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Can I Trust You? Negative Affective Priming Influences Social Judgments in Schizophrenia

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Successful social interactions rely on the ability to make accurate judgments based on social cues as well as the ability to control the influence of internal or external affective information on those judgments. Prior research suggests that individuals with schizophrenia misinterpret social stimuli and this misinterpretation contributes to impaired social functioning. We tested the hypothesis that for people with schizophrenia, social judgments are abnormally influenced by affective information. Twenty-three patients with schizophrenia and 35 healthy control participants rated the trustworthiness of faces following the presentation of neutral, negative (threat-related), or positive affective primes. Results showed that all participants rated faces following negative affective primes as less trustworthy than faces following neutral or positive primes. Importantly, this effect was significantly more pronounced for participants with schizophrenia, suggesting that schizophrenia may be characterized by an exaggerated influence of negative affective information on social judgment. Furthermore, the extent that the negative affective prime influenced trustworthiness judgments was significantly associated with patients' severity of positive symptoms, particularly feelings of persecution. These findings suggest that for people with schizophrenia, negative affective information contributes to an interpretive bias, consistent with paranoid ideation, when judging the trustworthiness of others. This bias may contribute to social impairments in schizophrenia.

Keywords: schizophrenia, paranoia, person perception, trustworthiness, social cognition

Successful social interactions rely on the ability to make accurate social judgments of others based on a variety of complex cues indicating a person's trait and state qualities: Is this person trustworthy, competent, or domineering? Is he or she feeling angry, disappointed, or bored? These social judgments influence our overall impressions of others and are directly related to our social behavior (Adolphs, 2002; Todorov, 2008). It is well established that patients with schizophrenia do not accurately judge social cues, such as facial expressions (Couture, Penn, & Roberts, 2006). Importantly, these deficits in social and affective judgments predict social functioning (Hooker & Park, 2002; Poole, Tobias, & Vinogradov, 2000) and mediate the relationship between neurocognition and functional outcome (Brekke, Kay, Lee, & Green, 2005; Gard, Fisher, Garrett, Genevsky, & Vinogradov, 2009). Identifying the mechanisms that contribute to the misinterpretation of social cues in schizophrenia could facilitate the development of effective interventions and ultimately improve outcome. However, at this point, the factors that influence social interpretations in schizophrenia are unclear.

One possible mechanism is that internal or external affective information is exerting inappropriate influence over social judgments and consequently affecting social functioning. That is, patients with schizophrenia may have an impaired ability to control the influence of affective information on social judgments. Affective priming studies with healthy adults demonstrate that judgments, including judgments about a person's state and trait characteristics, are influenced in a mood-congruent manner by the observer's affective state and/or by affective information in the environment that may impact affective state (Forgas, 1995; Murphy & Zajonc, 1993; Schwarz & Clore, 1983). This bias occurs even when the internal or external affective information has an incidental cause and is irrelevant to the present judgment, thereby contributing to misinterpretations. For example, people are more likely to judge a face as happy after a positive mood prime, such as viewing a pleasant film, and are more likely to judge a face as sad after a negative mood prime, such as viewing a sad film

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(Niedenthal, Halberstadt, Margolin, & Innes-Ker, 2000). Those with disorders that are characterized by the persistent elevation of an affective state show interpretive biases even in the absence of priming (Mathews & MacLeod, 2005); people with major depressive disorder are more likely to identify ambiguous facial expressions as sad and less likely to identify them as happy (Joormann & Gotlib, 2006). Affective priming reveals these biases in formerly depressed patients who report normal mood (LeMoult, Joormann, Sherdell, Wright, & Gotlib, 2009). Importantly, these interpretive biases contribute to the onset and maintenance of illness (Bouhuys, Geerts, & Gordijn, 1999) and are now a target for treatment (MacLeod, Koster, & Fox, 2009).

Despite the vast literature on social and affective perception deficits in schizophrenia (Edwards, Jackson, & Pattison, 2002; Marwick & Hall, 2008), reports of interpretive bias are surprisingly rare. However, schizophrenia is a heterogeneous disorder in which internal affective state may be variable across different subtypes and stages of illness (Arndt, Andreasen, Flaum, Miller, & Nopoulos, 1995; Herbener & Harrow, 2002). Without direct manipulation of affect, the variation in internal affective state across participants may obscure social judgment biases that exist on an individual level. Furthermore, incidental affective state is most likely to influence judgment when cognitive appraisals of affect are consistent with the nature of the judgment (Dunn & Schweitzer, 2005; Smith & Ellsworth, 1985). Feelings of paranoia are common among individuals with schizophrenia spectrum disorders (Tandon, Nasrallah, & Keshavan, 2009). Therefore, patients with schizophrenia should be most susceptible to interpretive bias when feelings of threat are elevated and the social judgment pertains to interpersonal safety.

Indeed, the studies that have demonstrated information processing biases suggest that social cues are often interpreted in a manner consistent with paranoid feelings and that patients with paranoia exhibit this bias more than patients without paranoia (Green & Phillips, 2004). For example, patients with schizophrenia tend to identify a person as looking at them rather than away from them (Hooker & Park, 2005). This self-referential bias is more pronounced in patients with paranoid symptoms than those without (Rosse, Kendrick, Wyatt, Isaac, & Deutsch, 1994). In addition, signal detection analyses of facial affect recognition performance indicate that patients with schizophrenia are less likely to interpret facial expressions as happy and more likely to interpret facial expressions as sad or fearful (Tsoi et al., 2008). This bias might be particularly related to paranoid symptoms, as prior studies show that patients with paranoid symptoms have an enhanced ability to identify fear (Kline, Smith, & Ellis, 1992; Phillips et al., 1999) even though they are also *less likely* to look at important facial features (Green, Williams, & Davidson, 2003) and to incorporate information about social context (Green, Waldron, & Coltheart, 2007; Green, Waldron, Simpson, & Coltheart, 2008). These apparently conflicting findings would be expected if internal feelings of threat are influencing the social judgment.

Initial evidence from affective priming studies in patients with schizophrenia supports this hypothesis (Höschel & Irle, 2001; Suslow, Roestel, & Arolt, 2003). When positive, negative, and neutral facial expression primes were subliminally presented prior to a valence judgment, patients with schizophrenia were more likely than control participants to judge neutral faces and objects as unpleasant after the negative expression prime. There was no difference between groups after the positive prime. This demonstration of affective priming effects on valence judgments provides initial evidence of abnormalities in schizophrenia. However, more targeted investigations of specific factors concerning the affective prime and type of judgment are necessary for a full understanding of the mechanisms and consequences of interpretive biases in schizophrenia.

Here we investigate interpretive bias by presenting threat-related pictures and measuring the influence of that affective information on a trait judgment pertaining to interpersonal safety (i.e. the trustworthiness of unfamiliar people). Traits, such as trustworthiness, concern a person's character and are perceived as more stable than emotional states. Therefore, interpretive bias in trustworthiness judgments may have long-lasting impact on decisions to avoid interpersonal relationships.

Given that paranoia, including suspiciousness and distrust of others, is a common symptom of schizophrenia spectrum disorders (Nayani & David, 1996; Tandon et al., 2009), it is reasonable to predict that patients with schizophrenia would judge faces as less trustworthy than healthy controls. However, prior studies that have investigated this hypothesis without affective priming have produced mixed results, including evidence that, compared to controls, patients with schizophrenia judge faces as being less trustworthy (Pinkham, Hopfinger, Pelphrey, Piven, & Penn, 2008), more trustworthy (Baas, van't Wout, Aleman, & Kahn, 2008), or no different (Couture, Penn, Addington, Woods, & Perkins, 2008). Identifying the influence of incidental affective information on trustworthiness judgments could help explain these conflicting findings.

In the present study, the influence of affective information on social judgment was investigated with the following predictions:

1. Relative to healthy control participants, patients with schizophrenia would show an exaggerated effect of a threat-related affective prime on social judgment, such that they would rate the same face as less trustworthy after the threat prime than the neutral prime. No difference in the influence of the positive affective prime between groups was expected.

2. The influence of the threat-related affective prime on trustworthiness judgments would be most extreme in patients with paranoid symptoms.

Participants completed a task in which they judged the trustworthiness of unfamiliar faces. The presence of affective information was manipulated by showing a negative (threatening), neutral, and positive picture prime just prior to the social judgment. Influence of the threat-related prime on the trustworthiness judgment was measured in two ways: (a) the trustworthiness rating after each prime condition (this provides information about group differences in the presence or absence of threat-related information) and (b) the difference between trustworthiness ratings after the threat-related prime and trustworthiness ratings after the neutral prime. This *difference score* provides a priming effect index because it represents each person's *shift* in judgment as a result of the affective prime. Therefore, it accounts for individual response tendencies, such as a tendency to rate faces as more or less trustworthy, in the absence of affective information.

Method

Participants

Twenty-three volunteers with schizophrenia or schizoaffective disorder and 35 nonpsychiatric, healthy adult volunteers participated in the study. Participants with schizophrenia were recruited from community mental health centers and outpatient clinics in the San Francisco Bay area. Diagnosis was assessed via the Structured Clinical Interview for *DSM–IV* Axis I Disorders (First, Spitzer, Gibbon, & Williams, 2002) and information from the participant's caretaker, medical team, and medical record. Symptom severity was assessed with the Positive and Negative Syndrome Scale—Extended (PANSS–E; Kay, Opler, & Fiszbein, 1987; Poole et al., 2000). Trained research staff conducted the clinical assessments. Final diagnosis and PANSS–E ratings were reached by consensus between two raters and supervised by a licensed psychiatrist (S.C.V.). PANSS–E ratings for positive, negative, and disorganized symptoms are reported. IQ was assessed with the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999). Inclusion criteria were diagnosis of schizophrenia or schizoaffective disorder, age 18–60 years, and English as a primary language (learned before age 12). Exclusion criteria were IQ below 70; history of head trauma; neurological or major medical illness; and active substance dependence, based on criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994) within the past 6 months.

Healthy adult control participants were recruited from the same geographic area. Controls were screened for schizotypal traits with the Schizotypal Personality Questionnaire (Raine, 1991) and were screened for psychiatric, neurological, and general medical problems with self-report questionnaires and a structured clinical interview that assessed past and current Axis I psychological symptoms, use of psychological/psychiatric services, psychiatric and nonpsychiatric medication use, academic and learning history, and general medical health including neurological and/or perception problems. IQ was assessed with the Wechsler Abbreviated Scale of Intelligence. Exclusion criteria were SPQ score above 30, IQ below 70, current use of psychotropic medication, history of or current psychiatric or neurological disorder (including substance abuse), and head injury with loss of consciousness. Trained research staff conducted the screening. Diagnoses relevant to exclusion were reached by consensus and were supervised by a licensed clinical psychologist (C.I.H.). The study was approved by the ethical review boards at the University of California, Berkeley, and University of California, San Francisco. Participants gave written informed consent and received nominal payment for their participation.

Demographic data for the two groups are summarized in Table 1. Despite efforts to match the two groups on demographic variables, the groups differed in age, education, and gender. These variables were entered as covariates in the statistical analyses.

Task and Stimuli

Participants completed a social judgment task (adapted from Adolphs, Tranel, & Damasio, 1998) in which they rated the trustworthiness of unfamiliar faces. An affective prime (i.e., an emotionally provocative scene) was presented just prior to the face. Valence ratings of the affective primes were collected, in a separate session, after completion of the social judgment task.

In the social judgment task (see Figure 1), participants were told that they would see a series of scenes followed by faces. They were asked to rate each face on a 7-point scale according to how

Table 1
Demographics and Clinical Details

Variable	Schizophrenia group	Control group	Differences between groups
Gender (female/male)	2/21	13/22	$\chi^2(1) = 13.52, p < .001$
Age: *M* (*SD*), [range]	44.22 (10.3), [23–59]	49.17 (7.65), [24–62]	$t(56) = 2.10, p = .041, d = 0.56$
Education: *M* (*SD*), [range]	13.35 (2.2), [9–20]	14.40 (1.40), [12–16]	$t(56) = 2.26, p = .028, d = 0.60$
WASI IQ: *M* (*SD*), [range]	102 (17.4), [73–138]	111 (10.7), [87–126]	$t(40) = 1.97, p = .055, d = 0.53$
Diagnosis: *n* [%]			
Schizoaffective	8 [34.78%]		
Schizophrenia	15 [65.22%]		
Schizophrenia subtypes			
Paranoid	7		
Catatonic	1		
Undifferentiated	6		
Residual	1		
Age of onset: *M* (*SD*), [range]	19.75 (6.2), [5–31]		
Length of illness: *M* (*SD*), [range]	26.00 (12.4), [5–47]		
Antipsychotic medication: *n* [%][a]			
Typical	3 [13.4%]		
Atypical	18 [78.26%]		
PANSS–E symptoms: *M* (*SD*), [range]			
Positive symptoms	2.44 (1.0), [1–4]		
Negative symptoms	2.23 (0.8), [1–3.9]		
Disorganized symptoms	1.74 (0.7), [1–3.4]		

Note. Age and education are measured in years. WASI = Wechsler Abbreviated Scale of Intelligence; PANSS–E = Positive and Negative Syndrome Scale—Extended; *d* = Cohen's *d* effect size.
[a] Medication details were obtained for 21 out of 23 patients.

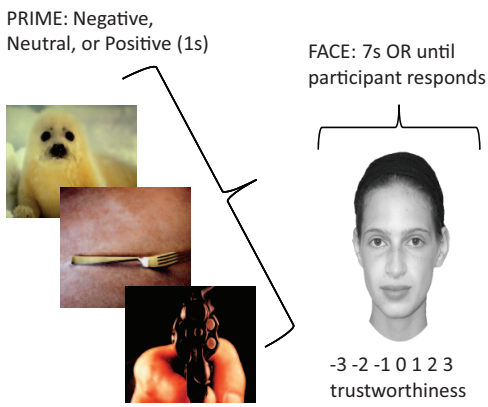

Figure 1. Social judgment task. Participants were asked to rate the trustworthiness of unfamiliar faces following a negative (threat-related), neutral, or positive prime.

trustworthy the person appeared (−3 = *very untrustworthy,* 3 = *very trustworthy*). It was emphasized that the scenes and the faces were not related and that the participant's job was to rate the faces alone. Instructions for how to evaluate trustworthiness were identical to those in Adolphs et al. (1998). Participants were asked to "imagine trusting the person in a very serious situation, for instance, with all your money or with your life."

There were two alternate forms of the task. (Two forms were created for later use in a treatment study.) Each form of the task contained 49 black-and-white photographs of unfamiliar male and female faces in natural poses taken from the 100-face stimulus set in Adolphs et al. (1998). Each face was rated for trustworthiness after each of the three prime conditions (negative [threatening], neutral, and positive) for a total of 147 trials. Normed trustworthiness ratings ranged from −2.45 to 1.57 for the faces used in Form 1 and from −2.66 to 1.83 for those used in Form 2 (Adolphs et al., 1998). The faces in each form did not differ in ratings of trustworthiness based on the normative sample: Form 1, $M = -0.25$, $SD = 1.14$; Form 2, $M = -0.25$, $SD = 1.17$; $t(96) = -0.004$, $p = .997$.

Affective primes were taken from the International Affective Picture System (IAPS) (Lang, Bradley, & Cuthbert, 2005). Forty-nine pictures in each condition were selected. Threat-related negative primes were IAPS pictures that were identified by a group of undergraduates at the University of California, Berkeley, as the most threatening but least disgusting of the picture set. The selected threat-related primes included pictures of snakes, spiders, weapons, and interpersonal assault. Population means of valence and arousal ratings are published in the IAPS manual; the rating scale is from 1 (*unpleasant valence/low arousal*) to 9 (*pleasant valence/high arousal*). The mean valence rating from the IAPS manual of these threat-related primes was 2.89 ($SD = 0.73$), and the mean arousal rating was 6.28 ($SD = 0.57$). Neutral primes were neutral on valence ($M = 4.99$, $SD = 0.3$) and low on arousal ($M = 2.91$, $SD = 0.6$); they typically portrayed household objects. Positive primes were positive on valence ($M = 7.62$, $SD = 0.39$) and high on arousal ($M = 5.48$, $SD = 0.85$); they typically portrayed sports and food. Paired samples *t* tests on the normed ratings confirmed that the negative affective primes were significantly more unpleasant, $t(48) = 14.63$, $p < .001$, and arousing, $t(48) = 27.38$, $p < .001$, than neutral primes. Positive primes were significantly more pleasant, $t(48) = 38.39$, $p < .001$, and arousing, $t(48) = 20.25$, $p < .001$, than neutral primes. Positive and negative affective primes differed on valence, $t(48) = 36.98$, $p < .001$, and arousal, $t(48) = 5.63$, $p < .001$, such that the negative prime pictures were more unpleasant and arousing than the positive primes.

Primes were randomly assigned to faces, and the face–prime pairs were presented in a fixed, pseudo-random order; none of the faces appeared twice in a row. Primes were presented for 1 s, followed by the face presented for 7 s (or until the participant responded), followed by an intertrial interval of 1.5 s. The participant's trustworthiness rating was the dependent variable of interest. The task was completed on a Dell Laptop computer, and the stimuli were presented with E-Prime software.

Validation of Affective Primes

Participants (21 controls and 19 patients with schizophrenia) returned to the lab on a separate day and rated the pleasantness of each of the IAPS pictures that were used as affective primes. Pictures were rated on a 7-point scale, ranging from −3 (*extremely unpleasant*) to 3 (*extremely pleasant*). The primes were presented in random order and remained on the screen until participants responded.

Data Analysis

Data analysis was conducted with SPSS. Variables were screened for normalcy and outliers, defined as values 2.5 or more standard deviations away from the mean of each group. Outliers were replaced with the group mean accordingly. Two scores were replaced: one negative response in the control group and one positive response in the patient group.

Priming Effect Index: Negative and Positive Difference Scores

Negative difference scores were calculated by subtracting trustworthiness ratings after the neutral prime from trustworthiness ratings after the negative affective prime. Positive difference scores were calculated by subtracting trustworthiness ratings after the neutral prime from trustworthiness ratings after the positive affective prime.

Hypothesis Testing

We examined group differences in the influence of affective primes (Hypothesis 1) with two analysis of covariance (ANCOVA) models: (a) 2 × 3 ANCOVA of trustworthiness ratings with diagnosis (controls vs. patients with schizophrenia) as the between-subjects factor and affective prime (negative, positive, neutral) as the within-subjects factor; (b) 2 × 2 ANCOVA of difference scores with diagnosis (controls vs. patients with schizophrenia) as the between-subjects factor and difference scores (negative, positive) as the within-subjects factor. Age, education, and gender were entered as covariates in both models. Independent and paired samples *t* tests were used to validate observed effects of the prime. Statistics are reported with two-tailed tests. However, because our hypotheses specified the direction of effect, one-tailed tests were accepted and noted when used. We used Pearson bivariate correlations (two-tailed) to determine whether positive symptoms, particularly levels of suspiciousness, were significantly

associated with the effect of threat-related primes on trustworthiness judgments (Hypothesis 2).

Results

Hypothesis 1: The influence of threat-related primes on trustworthiness judgments will be significantly greater in participants with schizophrenia than in healthy control participants.

Mean trustworthiness ratings, difference scores and between group statistics are reported in Table 2. ANCOVA results for trustworthiness ratings after each prime condition showed a significant Diagnosis × Prime interaction. There was no main effect of education, age, gender, or diagnosis. Independent samples *t* tests demonstrated that participants with schizophrenia rated the faces as less trustworthy than did healthy controls after the negative affective prime. This demonstrates that the participants with schizophrenia had an interpretive bias after the negative affective prime. However, there was no difference between groups after the neutral prime or positive prime. Importantly, results for the neutral prime show that in the absence of negative affective information there was no difference between groups.

ANCOVA results for the difference scores showed a significant Prime × Diagnosis interaction. There was no main effect of education, gender, or diagnosis. Independent samples *t* tests showed that patients with schizophrenia had a greater shift in judgment after the negative affective prime relative to the neutral prime ($p = .029$, one-tailed). There was no significant difference between groups in the positive difference score. Although the influence of the positive prime was nonsignificant for both groups, it influenced judgment in opposite directions, which most likely contributed to the Prime × Diagnosis interaction. This analysis accounts for responses after the neutral prime and demonstrates that the negative affective prime had a greater influence on trust judgments in participants with schizophrenia. Although the effect sizes are small, the results are in the predicted direction and are consistent across analyses. Results are illustrated in Figure 2.

Validation of Priming Effect

We conducted analyses to verify that the group difference in priming effect was not due to group differences in effectiveness of the priming paradigm or valence ratings of the affective primes.

1. Was the priming paradigm effective for both groups? Within each group, paired sample *t* tests were conducted on the trustworthiness ratings to verify that the priming procedure was effective**.** Results demonstrate that both groups were significantly influenced by the negative affective prime. Faces were rated as significantly less trustworthy after the negative affective prime than the neutral prime by healthy controls, $t(34) = 2.85$, $p = .007$, $d = 0.98$, as well as participants with schizophrenia, $t(22) = 2.32$, $p = .03$, $d = 0.98$. However, there was no significant difference between trustworthiness ratings after the positive affective prime as compared to the neutral prime either for the healthy controls, $t(34) = 0.40$, $p = .70$, $d = 0.14$, or for participants with schizophrenia, $t(22) = 0.41$, $p = .68$, $d = 0.18$. The significant influence of the negative affective prime in the healthy control group is consistent with prior research on interpretive biases and suggests that the difference between healthy controls and patients with schizophrenia here is not due to task-related confounds (i.e., the task was less effective for healthy controls). The findings also suggest that the positive affective prime did not significantly influence trustworthiness judgments for either group.

2. Did the groups rate the affective primes differently? Independent samples *t* tests (see Table 2) revealed no significant difference between groups in the pleasantness ratings of the negative, neutral, or positive primes. This is consistent with prior data showing that there is no difference between participants with

Table 2
All Behavioral Results, Including Trustworthiness Ratings After Each Prime Condition, Difference Scores (i.e., Index of Priming Effect) and the Pleasantness Ratings of the Affective Primes

Measure	Control group *M* (*SD*)	Schizophrenia group *M* (*SD*)	Difference between groups
Trustworthiness ratings			
Negative prime	0.41 (0.8)	−0.15 (1.07)	$t(56) = 2.30$, $p = .03$, $d = 0.61$
Neutral prime	0.57 (0.72)	0.39 (0.65)	$t(56) = 0.94$, $p = .35$, $d = 0.25$
Positive prime	0.54 (0.62)	0.42 (0.60)	$t(56) = 0.72$, $p = .48$, $d = 0.19$
Difference scores			
Negative difference score	−0.15 (0.32)	−0.54 (1.11)	$t(56) = 1.94$, $p = .057$,[a] $d = 0.52$
Positive difference score	−0.03 (0.37)	0.03 (0.38)	$t(56) = 0.573$, $p = .569$, $d = 0.15$
Pleasantness of prime			
Negative	−2.37 (0.36)	−2.47 (0.47)	$t(38) = 0.683$, $p = .50$, $d = 0.22$
Neutral	0.33 (0.40)	0.39 (0.63)	$t(38) = 0.405$, $p = .70$, $d = 0.13$
Positive	2.00 (0.64)	1.61 (0.69)	$t(38) = 1.56$, $p = .13$, $d = 0.51$

Note. For trustworthiness ratings, mixed analysis of covariance (ANCOVA) revealed an Affective Prime × Diagnosis interaction, $F(2, 106) = 4.36$, $p = .02$, $\eta_p^2 = .08$. For difference scores, mixed ANCOVA revealed a Difference Score × Diagnosis interaction, $F(1, 53) = 6.00$, $p = .02$, $\eta_p^2 = .10$. For pleasantness of prime, mixed ANCOVA revealed a main effect of prime, $F(2, 70) = 5.52$, $p = .006$, $\eta_p^2 = .14$. There was no Prime × Diagnosis interaction, $F(2, 70) = 0.904$, $p = .41$, $\eta_p^2 = .03$. Age, education, and gender were included as covariates of no interest for all analyses. Results showed no main effects of these covariates. d = Cohen's d effect size; η_p^2 = partial eta squared effect size.

[a] $p = .029$, one-tailed test. Because the hypothesis specified the direction of effect (i.e., the schizophrenia group would rate this as less trustworthy), we used the one-tailed *t* test here.

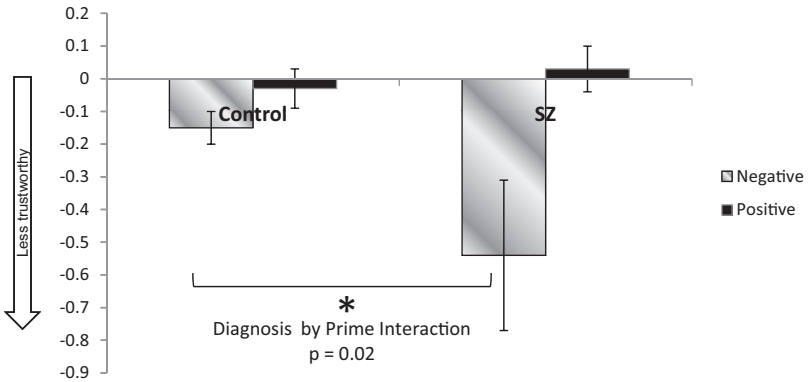

Figure 2. Influence of the prime was calculated by subtracting ratings after the neutral prime from ratings after the negative and positive primes; thus, zero indicates no priming effect. Patients with schizophrenia showed a greater priming effect such that their trustworthiness ratings were significantly lower than those of the control group after the negative prime relative to the neutral. There was no group difference between positive priming difference scores. Error bars indicate standard error of the mean. SZ = schizophrenia.

schizophrenia and healthy controls in ratings of valence and arousal and response to IAPS pictures (Herbener, 2008; Herbener, Song, Khine, & Sweeney, 2008; Kring, Barrett, & Gard, 2003; Kring & Moran, 2008). Thus, differences in trustworthiness ratings shown here can be attributed to differences in the influence of the primes on subsequent judgments of trustworthiness, not to differences in affective ratings.

> *Hypothesis 2:* Influence of the threat-related primes will be more extreme in participants with schizophrenia who have high levels of paranoia.

Zero-order correlations between symptoms, trustworthiness ratings, and difference scores are shown in Table 3. Correlations with the trustworthiness ratings show that ratings after the negative affective prime were significantly related to symptoms of suspiciousness/persecution. As predicted, participants with schizophrenia who had a higher level of suspiciousness/persecution were more likely to rate faces as less trustworthy after the negative affective prime. The relationship between trustworthiness ratings after the negative affective prime and the positive symptom cluster was in the predicted direction but did not reach significance. There was no relationship between trustworthiness ratings after the neutral and positive primes and any positive symptoms. There was a significant positive correlation between ratings after neutral and positive primes and the disorganized symptom cluster. Specifically, greater conceptual disorganization and incoherent speech were associated with higher trustworthy ratings after the neutral prime and greater incoherent speech was associated with higher trustworthiness ratings after the positive prime.

Analysis of the difference scores showed a significant relationship between the positive symptom cluster and negative affective prime difference scores (see Table 3 and Figure 3). Three of the five component symptoms of the positive symptom cluster were significantly correlated with negative difference scores: unusual thought content, delusions, and suspiciousness/persecution (see bottom half of Table 3). Suspiciousness/persecution showed the largest correlation, suggesting that the extent to which negative affect influences trustworthiness judgments varies according to feelings of suspiciousness/persecution.

The negative difference score analysis demonstrates that a higher level of positive symptoms is associated with a greater *shift* in judgment as a result of the negative affective prime relative to the neutral prime. There was no significant correlation between the negative difference score and negative or disorganized symptoms; there was no significant relationship between the positive difference score and any symptoms.

Discussion

This study examined whether affective information had an exaggerated influence on social judgment in participants with schizophrenia. Negative (threat-related), neutral, and positive affective primes were presented just prior to judging the trustworthiness of an unfamiliar face. Two main findings emerged from our study. First, relative to healthy control participants, schizophrenia participants' judgments of trustworthiness were more influenced by negative affective primes, such that they judged the person as less trustworthy after the negative affective prime. Second, the extent of this influence was associated with positive symptoms, particularly feelings of suspiciousness and persecution; the greater the severity of positive symptoms, the greater the influence of the negative affective primes on trustworthiness evaluations.

These findings demonstrate an interpretive bias, consistent with paranoia, for evaluations of trustworthiness in schizophrenia. This interpretive bias was only apparent after the presentation of negative affective primes. There was no difference between patients with schizophrenia and healthy control participants in their ratings of trustworthiness after the neutral prime, and there was also no relationship between positive symptoms and trustworthiness ratings after the neutral prime. The influence of the negative affective prime was not due to participants with schizophrenia perceiving the threat-related pictures as more unpleasant than did the healthy controls; nor can the effect be explained by an excess of general affective priming in the schizophrenia sample, as there was no difference between the groups in the influence of positive affective

Table 3
Pearson Correlations of Symptom Clusters and Symptom Components With Difference Scores and Raw Trustworthiness Ratings

Variable	Symptom clusters		
	Positive symptoms	Negative symptoms	Disorganized symptoms
Negative difference score	−0.51*	0.18	−0.17
Positive difference score	−0.11	0.11	−0.15
Raw trustworthiness ratings			
Negative prime	−0.30	0.20	0.11
Neutral prime	0.38	0.02	0.48*
Positive prime	0.35	0.09	0.43*

	Difference scores		Trustworthiness ratings		
	Negative difference score	Positive difference score	Negative prime	Neutral prime	Positive prime
Positive symptom components					
Unusual thought content	−0.46*	−0.26	−0.24	0.39	0.26
Delusions	−0.50*	−0.14	−0.29	0.38	0.33
Grandiosity	−0.16	−0.01	−0.05	0.18	0.19
Suspiciousness	−0.56*	−0.19	−0.43*	0.26	0.16
Hallucinatory behavior	−0.25	0.15	−0.08	0.22	0.34
Negative symptom components					
Emotional withdrawal	0.11	0.23	−0.01	−0.20	−0.08
Social withdrawal	0.17	0.28	0.16	−0.02	0.16
Lack of spontaneity	0.25	0.14	0.27	0.01	0.09
Poor rapport	0.24	−0.05	0.28	0.05	0.03
Blunted affect	0.13	−0.13	0.06	−0.12	−0.21
Motor retardation	0.00	−0.08	0.14	0.22	0.19
Disturbance of volition	0.07	0.11	0.22	0.23	0.32
Disorganized symptom components					
Conceptual disorganization	−0.29	−0.35	0.01	0.51*	0.34
Incoherent speech	−0.01	−0.09	0.27	0.47*	0.45*
Poverty of speech content	−0.08	0.06	0.11	0.32	0.39
Inappropriate affect	−0.26	−0.31	−0.02	0.41	0.25
Bizarre appearance	0.13	0.28	0.11	−0.04	0.14
Bizarre social behavior	−0.25	0.31	−0.10	0.39	0.58*

* $p < .05$.

primes. This pattern of results indicates that individuals with schizophrenia, especially those with positive symptoms, are particularly sensitive to the influence of incidental, threat-related negative affective information on judgments of trustworthiness.

These findings may help explain inconsistencies in prior studies that investigated trustworthiness judgments without affective priming. Some studies reported no difference in trustworthiness ratings between healthy controls and participants with schizophrenia (Baas, Aleman, et al., 2008; Couture et al., 2008), yet others demonstrated that participants with schizophrenia (Baas, van't Wout, et al., 2008) and those at risk for schizophrenia (Couture et al., 2008) judged faces as more trustworthy than did healthy controls. However, studies that considered symptom profile indicated that participants with schizophrenia who had paranoid symptoms judged faces as less trustworthy than did both those without paranoid symptoms (Pinkham et al., 2008) and healthy controls (Couture et al., 2010).

Collectively, these studies suggest that schizophrenia patients' trustworthiness judgments may not be stable but rather that these social judgments are influenced by factors such as symptom profile and severity, internal affective state, and/or incidental emotional provocations that may impact affective state. Our study specifically investigated these factors. Consistent with prior research, we found that across a group of patients with varying levels of symptoms, judgments of trustworthiness did not differ between patients with schizophrenia and controls when the prime was affectively neutral. Thus, without specific manipulation of negative affect or the presence of negative affective information through priming, interpretive bias in trustworthiness judgments was not apparent. Our finding that patients with a high degree of paranoid symptoms were most influenced by the negative affective prime suggests that threatening contexts may influence social judgments more in patients with paranoia than in patients without paranoid symptoms. Interestingly, the participants in Pinkham et al. (2008) made their judgments while undergoing fMRI scanning, a context that most people consider mildly anxiety provoking and aversive. It is possible that the negative context of the scanner environment may have led patients with paranoia to judge faces as untrustworthy in that study. Furthermore, our findings suggest that, in the absence of negative affective priming, disorganized symptoms are associated with judging faces as more trustworthy. Although symptom severity was not reported by prior studies showing that participants with schizophrenia judged faces as more trustworthy (Baas, van't Wout, et al., 2008), participants in these studies may have had a high level of disorganized symptoms.

Although the current results demonstrate that incidental threat-related information has an exaggerated influence on trust judgments for patients with schizophrenia, more research is needed to

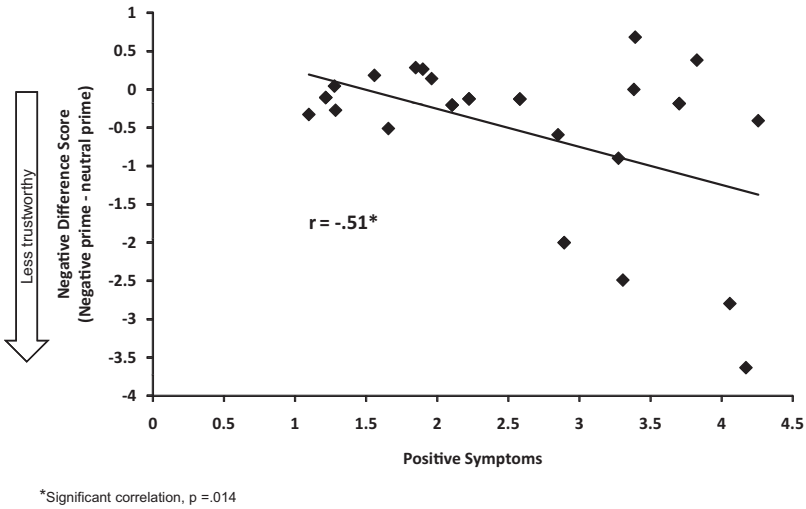

Figure 3. The extent to which the negative prime influenced trustworthiness ratings of patients with schizophrenia was significantly related to their positive symptoms. As the severity of their positive symptoms increased, faces were rated as less trustworthy following the negative prime relative to the neutral prime.

identify the underlying cause of this effect. Research with healthy adults shows that multiple factors contribute to the influence of affect on trustworthiness judgments, including the specific emotion that is primed, salience of the priming source, the type of judgment, and characteristics of both the target and the observer (Dunn & Schweitzer, 2005; Todorov, 2008). Certain aspects of schizophrenia may interact with these factors to cause an exaggerated influence of affect on trust judgments. Our findings here suggest an interaction between primed emotion and psychotic symptoms on trust judgments of unfamiliar faces. We identify two possible mechanisms that are neither exhaustive nor mutually exclusive and are proposed here to stimulate further research. One possibility, consistent with information processing and cognitive psychology theories, is that the threat-related primes activated paranoid cognitive schemas that then influenced trust assessments. Another possibility, consistent with neurocognitive models in schizophrenia, is that deficits in cognitive control skills contributed to the inability to regulate the influence of threat-related information or feelings on judgment.

First, although we did not assess specific emotional state after the prime, it is likely that the threat-related primes provoked feelings of fear, even if those feelings were relatively mild. Fear is associated with specific action tendencies (i.e., to avoid or escape danger) and cognitive appraisals, including appraisals that escape is uncertain and outside of one's personal control (Smith & Ellsworth, 1985). Trusting someone "with your money or your life" (as we asked our participants to imagine doing) involves relinquishing personal control to another person and leaving oneself vulnerable to potential exploitation. Taking such a risk requires certainty about the intentions of the other person and the situational demands that may influence him or her. Given the type of judgment, emotions that are associated with appraisals of uncertainty and low personal control, such as fear, will have the most influence on trustworthiness judgments. When people feel fearful they overestimate potential dangers, are less likely to take risks, and more likely to avoid uncertain situations (Lerner & Keltner, 2001). These effects of fear have been demonstrated for decisions of financial and physical risks (Au, Chan, Wang, & Vertinsky, 2003; Chou, Lee, & Ho, 2007; Lerner, Gonzalez, Small, & Fischhoff, 2003) and, as demonstrated here, for decisions concerning interpersonal risk (i.e., whether or not to trust someone). Furthermore, appraisals associated with fear may activate core belief systems (schemas) related to psychosis, such as the belief that other people, particularly unfamiliar people, may have malevolent intentions (Beck & Rector, 2005). Our data suggest that paranoid ideation may not influence trust evaluations unless activated by threat-related information. Prior research shows that identifying the source of emotional provocations diminishes the influence of that affective state on unrelated judgments (Dunn & Schweitzer, 2005; Schwarz & Clore, 1983). Therefore, interventions that help patients identify environmental cues or experiences that provoke negative affect might improve both paranoid symptoms and interpretive biases related to those symptoms.

In addition, deficits in cognitive control skills, such as attentional control, which are characteristic of schizophrenia, may contribute to the exaggerated influence of affective state on trust judgments. The influence of emotionally provocative stimuli on affective state and subsequent behavior can be regulated by cognitive strategies such as evaluation, inhibition, and attentional control (Derryberry & Reed, 2002; Hooker, Gyurak, Verosky, Miyakawa, & Ayduk, 2009; Lieberman et al., 2007). Individuals with schizophrenia consistently demonstrate behavioral impairments in these skills (Henry et al., 2007; Reichenberg & Harvey, 2007). Our results are consistent with the idea that positive symptoms may interact with cognitive control deficits, resulting in difficulties with regulating the influence of negative affect on trustworthiness judgments. Although the current data cannot address this hypothesis directly, future research could investigate whether cognitive control skills predict the extent to which negative affect influences judgment. Evidence of this association would suggest that improving cognitive control skills might help patients control the influence of affect on judgment.

The current study has several limitations that should be addressed in future research. First, although we interpret the results as suggesting that the threat-related primes provoked feelings of fear that then influenced trust judgments, we did not assess emotional state after the primes. Therefore, alternative explanations should be considered and tested. For example, threat-related primes could activate the cognitive category of fear rather than the emotional response, and/or the threat-related primes could have provoked emotional responses other than fear. Second, the positive affective primes did not influence trust judgments for either group, suggesting that these primes may not have been effective. The positive primes were not as arousing as the negative primes, indicating that arousal level may contribute to the influence of affect on judgment. Content of the positive primes was also more diverse than that of the negative primes, and the influence therefore may have been more diffuse. Future research should manipulate and assess specific positive and negative emotional states, such as gratitude and anger, which might have different effects on trust judgments (Dunn & Schweitzer, 2005). Finally, although differences in age, education, and gender were statistically controlled for in our analyses, future studies should replicate the current results with appropriately matched samples.

In summary, the current study demonstrated that schizophrenia is associated with an interpretive bias, consistent with feelings of paranoia, when judging the trustworthiness of others. These findings have implications for how patients with schizophrenia interact with others: An impaired ability to make accurate social judgments due to the inappropriate influence of negative affective information could be an important contributing factor to the chronic and debilitating social behavior deficits seen in the disorder. Additional research may facilitate the development of interventions whereby patients learn to develop skills and strategies to aid in the regulation of affective information during social judgments and thus minimize misinterpretations.

References

Adolphs, R. (2002). Recognizing emotion from facial expressions: Psychological and neurological mechanisms. *Behavioral and Cognitive Neuroscience Reviews, 1,* 21–62. doi:10.1177/1534582302001001003

Adolphs, R., Tranel, D., & Damasio, A. R. (1998, June 4). The human amygdala in social judgment. *Nature, 393,* 470–474. doi:10.1038/30982

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Arndt, S., Andreasen, N. C., Flaum, M., Miller, D., & Nopoulos, P. (1995). A longitudinal study of symptom dimensions in schizophrenia: Prediction and patterns of change. *Archives of General Psychiatry, 52,* 352–360.

Au, K., Chan, F., Wang, D., & Vertinsky, I. (2003). Mood in foreign exchange trading: Cognitive processes and performance. *Organizational Behavior and Human Decision Making Processes, 91,* 322–338. doi:10.1016/S0749-5978(02)00510-1

Baas, D., Aleman, A., Vink, M., Ramsey, N. F., de Haan, E. H., & Kahn, R. S. (2008). Evidence of altered cortical and amygdala activation during social decision-making in schizophrenia. *NeuroImage, 40,* 719–727. doi:10.1016/j.neuroimage.2007.12.039

Baas, D., van't Wout, M., Aleman, A., & Kahn, R. S. (2008). Social judgement in clinically stable patients with schizophrenia and healthy relatives: Behavioural evidence of social brain dysfunction. *Psychological Medicine, 38,* 747–754. doi:10.1017/S0033291707001729

Beck, A. T., & Rector, N. A. (2005). Cognitive approaches to schizophrenia: Theory and therapy. *Annual Review of Clinical Psychology, 1,* 577–606. doi:10.1146/annurev.clinpsy.1.102803.144205

Bouhuys, A. L., Geerts, E., & Gordijn, M. C. (1999). Depressed patients' perceptions of facial emotions in depressed and remitted states are associated with relapse: A longitudinal study. *Journal of Nervous and Mental Disease, 187,* 595–602. doi:10.1097/00005053-199910000-00002

Brekke, J., Kay, D. D., Lee, K. S., & Green, M. F. (2005). Biosocial pathways to functional outcome in schizophrenia. *Schizophrenia Research, 80,* 213–225. doi:10.1016/j.schres.2005.07.008

Chou, K. L., Lee, T. M. C., & Ho, A. H. Y. (2007). Does mood state change risk-taking tendency in older adults? *Psychology of Aging, 22,* 310–318. doi:10.1037/0882-7974.22.2.310

Couture, S. M., Penn, D. L., Addington, J., Woods, S. W., & Perkins, D. O. (2008). Assessment of social judgments and complex mental states in the early phases of psychosis. *Schizophrenia Research, 100,* 237–241. doi:10.1016/j.schres.2007.12.484

Couture, S. M., Penn, D. L., Losh, M., Adolphs, R., Hurley, R., & Piven, J. (2010). Comparison of social cognitive functioning in schizophrenia and high-functioning autism: More convergence than divergence. *Psychological Medicine, 40,* 569–579. doi:10.1017/S003329170999078X

Couture, S. M., Penn, D. L., & Roberts, D. L. (2006). The functional significance of social cognition in schizophrenia: A review. *Schizophrenia Bulletin, 32*(Suppl. 1), 44–63.

Derryberry, D., & Reed, M. A. (2002). Anxiety-related attentional biases and their regulation by attentional control. *Journal of Abnormal Psychology, 111,* 225–236. doi:10.1037/0021-843X.111.2.225

Dunn, J. R., & Schweitzer, M. E. (2005). Feeling and believing: The influence of emotion on trust. *Journal of Personality and Social Psychology, 88,* 736–748. doi:10.1037/0022-3514.88.5.736

Edwards, J., Jackson, H. J., & Pattison, P. E. (2002). Emotion recognition via facial expression and affective prosody in schizophrenia: A methodological review. *Clinical Psychology Review, 22,* 789–832. doi:10.1016/S0272-7358(02)00130-7

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (2002). *Structured Clinical Interview for DSM–IV–TR Axis I Disorders, Research Version, Patient Edition (SCID–I/P).* New York, NY: Biometrics Research, New York State Psychiatric Institute.

Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin, 117,* 39–66. doi:10.1037/0033-2909.117.1.39

Gard, D. E., Fisher, M., Garrett, C., Genevsky, A., & Vinogradov, S. (2009). Motivation and its relationship to neurocognition, social cognition, and functional outcome in schizophrenia. *Schizophrenia Research, 115,* 74–81. doi:10.1016/j.schres.2009.08.015

Green, M. J., & Phillips, M. L. (2004). Social threat perception and the evolution of paranoia. *Neuroscience & Biobehavioral Reviews, 28,* 333–342. doi:10.1016/j.neubiorev.2004.03.006

Green, M. J., Waldron, J. H., & Coltheart, M. (2007). Emotional context processing is impaired in schizophrenia. *Cognitive Neuropsychiatry, 12,* 259–280. doi:10.1080/13546800601051847

Green, M. J., Waldron, J. H., Simpson, I., & Coltheart, M. (2008). Visual processing of social context during mental state perception in schizophrenia. *Journal of Psychiatry & Neuroscience, 33,* 34–42.

Green, M. J., Williams, L. M., & Davidson, D. (2003). Visual scanpaths to threat-related faces in deluded schizophrenia. *Psychiatry Research, 119,* 271–285. doi:10.1016/S0165-1781(03)00129-X

Henry, J. D., Green, M. J., de Lucia, A., Restuccia, C., McDonald, S., & O'Donnell, M. (2007). Emotion dysregulation in schizophrenia: Reduced amplification of emotional expression is associated with emotional blunting. *Schizophrenia Research, 95,* 197–204. doi:10.1016/j.schres.2007.06.002

Herbener, E. S. (2008). Emotional memory in schizophrenia. *Schizophrenia Bulletin, 34,* 875–887. doi:10.1093/schbul/sbn081

Herbener, E. S., & Harrow, M. (2002). The course of anhedonia during 10 years of schizophrenic illness. *Journal of Abnormal Psychology, 111,* 237–248. doi:10.1037/0021-843X.111.2.237

Herbener, E. S., Song, W., Khine, T. T., & Sweeney, J. A. (2008). What aspects of emotional functioning are impaired in schizophrenia? *Schizophrenia Research, 98,* 239–246. doi:10.1016/j.schres.2007.06.025

Hooker, C., & Park, S. (2002). Emotion processing and its relationship to social functioning in schizophrenia patients. *Psychiatry Research, 112,* 41–50. doi:10.1016/S0165-1781(02)00177-4

Hooker, C., & Park, S. (2005). You must be looking at me: The nature of gaze perception in schizophrenia patients. *Cognitive Neuropsychiatry, 10,* 327–345. doi:10.1080/13546800444000083

Hooker, C. I., Gyurak, A., Verosky, S. C., Miyakawa, A., & Ayduk, O. (2009). Neural activity to a partner's facial expression predicts self-regulation after conflict. *Biological Psychiatry, 67,* 406–413.

Höschel, K., & Irle, E. (2001). Emotional priming of facial affect identification in schizophrenia. *Schizophrenia Bulletin, 27,* 317–327.

Joormann, J., & Gotlib, I. H. (2006). Is this happiness I see? Biases in the identification of emotional facial expressions in depression and social phobia. *Journal of Abnormal Psychology, 115,* 705–714. doi:10.1037/0021-843X.115.4.705

Kay, S. R., Opler, L. A., & Fiszbein, A. (1987). The Positive and Negative Syndrome rating scale (PANSS) for schizophrenia. *Schizophrenia Bulletin, 45,* 20–31.

Kline, J. S., Smith, J. E., & Ellis, H. C. (1992). Paranoid and nonparanoid schizophrenic processing of facially displayed affect. *Journal of Psychiatric Research, 26,* 169–182. doi:10.1016/0022-3956(92)90021-F

Kring, A. M., Barrett, L. F., & Gard, D. E. (2003). On the broad applicability of the affective circumplex: Representations of affective knowledge among schizophrenia patients. *Psychological Science, 14,* 207–214. doi:10.1111/1467-9280.02433

Kring, A. M., & Moran, E. K. (2008). Emotional response deficits in schizophrenia: Insights from affective science. *Schizophrenia Bulletin, 34,* 819–834. doi:10.1093/schbul/sbn071

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2005). *International Affective Picture System (IAPS): Affective ratings of pictures and instruction manual* (Tech. Rep. No. A-6). Gainesville: University of Florida.

LeMoult, J., Joormann, J., Sherdell, L., Wright, Y., & Gotlib, I. H. (2009). Identification of emotional facial expressions following recovery from depression. *Journal of Abnormal Psychology, 118,* 828–833. doi:10.1037/a0016944

Lerner, J. S., Gonzalez, R. M., Small, D. A., & Fischhoff, B. (2003). Effects of fear and anger on perceived risks of terrorism: A national field experiment. *Psychological Science, 14,* 144–150. doi:10.1111/1467-9280.01433

Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology, 81,* 146–159. doi:10.1037/0022-3514.81.1.146

Lieberman, M. D., Eisenberger, N. I., Crockett, M. J., Tom, S. M., Pfeifer, J. H., & Way, B. M. (2007). Putting feelings into words: Affect labeling disrupts amygdala activity in response to affective stimuli. *Psychological Science, 18,* 421–428. doi:10.1111/j.1467-9280.2007.01916.x

MacLeod, C., Koster, E. H., & Fox, E. (2009). Whither cognitive bias modification research? Commentary on the special section articles. *Journal of Abnormal Psychology, 118,* 89–99. doi:10.1037/a0014878

Marwick, K., & Hall, J. (2008). Social cognition in schizophrenia: A review of face processing. *British Medical Bulletin, 88,* 43–58. doi:10.1093/bmb/ldn035

Mathews, A., & MacLeod, C. (2005). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology, 1,* 167–195. doi:10.1146/annurev.clinpsy.1.102803.143916

Murphy, S. T., & Zajonc, R. B. (1993). Affect, cognition, and awareness: Affective priming with optimal and suboptimal stimulus exposures. *Journal of Personality and Social Psychology, 64,* 723–739. doi:10.1037/0022-3514.64.5.723

Nayani, T. H., & David, A. S. (1996). The auditory hallucination: A phenomenological survey. *Psychological Medicine, 26,* 177–189. doi:10.1017/S003329170003381X

Niedenthal, P. M., Halberstadt, J. B., Margolin, J., & Innes-Ker, E. S. H. (2000). Emotional state and the detection of change in facial expression of emotion. *European Journal of Social Psychology, 30,* 211–222. doi:10.1002/(SICI)1099-0992(200003/04)30:2<211::AID-EJSP988>3.0.CO;2-3

Phillips, M. L., Williams, L., Senior, C., Bullmore, E. T., Brammer, M. J., Andrew, C., & David, A. S. (1999). A differential neural response to threatening and non-threatening negative facial expressions in paranoid and non-paranoid schizophrenics. *Psychiatry Research: Neuroimaging, 92,* 11–31. doi:10.1016/S0925-4927(99)00031-1

Pinkham, A. E., Hopfinger, J. B., Pelphrey, K. A., Piven, J., & Penn, D. L. (2008). Neural bases for impaired social cognition in schizophrenia and autism spectrum disorders. *Schizophrenia Research, 99,* 164–175. doi:10.1016/j.schres.2007.10.024

Poole, J. H., Tobias, F. C., & Vinogradov, S. (2000). The functional relevance of affect recognition errors in schizophrenia. *Journal of the International Neuropsychological Society, 6,* 649–658. doi:10.1017/S135561770066602X

Raine, A. (1991). The SPQ: A scale for the assessment of schizotypal personality based on *DSM–III–R* criteria. *Schizophrenia Bulletin, 17,* 555–564.

Reichenberg, A., & Harvey, P. D. (2007). Neuropsychological impairments in schizophrenia: Integration of performance-based and brain imaging findings. *Psychological Bulletin, 133,* 833–858. doi:10.1037/0033-2909.133.5.833

Rosse, R. B., Kendrick, K., Wyatt, R. J., Isaac, A., & Deutsch, S. I. (1994). Gaze discrimination in patients with schizophrenia: Preliminary report. *American Journal of Psychiatry, 151,* 919–921.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology, 45,* 513–523. doi:10.1037/0022-3514.45.3.513

Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology, 48,* 813–838. doi:10.1037/0022-3514.48.4.813

Suslow, T., Roestel, C., & Arolt, V. (2003). Affective priming in schizophrenia with and without affective negative symptoms. *European Archives of Psychiatry and Clinical Neuroscience, 253,* 292–300. doi:10.1007/s00406-003-0443-4

Tandon, R., Nasrallah, H. A., & Keshavan, M. S. (2009). Schizophrenia, "just the facts" 4: Clinical features and conceptualization. *Schizophrenia Research, 110,* 1–23. doi:10.1016/j.schres.2009.03.005

Todorov, A. (2008). Evaluating faces on trustworthiness: An extension of systems for recognition of emotions signaling approach/avoidance behaviors. In A. Kingstone & M. B. Miller (Eds.), *Annals of the New York Academy of Sciences: Vol. 1124. The year in cognitive neuroscience 2008* (pp. 208–224). doi:10.1196/annals.1440.012

Tsoi, D. T., Lee, K. H., Khokhar, W. A., Mir, N. U., Swalli, J. S., Gee, K. A., . . . Woodruff, P. W. R. (2008). Is facial emotion recognition impairment in schizophrenia identical for different emotions? A signal detection analysis. *Schizophrenia Research, 99,* 263–269. doi:10.1016/j.schres.2007.11.006

Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence.* San Antonio, TX: Psychological Corporation.

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