliable and valid? *Minor issue identified (+), assessment of command hallucinations through interview not described clearly.*

Is missing data reported and treated appropriately? *No problems identified - no missing data apparent from report*

Are distributions of key confounding variables described? *No problems identified*

Are confounders adjusted for in the main analyses? *No problems identified*

APPENDIX L. Skew and kurtosis statistics for all variables

	N	Skewness		Kurtosis	
		Statistic	Std. Error	Statistic	Std. Error
HADS Anxiety	534	.327	.106	-.275	.211
HADS Depression	534	.782	.106	.238	.211
SCS Rank	534	-.080	.106	.490	.211
SCS Attractiveness	534	.033	.106	.056	.211
SCS Group fit	534	.062	.106	-.105	.211
SCS Total score	534	-.134	.106	.275	.211
SERS Positive	534	-.416	.106	-.303	.211
SERS Negative	534	.710	.106	-.043	.211
Initial-preference	442	.150	.116	-.214	.232
Birthdate-preference	457	.499	.114	.420	.228
PADS Persecution	534	.524	.106	-.536	.211
PADS Deservedness	320	.736	.136	.093	.272

Note. HADS, Hospital Anxiety and Depression Scale; SCS, Social Comparison Scale; SERS, Self-esteem Rating Scale; PADS, Persecution and Deservedness Scale.

APPENDIX M. Tests of differences between subgroups with invalid responses and the rest of the sample

i) invalid initial-preference task (IPT) scores

Variable	Group				Difference (Mann-Whitney *U*)			
	IPT invalid (*n* = 76)		IPT valid (*n* = 458)					
Gender	Female: 54 (71%) Male: 22 (29%)		Female: 319 (70%) Male: 139 (30%)					
	Median	*IQR*	Median	*IQR*	*U*	*z*	*p* (2-tailed)	Effect size *r*
Age	28.50	17.00	21.00	7.00				
HADS-Anxiety	6.00	6.00	8.00	6.00	12504.00	-3.944	<.001	-.171
HADS-Depression	2.00	3.00	4.00	4.00	13135.00	-3.448	.001	-.149
SERS-Positive	39.00	13.00	37.00	16.00	14982.50	-1.945	.052	-.084
SERS-Negative	13.50	16.00	19.00	16.00	12861.00	-3.648	<.001	-.158
SCS-Rank	5.60	1.40	5.40	1.80	16565.00	-.674	.500	-.029
SCS-Attractiveness	5.00	1.67	5.00	2.00	16717.00	-.553	.580	-.024
SCS –Group Fit	5.00	1.92	5.00	2.33	16316.50	-.875	.382	-.038
PADS-Persecution	0.70	1.08	1.30	1.40	12343.50	-4.065	<.001	-.176
PADS-Deservedness	0.80	1.34	1.00	1.08	3832.50	-1.796	.072	-.100

ii) invalid birthdate-preference task (PPT) scores

Variable	Group				Difference (Mann-Whitney *U*)			
	BPT invalid (*n* = 76)		BPT valid (*n* = 458)					
Gender	Female: 48 (63%) Male: 28 (37%)		Female: 325 (71%) Male: 133 (29%)					
	Median	*IQR*	Median	*IQR*	*U*	*z*	*p* (2-tailed)	Effect size *r*
Age	29.00	19.00	21.00	7.00				
HADS-Anxiety	6.00	7.00	8.00	6.00	13427.00	-3.201	.001	-.139
HADS-Depression	3.00	4.00	4.00	4.00	14946.50	-1.985	.047	-.086
SERS-Positive	38.00	14.00	37.00	16.00	15845.50	-1.252	.211	-.054
SERS-Negative	15.00	16.75	19.00	16.25	13661.00	-3.006	.003	-.130
SCS-Rank	5.60	1.75	5.40	1.80	16556.00	-0.681	.496	-.029
SCS-Attractiveness	5.17	1.58	5.00	2.33	15923.50	-1.191	.234	-.052
SCS –Group Fit	5.00	2.00	5.00	2.33	15737.00	-1.341	.180	-.058
PADS-Persecution	0.90	1.20	1.30	1.40	14252.50	-2.532	.011	-.110
PADS-Deservedness	1.00	1.25	1.00	1.09	5286.00	-0.574	.566	-.032

Note. HADS, Hospital Anxiety and Depression Scale; SCS, Social Comparison Scale; SERS, Self-esteem Rating Scale; PADS, Persecution and Deservedness Scale.

APPENDIX N. Initial regression model for persecution, including implicit self-esteem measures.

Variable	*B*	*SE B*	β	*t*	*p*	Semi-partial correlation
Block 1						
Age	-.018	.004	-.168	-4.332	<.001	-.168
Gender	-.136	.082	-.066	-1.659	.098	-.064
Anxiety	.110	.011	.476	10.140	<.001	.393
Depression	.057	.014	.187	3.974	<.001	.154
Block 2						
Age	-.011	.004	-.103	-3.030	.003	-.099
Gender	-.123	.073	-.060	-1.694	.091	-.055
Anxiety	.058	.010	.253	5.757	<.001	.188
Depression	.015	.013	.050	1.215	.225	.040
Positive self-esteem	-.006	.005	-.077	-1.317	.189	-.043
Negative self-esteem	.036	.004	.468	8.057	<.001	.263
Social rank	.127	.033	.215	3.911	<.001	.128
Social attractiveness	-.078	.029	-.148	-2.701	.007	-.088
Group fit	-.046	.027	-.084	-1.719	.086	-.056
Initial preference	-.018	.028	-.021	-0.630	.529	-.021
Birthdate preference	.012	.029	.014	0.416	.678	.014

Note. Block 1 adjusted R^2 = .384; Block 2 adjusted R^2 = .563.

APPENDIX O. Initial regression model for deservedness, including implicit self-esteem measures.

	B	*SE B*	β	*t*	*p*	Semi-partial correlation
Block 1						
Age	-.020	.007	-.188	-3.116	.002	-.187
Gender	.196	.119	.102	1.654	.099	.057
Anxiety	.029	.016	.126	1.763	.079	.106
Depression	.055	.021	.190	2.674	.008	.160
Block 2						
Age	-.016	.007	-.148	-2.457	.015	-.144
Gender	.208	.117	.108	1.786	.075	.105
Anxiety	.008	.017	.036	0.476	.635	.028
Depression	.046	.020	.160	2.275	.024	.134
Persecution	.274	.084	.222	3.240	.001	.190
Block 3						
Age	-.013	.006	-.125	-2.108	.036	-.117
Gender	.126	.116	.066	1.086	.279	.060
Anxiety	-.007	.017	-.031	-0.422	.673	-.023
Depression	.026	.020	.091	1.325	.186	.073
Persecution	.082	.089	.066	0.918	.360	.051
Positive self-esteem	-.007	.007	-.088	-0.942	.347	-.052
Negative self-esteem	.020	.007	.265	2.745	.007	.152
Social rank	-.073	.051	-.139	-1.428	.155	-.079
Social attractiveness	.029	.045	.059	0.642	.521	.036
Group fit	-.011	.044	-.021	-0.258	.797	-.014
Initial preference	-.019	.042	-.025	-0.444	.658	-.025
Birthdate preference	-.055	.045	-.069	-1.224	.222	-.068

Note. Block 1 adjusted R^2 = .103; Block 2 adjusted R^2 = .136; Block 3 adjusted R^2 = .235

APPENDIX P. Scatterplots of standardised residuals.