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Situational context influences the degree of hostile attributions made by individuals with schizophrenia or autism spectrum disorder

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Objectives. Previous work has demonstrated that the tendency to make hostile attributions is not a stable trait but varies across different social situations. Therefore, we sought to investigate whether hostile attributions within clinical samples are better understood as a persistent characteristic or one that varies across contexts.

Methods. The current analyses investigated patterns of attributions among people diagnosed with schizophrenia (SCZ, $n = 271$) or autism spectrum disorder (ASD, $n = 100$) and non-clinical control participants (NCC, $n = 233$) in an existing data set.

Results. Results showed that specific relational features in vignettes portraying different social encounters influence the way people make attributions and that variability across contexts is present in both non-clinical and clinical populations. Like non-clinical participants, participants diagnosed with ASD ascribed the greatest hostility to a scene involving an authority figure. In contrast, SCZ participants reported the greatest hostility in response to a scene involving a friend.

Conclusions. These findings suggest that salient environmental factors should be considered when assessing social cognitive skills and biases.

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Practitioner points

- Hostile attributions should be perceived as situational constructs rather than stable and persistent characteristics.
- Hostile attributions were most prevalent among persons diagnosed with schizophrenia; however, on average, all participants showed greater hostility for situations involving an authority figure, an acquaintance, or a friend relative to those involving a co-worker or stranger.
- Psychotherapists and clinicians working with people diagnosed with schizophrenia or autism spectrum disorder could work on identifying situation triggers, which may prompt hostile attributions.
- Psycho-educational and psychotherapeutic interventions can be altered based on individual triggers of hostile attributions, and attempts can be made to lessen these attributions.
- Paranoia appears to be linked to hostile attributions regardless of the specific clinical diagnosis and should be considered in the therapeutic process.

Psychological research of individual differences in personality often ignores variability of behaviours across situations (Mischel & Shoda, 1995; Zajenkowski, Jonason, Leniarska, & Kozakiewicz, 2020). They stress that when trying to understand social behaviours, it is necessary to account not only for the stability of qualities underlying certain personality traits but also how behaviours can, and often do, differ across situations and contexts.

Acknowledging cross-situational variability can also inform understanding of abnormal or disordered social behaviours. As early as 1967, individuals with schizophrenia were shown to alter their behaviours during clinical interview to present themselves as 'sick' or 'healthy' depending on the situation and the goals they wished to achieve. More recently, Pinkham et al. (2011) showed that context impacts social cognitive performance such that paranoid individuals with schizophrenia were much more likely to rate a face as untrustworthy when ratings were made privately via computer. In contrast, when providing a verbal response to an experimenter, these individuals were much more likely to give normative responses. In this sense, consideration of situational variability in clinical samples can provide knowledge about situational triggers of responses to social cues (Zajenkowska, Prusik, & Szulawski, 2018) and information about when certain patterns of responding (e.g., more paranoid) may be expected.

On the other hand, such findings raise important questions regarding the validity of data gathered in different circumstances and the contextual factors and individual sensitivity to the 'context' that may impact behaviours and assessments. Person-oriented assessment creates a tendency among clinicians to attribute the causes of behaviour to dispositions of individuals, which can overshadow situational contributors to psychopathology (Moos & Fuhr, 1982; Morrison, 2014). In this sense, clinicians and researchers may make the fundamental attribution error in regard to personality (Ross, 1977) by focusing assessment and treatment solely upon the individual rather than also incorporating consideration of external factors that affect clinical presentation and well-being. Morrison (2017) has argued that clinicians should also stress the importance of the life context when evaluating patients and try to link information from the life history of patients to the categorical diagnosis of DSM. In an example of situational variables impacting illness symptoms, Depp et al. (2016) reported that being alone was associated with increases in negative self-evaluations in people with schizophrenia who manifested suicidal ideation compared with situations where they were in the presence of other people.

One area in which it may be particularly informative to consider situational/contextual influences is in attributional style, or the way in which individuals explain the causes of social events or interactions (Green et al., 2008). A growing body of literature

demonstrates that individuals with psychosis, and particularly schizophrenia, tend to make attributions that are more hostile than non-clinical individuals (Buck et al., 2017; Pinkham, Penn, Green, & Harvey, 2016). This hostility bias is strongly linked to the presence of paranoid ideation such that as paranoia increases, so too do hostile attributions. That circular mechanism may lead to persistent hostile attributions, with lower cross-situation variability (Buck, Healey, Gagen, Roberts, & Penn, 2016; Pinkham, Harvey, & Penn, 2016). Interestingly among children, and especially boys, there is a strong association between hostile attributions and the likelihood of engaging in aggressive or violent acts (De Castro, Veerman, Koops, Bosch, & Monshouwer, 2002); however, among adults this association is small to medium (Tuente, Bogaerts, & Veling, 2019). In clinical samples, greater hostility bias predicts generally poorer social functioning (Lahera et al., 2015).

Although hostility biases, if present, are likely to be stable, a solid theory of context of hostile attributions is needed (Dodge, 2006) and some studies have shown that hostile attributions of social encounters (as indexed by feelings of anger and ascribing intent and blame to other people) are dependent upon social context (e.g., Zajenkowska et al., 2018). Many of these investigations have utilized the Ambiguous Intentions and Hostility Questionnaire (e.g., Combs, Penn, Wicher, & Waldheter, 2007), which asks participants to read five vignettes depicting ambiguous social interactions (with an authority figure, a friend, an acquaintance, strangers, or a new colleague from work), imagine that scenario happening to them, and then rate to what degree they thought the other person did it on purpose (intentionality), how angry they would feel (anger), and how much they would blame the other person (blame). Factor analytic studies of social cognition that include the AHIQ consistently report that the measure loads on a single factor representing hostile attributional style (Buck, Healey, et al., 2016; Mancuso, Horan, Kern, & Green, 2011). However, these studies compare the AHIQ to tasks tapping into other domains of social cognition such as emotion processing and mentalizing. When examined independently, instead of responses loading onto a single factor of blaming/hostile attributions or three separate factors for each of the individual question types (e.g., intentionality, anger, and blame), a five-factor model has been demonstrated to best fit the data (Zajenkowska et al., 2018). These five factors map onto the five different types of relationships utilized in each vignette, suggesting that social contextual factors affect the tendency to make hostile attributions. Other studies on hostile attributions have also found that they vary depending on relationship type. For example, mild to moderately intellectually disabled individuals, depending on their level of aggressive behaviour, have been found to ascribe hostile intent differently when the situation involves an authority figure compared with a peer (Jahoda et al., 2006). Additionally, community-dwelling non-clinical adults ascribed more hostility if the situation involved an acquaintance or an authority figure (Zajenkowska et al., 2018).

Current study

We sought to investigate whether hostile attributions within clinical samples are better understood as a persistent characteristic or one that varies across contexts, and therefore, we aimed to replicate the results from the community dwelling adults, which support the latter notion (Zajenkowska et al., 2020). To do this, we analysed data collected as part of two large scale projects: the Social Cognition Psychometric Evaluation study (Pinkham, Penn, et al., 2016) and a companion study assessing social cognitive performance in autism spectrum disorder (Pinkham et al., 2019). This allowed us to examine attributional

responses in two clinical groups, individuals with schizophrenia (SCZ) and individuals with autism (ASD), and compare their responses to a non-clinical control group (NCC). A hostility bias is frequently reported in SCZ, which makes SCZ an ideal candidate for assessing variability across situations. ASD was chosen as a clinical comparison for three primary reasons. First, as noted above, hostility bias is strongly linked to paranoid ideation, and previous findings suggest overlap in the amount of paranoid ideation in ASD and schizophrenia (Pinkham, Hopfinger, & Penn, 2012). Second, findings regarding the presence of a hostility bias in ASD are mixed, with some studies showing no increase in hostility as compared to non-clinical individuals (Craig, Hatton, Craig, & Bentall, 2004; Pinkham et al., 2019) and others showing greater hostility in ASD (Mazza et al., 2017). Thus, consideration of potential situational or context effects may help to clarify the discrepancy in previous work. Finally, SCZ and ASD both show reduced performance on social cognitive tasks and difficulties in social functioning (Fernandes, Cajão, Lopes, Jerónimo, & Barahona-Corrêa, 2018; Sasson, Pinkham, Carpenter, & Belger, 2011). While a previous comparison of attributional bias assessed with the AIHQ showed a small but significant difference between SCZ and ASD (Cohen's d −.21; Pinkham et al., 2019), a more detailed comparison that considers the potential role of situation may help to identify disorder specific biases and patterns.

To address our overarching question of whether the attributions of individuals with clinical diagnoses would be stable or variable across situational contexts, we first tested and aimed to replicate whether the same five-factor situation-based model found in Zajenkowska et al. (2018) would fit the data from each of the three groups. We anticipated that this model would provide better fit within each group than a one-factor model, demonstrating the importance of situational context on attributions, regardless of clinical status. We also examined measurement invariance (configural, metric and scalar) to determine whether the three groups interpreted the items in the same way.

Next, we examined both between- and within-group differences across each of the five factors/situations to test for specific patterns of hostile attributions (e.g., in which context hostile attrbutions are the strongest), depending on the social context presented in the vignettes of AIHQ. Given the previous research highlighting sensitivity to context in SCZ and the social cognitive overlap between SCZ and ASD, we hypothesized that individuals with SCZ and individuals with ASD would both show differences in the degree of the hostility bias across situations as compared to NCC. Classic research on attribution showed the *mere exposure* effect such that people become more favourable towards a stimulus merely due to frequency of previous contact. Therefore, one could expect that closer/deeper relationships may garner the least hostile attributions (Dodge, 2006). However, more recent work suggests an opposite pattern (Jahoda et al., 2006; Zajernkowska et al., in press), and thus, it is possible that especially for people with interpersonal problems, closer relations may generate more tension and hostility. Therefore, we would expect that in our study both clinical samples would present more hostile attributions in case of scenes depicting closer relationships (e.g., friend). Consistent with the literature (Buck et al., 2017; Lahera et al., 2015; Pinkham, Penn, et al., 2016), we also anticipated that the SCZ group would show overall higher hostility ratings than the NCC group. Finally, given the strong link between the hostility bias and paranoia (Buck, Healey, et al., 2016; Pinkham, Harvey, et al., 2016), we explored the relationship between current levels of self-reported paranoia and attribution ratings across situations. Also, we hypothesized that in all groups and situations, increased paranoia would be associated with greater hostility.

Method

Participants

The current study utilized archival data. Participants were 234 non-clinical control individuals (NCC), 271 individuals with schizophrenia, and 101 individuals with ASD; however, due to missing data 2 individuals were excluded from the study (one NCC and one ASD). NCC and SCZ individuals were participants in Phases 3 and 4 of the multi-site Social Cognition Psychometric Evaluation Study (Pinkham, Penn, et al., 2016), which ran concurrently with data collection for the ASD group. ASD individuals were recruited from The University of Texas at Dallas (UTD) and had ASD diagnoses confirmed via the Autism Diagnostic Observation Schedule (Lord et al., 2000). Participants with SCZ were recruited from Metrocare Services, a non-profit mental health services provider in Dallas County, TX, from the Miami VA Medical Center and the Jackson Memorial Hospital-University of Miami Medical Center (UM), and from the Outreach and Support Intervention Services (OASIS) program affiliated with the University of North Carolina at Chapel Hill (UNC-CH). Diagnoses for individuals in the SCZ group were confirmed via clinical interview with the Mini International Neuropsychiatric Interview (Sheehan et al., 1998) and Structured Clinical Interview for DSM Disorders Psychosis Module (First, Spitzer, Gibbon, & Williams, 2002). NCC adults were recruited via advertisements in the local communities of Dallas, TX, Miami, FL and Chapel Hill, NC and were screened for history of psychopathology to ensure they did not meet criteria for any developmental disabilities or mental illnesses.

To be eligible for the study, all participants had to be proficient in English and between the ages of 18 and 65. Clinical participants could not have any hospitalizations within the last 2 months and had to be on a stable medication regimen for a minimum of 6 weeks with no dose changes for a minimum of 2 weeks. Individuals with dual diagnoses of SCZ and ASD were excluded. Exclusion criteria for all groups included: (1) presence or history of intellectual disability (defined as IQ < 70), (2) presence or history of medical or neurological disorders that may affect brain function (e.g., uncontrolled hypertension, history of seizures, head trauma with unconsciousness for more than 15 min), (3) visual or hearing limitation that would interfere with assessment, and (4) current substance use disorder, except nicotine.

Demographic and clinical characteristics of each group are provided in Table 1. Groups significantly differed on age ($F(2, 601) = 57.37$, $p < .001$) and years of education ($F(2, 601) = 23.47$, $p < .001$). There were also differences in parental education (for mothers $F(2, 530) = 20.11$, $p < .001$, for fathers $F(2, 407) = 11.49$, $p < .001$). Groups also differed on sex ($\chi^2 = 22.04$, $p < .001$), race ($\chi^2 = 70.03$, $p < .001$), and ethnicity ($\chi^2 = 10.14$, $p = .006$). Ratings for positive ($t(368) = 14.61$, $p < .001$), negative ($t(368) = 2.10$; $p = .04$), and general symptoms ($t(368) = 12.46$, $p < .001$) from the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1986) were also higher in the SCZ group as compared to ASD.

Measures

Hostile attributions

The Ambiguous Intentions and Hostility Questionnaire (AIHQ; Combs et al., 2007) evaluates hostile social cognitive biases. Participants are presented with five hypothetical, ambiguous situations, which involve a range of social relationships, including a new co-worker, an authority figure, strangers, an acquaintance, and an established friend. The scenarios are as follows:

Table 1. Descriptive statistics of the SCZ, ASD and NCC groups

Descriptive statistics	SCZ (n = 271) Mean (*SD*)	ASD (n = 100) Mean (*SD*)	NCC (n = 233) Mean (*SD*)
Age in years[a]	39.35 (12.81)	24.26 (6.21)	34.01 (13.16)
Years of education[b]	12.94 (2.18)	13.63 (1.72)	14.16 (1.87)
Years of education of mother[c]	13.25 (3.46)	15.54 (2.20)	13.87 (2.70)
Years of education of father[c]	14.09 (3.89)	16.04 (2.55)	14.33 (2.94)
PANSS Positive Symptoms	16.31 (5.47)	9.83 (2.93)	
PANSS Negative Symptoms	14.02 (4.92)	12.82 (4.80)	
PANSS General Symptoms	31.66 (7.81)	23.24 (4.80)	
	N (%)	*N* (%)	*N* (%)
Gender (% of females)	89 (33%)	11 (12%)	84 (36%)
Ethnicity (% of non-Hispanic)	222 (82%)	94 (94%)	187 (80%)
Caucasian	126 (46.5%)	88 (88%)	130 (55.8%)
African American	126 (46.5%)	4 (4%)	87 (37.3%)
American Indian/Alaskan Native	1 (0.3%)	0	0
Asian	7 (2.6%)	8 (8%)	8 (3.4%)
Other	11 (4.1%)	0	8 (3.4%)

Information regarding maternal education was missing from 50 SCZ, 3 ASD, and 18 NCC. Paternal education levels were missing from 119 SCZ, 8 ASD, and 67 NCC.
[a]All groups significantly different at $p < .001$.; [b]SCZ < ASD & NCC.; [c]ASD > SCZ & NCC.

1. You've been in a new job for 3 weeks. One day, you see one of your new co-workers on the street. You start to walk up to this person and start to say hello, but she/he passes by you without saying hello.
2. You have an appointment with an important person. When you arrive at your appointment, the secretary informs you that the person is not in; they took the day off.
3. You walk past a bunch of teenagers at a mall and you hear them start to laugh.
4. You are supposed to meet a new friend for lunch at a restaurant but she/he never shows up.
5. You call a friend and leave a message on their answering machine, asking them to call you back. One week passes and they have not called you back.

Participants read each scenario, imagined it happening to them, and then used Likert scales to rate whether the other person/s performed the action on purpose (rated from 1 to 6, 'definitely yes'), how angry it made them feel (rated from 1 to 5, 'very angry'), and how much they blamed the other person/s (rated from 1 to 5, 'very much'). These three scores are averaged to create a Blame Index (comprised of ascribing intentionality, blame and anger; Combs et al., 2007), which has previously been shown to have acceptable reliability and validity and to be significantly related to clinically rated hostility and suspiciousness symptoms (Buck et al., 2017). Because the Blame Index is comprised of attributions of intentionality, blame and anger, it is operationalized as a broader Hostile Attribution index (Zajenkowska et al., 2020).

Additionally, participants answered two open-ended questions about their interpretation of the actor's motive and how the participant would respond to the situation. However, psychometric properties for the rater-scored, open-ended questions were

found to be poor in previous studies (Buck et al., 2017; Pinkham, Penn, et al., 2016) and are therefore better suited for a quantitative analysis (Zajenkowska et al., 2020).

Paranoia

Levels of paranoid ideation were assessed via the Paranoia Scale (PS; Fenigstein & Vanable, 1992), a 20-item, self-report measure designed to assess subclinical paranoid thought and that specifically measures self-consciousness and self-attention. Each item is rated on a Likert scale from 1 to 5, (1 = *Not at all applicable*; 5 = *extremely applicable*), and performance is indexed as the total score, with higher scores indicating higher levels of paranoia.

Procedures

All participants provided written informed consent and then completed the AIHQ and PS. Both tasks were collected in the same session, and for those individuals who were in the SCOPE study, only data from visit one were used. The institutional review boards of UTD and UNC-CH approved the study protocol, and all participants provided written informed consent.

Statistical analysis

To evaluate whether the five-factor measurement model fits the data better than the one-factorial proposition, we conducted confirmatory factor analysis (CFA). We used conventional criteria to evaluate model fit; that is, the model is seen as well-fitted when approximate fit indices of Comparative Fit Index (CFI) are higher than .900 and Root Mean Square Error of Approximation (RMSEA) is lower than .08 (Byrne, 1994; Schermelleh-Engel, Moosbrugger, & Müller, 2003). Moreover, we used the Bayesian Information Criterion (BIC) to assess which of the compared models explains more information. The model is preferable when the BIC values are lower (Kline, 2011). Furthermore, we evaluated whether the best-fitting model is equivalent for studied samples using the measurement invariance procedure. In brief, there are three levels of invariance differing in their degree of restrictiveness: configural – without any constraints, tests whether the basic factorial structure is same across samples; metric – constraining factor loadings to be equal across groups, tests whether the items relate to the trait in the same way in the different samples; and scalar – constraining item intercepts to be equivalent, tests whether the observed means conditional on the trait level are the same across samples (Meredith, 1993). To evaluate whether samples are invariant, one needs to compare the approximate fit indices of two subsequent models (i.e., configural vs metric and metric vs scalar). The models are deemed as invariant when the difference in CFI (i.e., ΔCFI) does not exceed .010 and the difference in RMSEA (i.e., ΔRMSEA) is lesser than .015 (Chen, 2007).

To assess between-group differences and within-group patterns of hostile attributions in addition to invariance tests, we utilized univariate repeated measures ANOVA (RM ANOVA) to analyse how participants from each of the groups perceive social encounters based on the type of social relationship presented in the scenario. Finally, the relationship between paranoia and hostile attributions was assessed via zero-order Pearson's correlations.

Table 2. Model fit indices for different measurement models of the AIHQ across groups

Group	Model	$\chi^2_{(df)}$	*p*	CFI	RMSEA	90% CI	BIC
Non-clinical control ($N = 233$)	One-factor	$775.06_{(90)}$	.001	.447	.181	0.169, 0.193	10,993.70
	Five-factor	$237.51_{(80)}$	.001	.873	.092	0.079, 0.106	10,354.51
Schizophrenia ($N = 270$)	One-factor	$857.88_{(90)}$	.001	.509	.178	0.167, 0.189	14,316.55
	Five-factor	$266.33_{(80)}$	.001	.879	.093	0.081, 0.105	13,592.84
Autism spectrum disorder ($N = 101$)	One-factor	$353.97_{(90)}$	.001	.509	.170	0.152, 0.189	4,765.36
	Five-factor	$170.75_{(80)}$	.001	.831	.106	0.084, 0.128	4,565.41

Results

Five-factor model of the Ambiguous Intentions Hostility Questionnaire (AIHQ)

The model fit[1] of the five-factor measurement model of the AIHQ is presented in Table 2. For comparison purposes, we also report the fit indices of the one-factor solution.

As expected, according to the approximate fit indices (i.e., CFI and RMSEA) and information criteria (i.e., BIC), the five-factor model appeared to have better fit than the one-factor model in all samples. Further, we assessed whether this model is invariant across studied samples. First, configural model was fitted below acceptable threshold ($\chi^2_{(240)} = 678.60$; $p < .001$; CFI = .868; RMSEA = .095); thus, we sequentially correlated residuals until satisfactory model fit was reached. After correlating five pairs of residuals, the model fit was satisfactory ($\chi^2_{(225)} = 506.46$; $p < .001$; CFI = .916; RMSEA = .079). Metric was well-fitted as well, and the differences in approximate fit indices between these models were in assumed range: $\chi^2_{(2454)} = 538.34$; $p < .001$; CFI = .912; RMSEA = .077. Finally, scalar model was poorly fitted: $\chi^2_{(265)} = 627.81$; $p < .001$; CFI = .892; RMSEA = .082). Thus, we sequentially freed item intercepts in order to improve overall fit. The introduced amendments resulted in an improved model fit ($\chi^2_{(260)} = 566.47$; $p < .001$; CFI = .909; RMSEA = .076).[2] The differences between metric and partial scalar model (i.e., ΔCFI = .003 and ΔRMSEA = .001) were within the acceptable boundaries. We also analysed an additional five-factor model with three method factors, corresponding to the method bias due to the same pattern of questions in each vignette. The model has been much better fitted in all samples, and we obtained full scalar invariance (configural: $\chi^2_{(231)} = 325.82$; $p < .001$; CFI = .971; RMSEA = .045; metric: $\chi^2_{(251)} = 354.06$; $p < .001$; CFI = .969; RMSEA = .045; scalar: $\chi^2_{(265)} = 391.05$; $p < .001$; CFI = .962; RMSEA = .049). However, due the fact that the introduction of these method factors partials out important variance, we decided not to analyse this model further, but rather retain the composite scores. Summarizing, the five-factor model of the AIHQ seems

[1] *No residuals were allowed to correlate. We used Mplus v 7.2. with robust maximum likelihood estimation. Full information maximum likelihood was used to handle missing data (in total, only five missing data patterns were observed).*

[2] *We also assessed whether age and gender, which were entered into the model as varying covariates, are significant predictors of different situations across groups. The effects were negligible, that is there were no significant effects in ASD group, for gender, males scored higher on authority situation ($\beta = 0.13$; p = .006) in NCC and lower on strangers situation ($\beta = -0.49$; p = .010) in SCZ; for age, older participants from SCH group scored higher on strangers ($\beta = 1.17$; p = .033) and lower on acquaintance situation ($\beta = -2.18$; p = .026). The introduction of covariates slightly decreased model fit of the partial scalar model ($\chi^2_{(325)} = 668.87$; p < .001; CFI = .903; RMSEA = .072).*

Table 3. Means, *SD* and 95% confidence intervals for social relationships: SCZ, ASD, and NCC groups

Variable	*M*	*SD*	95% CI
NCC			
Co-worker	1.99	1.03	1.84; 2.13
Authority	2.73	1.05	2.57; 2.89
Strangers	1.74	1.07	1.57; 1.90
Acquaintance	2.62	1.11	2.47; 2.77
Friend	2.63	1.22	2.47; 2.80
SCZ			
Co-worker	2.64	1.24	2.51; 2.78
Authority	2.83	1.39	2.68; 2.98
Strangers	2.65	1.48	2.50; 2.80
Acquaintance	2.91	1.29	2.76; 3.05
Friend	3.13	1.32	2.98; 3.28
ASD			
Co-worker	2.12	.93	1.90; 2.34
Authority	2.81	1.15	2.57; 3.05
Strangers	1.87	1.07	1.62; 2.12
Acquaintance	2.44	1.07	2.20; 2.67
Friend	2.41	1.13	2.16; 2.66

to be preferable over the one-factor solution with each situation indicating the level of hostile attribution or hostile perception in the particular context.

Between-group differences

A univariate repeated measures ANOVA was conducted to determine whether NCC, SCZ, and ASD participants showed higher levels of hostile attribution based on the type of social relationship presented in the scenario.[3] For this analysis, type of social relationship in the vignette (five types: co-worker, authority figure, strangers, acquaintance, and friend) was included as the within-subject variable, and group (SCZ, ASD, NCC) was the between-subject variable. The analysis revealed a main effect of the type of relationship $F(4, 598) = 43.755, p < .001, \eta_p^2 = .226$ such that the situations involving a co-worker and strangers received the least hostile attribution ratings (e.g., Blame Index score), and those situations involving an authority figure, an acquaintance, and a friend received the highest hostile attribution ratings. The main effect of group $F(2, 601) = 25.745$, $p < .001$, $\eta_p^2 = .079$ was significant indicating that the SCZ group demonstrated more hostility than either the ASD or NCC groups ($p < .001$ for both comparisons). The interaction between group and the type of relationship was also significant $F(8, 1{,}198) = 6.603$, $p < .001$, $\eta_p^2 = .043$. As compared to the ASD and NCC groups, the SCZ group had higher hostility ratings for every situation, $p < .020$, except the one with an Authority figure, where there

[3] *We also compared latent means between groups as found in the scalar model. The results for the model without method factors were in high congruence to ones reported in Between group differences section. The two exceptions between results provided by ANOVA and MGCFA was regarding situation 4 (an acquaintance) between NCC and SCZ, which was significant in ANOVA (at* p = *.023), and non-significant in MGCFA (at* p = *.060) and between NCC and ASD, non-significant in ANOVA (at* p = *.370) and significant in MGCFA (at* p = *.009). When we analysed measurement model with method factors, there were no differences between analysed groups in any situation.*

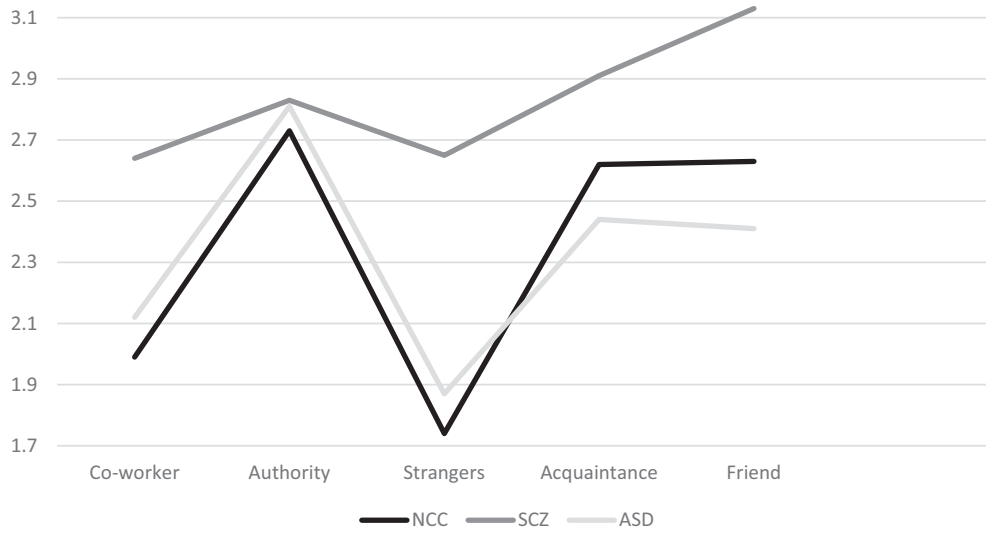

Figure 1. Mean scores on each situation across NCC, SCZ, and ASD groups.

were no significant differences between the three groups. The ASD group did not significantly differ from the NCC group in any of the AIHQ situations (Table 3; Figure 1).

In order to examine the cross-situational consistency in each of the groups, we calculated Cronbach's α, which was slightly higher in the SCZ and ASD groups, $\alpha = .74$ in both cases, than in NCC, for which it was $\alpha = .68$.

Patterns of hostile attributions within groups

When attributional patterns were examined separately in each group, RM ANOVA showed that among ASD participants, the greatest hostility was ascribed to the scene with an authority figure. However, this rating did not statistically differ from the scene with an acquaintance, $p = .095$ or a friend, $p = .073$. The lowest hostile attribution was ascribed to the strangers, but it was not significantly lower than as compared to a colleague from work, $p = .559$.

SCZ participants ascribed the greatest hostility to the scene with a friend, and it was significantly higher than all other situations, $p < .034$. It was followed by the situation with an acquaintance, which was assessed as less hostile in comparison with a friend, but more in comparison with strangers and new co-worker, $p < .05$. Encounters with an authority figure, colleague from work or strangers were perceived as equally hostile at the same level. $p > .339$.

NCC perceived the encounters with an authority figure, an acquaintance, and a friend most hostile (there were no differences between those three types of relations), and more hostile than with strangers and a colleague from work (which were assessed similarly), $p < .001$.

Finally, we checked the level of paranoia scores for each of the three groups and the correlation between paranoia scores and hostile attributions. As expected, paranoia was highest in SCZ, followed by ASD and then NCC ($p < .001$ for all comparisons). The relation was significant and positive for every group in every situation except for ASD participants in the co-worker situation (Tables 4 and 5). However, this correlation was not

Table 4. Means, *SD*, min and max values for paranoia scores in SCZ, NCC and ASD groups

Paranoia	*M*	*SD*	Min	Max
NCC	30.79	10.03	20	69
SCZ	46.62	18.83	20	94
ASD	37.77	10.82	20	72

Table 5. Correlation coefficient *r* between paranoia scores and hostile attributions across different contexts in SCZ. ASD and NCC groups

Variable	Co-worker	Authority	Strangers	Acquaintance	Friend
Paranoia					
SCZ	.22**	.22*	.28**	.25**	.28**
ASD	.18	.20*	.32**	.41**	.30**
NCC	.22**	.14*	.25**	.24**	.28**

*$p < .05$ (two-tailed).; **$p < .001$ (two-tailed).

materially different in magnitude ($r = .18$ vs $r = .20$) from other correlations that were significant in this sample.

Discussion

The present study examined whether the tendency to make hostile attributions within clinical populations is a stable construct or if the imagined situational context may selectively provoke them. By analysing archival data (Pinkham et al., 2019; Pinkham, Penn, et al., 2016), we replicated our previous finding in non-clinical individuals showing that a five-factor model (aligning with the different social situations of the AIHQ) provided better model fit than the one-factor model (Zajenkowska et al., 2018). This same five-factor model was also better fitted to the data in two distinct clinical groups, individuals with schizophrenia (SCZ) and individuals with autism spectrum disorder (ASD). Further, within-group comparisons showed significantly different levels of hostile attributions across situations in NCC individuals and in both clinical groups. The SCZ and ASD groups did not show any greater stability across situations compared to the NCC group, as indicated by Cronbach's alpha. Thus, these results support our hypothesis that specific social-relational features in the AIHQ vignettes may impact the way people make attributions and that variability across contexts is present in both non-clinical and clinical populations. Acknowledging cross-situational variability is important in understanding abnormal or disordered social behaviours as context may 'trigger' psychopathological responses (Morris et al., 2007). Still, apart from the type of the relation between the protagonist and harm doer, additional features may require recognition and further investigation, such as perspective taking (does the situation concern me or somebody else?; Jahoda et al, 2006, Zajenkowska et al., 2020), the level of ambiguity of the social situation (Wilkowski et al., 2007), or whether the social encounter takes place in private or in public (Zajenkowska et al., 2020). Consequently, a strong theory of context in regard to hostile attribution is needed that would include contextual factors related to the social percepetion (Dodge, 2006).

In general, our results are congruent with previous studies conducted on different populations (inmates vs. non-inmates; American, Poles and Japanese; Zajenkowska et al., 2018, 2020) which revealed that AIHQ has a five factor structure. This suggests that the hostility bias is strongly influenced by socio-relational conditions and not a general tendency consistently present to the same degree across situations and relationships. Attributional differences across situations are also in line with older studies (e.g., Cutrona, Russell, & Jones, 1984; Miller, Klee, & Norman, 1982) that reported weak consistency of causal attributions. The current results supporting a five-factor structure also underscore the limited distinction, from a factor analytic perspective, between attributions of intentionality, anger, and blame. Each of these three attributions is specifically queried by the AIHQ for all scenarios; however, it appears that distinctions between the scenarios themselves are more critical than those between the types of attributions.

Our results also confirmed the (partial) scalar invariance of the AIHQ with five factors across SCZ, ASD, and NCC groups. Moreover, we identified a potential cause of poor model fit in the form of method factor bias. Because scalar invariance was only partly supported, this may suggest that the observed differences in means between groups were due to mean differences in the factors of anger, blame, and intentionality. The influence of method factor may be due to the instrument, and for example, due to wording that induces similar responses (Podsakoff, MacKenzie, & Podsakoff, 2012). The presence of method bias could distort invariance tests, especially when examining clinical populations (Meganck, Vanheule, & Desmet, 2008). While some sources of method bias could be eliminated through different wording of items, for the AIHQ such modifications are impossible due its very nature (i.e., asking the same questions about different situations) and the fact that it is related to clinical constructs (Buck, Healey, et al., 2016; Roberts et al., 2014).

Given the substantial effects of method factors on invariance results, and especially scalar invariance, between-group comparisons must be interpreted with great caution. Scalar invariance basically tests whether our three groups use the response scale in a similar way, and this does not appear to be the case in our study. However, we were able to show metric invariance, indicating that the relation between the items and the factors are similar across the studied groups. That implies that all three groups are interpreting the items in the same way, but that they are using the response scale differently. Similar issues have been previously acknowledged by researchers examining clinical populations (Lavoie & Douglas, 2012), and such results are thought to indicate measurement bias (Camilli & Shepard, 1994; Vandenburg & Lance, 2000). This suggest that individuals from different groups using the AIHQ report hostility bias in a slightly different way and that is why identical scores across groups cannot be assumed to signify identical meaning. Lavoie and Douglas (2012) stress that such findings do not render all comparisons of clinical and non-clinical samples incorrect or invalid, but rather that the measurement type is perceived differently by participants from separate groups. Thus, while our finding of greater hostility bias in SCZ is consistent with the previous literature, our results suggest that the differences between groups may be partially due to the way participants understand and respond to questions regarding the constructs of blame, intent, and anger. Additional studies are needed to more thoroughly investigate the ways people with SCZ and ASD understand these constructs. Such studies may also shed light on the inconsistent findings regarding increased hostility in ASD. While we failed to find differences between the ASD and NCC groups, we cannot definitively conclude that no differences exist given the fact that the post hoc power analysis revealed that the current study was

underpowered to detect such small effect sizes as those observed in the current study. Future studies should address this limitation.

In regard to within-group differences across the five situations, we found qualitatively similar patterns of hostility between the ASD and NCC groups. Both groups showed the greatest hostility for the situation involving an authority figure and the least for the situation involving strangers. This suggests a normative situational effect in ASD that is consistent with the lack of significant differences between these groups. For individuals with SCZ, however, the greatest amount of hostility was ascribed to the situation involving an established friend, followed by an acquaintance. This finding may have important real-world implications as it suggests that hostility in SCZ is most likely emerge to the largest degree within close relationships. This finding may also help explain why violence among individuals with SCZ tends to be directed towards someone the individual knows well, such as family members or friends (Joyal, Putkonen, Paavola, & Tiihonen, 2004). Interventions seeking to limit risk for aggression in SCZ may therefore benefit from emphasizing reductions in the hostility bias.

Importantly, greater hostility bias was also associated with increased paranoia across clinical groups and across situations. These effects were generally in the medium to large range (Gignac & Szodorai, 2016) suggesting that the two constructs overlap but are not redundant. The finding that the SCZ group showed the highest paranoia level may also offer some explanation for why this group, as a whole, also showed the greatest hostility bias. That is, paranoia may serve as part of the mechanism underlying the hostility bias. It is possible that paranoia may predispose an individual to hostile attributions that are then more likely to be triggered by certain situations. It is interesting to note that the correlations were generally stronger for situations involving strangers, acquaintances, and friends, which may indicate that these situations are particularly relevant for individuals who are paranoid. As our current data are strictly correlational, future work will be needed to determine whether a causal relationship exists between increased paranoia and increased hostility. Additionally, while this model assumes that paranoia would be relatively stable across contexts, it is also possible that paranoia itself could be somewhat context dependent, and studies are therefore needed that will further examine the cross-situational consistency of paranoia level.

Limitations and conclusions

The current study has several limitations that require consideration. First, the between-group comparison is limited not only by scalar invariance issues but also by differences in demographic factors such as age and education. The ASD group was also largely male. This is not uncommon in ASD research given that females are less likely than males to meet diagnostic criteria for ASD at equivalently high levels of autistic-like traits (Dworzynski, Ronald, Bolton, & Happé, 2012); however, this does limit the generalizability of the current findings. Second, we used vignettes and questionnaire methods to assess the degree of hostile attributions; however, assessing both the encoding and interpretation of social information may have provided additional insight. Physiological methods like eye-tracking could be employed (Zajenkowska & Rajchert, 2020, in print) to assess these processes. Using multifaceted approaches to examine hostile attributions could also help better evaluate between-group differences, which are possibly more qualitative than quantitative. For example, differences in interpretation or reactivity to particular situations can be due to different attentional patterns and a focus on different social cues (Chen, Basanovic, Notebaert, MacLeod, & Clarke, 2017). Third, we presented

participants with only five scenarios. It is possible that other relationships, such as romantic partners or family members, may provide additional contexts for assessing hostile attributions. Future work should continue to examine attributional patterns across situations in order to identify those that provoke the greatest hostility in various clinical groups. These limitations notwithstanding, the current results demonstrate substantial variability in hostility ratings across social contexts regardless of clinical diagnosis. These findings suggest that situational context should be considered when assessing social cognitive processing in individuals with schizophrenia and individuals with autism and that comparisons of social cognitive performance between clinical groups are likely to benefit from considering both absolute, as well as situational patterns, of performance.

Conflicts of interest

All authors declare no conflict of interest.

Author contribution

Anna Zajenkowska, PhD (Conceptualization; Funding acquisition; Methodology; Validation; Writing – original draft; Writing – review & editing) Radosław Rogoza (Data curation; Formal analysis; Methodology; Validation; Visualization; Writing – original draft; Writing – review & editing) Noah Sasson (Investigation; Methodology; Project administration; Resources; Supervision; Validation; Writing – original draft) Philip Harvey (Investigation; Methodology; Project administration; Resources; Supervision; Validation; Writing – original draft) David Penn (Investigation; Methodology; Project administration; Resources; Supervision; Validation; Writing – original draft) Amy Pinkham (Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Writing – original draft; Writing – review & editing).

Data availability statement

The data needed to reproduce the results are open and available at: http://apsycholab.pl/downloads/.

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