Psychology Press
Taylor & Francis Group

Perceptions of hostility by persons with and without persecutory delusions

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Introduction. Current models of paranoia propose that ambiguous situations, in which cues regarding the intentions of others are lacking, may be perceived as hostile by persons with persecutory delusions (PD). Thus, a social-cognitive bias for the perception of hostility may be present. In this study, the Ambiguous Intentions Hostility Questionnaire (AIHQ) was used to present situations that are ambiguous regarding the intentions of others. It was predicted that on the AIHQ, persons with PD would show greater levels of perceived hostility, blame, and aggression than both psychiatric and nonpsychiatric controls.

Methods. The sample comprised 32 persons with PD, 28 persons without PD (psychiatric controls), and 50 healthy participants (nonpsychiatric controls). Participants completed the AIHQ along with measures of paranoia, attributional style, depression, anxiety, self-esteem, and public self-consciousness.

Results. As predicted, the group with PD showed greater perceptions of hostility, blame, and aggression scores for ambiguous situations on the AIHQ. Also, the AIHQ Hostility bias score was predictive of paranoid ideation.

Conclusions. Persons with PD showed a social-cognitive bias for perceiving hostility in ambiguous situations. The bias appears to be specific as it was not found in the psychiatric or nonpsychiatric control groups. Suggestions for future research are discussed.

Keywords: Persecutory delusions; Ambiguity; Hostility; Perceptions; Social cognition.

INTRODUCTION

Recent models of persecutory delusions have emphasised a multitude of factors that lead to the formation and maintenance of paranoid beliefs. Paranoia appears to be largely influenced by emotional, cognitive, and environmental factors (Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002). Paranoia is considered a threat belief in which the person perceives that others have intentions to harm them now or in the future with little or no supporting evidence (Freeman & Garety, 2000; McKay, Langdon, & Coltheart, 2006). These beliefs appear to be accompanied by considerable anxiety, worry, and behavioural avoidance (Freeman & Garety, 2003; Freeman, Garety, & Kuipers, 2001; Freeman et al., 2007; Startup, Freeman, & Garety, 2007). There is also some evidence that self-esteem (Ellett & Chadwick, 2007; Freeman et al,., 1998; Thewissen et al., 2007), depression (Bentall & Kaney, 2005; Combs, Penn, Chadwick, et al., 2007; Trower & Chadwick, 1995; Zigler & Glick, 1988), and public self-consciousness (Fenigstein & Vanable, 1992; Martin & Penn, 2001) are important in paranoia, but the exact role of these emotional correlates is unclear at present (Humphreys & Barrowclough, 2006). In addition to these emotional factors, there are a number of cognitive and social-cognitive biases found in paranoia and persecutory delusions (Combs & Penn, 2008; Penn, Corrigan, Bentall, Racenstein, & Newman, 1997). Increased attention to threatening stimuli, jumping to conclusions, a failure to generate alternatives, theory of mind deficits, problems in emotion perception, and the presence of differences in attributional style have all been associated with persecutory delusions (see Bentall, Corcoran, Howard, Blackwood, & Kinderman, 2001; Freeman, 2007; Garety & Freeman, 1999, for reviews of these areas). More emphasis has been placed on understanding of the cognitive and social-cognitive biases found in paranoia, and the exact function of persecutory delusions remains a mystery (e.g., possibly to maintain self-esteem in the face of negative events; see Freeman et al., 1998).

In terms of attributional style, persons with persecutory delusions tend to exhibit a "personalising" bias in which they tend to blame others rather than situations for negative outcomes (Kinderman & Bentall, 1996, 1997). This personalising bias appears to be more characteristic of the paranoid thought process than an externalising bias, which consists of a tendency to take credit for positive events and blame others for negative events (e.g., self-serving bias; Garety & Freeman, 1999; McKay, Langdon, & Coltheart, 2005). Despite the consistency of this finding, current research has not focused on a core feature of paranoia, namely the tendency to infer/perceive hostility (i.e., intention to harm) where none exists (Freeman, 2007; Freeman & Garety, 2004).

It is possible that perceived hostility may be strongest in ambiguous situations, where situational cues are lacking. A "hostility bias" has been found in a number of samples and contexts. Persons with conduct disorders and persons with high levels of social anxiety tend to perceive hostility in ambiguous social interactions (Constans, Penn, Ihnen, & Hope, 1999; Crick & Dodge, 1994; de Castro, Slot, Bosch, Koops, & Veerman, 2003; Epps & Kendall, 1995). There is a clear link between perceived hostility and higher rates of aggression (Graham, Hudley, & Williams, 1992; Homant & Kennedy, 2003; Mathews & Norris, 2002; Tremblay & Belchevski, 2004). However, we know little about how persons with persecutory delusions process and interpret ambiguous situations. It has only been recently that ambiguity has been incorporated into theoretical models of paranoia.

According to the cognitive model of persecutory delusions, ambiguous situations are more difficult to interpret and the intentions of others may be misperceived as hostile and threatening (Freeman, Dunn, et al., 2005; Freeman & Garety, 2003; Freeman et al., 2002; Green & Phillips, 2004; Turkat, Keane & Thompson-Pope, 1995). The importance of ambiguity can be gleaned from a number of different lines of research on paranoia. Phillips, Senior, and David (2000) found that persons with persecutory delusions spent more time looking at ambiguous scenes on visual scanning tasks. Persons with high levels of subclinical paranoia perceived neutral experimenter behaviour in a more negative manner and showed more avoidant social behaviours as a result of this perception (Combs & Penn, 2004; Gay & Combs, 2003). Similar findings have also been found in virtual reality environments (Freeman, Garety, Bebbington, Slater, et al., 2005; Valmaggia et al., 2007). Relatedly, persons with delusions expressed a greater need for closure and a poorer tolerance of ambiguity when it came to decision making, thus emphasising problems dealing with ambiguity (Bentall & Swarbrick, 2003; Colbert & Peters, 2002; Freeman, Dunn, et al., 2005; McKay, Langdon, & Coltheart, 2007; see Freeman et al., 2006, for an exception). Paralleling research with conduct disorder, several studies have shown a link between perceived hostility and aggression in persons with psychosis (Waldheter, Jones, Johnson, & Penn, 2005) and subclinical paranoia (Combs, Penn, Wicher, & Waldheter, 2007). In sum, it appears that paranoia is associated with a number of biases, one of which may be the tendency to perceive hostility in ambiguous situations, although most studies have examined the importance of ambiguity only indirectly.

The Ambiguous Intentions Hostility Questionnaire (AIHQ) was developed to facilitate the study of perceived hostility across situations that vary in intentionality (Combs, Penn, Wicher, & Waldheter, 2007). In the initial study on the AIHQ, it was found that independent ratings of perceived hostility (defined as the perception of hostile intentions of others) and participant-assigned blame (the person acted intentionally, is to blame, and

the event resulted in anger) for ambiguous situations were important predictors of nonclinical paranoia among a sample of 322 college student participants (Combs, Penn, Wicher, & Waldheter, 2007). This finding is consistent with research showing similar social-cognitive biases across the paranoia continuum, which includes both clinical and nonclinical samples (Combs, Michael, & Penn, 2006; Freeman, 2007). The AIHQ also showed incremental validity over an existing measure of attributional style, the Internal, Personal, and Situational Attributions Questionnaire (IPSAQ; Kinderman & Bentall, 1996) in the prediction of paranoia. Recently, the AIHQ has been shown to be sensitive to change following an intervention (Social Cognition and Interaction Training) designed to reduce perceptions of hostility by persons with persecutory delusions (Combs, Adams, et al., 2007; Combs & Penn, 2008).

The study of perceived hostility in ambiguous situations has significant theoretical importance as it may provide additional information on how persons with paranoia process social situations. Given the link to aggression, a better understanding of perceived hostility may lead to effective methods to reduce aggression among persons with paranoia and psychosis (see Combs, Adams, et al., 2007, for an example). Building on our earlier study with nonclinical participants, the purpose of the current study was to examine how persons with and without persecutory delusions (but with other types of nonpersecutory delusions) perceive and interpret ambiguous situations. It is argued that as paranoia increases to delusional levels, the perception of hostility becomes more salient and observable (Combs, Michael, & Penn, 2006; Combs, Penn, & Mathews, 2003; Ellett, Lopes, & Chadwick, 2003; Freeman, 2007; Freeman, Dunn, et al., 2005; Martin & Penn, 2002; McKay et al., 2005). Thus, we hypothesised that persons with persecutory delusions would show significantly greater perceived hostility, blame, and aggression for ambiguous situations on the AIHQ as compared to a group of persons without persecutory delusions and nonpsychiatric controls. The inclusion of a group of healthy, nonpsychiatric controls and a group of psychiatric controls (persons without PD) may address whether the presence of a hostility bias is specific to persecutory delusions (versus delusions in general), which is an important area of current interest (Combs & Penn, 2008, for a review; Freeman, 2007; Martin & Penn, 2002) We also predicted that hostility, blame, and aggression scores from the AIHQ would be significant predictors of paranoia levels. In this analysis we included a number of other important variables that may be associated with paranoid beliefs such as depression, anxiety, self-esteem, public self-consciousness, and attributional style (externalising and personalising bias) (Bentall, 2001; Combs & Penn, 2004; Ellett et al., 2003; Feingstein & Vanable, 1992; Freeman, Dunn, et al., 2005; Freeman, Garety, Bebbington, Smith, et al., 2005; Kramer, 1998; Martin & Penn, 2001).

METHOD

Participants

The sample comprised both clinical/psychiatric and nonpsychiatric partici-
pants. The nonpsychiatric sample consisted of 50 undergraduate college
students (nine male and 41 female) from a private university. The clinical/
psychiatric sample consisted of 32 (17 male and 15 female) persons with
persecutory delusions (PD group) and 28 (nine male and 19 female) persons
without persecutory delusions (non-PD group). The non-PD group served as
psychiatric controls. All of the clinical participants were recruited from an
inpatient psychiatric facility and had a DSM-IV-TR diagnosis of schizo-
phrenia based on the Structured Clinical Interview for DSM-IV- Patient
Edition (SCID-P; First, Gibbon, Spitzer, Williams, & Benjamin, 2001).
Participants were classified as having a persecutory delusion if they had a
Brief Psychiatric Rating Scale (BPRS; Lukoff, Nuechterlein, & Ventura,
1986) suspiciousness item score greater than or equal to 5.0. BPRS items
range from 1 to 7 and suspiciousness item scores ≥ 5 reflect paranoid beliefs
that are held with delusional levels of conviction. Participants without
persecutory delusions had a BPRS suspiciousness score of less than or equal
to 4, but all of them did have other types of nonpersecutory delusions, e.g.,
grandiose ($n = 16$), somatic ($n = 4$), reference ($n = 8$). A BPRS suspiciousness
item score of 4 reflects infrequent or transitory paranoid beliefs that are held
with less than delusional levels of conviction, whereas a score of 1 reflects the
absence of paranoid beliefs. These specific cutoff scores from the BPRS have
been used in previous research (see Combs, Michael, & Penn, 2006; Martin
& Penn, 2002) and represent a quantitative criterion to define the presence
or absence of persecutory delusions. Based on participant responses on the
BPRS, all persons with PD met the criteria for a persecutory delusion as
defined by Freeman and Garety (2000). All the participants had only one
primary delusion based on examination with the BPRS. Exclusion criteria
for the psychiatric sample included a history of head trauma, having met
DSM-IV-TR criteria for substance dependence within 3 months of the study
(to rule out substance induced psychotic conditions), or having a docu-
mented neurological condition other than schizophrenia. Exclusion criteria
for the nonpsychiatric sample included a history of current or past
psychiatric treatment based on self-report information. Table 1 presents
demographic, clinical, and symptom data for the three samples.

There were expected differences in age, $F(2, 106) = 82.0$, p < .0001,
educational level, $F(2, 106) = 62.0$ $p < .0001$, gender, $\chi^2(df = 1, 108) = 14.5$,
$p < .001$, and ethnicity, $\chi^2(df = 1, 108) = 11.7$, $p < .001$, among the psychia-
tric and nonpsychiatric samples. Specifically, participants in the psychiatric
group as a whole were significantly older and less educated than the

TABLE 1
Summary of participant demographics and clinical characteristics

Variable	PD group Mean (SD)	Non-PD group Mean (SD)	Nonpsychiatric group Mean (SD)
N	32	28	50
Age (years)	41.8 (9.5)	43.0 (10.9)	22.1 (4.8)[a]
Educational level (years)	11.5 (1.7)	11.6 (1.7)	14.8 (1.1)[a]
% male	53%	32%	18[a]
% white	46%	53%	83[a]
BPRS total score	54.7 (10.9)[b]	44.3 (9.7)	—
Thought disorder	13.5 (3.9)[b]	10.2 (4.5)	—
Affect	12.8 (4.5)[b]	7.9 (2.9)	—
Anergia	8.8 (4.1)	8.0 (4.7)	—
Disorganisation	5.3 (1.7)	4.7 (1.5)	—
Length of illness (years)	13.2 (3.9)	10.2 (4.5)	—
Number of prior hospitalisations	6.3 (5.0)	4.5 (3.0)	—
Medication dosage (CPZ)	660.4 (383.7)	644.5 (473.0)	—

PD = persecutory delusions; BPRS = Brief Psychiatric Rating Scale; CPZ = Chlorpromazine equivalent dosages (Woods, 2003). [a]Control group significantly different from PD and non-PD groups ($p < .05$). [b]PD group significantly different from non-PD group ($p < .05$).

nonpsychiatric control group. Regarding differences in gender and ethnicity, there were more female and Caucasian participants in the nonpsychiatric sample than the psychiatric sample. To account for these group differences, these variables will be entered as potential covariates in the subsequent statistical analyses. In terms of symptom severity, participants with PD showed significantly higher scores on the BPRS total score, $t(58) = 3.8$, $p < .001$, thought disorder subscale, $t(58) = 2.9$, $p < .001$, and the affect subscale, $t(58) = 4.8$, $p < .0001$, than participants without PD. There were no differences on the BPRS disorganisation subscale, $t(58) = 1.3$, ns, BPRS anergia subscale, $t(58) = 0.70$, ns, medication dosage in chlorpromazine equivalents, $t(58) = 0.12$, ns, length of illness, $t(58) = 2.0$, ns, or number of hospitalisations, $t(58) = 1.1$, ns, between the PD and non-PD groups.

Measures

Clinical/symptom self-report measures

Paranoia Scale. The Paranoia Scale (PS) is a 20-item scale that measures subclinical paranoid ideation found in normal individuals in response to everyday events and situations (Fenigstein & Vanable, 1992). Each item is scored on a Likert scale ranging from 1 ("not at all") to 5 ("extremely applicable") with total scores ranging from 20 to 100. Higher scores reflect higher levels of subclinical paranoia. The PS was developed for use in

analogue samples and was not originally intended for clinical or diagnostic use, but the PS has demonstrated validity in persons with paranoid schizophrenia (Smari, Stefansson, & Thorgilsson, 1994). The scale has good psychometric properties and has been widely used in paranoia research (Combs, Penn, & Fenigstein, 2002; Martin & Penn, 2001). In the current study, the PS showed excellent internal consistency in both the clinical (Cronbach's alpha = .90) and nonclinical samples (Cronbach's alpha = .90).

Personality Assessment Inventory persecutory ideation subscale. The Personality Assessment Inventory persecutory ideation subscale (PAI-P) is an eight-item scale that measures beliefs of persecution, malevolent intentions, and harm (Combs & Penn, 2004; Morey, 1991). The PAI-P subscale is part of the larger PAI paranoia scale, which contains three subscales: persecutory ideation, hypervigilance, and resentment. We used the persecutory ideation subscale as this is considered the most important feature of paranoia (Freeman & Garety, 2000; Garety & Freeman, 1999; McKay et al., 2006). The subscale items are rated on a Likert scale ranging from 0 ("false") to 3 ("very true"). Subscale scores can range from 0 to 24, with higher scores reflective of greater persecutory ideation. The PAI-P has demonstrated good internal consistency levels across studies (alphas = .85–.88; Combs & Penn, 2004; Combs, Adams, et al., 2007; Morey, 1991). The PAI-P is positively correlated with the presence of persecutory delusions as measured by the BPRS (Combs, Michael, & Penn, 2006). In the present study, the internal consistency reliability of the PAI-P was acceptable in both the clinical (Cronbach's alpha = .73) and nonclinical samples (Cronbach's alpha = .71).

Beck Depression Inventory–2. The Beck Depression Inventory–2 (BDI-2) is a 21-item scale that measures the severity of self-reported depressive symptoms (Beck, Steer, & Brown, 1996). Each item is rated on a Likert scale from 0 to 3 with total scores ranging from 0 to 63. Higher scores reflect an increased severity of depressive symptoms. The BDI-2 has demonstrated good reliability, substantial convergent validity (correlates highly with other validated measures of depression), good discriminant validity, and has been widely used in research (Beck et al., 1996). For this study, the internal consistency of the BDI-2 was good in both the clinical (Cronbach's alpha = .85) and nonclinical samples (Cronbach's alpha = .87).

Rosenberg Self-Esteem Scale. The Rosenberg Self-Esteem Scale (RSES) is a 10-item scale that measures self-esteem level (Rosenberg, 1965). Each item is rated on a Likert scale of 1 ("strongly disagree") to 4 ("strongly agree") with total scores ranging from 10 to 40; higher scores reflect increased levels of self-esteem. The internal consistency of the RSES has

been shown to be excellent across studies (Combs et al., 2002; Martin & Penn, 2001). The scale has good validity data and correlates highly with other measures of self-esteem, but has been criticised for its relationship with depression (Robinson & Shaver, 1973). For this study, the internal consistency was acceptable in both the clinical (Cronbach's alpha = .73) and nonclinical samples (Cronbach's alpha = .75).

Brief Fear of Negative Evaluation Scale.   The Brief Fear of Negative Evaluation scale (FNES) is a 12-item scale that measures social anxiety, fear of criticism, and fear of negative evaluation in social settings (Leary, 1983). Each item is rated on a Likert scale ranging from 1 ("not at all") to 5 ("extremely"), with total scores ranging from 12 to 60; higher scores reflecting greater social anxiety. In previous research, the internal consistency of the FNES was found to be excellent (alpha = .90; Leary, 1983). Validity data showed that the brief FNES positively correlated with other clinical and structured interview measures of social anxiety and behavioural avoidance (Leary, 1983). For this study, the internal consistency was found to be acceptable in both the clinical (Cronbach's alpha = .78) and nonclinical samples (Cronbach's alpha = .78).

Self-Consciousness Scale—Public self-consciousness subscale.   The Self-Consciousness Scale (SCS) is a 23-item scale that measures level of self-focused attention for public and private events (Fenigstein, Scheier, & Buss, 1975). The items are rated on a Likert scale ranging from 0 ("extremely uncharacteristic") to 4 ("extremely characteristic"). The SCS contains three subscales—private and public self-consciousness and social anxiety. For this study, we used the public self-consciousness subscale, which reflects a belief that the person is the object of others' attention (i.e., self as a social object) as compared to a focus on their own thoughts (private self-consciousness). Also, the public self-consciousness subscale has been shown to correlate with paranoia in both subclinical and clinical samples and is theoretically linked to paranoia (Combs & Penn, 2004; Fenigstein & Vanable, 1992; Kramer, 1998). In the present study, the SCS public self-consciousness subscale showed good internal consistency in both the clinical (Cronbach's alpha = .80) and nonclinical samples (Cronbach's alpha = .82).

Clinical/symptom interview measures

Structured Clinical Interview for DSM-IV-TR–Patient Edition.   The Structured Clinical Interview for DSM-IV-TR–Patient Edition (SCID-P) was used to derive a psychiatric diagnosis based on the DSM-IV-TR system (First et al., 2001) and was only administered to the clinical participants. The SCID-P was administered by a doctoral-level research assistant and the final

DSM-IV diagnosis was made independently by one of the researchers based on all available information (DC). The researcher who administered the SCID-P was trained to an acceptable level of reliability with a criterion-trained rater (ICC = .90+).

Expanded Brief Psychiatric Rating Scale.   The Expanded Brief Psychiatric Rating Scale (BPRS) is a 24-item semistructured interview that measures psychiatric symptom severity (Lukoff et al., 1986). For this study, the BPRS was used to assess for the presence of persecutory delusions for the clinical participants. BPRS items are rated on a scale ranging from 1 ("not present") to 7 ("extremely severe"). The BPRS comprises four factor scores: anergia, affect, thought disorder, and disorganisation (see Mueser, Curran, & McHugo, 1997). The researcher who administered the BPRS was trained to acceptable levels of reliability with a criterion-trained rater (ICC = .80+; Ventura, Green, Shaner, & Liberman, 1993).

Attribution and hostility measures

Ambiguous Intentions Hostility Questionnaire.   The Ambiguous Intentions Hostility Questionnaire (AIHQ) was used to measure level of perceived hostility, blame, and aggression for situations that vary in intentionality (Combs, Penn, Wicher, & Waldheter, 2007). The AIHQ is comprised of 15 short vignettes that reflect negative interpersonal events for intentional, accidental, and ambiguous situations. Participants are asked to read each vignette, to imagine the scenario happening to her or him (e.g., "You walk past a bunch of teenagers at a mall and you hear them start to laugh"), and to write down the reason why the other person (or persons) acted that way towards them. Two blinded raters subsequently code this written response for the purpose of computing a "Hostility bias" (described later). The participant then rates, on a Likert scale, whether the other person (or persons) performed the action on purpose (anchored by [1] "definitely no", and [6] "definitely yes"), how angry it would make them feel (anchored by [1] "not at all angry", and [5] "very angry"), and how much they would blame the other person (or persons) (anchored by [1] "not at all", and [5] "very much"). These three self-rated scores are then collapsed to form a composite Blame score, which is more psychometrically sound than using the three individual items (Combs, Penn, Wicher, & Waldheter, 2007). Finally, the participant is asked to write down how she or he would respond to the situation, which is later coded by two independent raters to compute an "Aggression bias".

For this study, we decided a priori to use only the Hostility, composite Blame, and Aggression bias scores for five ambiguous situations (AIHQ items 3, 5, 8, 10, 13) as these three scores have demonstrated significant

relationships with subclinical paranoia (Combs, Penn, Wicher, & Waldheter, 2007) and inpatient social behaviour (Waldheter et al., 2005). We administered all 15 items because the scale was normed and developed using all items and the ambiguous items are embedded within the measure along with accidental and intentional situations (Combs, Penn, Wicher, & Waldheter, 2007). Thus, the ambiguous items are rated in the context of the accidental and intentional items. The AIHQ has demonstrated good reliability and validity with other measures of paranoia in two studies (Combs, Penn, et al., 2006; Combs, Penn, Wicher, & Waldheter, 2007) and was recently used as an outcome measure to demonstrate a reduction in perceived hostility following psychosocial treatment (Combs, Adams, et al., 2007).

The Hostility and Aggression bias scores were independently rated by two research assistants who were blinded to group membership and BPRS interview responses using a 5-point Likert scale ranging from 1 ("not at all hostile") to 5 ("very hostile") and 1 ("not aggressive") to 5 ("physically aggressive"), respectively. The raters underwent extensive training on the AIHQ prior to scoring participant responses, which included didactic training on the measure, ratings of sample responses, and training and feedback on 10 AIHQ scales (all raters were trained to an ICC of .80+ with a criterion-trained rater). Ten per cent of the AIHQ protocols were rated by an independent researcher to assess for rater bias and drift. AIHQ scores that differed by more than 2 points (on a 5-point scale) from the independent rater were reviewed and discussed, but the final ratings were not altered based on this feedback. For this study, the raters demonstrated good levels of agreement on the AIHQ Hostility and Aggression bias scores (ICCs ranged from .80 to .86). The internal consistency of the composite Blame score was acceptable for both clinical (Cronbach's alpha = .74) and nonclincial participants (Cronbach's alpha = .78).

Internal, Personal, and Situational Attributions Questionnaire. The Internal, Personal, and Situational Attributions Questionnaire (IPSAQ) is a 32-item questionnaire that is comprised of 16 positive social situations and 16 negative social situations (Kinderman & Bentall, 1996, 1997). The participant has to determine if the outcome (e.g., someone pays them a compliment) is due to them (internal attribution), other people (external–personal attribution), or situational factors (external–situational attribution). The primary indices of interest on the IPSAQ were the Externalising bias (EB) score, which reflects the tendency for the person to take credit for positive events and externalise responsibility for negative events (i.e., self-serving bias) and the Personalising bias (PB) score, which reflects the tendency for the person to blame others, rather than situations, for negative outcomes. In the present study, the internal consistency of the IPSAQ was

acceptable for both the clinical (Cronbach's alpha = .71) and nonclinical samples (Cronbach's alpha = .75)

Procedure

All participants completed the measures in a single session lasting between 1.5 and 2.5 hours. A doctoral level research assistant administered the measures. The clinical and nonclinical participants received a group presentation about the study, and all participants volunteered to complete the study. Participants provided both verbal and written informed consent and then completed a demographic information form. This was followed by administration of the BPRS, SCID-P, and self-report measures of paranoia, clinical symptoms (mood, self-esteem, anxiety, etc.), and hostility/attributional style (AIHQ and IPSAQ). Two blinded research assistants then rated participant responses to compute the AIHQ Hostility and Aggression bias scores. The clinical participants were paid a stipend for completing the study and the nonclinical participants were provided with extra credit for use in their psychology classes.

Data analytic plan

First, we computed mean and summary scores for the measures according to group membership (PD, non-PD, and nonpsychiatric controls). We then computed correlations between the AIHQ and the measures of paranoia, emotional functioning, and attributional style. Second, we conducted a series of ANOVA analyses to examine for group differences on the measures. Since there is some evidence that paranoia scores may differ by gender and ethnicity, we also examined for group differences on these variables (Combs et al., 2002; Combs, Penn, et al., 2006; Spauwen, Krabbendam, Lieb, Wittchen, & van Os, 2003; Whaley, 2004, 2006). Third, we conducted a one-way MANCOVA (age, education, gender, and ethnicity served as covariates) to examine for group differences on the three primary AIHQ index scores (Hostility, composite Blame, and Aggression). Finally, we conducted a multiple regression analysis to determine which of the study variables predicted paranoia scores for the total sample.

RESULTS

Descriptive and summary scores

Mean scores for the study measures according to group membership (PD, non-PD, and nonpsychiatric controls) are presented in Table 2. All of the

TABLE 2
Paranoia, symptom, and attributional scores by group membership

Measure	PD group	Non-PD group	Nonpsychiatric group
BPRS Suspiciousness Score	5.2 (0.99)[a]	2.2 (1.1)	—
Paranoia Scale	53.6 (14.9)[b]	37.5 (7.9)	35.6 (10.5)
PAI Persecutory Ideation	8.0 (4.1)[b]	3.9 (2.6)	2.5 (2.1)
Beck Depression Inventory–2	11.4 (7.7)[c]	8.5 (6.0)	7.5 (5.8)
Rosenberg Self-Esteem Scale	30.9 (4.4)[c]	32.5 (4.9)	35.0 (4.5)
Fear of Negative Evaluation Scale	36.9 (7.7)[c]	34.5 (8.7)	31.3 (6.0)
SCS Public Self-Consciousness	18.7 (6.1)	19.0 (4.7)	17.8 (4.5)
IPSAQ Personalising Bias	0.75 (0.19)[b]	0.59 (0.21)	0.55 (0.24)
IPSAQ Externalising Bias	5.0 (3.7)	4.5 (3.8)	3.8 (3.5)
AIHQ Hostility Ambiguous	2.5 (0.52)[b]	1.4 (0.43)	1.5 (0.31)
AIHQ Blame Ambiguous	3.1 (0.60)[b]	2.4 (0.60)	2.5 (0.61)
AIHQ Aggression Ambiguous	1.7 (.47)[b]	1.3 (0.29)	1.4 (0.14)

PD = persecutory delusions; BPRS = Brief Psychiatric Rating Scale; PAI = Personality Assessment Inventory; SCS = Self-Consciousness Scale; IPSAQ = Internal, Personal, and Situational Attributions Questionnaire; AIHQ = Ambiguous Intentions Hostility Questionnaire. [a]PD group significantly different from non-PD group ($p < .05$ ANOVA). [b]PD group significantly different from non-PD and control groups ($p < .05$ ANOVA). [c]PD group significantly different from control group ($p < .05$ ANOVA).

measures showed acceptable levels of kurtosis and skewness (i.e., values between $+/-1$) prior to statistical analysis. Correlations among the measures are reported in Table 3 and reflected a number of significant positive relationships between the AIHQ scores and measures of paranoia and emotional functioning (depression and anxiety). The strongest relationships (correlations $> .30$) were between the AIHQ Hostility bias, composite Blame, and paranoia as measured by the PS and PAI-P.[1]

Group differences

Given that the presence of persecutory delusions was primarily defined by the BPRS suspiciousness item, we examined for differences on the Paranoia Scale (PS) and PAI persecutory ideation subscale (PAI-P) as well (see Table 2). The results showed that the group with PD showed significantly higher PS, $F(2, 106) = 25.6$, $p < .0001$, $\eta_p^2 = .32$, and PAI-P, $F(2, 106) = 32.9$, $p \leq .0001$, $\eta_p^2 = .38$, scores than the group without PD and nonpsychiatric controls. This finding provides converging evidence that the groups actually differed

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[1] For the clinical sample only, the correlation between the BPRS hostility item, which measures anger and aggression, was significant for the composite Blame, $r = .48$, $p < .001$, and the Aggression bias score, $r = .39$, $p < .001$, but not the Hostility bias score, $r = .25$, $p < .10$.

TABLE 3
Correlations between the AIHQ, paranoia, and symptom measures

Measure	Age	Educ.	Gender	Ethnicity	PS	PAI-P	RSES	BDI	SCS-P	FNES	IPSAQPB	IPSAQEB
AIHQ Hostility Ambiguous	.24*	−.38**	−.26*	.27*	.59**	.41**	−.16	.24*	.16	.36**	.35**	.15
AIHQ Blame Ambiguous	.16	−.14	−.05	.12	.31**	.37**	−.09	.13	.01	.29*	.05	.05
AIHQ Aggression Ambiguous	.04	−.12	.13	.09	.17	.15	−.08	.11	.02	.21*	.12	.20*

Educ. = educational level in years; PS = Paranoia Scale; PAI-P = Personality Assessment Inventory, Persecutory Ideation subscale; RSES = Rosenberg Self-Esteem Scale; BDI-2 = Beck Depression Inventory–2; SCS-P = Self-Consciousness Scale, Public Self-consciousness subscale; FNES = Fear of Negative Evaluation Scale; IPSAQ PB = Internal, Personal, and Situational Attributions Questionnaire Personalising Bias index; IPSAQ EB = Internal, Personal, and Situational Attributions Questionnaire Externalising Bias index. *$p < .05$, **$p < .00138$ (Bonferroni-adjusted p-value).

in level of paranoid ideation with the PD group showing the highest level of paranoid ideation.

There were significant group differences on the Beck Depression Inventory–2, $F(2, 106) = 3.3$, $p < .03$, $\eta_p^2 = .06$, Rosenberg Self-Esteem Scale, $F(2, 106) = 6.4$, $p < .002$, $\eta_p^2 = 10$, Fear of Negative Evaluation Scale, $F(2, 106) = 5.8$, $p < .004$, $\eta_p^2 = .10$, and the IPSAQ Personalising bias index, $F(2, 106) = 7.6$, $p < .001$, $\eta_p^2 = .12$. The PD group reported greater levels of depression and social anxiety, lower self-esteem, and a greater tendency to blame others rather than situations for negative events. There were no differences on the IPSAQ Externalising bias index, $F(2, 106) = 0.99$, ns, $\eta_p^2 = .09$, or the public self-consciousness subscale, $F(2, 106) = 0.57$, ns, $\eta_p^2 = .01$.

In terms of gender differences, males showed significantly higher scores on both the PS, $t(107) = 3.3$, $p < .001$, $d = 0.65$, and PAI-P, $t(107) = 2.4$, $p < .01$, $d = 0.47$. For ethnicity, African American participants showed significantly higher scores on the PS, $t(107) = 2.2$, $p < .02$, $d = 0.41$, but not the PAI-P, $t(107) = 1.5$, ns, $d = 0.33$. There were no other differences found for gender or ethnicity.

Differences on the AIHQ scores were examined using a one-way MANCOVA. Group membership (Group: PD, non-PD, and nonpsychiatric controls) served as the between-groups variable and the Hostility bias, composite Blame score, and Aggression bias scores from the AIHQ served as the dependent variables in the analysis. Owing to differences between the groups on age, education, gender, and ethnicity, these were included as potential covariates (BPRS scores were not included since the scale was administered only to clinical participants). Overall, there was a significant multivariate effect for group, Wilk's lambda = 10.4, $p < .0001$, $\eta_p^2 = .28$. However, none of the covariates were significant (all F-values < 1) and, thus were dropped from further analysis. Follow-up examination using a series of univariate ANOVAs revealed significant differences on the Hostility bias, $F(2, 106) = 48.0$, $p < .0001$, $\eta_p^2 = .53$, composite Blame, $F(2, 106) = 7.4$, $p < .001$, $\eta_p^2 = .14$, and Aggression bias scores, $F(2, 106) = 7.8$, $p < .001$, $\eta_p^2 = 15$. Post hoc testing using the Tukey HSD procedure revealed that the group with PD showed greater levels of perceived hostility, reported more blame towards others, and reported more aggressive behaviours than both the group without PD and controls.

Regression analysis

A multiple regression analysis was conducted to examine which variables predicted paranoia scores. We examined the total sample ($N = 110$) to get a fuller picture of the relationship between AIHQ scores and paranoia and to avoid a restricted range for measures if we examined just the PD group.

Since the PS and PAI-P subscale were significantly correlated, $r = .55$, $p < .0001$, a composite paranoia score was computed by transforming the scores into standardised Z-scores and then deriving a mean (see Combs, Penn, Wicher, & Waldheter, 2007). This composite paranoia score was used in the analyses as our dependent variable of interest. Age and education served as predictors as the groups showed significant differences on these variables. Because higher paranoia scores were found for males and African Americans, we felt that it was important to account for these variables in the regression model as well. We entered scores from the BDI-2, FNES, RSES, public self-consciousness subscale, and the IPSAQ Externalising and Personalising bias scores, as these have been theoretically and empirically related to paranoia. Finally, from the AIHQ, we entered the Hostility, composite Blame, and Aggression bias scores for ambiguous situations. All variables were entered in a single step (direct method). Tolerances among the predictor variables did not indicate multicollinearity (all tolerance values > .40). A summary of the regression results can be found in Table 4. Overall, the full regression model was significant and the predictors accounted for 40% (30% when adjusted for shrinkage) of the variance in paranoia. In the regression model, only the AIHQ Hostility bias score emerged as a significant unique individual predictor of paranoia based on its partial

TABLE 4
Regression results for the prediction of paranoia

Model	R	R^2	$\triangle R^2$	F	p-value
1	.639	.409	.304	3.88	.0001

Predictor variables	Beta (β)	t-value	Partial correlation
Age	−.027	−.236	−.021
Educational level	−.207	−1.75	−.160
Gender	−.040	−.399	−.036
Ethnicity	.022	.197	.018
AIHQ Hostility Ambiguous	.340	2.51*	.226**
AIHQ Blame Ambiguous	.142	.313	.028
AIHQ Aggression Ambiguous	.094	.879	.079
Beck Depression Inventory–2	.032	.305	.027
Rosenberg Self-Esteem Scale	−.100	−.990	−.089
Fear of Negative Evaluation	.212	1.63	.147
SCS Public Self-Consciousness	−.067	−.550	−.050
IPSAQ Externalising Bias	.110	1.12	.101
IPSAQ Personalising Bias	.085	.820	.074

AIHQ = Ambiguous Intentions Hostility Questionnaire; SCS = Self-Consciousness Scale; IPSAQ = Internal, Situational, and Personal Attributions Questionnaire. *$p <.05$, **$p <.01$.

correlation with paranoia, partial $r = .226$, $p = .01$. None of the other demographic variables or clinical symptom scores were significant predictors in the model.[2]

DISCUSSION

This study examined perceptions of hostility by persons with persecutory delusions (PD), persons without persecutory delusions (psychiatric controls), and persons without a psychiatric condition (nonpsychiatric controls) in a cross-sectional design. We predicted that persons with PD would show evidence of a social-cognitive bias towards the perception of hostility in ambiguous situations, which was generally supported by the data. This study builds on previous work with nonclinical samples (Combs, Penn, Wicher, & Waldheter, 2007) and represents one of the first studies to use the AIHQ with different psychiatric and nonpsychiatric samples. Clinical/psychiatric participants had no problems completing the AIHQ, and the psychometric properties (internal consistency and interrater agreement levels) for the AIHQ appear sound. Strengths of the current study include obtaining a sizable sample of persons with and without persecutory delusions, employing a quantitative definition of persecutory delusions, and using multiple measures of paranoid ideation.

Theoretical models of persecutory delusions propose that persons with persecutory delusions interpret the world as threatening, and in situations where contextual cues are limited, the tendency to perceive hostility may be stronger (Combs & Penn, 2008; Freeman et al., 2002). In this study, the AIHQ Hostility, composite Blame, and Aggression bias scores were all significantly higher in the PD group. It should be noted that the AIHQ scores were not large in terms of absolute magnitude, but there were clear differences between the three groups. In the regression model, the AIHQ Hostility bias score was the only significant predictor of paranoia even after accounting for the influence of depression, anxiety, self-esteem, and public self-consciousness, thus replicating the results of our earlier study with nonclinical participants (Combs, Penn, Wicher, & Waldheter, 2007). We tentatively conclude that persons with persecutory delusions show a greater tendency to perceive hostility in ambiguous situations. The tendency to perceive hostility in others also appears to be specific as there were differences between the group with PD and both the psychiatric and

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[2] Consistent with the regression results using the whole sample, when only clinical participants were examined the predictors accounted for 31% of the variance, $R = .55$, $R^2 = .31$, adjusted $R^2 = .174$, $p < .05$, in paranoia scores, and only the AIHQ Hostility bias index emerged as a significant individual predictor of paranoia, partial $r = .30$, $p < .01$.

nonpsychiatric controls. Our findings appear consistent with results by McKay et al. (2005), in which a personalising attributional style became apparent only when paranoia reached delusional levels. Finding a specific social-cognitive bias associated with persecutory delusions is important since some of the findings (e.g., Theory of Mind, externalising bias) have been present in groups of persons with schizophrenia as well (Combs & Penn, 2008; Freeman, 2007; Martin & Penn, 2002).

In terms of the integration of these findings with the larger body of research on attributional style, we see some new avenues for study. It may be time to move beyond the study of locus of attributions (blaming the self, others, situations). This statement is supported by the finding that neither the IPSAQ Externalising or Personalising bias scores were predictive of paranoia (see Combs, Penn, Wicher, & Waldheter, 2007, for a similar finding). The current results highlight the importance of context in paranoia, as the AIHQ, by design, provides few contextual cues regarding intention. Perhaps failing to appreciate social context is characteristic of schizophrenia (Green, Uhlhaaas, & Coltheart, 2005), but persons with PD may also interpret ambiguous contexts in a more hostile manner (thus, a deficit and a bias is present). Also, the inclusion of measures such as the AIHQ that have both rater-derived and participant-derived scores is important as the evidence is mixed as to which method of scoring is most valid (Bentall, 2001; Kinderman, Dunbar, & Bentall, 1998; Martin & Penn, 2002; Randall, Corcoran, Day, & Bentall, 2003). In the current study, the rater-derived Hostility bias score was a significant predictor, whereas the composite Blame score was not.

A number of limitations are associated with the current study. First, as with any study on paranoia, there is the high likelihood of a sampling bias in which the most paranoid participants decline to participate, thus reducing the external validity of the findings. Also, using a control sample consisting of college students may be less than ideal, but we attempted to account for group differences in the analyses (age, educational level, as covariates and as additional predictors in the regression model). The groups likely differed on other important variables that were not measured or accounted for in the present study such as life experiences, stress levels, SES status, and cognitive function. Matching participants on these important characteristics would have strengthened the study.

In terms of the assessment strategy for paranoia, the determination of the presence of persecutory delusions was derived from a single item on the BPRS. To reduce potential problems with this approach, all researchers were reliably trained on the BPRS and we decided a priori to administer two additional self-report measures of paranoia (PS and PAI-P) to provide supporting evidence for the presence of paranoid ideation. In fact, the PAI-P scale has correlated positively with the presence of persecutory delusions,

which may partially mitigate problems related to using a single item to classify participants (see Combs, Michael, & Penn, 2006). Also, we used a specific BPRS cutoff score for determining persecutory delusions (BPRS ≥ 5 for the presence of PD), which has been used in several studies to define the presence of persecutory delusions (see Combs, Michael, & Penn, 2006; Martin & Penn, 2002). Based on our classification method, the non-PD group did contain some persons with mild levels of paranoia as defined by a BPRS suspiciousness score equal to 4. However, these persons did not show beliefs that were delusional in nature (i.e., based on conviction, preoccupation, and reaction to evidence). Given that delusions are considered dimensional constructs, we were primarily interested in delusional levels of paranoia and mild beliefs of paranoia are quite common and not generally considered pathological (see Freeman, 2007, for a discussion). Of note, the non-PD group showed scores similar to nonpsychiatric controls on both the PS and PAI-P (see Table 2), which argues against the claim that the non-PD group had evidence of persecutory delusions. Furthermore, the results did not change when persons with BPRS scores equal to 4 were removed from the analyses. To attenuate possible criterion contamination, blinded researchers who did not have access to information on group membership or other assessment data (e.g., BPRS scores or responses) were used to rate the AIHQ. Thus, the raters had access to only the participant responses on the AIHQ items and not symptom data.

Future research needs to investigate how perceived hostility affects the formation and maintenance of persecutory beliefs, which can in turn help to refine theoretical models of persecutory delusions. Ideally, this will come from longitudinal type research. There are a few possibilities to consider. First, the relationship between perceived hostility and paranoia may overlap as both intention and harm are involved in both constructs and may ultimately prove to be redundant, circular constructs. Second, perceived hostility and paranoia may interact and build on each other leading to the formation of persecutory delusions. Third, perceived hostility may be a facet/symptom of paranoia reflecting a type of cognitive bias for threat.

There is room to explore the relationship between perceived hostility and the other cognitive biases found in paranoia. The tendency to see hostility may be a type of data gathering bias in which there is a failure to fully attend to important aspects of situations (visual scanning; Combs, Michael, & Penn, 2006; Phillips et al., 2000), a form of the jumping to conclusions bias in which decisions are made quickly (Broome et al., 2007; Moritz & Woodward, 2005), or a problem in generating alternatives, indicating cognitive rigidity (Freeman et al., 2004). It may also be that perceiving hostility in ambiguous situations may reflect a strong need for closure in which the person sees hostility in all situations and prematurely halts the attributional process (see Colbert, Peters, & Garety, 2005). Potential

modifications to the AIHQ to disentangle these constructs may involve including reaction time measurements or allowing the person to generate as many reasons for the other person's behaviour as possible. For example, does the person make decisions quickly suggesting a jumping to conclusions type bias, or does the person appear to be engaging in extended serial cognitive processing (Green, Williams, & Davidson, 2001). These underlying mechanisms may be useful in developing interventions to reduce perceived hostility (Combs, Adams, et al., 2007).

In closing, as researchers begin to fully understand paranoia it is important to include situations that differ in intentionality, especially ambiguous ones, in future studies. It appears that persons with persecutory delusions have problems processing ambiguity and in the absence of clear cues regarding intention exhibit a tendency to perceive hostility in others. The presence of a hostility bias, if confirmed by future research, could be useful in refining existing models of paranoia to provide a greater emphasis on contextual cues. The complexity of paranoia makes isolating one construct difficult, but it is important to study individual variables to understand their contribution to paranoid ideation. We hope that researchers and clinicians include measures of ambiguity in future studies as this may be an important construct in the study of paranoia.

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