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Deficits in implicit facial recognition of fear in aggressive patients with schizophrenia

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Aggression in individuals with schizophrenia is a complex, multidimensional problem (Hoptman and Antonius, 2011). An area of research that may hold promise for better understanding the underlying causes of aggression in schizophrenia is facial emotion recognition, which is impaired in schizophrenia patients (Kohler et al., 2010) and related to functional outcomes (Irani et al., 2012).

Deficits in *explicit* fear recognition is associated with aggressive personalities, including in people with schizophrenia (Weiss et al. 2006), and has led investigators to speculate that facial expressions of fear communicate cues of submissiveness and low dominance, which lead to approach behavior and an inhibition of aggressive behavior in the perceiver (Marsh and Blair, 2008). Little is known whether *implicit* fear recognition is linked to aggression, and whether the perception of dominance/submissiveness modulates this relationship. This is an important research question as researchers have shown that implicit and explicit social perception are linked to different neural circuits (Lieberman, 2007) and most emotional expressions are of low intensity and processed implicitly (Willis and Todorov, 2006). Humans use these subtle emotional expressions to form impressions of others (does a person

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Contributors

Drs. Antonius and Trémeau designed and wrote the study protocol. Drs. Antonius, Trémeau, White-Ajmani, and Mr. Kline and Miss Gianfagna managed literature reviews. Drs. Antonius and Trémeau managed statistical analyses. Drs. Antonius, Trémeau, White-Ajmani, Sinclair, and Malaspina, and Mr. Kline and Miss Gianfagna were involved in the writing of various drafts and the final manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

appear aggressive/dominant/submissive) that can have long-lasting social consequences (Olivola and Todorov, 2010). Although impressions of dominance have been linked to implicit fear recognition (Said et al., 2009), it is unknown if this relationship is present in aggressive schizophrenia patients.

The present study targeted this gap in the literature by examining dominance and implicit fear perception ratings to neutral faces in schizophrenia patients with low or high self-reported aggression. We expected the high aggression group would judge the neutral faces as being higher on dominance than the low aggression group and would rely less on implicit fear recognition when judging dominance.

Twenty individuals with a diagnosis of schizophrenia or schizoaffective disorder were categorized into aggression groups by a median split on their total Aggression Questionnaire scores. The average total aggression scores were comparable to scores found in other schizophrenia studies (Hoptman et al., 2010). Neutral faces were presented individually to participants who were asked to rate how dominant the person looks (1: not-at-all; 5: extremely). Participants were not asked to pay attention to emotional expressions. Instead, a previously used computer paradigm was used to calculate how close each neutral face was compared to an emotional expression of anger, disgust, happiness, sadness, surprise and fear (Said et al., 2009); each face received an emotion prediction score for each emotion ranging from 0–1. The study was approved by the local IRB.

Demographic and clinical data are presented in Table 1. We used a mixed model analysis, with subject as random factor, to compare the two aggression groups' ratings of dominance and the effect of emotions on dominance. The emotion probabilities of each face were entered as main fixed effects. The two groups did not differ in their dominance ratings (high aggression: mean=2.86, SD=1.35; low aggression: mean=2.76, SD=1.44; $df=1,579$, $F=0.06$, $p=0.80$). Anger and happiness were significant predictors of dominance ($\beta=0.80$, $t=2.63$, $p=0.009$, and $\beta=-1.41$, $t=-3.75$, $p=0.0001$ respectively). The interaction factor, group by fear, was also significant ($\beta=-1.93$, $t=2.17$, $p=0.03$). In the low aggressive patients, micro-facial expressions of fear was a significant predictor of dominance ($\beta=-1.60$, $t=-2.60$, $p=0.01$); fear was unrelated to dominance in the high aggression group ($\beta=0.01$, $t=0.02$, $p=0.98$).

The findings partially support an aggression-emotion model in schizophrenia of impaired fear processing being related to misperception of dominance cues and poor inhibition of aggressive behavior. Schizophrenia patients high on self-reported aggression showed deficits in implicit fear recognition as they did not use subtle fear facial expressions to make dominance judgments. Their ratings of dominance were only non-significantly higher than the low aggression group. Future studies on implicit fear recognition in aggressive schizophrenia patients should include a larger sample and actuarial measures of aggression.

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Table 1

Demographic and Clinical Data

	Total Sample (n=20)	Low Aggression (n=10; AQ Total 58)	High Aggression (n=10; AQ Total 59)	Statistical Group Differences
<u>Demographic Data</u>				
Age ^a	42.35 (8.62)	41.50 (9.94)	43.20 (7.51)	NS ^d
Education in years ^a	13.00 (1.97)	12.35 (1.94)	13.65 (1.86)	NS ^d
Sex (male/female) ^b	14/6	8/2	6/4	NS ^e
Race/ethnicity ^b				NS ^e
White	7	4	3	
Black non-hispanic	10	5	5	
Asian/Pacific Islander	1	1	0	
Hispanic	1	0	1	
Other	1	0	1	
Diagnosis ^b				NS ^e
Schizophrenia Paranoid	7	4	3	
Schizophrenia Undifferentiated	4	2	2	
Schizoaffective Disorder	9	4	5	
Age of first symptoms ^a	21.55 (6.27)	21.10 (6.05)	22.00 (6.78)	NS ^d
Age of first hospitalization ^a	23.94 (6.85)	22.44 (6.31)	25.44 (7.40)	NS ^d
Number psychiatric hospitalizations ^a	11.67 (15.08)	15.00 (20.95)	8.33 (4.35)	NS ^d
Months in psychiatric hospitals ^a	12.80 (20.84)	20.76 (28.94)	5.72 (4.06)	NS ^d
<u>Clinical Measures</u>				
PANSS ^c scores ^a				
Positive Symptoms	12.50 (3.50)	10.00 (2.62)	14.30 (5.89)	$t(18)=2.11, p=0.06^f$
Negative Symptoms	13.15 (4.96)	12.70 (4.11)	13.60 (4.88)	NS ^d
General Symptoms	28.40 (7.68)	26.20 (4.47)	30.60 (9.69)	NS ^d
Aggression Questionnaire ^a				
Physical Aggression	18.15 (6.84)	15.30 (3.78)	21.00 (8.18)	$t(18)=2.01, p=0.07^f$
Verbal Aggression	12.15 (4.66)	9.80 (3.55)	14.50 (4.58)	$t(18)=2.57, p=0.02$
Anger	13.50 (4.07)	10.00 (1.41)	17.00 (2.40)	$t(18)=7.94, p<0.001$
Hostility	19.25 (7.54)	15.20 (4.02)	23.30 (8.21)	$t(18)=2.80, p=0.01$
Total Aggression	63.05 (16.27)	50.30 (4.62)	75.80 (13.27)	$t(18)=5.74, p<0.001$

Note:

^a Mean and standard deviation;^b Total numbers;^c PANSS: Positive and Negative Syndrome Scale;^d t-tests statistics;

^e Chi-square statistics;

^f not significant, but a trend was found.