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Short Report:

Labelling faces as "Autistic" reduces the Inversion Effect.

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Abstract

Does the belief that a face belongs to an individual with autism affect recognition of that face? To address this question, we used the *inversion effect* as a marker of face recognition. In Experiment 1, participants completed a recognition task involving upright and inverted faces labelled as either "regular" or "autistic". In reality, the faces presented in both conditions were identical. Results revealed a smaller inversion effect for faces labelled as autistic. Thus, simply labelling a face as "autistic" disrupts recognition. Experiment 2 showed a larger inversion effect after the provision of humanizing vs dehumanizing information about faces labelled as "autistic". We suggest changes in the inversion effect could be used as a measure to study stigma within the context of objectification and dehumanization.

Keywords: autism; face inversion effect; face recognition; stigma; objectification

Autism is one of the fastest growing and the most commonly diagnosed neurodevelopmental disorders (often associated with depression, obsessive compulsive and mood disorders). In 2018, the Centers for Disease Control and Prevention (CDC) released new data showing that in the United States 1 in 59 children is diagnosed with autism. Individuals with autism are often susceptible to stigmatization and its discriminatory consequences. For example, children with autism experience disproportionately high rates of bullying (Montes & Halterman, 2007), routinely struggle with loneliness, anxiety and depression, and are under supported by academic institutions (Gelbar, Smith, & Reichow, 2014).

In a recent study, university students read a vignette describing a person with the symptoms of autism (without presenting the label) before completing a measure of openness towards that person. The majority of students stigmatized the target person by reporting a preference for having a distant relationship with them, rather than close engagement (Gardiner & Iarocci, 2014; Butler & Gillis, 2011).

Here, we investigated university students' recognition of faces labelled as autistic. In Experiment 1 we manipulated the category label associated with a set of "regular" faces presented to participants: one group was instructed to memorize, and later recognize, a set of faces labeled as "regular" whereas another group was given the same instructions for faces labeled as belonging to individuals with "autism".

We assessed the face inversion effect which refers to impaired performance when trying to recognize a face stimulus turned upside down. The explanation for this deficit is that inversion disrupts configural perceptual processing (i.e. spatial relationships among facial features). Critically, a significantly smaller inversion effect is found when stimuli are

objects rather than faces, suggesting more featural perceptual processing for objects (see Maurer, LeGrand & Mondloch, 2002). This paradigm has been previously used as a cognitive marker of objectification/dehumanization of sexualized images of men and women (wearing under garments). Specifically, studies have shown the inversion effect to be smaller (i.e. more object-like featural processing) when participants are presented with sexualized images and objects (shoes) compared to non-sexualized images (people wearing a t-shirt and jeans). Further, it has been shown that giving humanizing information about the sexualized images can reduce objectification by increasing the inversion effect (i.e. increased face-like configural processing) (Bernard et al., 2012, 2015; 2017; Civile & Obhi, 2016, Civile, Rajogobal, & Obhi, 2016).

Here we aimed to extend this paradigm to stigma and mental health. We specifically selected autism (future studies should examine other disorders) because of its increasing prevalence and the corresponding need to understand how people perceive individuals with autism. In Experiment 1, we engaged students in a recognition task involving upright and inverted face stimuli simply labelled as "autistic". We anticipate a reduction of the inversion effect compared to the control group who were presented with the same stimuli labelled as "regular". In Experiment 2, we tested an intervention providing humanizing vs. dehumanizing information prior to exposure to the (autistic) faces in an attempt to determine whether top-down information would modulate the magnitude of the inversion effect.

Method

Participants

One hundred sixty naïve participants took part in the two experiments (119 female, M_{age}=18.62, SD=1.51). Each experiment included 80 participants randomly assigned to either one of the two groups (40 in each group). All the participants were students from McMaster University. The experiment was approved by the research ethics committee at McMaster University. For experiment 1, the sample size was determined from earlier studies that used the same face stimuli and behavioural paradigm (Civile, McLaren & McLaren, 2011, 2014, 2016). At the end of the study, the participants in the autistic faces group were asked if they knew what autism was. All participants reported being familiar (some from direct experience and others from reading about it) with autism (for similar findings, see Tipton & Blacher, 2014 who found that despite students, professors and university staff being knowledgeable about autism, misperceptions remain).

Materials

The study used 120 images of faces (60 males & 60 females) standardized in gray-scale format and cropped around the hairline (pics.stir.ac.uk).

Procedure

The *old/new recognition* task consisted of two parts: a ‘study phase’ and an ‘old/new recognition phase’ (Civile et al., 2011, 2014, 2016). In the study phase, each participant was shown upright and inverted faces with 30 images for each type (60 images overall). Faces were presented one at a time in random order. In each trial participants saw first a fixation cross in the centre of the screen presented for 1 second. After this, one of the

faces was presented on screen for 3 seconds. The next trial started with the presentation of a fixation cross again. After the 60 faces had been presented, the program displayed another set of instructions, explaining the recognition task. Hence, 60 novel faces split into the same stimulus types were added to the 60 faces seen in the study phase, and all 120 images were presented one at a time in random order. No face ever appeared in more than one condition during the experiment for the same participant. In the recognition task, participants were asked to press the '.' key if they recognized the stimulus as having been shown in the study phase on any given trial, or press 'x' if they did not (the keys were counterbalanced). The faces were shown for 3 seconds during which time participants had to respond (Figure 1, Panel a).

The critical (and only) manipulation in both experiments was applied as part of the study phase instructions by providing category label information about the faces being presented.

In Experiment 1, participants assigned to the regular face condition read the following instruction:

"You will see a set of faces presented one at a time

These are faces of REGULAR people

Try to remember as many as you can"

Critically, participants assigned to the autistic faces condition read the following instruction:

"You will see a set of faces presented one at a time

These are faces of people diagnosed with AUTISM

Try to remember as many as you can"

In Experiment 2, participants assigned to the humanizing condition read the following instruction:

"You will see a set of faces presented one a time

These are faces of individuals diagnosed with Autism"

"Some of the traits of people diagnosed with Autism are:

-Trustworthiness. Individuals with Autism don't have hidden agendas.

-High Integrity. The idea of trying to cheat on the job, or to slack in their work, does not occur to individuals with autism. They are conscientious, diligent workers.

-Little/No prejudice. Because they know what it is like to be different, people with Autism tend to be more accepting of others.

Try to remember as many faces as you can"

In contrast, participants assigned to the dehumanizing condition read the following instruction:

"You will see a set of faces presented one at a time

These are faces of individuals diagnosed with Autism"

"Some of the traits of people diagnosed with Autism are:

-Significant problems developing nonverbal communication skills, such as eye-to-eye gazing, facial expressions, and body posture.

-Lack of interest in sharing enjoyment, interests, or achievements with other people.

-Lack of empathy. People with autism may have difficulty understanding another person's feelings, such as pain or sorrow.

Try to remember as many faces as you can"

Data Analysis

Our primary measure was performance accuracy. The data from all the participants was used to extract *d'* sensitivity in the recognition task where a *d'* = of 0.00 indicates chance-level performance (Stanislaw & Todorov, 1999). Each p-value reported is two-tailed, and we also report the F or t value along with effect size (η^2_p). We also analyzed data from the accuracy scores which confirmed the effects obtained from our *d'* sensitivity analysis. Finally, we analyzed the RTs data which did not add anything to our interpretation of the results.

Experiment 1

We computed a 2 x 2 mixed model ANOVA using, as a within-subjects factor, *Face Orientation* (upright or inverted), and the between-subjects factor *Face Label* (autistic or regular). There was a significant two-way interaction, $F(1, 78) = 5.87$, $p = .018$, $\eta^2_p = .07$, which reflected the fact that the inversion effect in the autistic faces group was smaller than in the regular faces group. There was a significant main effect of *Orientation* $F(1, 78) = 61.08$, $p < .001$, $\eta^2_p = .43$, which simply confirmed that upright faces were better responded to than inverted ones. Follow-up paired *t* test analyses were conducted to compare performance on upright and inverted face stimuli (the inversion effect) in each *Face Label* group (regular, autistic). Based on previous studies that used the same stimuli and experimental paradigm (Civile et al., 2012, 2014, 2016; Civile & Obhi, 2016; Civile et al., 2016) our primary measure was the face inversion effect given by comparing performance on upright and inverted faces in each *Face Label* group. A significant inversion effect was found in the regular faces group, $t(39) = 7.13$, $p < .001$, $\eta^2_p = .56$, and a *reduced* (but still

significant) *inversion effect* was found in the autistic faces group, $t(39) = 3.87$, $p < .001$, $\eta^2_p = 0.27$ (see Figure 1, Panel b).

Experiment 2

The same statistical analysis was conducted for Experiment 2. The 2x2 ANOVA (*Face Orientation* x *Face Label*) revealed a significant interaction, $F(1, 78) = 5.26$, $p = .025$, $\eta^2_p = .06$, indicating a greater inversion effect for faces associated with positive traits compared to that for faces associated with negative traits. There was a significant main effect of *Orientation* $F(1, 78) = 30.63$, $p < .001$, $\eta^2_p = .28$, confirming that upright faces were better responded to than inverted ones. A significant inversion effect was found in the positive traits group, $t(39) = 5.58$, $p < .001$, $\eta^2_p = 0.44$, and a *reduced* (but still significant) *inversion effect* was found in the negative traits group, $t(39) = 2.27$, $p = .029$, $\eta^2_p = 0.11$ (see Figure 1, Panel c).

Figure 1: About here please

General Discussion

In Experiment 1, we investigated how being exposed to a set of faces labelled as "autistic" can affect the way that university students recognize faces. Critically, the robust inversion effect typical of face recognition, was significantly reduced for faces labelled as belonging to individuals with autism compared to (identical) faces labelled as belonging to "regular" non-autistic individuals. This finding suggests that when people think they are presented with a face of someone with autism, they show poorer recognition performance. In Experiment 2, we examined the effects of humanizing vs dehumanizing information on

recognition of the same set of autistic faces used in Experiment 1. Importantly, we found a larger inversion effect when humanizing vs dehumanizing information were presented.

Our results are reminiscent of previous studies that adopted the inversion effect paradigm as an index of "objectification" (Bernard et al., 2012; 2015; 2017; Civile & Obhi, 2016, Civile, Rajagobal, & Obhi, 2016). This paradigm makes use of the consensus that faces are processed more configurally whereas objects are processed more featurally (Maurer et al., 2002). In Experiment 1, we suggest that the autistic faces resulted in a smaller inversion effect because they were processed more featurally – in a manner more similar to processing of objects rather than faces.

Objectification is often linked to *dehumanization*—perceiving others as lacking core human characteristics such as a sense of agency and warmth (Cameron, Harris, & Payne, 2016). Hugenberg et al (2015, Experiment 1 & 2) provided direct evidence of how inversion disrupts activation and categorization of humanness in human faces compared to controls (machine or animal comparisons). Importantly, Fincher and Tetlock (2016) demonstrated that the inversion effect is attenuated when faces are paired with negative social information (e.g. faces of norm violators). Moreover, Bernard et al., (2015, Experiment 3) showed that inversion effect for sexualized images of women increased (i.e. more face-like processing vs object-like processing) after the provision of humanizing information about the women depicted in the images. The results from our Experiment 2 are consistent with these findings and provide some evidence in support of the de-stigmatization effects of pairing autism with humanizing information.

Future research exploring the cognitive bases of stigma could seek to further inform what responses are elicited when such a label (i.e. “autistic”) is presented. For instance, will participants feel pity or contempt when presented with the “autistic” label, and how might individual difference factors influence these feelings? Does the provision of humanizing information about autism make participants more compassionate?

In sum, our research demonstrates that the mere labelling of faces as belonging to individuals with autism reduces the magnitude of the inversion effect that normally occurs for face stimuli (Experiment 1). We suggest that stigma-laden labelling induces a processing style akin to the typical processing deployed in object recognition. Crucially, this effect can then be modulated by providing humanizing vs. dehumanizing information about autism (Experiment 2). We suggest that changes in the inversion effect may be a useful index of the objectification and dehumanization of individuals diagnosed with autism. Research investigating the cognitive bases of stigma could be instrumental as a first step towards eliminating it altogether. If we can better understand why and how individuals are stigmatized, perhaps we can devise more efficient and effective solutions for combating stigma (e.g. providing humanizing information).

Individuals with a mental disorder experience two sets of problems—problems associated with the disorder itself, as well as problems associated with the stigma—and this report has made strides towards better understanding the latter.

Figure 1

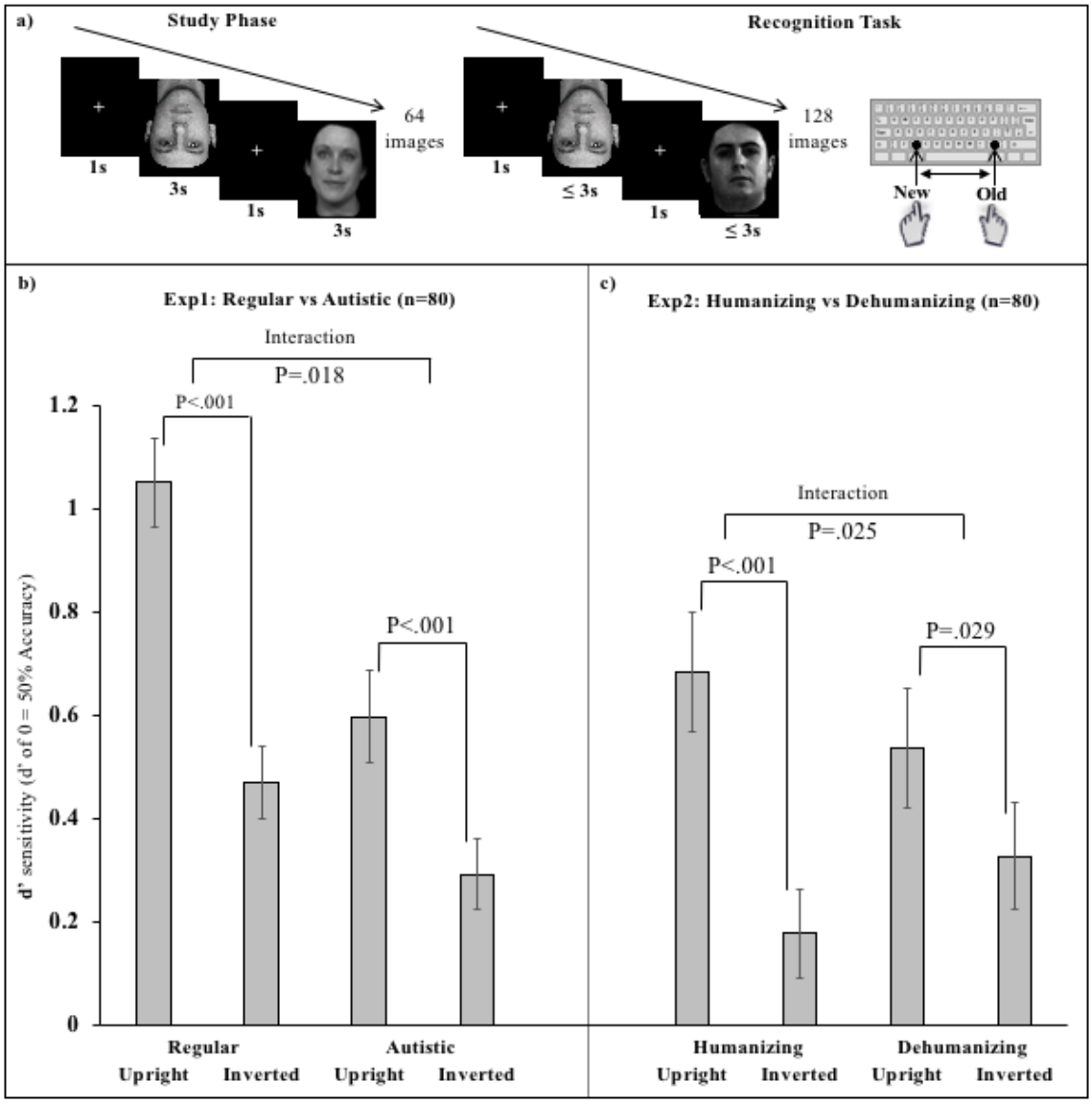

Figure 1. **Panel a**, shows a schematic representation of the procedure adopted in the study. The experiment was implemented using SuperLab 4.5 installed on a PC. The dimensions of the stimuli were 6.95 cm × 5.80 cm. **Panel b**, shows the results for the old/new recognition task in Experiment 1. **Panel c**, shows the results for the old/new recognition task in Experiment 2. Error bars represent s.e.m.

References

Bernard, P., Gervais, S., Allen, J., Campomizzi, S., & Klein, O. (2012). Integrating sexual objectification with object versus person recognition: The sexualized-body-inversion hypothesis. *Psychological Science*, 23, 469-471.

Bernard, P., Gervais, S., Allen, J., Delmee, A., & Klein, O. (2015). From sex objects to human beings: Masking sexual body parts and humanization as moderators to women's objectification. *Psychology of Women Quarterly*, 39, 432-446. doi.org/10.1177/1948550617714582

Bernard, P., Rizzo, T., Hoonhorst, I., Deliens, G., Gervais, S., Eberlen, J., et al., (2017). The neural correlates of cognitive objectification: An ERP study on the body inversion effect associated with sexualized bodies. Social Psychological and Personality Science

Butler, R., & Gillis, J. (2011) The impact of labels and behaviors on the stigmatization of adults with Asperger's disorder. *Journal of Autism and Developmental Disorders*, 41, 741-749.

Civile, C., McLaren, R. and McLaren, I.P.L. (2011). Perceptual learning and face recognition: Disruption of second-order relational information reduces the face inversion effect. In L. Carlson, C. Hoelscher, & T.F. Shipley (Eds.), *Proceedings of the 33rd Annual Conference of the Cognitive Science Society,* (pp. 2083-88). Austin, TX: Cognitive Science Society.

Civile, C., McLaren, R., & McLaren, I. P. L. (2014). The face inversion effect—Parts and wholes: Individual features and their configuration. *The Quarterly Journal of Experimental Psychology*, 67, 728-746.

Civile, C., McLaren, R., & McLaren, I. P. L. (2016). The face inversion effect: Roles of first and second-order relational information. *The American Journal of Psychology*, 129, 23–35.

Civile, C., Rajagobal, A., & Obhi, S.S. (2016). Power, ethnic origin and objectification. *SAGE Open*. doi:10.1177/2158244016646150.

Civile, C., & Obhi, S.S. (2016). Power, objectification, and recognition of sexualized women and men. *Psychology of Women Quarterly*, *40*, *199-212*.

Cameron, C., Harris, L., & Payne, B. (2015). The emotional cost of humanity anticipated exhaustion motivates dehumanization of stigmatized targets. *Social Psychological and Personality Science, 7,* 105-112.

Psychology: Science and Practice, *7*(1), 48–67. http://doi.org/10.1093/clipsy.7.1.48

Fincher, K. M., & Tetlock, P. E. (2016). Perceptual dehumanization of faces is activated by norm violations and facilitates norm enforcement. *Journal of Experimental Psychology: General*, 145, 131.

Gardiner, E., & Iarocci, G. (2013). Students with autism spectrum disorder in the university context: Peer acceptance predicts intention to volunteer. *Journal of Autism and Developmental Disorders*, 44, 1008–1017.

Gelbar, N.W., Smith, I., & Reichow, B. (2014). Systematic review of articles describing experience and supports of individuals with autism enrolled in college and university programs. *Journal of Autism and Developmental Disorders, 44*(10), 2593-2601.

Hugenberg, K., Young, S.G, Rydell, R. J., Almaraz, S., Stanko, K. A., See, P. E., & Wilson, J. P. (2016). The face of humanity: Configural face processing influences ascriptions of humanness. *Social Psychological and Personality Science*, 7, 167-175.

Montes G, & Halterman J. (2007). Bullying among children with autism and the influence of comorbidity with ADHD: A population-based study. *Ambulatory Pediatrics*, 7, 253–257.

Maurer, D., LeGrand, R., & Mondloch, C. (2002). The many faces of configural processing. *Trends in Cognitive Sciences*, 6, 255-260.

Stanislaw, H., & Todorov, N. (1999). Calculation of signal detection theory measures. *Behaviour Research Methods, Instruments, & Computers*, 31, 137-149.

Tipton, L., & Blacher, J. (2014). Brief report: Autism awareness: Views from a campus community. *Journal of Autism and Developmental Disorders*, 44, 477–483.