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Face identity discrimination in schizophrenia: impairments to faces with high exposure in society

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Recognizing individual identities from faces is a perceptual ability crucial for social interactions. In schizophrenia, a condition associated with impaired social functioning, whether face identity discrimination is compromised remains unclear (Chen and Ekstrom 2015; Darke et al. 2014). Social category (such as gender and race) is a key factor for face identity discrimination (Ekstrom et al. 2014; Farkas et al. 2005; Ferrario et al. 1993). How this factor affects schizophrenia patients' ability to discriminate one facial identity from another has not been examined.

This study examined and compared perceptual performance on face identity discrimination tasks using both within- and between-category faces with varying degrees of everyday social exposure in patients with schizophrenia (n=19) or schizoaffective disorder (n=32) and in healthy controls (n=31). Patients were diagnosed using the SCID-IV. The groups did not differ in age ($t=.25$, $p=.8$) or gender ($\chi^2=1.06$, $p=.3$). Patients' average illness duration was 20.1 years (stdev= 13.0 years). Their positive, negative and general PANSS scores were 16.28 (4.65), 13.4 (3.69) and 30.1 (6.22), respectively.

To compare perceptual performances across different types of faces, we used six sets of face pairs: 1) two Asian females (AF), 2) two White females (WF), 3) two White males (WM), and 4) two Black males (BM), all considered within-category, and 5) a Black male and a White male (B/WM), and 6) a White male and a White female (WM/F), both considered between-category. To characterize ability of face identity discrimination, we systematically manipulated facial dissimilarity (6 levels) in each pair by morphing between two original face images. Original face images were of twelve face models taken from the NimStim Face Stimulus Set (Tottenham et al. 2009). In each trial, a study face was presented first, and then two test faces were presented. Participants selected the test face that matched the study face. Each participant performed 672 trials, blocked by face model pair. Presentation order of face model pair was counterbalanced across participants. We measured percent of correct trials under six levels of facial dissimilarity. We then computed perceptual threshold, defined as the minimum facial dissimilarity level to yield 80% correct performance level for each face pair (Chen et al. 2009).

ANOVA of perceptual thresholds with category and group as factors shows a main effect of group ($F_{1, 80}=12.765$, $p<.001$). The interaction between group and category was non-significant ($F_{1, 1}=2.852$, $p=.092$). When the category factor was formed based on the degree of social exposure (BM, WF, WM (high exposure) vs. AF, B/WM, WM/F (low exposure))

(see next paragraph), significant effects were found for group ($F_{1, 80}=18.911$, $p<.001$) and the interaction ($F_{1, 1}=5.287$, $p=.022$). Post-hoc tests show that patients had significantly higher thresholds (worse performance) than controls for BM, WM, and WF ($t_s = 2.4$, $p_s = .02$, Effect sizes $.61$) (Figure). Groups did not differ for AF, WM/F and W/BM. This result indicates that face identity discrimination in schizophrenia is deficient for faces with high exposure, but not for faces with low exposure, in society.

In the Greater Boston region where this study recruited participants, prevalence is high for Whites (54.1%) and Blacks (20.4%), compared to Asians (8.6%) (Caceres et al. 2007). The across-gender and across-race faces are even less prevalent. The result that patients' perceptual performance aligned with social prevalence of the faces being discriminated suggests that social exposure is the key factor in determining their face discrimination ability. For those faces with extensive social exposure, perceptual identity discrimination is presumably optimal (Kelly et al. 2007; Pascalis et al. 2002), but patients with schizophrenia have impaired performances. This highlights the importance of face-based perceptual training for patients to improve face perception expertise.

References

- Caceres, I.; West, J.; Wooley, L. Regional Health Status Indicators. Boston Massachusetts: 2007.
- Chen Y, Ekstrom T. Visual and associated affective processing of face information in schizophrenia: A selective review. *Current Psychiatry Reviews*. 2015; 11(4):262–277.
- Chen Y, Norton D, McBain R, Ongur D, Heckers S. Visual and cognitive processing of face information in schizophrenia: detection, discrimination and working memory. *Schizophr Res*. 2009; 107(1):92–98. [PubMed: 18947982]
- Darke H, Peterman JS, Park S, Sundram S, Carter O. Are patients with schizophrenia impaired in processing non-emotional features of human faces? *Front Psychol*. 2014; 4:529. [PubMed: 23970872]
- Ekstrom T, Stephen Maher S, Norton D, Chen Y. Within- and Between-Category Face Identity Discrimination: Association with Physical Facial Features. *The Open Behavioral Science Journal*. 2014; 8:8–14.
- Farkas LG, Katic MJ, Forrest CR, Alt KW, Bagic I, Baltadjiev G, Cunha E, Cvicelova M, Davies S, Erasmus I, et al. International anthropometric study of facial morphology in various ethnic groups/races. *J Craniofac Surg*. 2005; 16(4):615–646. [PubMed: 16077306]
- Ferrario VF, Sforza C, Pizzini G, Vogel G, Miani A. Sexual dimorphism in the human face assessed by euclidean distance matrix analysis. *J Anat*. 1993; 183(Pt 3):593–600. [PubMed: 8300436]
- Kelly DJ, Quinn PC, Slater AM, Lee K, Ge L, Pascalis O. The other-race effect develops during infancy: evidence of perceptual narrowing. *Psychol Sci*. 2007; 18(12):1084–1089. [PubMed: 18031416]
- Pascalis O, de Haan M, Nelson CA. Is face processing species-specific during the first year of life? *Science*. 2002; 296(5571):1321–1323. [PubMed: 12016317]
- Tottenham N, Tanaka JW, Leon AC, McCarry T, Nurse M, Hare TA, Marcus DJ, Westerlund A, Casey BJ, Nelson C. The NimStim set of facial expressions: judgments from untrained research participants. *Psychiatry Res*. 2009; 168(3):242–249. [PubMed: 19564050]

Figure.

Perceptual threshold of face identity discrimination (left). Face pairs used for perceptual discrimination (right). * indicates a significant group difference. See text for abbreviations.