Psychiatry Research 259 (2018) 176–183

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

The effect of visual cues on performance in the ultimatum game in individuals with autism spectrum disorder

Daisuke Ikuse[a,b,*], Masayuki Tani[b], Takashi Itahashi[a], Hiroki Yamada[a], Haruhisa Ohta[a], Teppei Morita[a], Gousuke Arai[a], Nobuyuki Saga[a], Takahiro Tokumasu[a], Marie Ohta[a], Ayaka Sato[a], Akira Iwanami[a]

[a] Department of Psychiatry, Showa University of Medicine, 6-11-11 Kitakarasuyama, Setagaya-ku, Tokyo 157-8577, Japan
[b] Department of Psychiatry, Showa University East Hospital, 2-14-19 Nishinakanobu, Sinagawa-ku, Tokyo 142-0054, Japan

ARTICLE INFO

Keywords:
Trust
Altruism
Autistic disorder
Schematic eye

ABSTRACT

The Ultimatum Game (UG) allows for the assessment of altruistic behavior as well as the perception of fairness. We examined the effects of visual social cues (gaze of others), factors associated with autism, and trust on UG performance in typical adults (TAs) and individuals with autism spectrum disorder (ASD). We hypothesized that individuals with ASD would be less affected by visual social cues than TAs. We recruited 30 TAs and 30 individuals with ASD. Participants completed 30 trials of the UG, during which the visual background was altered to include either stylized eyespots, flowers, or a neutral background. Reaction times and money distributed in each condition were recorded. Reaction times did not vary among background conditions in either group, although individuals with ASD responded more slowly overall. TAs distributed less money in the neutral background and flowers conditions than in the eyespots condition, while no significant differences in the amount of money distributed were observed among background conditions for individuals with ASD, who also distributed more money overall than TAs. Such findings may be due to decreased susceptibility to social cues among individuals with ASD.

1. Introduction

Altruistic behavior, fairness, and cooperation are essential elements of successful social human interactions. Economic and psychological models have attempted to explain why people behave selfishly in some situations, while they are driven to cooperate in others (Fehr and Schmidt, 1999). Cooperation between humans relies on social norms—standards or beliefs that define how individuals should behave in certain situations (Fehr and Fischbacher, 2004). Various factors promote or inhibit deviations from social norms, such as the so-called "eyes effect", during which social norm adherence is modulated by the awareness of being watched and the expectation of deviation resulting in consequences such as punishment (Kurzban et al., 2007).

The Ultimatum Game (UG) has been utilized to evaluate altruistic behaviors as well as the impression of an agent's fairness (Güth et al., 1982). Thus, the ultimate game (UG) addresses issues associated with social norms regarding acceptable distribution and rational behavior. In this game, the participant (the proposer) receives a sum of money and is asked to suggest a plan to divide it between him/herself and another player (the responder). The responder chooses to either accept or reject this proposal. If the responder accepts, the money will be divided according to the proposal. If the responder declines the proposal, neither player will receive any money. Therefore, the proposer must suggest an amount sufficient to prevent the responder from rejecting the proposal. According to game theory, the most rational strategy for this game is for the responder to accept any proposal and the proposer to increase his or her share as much as possible (Nowak et al., 2000). However, there are considerable cultural differences in perceptions of fairness (Henrich, 2000), and participants frequently deviate from the rational strategy because they are swayed by various psychological factors, including the desire to avoid the imposition of an inferior status (Yamagishi et al., 2012). Thus, the UG is often presented as an example of how human behavior is not always rational.

The UG was later modified, leading to the development of the

* Corresponding author at: Department of Psychiatry, Showa University School of Medicine, 6-11-11 Kitakarasuyama, Setagaya-ku, Tokyo 157-8577, Japan.
E-mail addresses: ikuself3211731@yahoo.co.jp (D. Ikuse), tanimambo@med.showa-u.ac.jp (M. Tani), itapan322@gmail.com (T. Itahashi), yamada_showa_psy@yahoo.co.jp (H. Yamada), haruhisap@gmail.com (H. Ohta), allergen_mori@yahoo.co.jp (T. Morita), g.arai@med.showa-u.ac.jp (G. Arai), MHD00746@nifty.com (N. Saga), t_tokumasu@hotmail.com (T. Tokumasu), mariemarie1015@yahoo.co.jp (M. Ohta), myaka.ballet@gmail.com (A. Sato), iwanami@med.showa-u.ac.jp (A. Iwanami).

http://dx.doi.org/10.1016/j.psychres.2017.10.013
Received 13 March 2017; Received in revised form 29 August 2017; Accepted 3 October 2017
Available online 05 October 2017
0165-1781/

Dictator Game, which begins in a similar fashion with the proposer being given money and proposing a plan for its division between the two players (Kahneman et al., 1986); however, in the Dictator Game, the responder cannot reject the proposal. Haley and Fessler (2005) investigated the effect of visual cues on allocation behavior in the Dictator Game, observing that the proposer distributed more money if the game screen presented an eye-shaped background rather than no background image. This finding suggests that the participants responded to the "eyespots" (stylized eye-like or face-like images) as if they were another person's eyes, adopting a more cautious and generous behavior in consideration of the feelings of others.

According to the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5), autism spectrum disorder (ASD) is a neurodevelopmental disorder that typically manifests during early childhood, and is characterized by impairments in social communication as well as repetitive and restricted interests/activities (American Psychiatric Association, 2013). Considerable evidence suggests that ASD is associated with abnormalities in the processing of information conveyed by the eye-region of the face. For instance, individuals with ASD pay less attention to the eye-region when observing or participating in social interactions (Merin et al., 2007), and may experience difficulty identifying the emotions or intentions of others based on information conveyed by this region (Ashwin et al., 2015). Individuals with ASD also tend to struggle with processing the direction of another person's gaze (Senju et al., 2004) in the context of joint attention (Emery, 2000). Additionally, some evidence indicates that eye contact may be overly arousing for individuals with ASD (Osterling et al., 2002). Therefore, we propose that such individuals may be less susceptible to the eyes effect. Indeed, a previous study involving both typical adults (TAs) and individuals with ASD—which utilized a real observer during the Dictator Game—reported that the behavior of individuals with ASD was less influenced by the presence of the observer than that of TAs, suggesting that individuals with ASD are less concerned with their own social reputation in the eyes of others than TAs (Izuma et al., 2011; Chevallier et al., 2012).

Previous studies have revealed that children with ASD are more likely to accept low initial offers in the UG and reject fair proposals than typically developing children (Sally and Hill, 2006). In another study that examined children's commitment to equality (Schmitz et al., 2015), both children with ASD and typically developing children preferred equal distributions. When the instrumental outcomes were varied, children with ASD were less likely to select an unequal distribution when harm could be done to others. However, when they knew that no one would be harmed, they more frequently opted for an unequal distribution that produced a greater gain than the equal distribution. These findings suggest that children with ASD are less likely to commit to equality. It is also important to note that most of these studies focused on children. Kim et al. (2000) have suggested that this tendency towards altruism in individuals with ASD is a strategy to avoid rejection, as they often interpret and experience rejection as failure. To our knowledge, few studies have examined the observer effect and the role of trust in relation to altruistic behaviors in adults with ASD or related disorders.

In the present study, we investigated the effect of visual cues (stylized images of eyes) on UG performance in TAs and individuals with ASD. We hypothesized that these specific visual cues would affect altruistic behaviors in TAs but not in those with ASD. We further explored whether UG performance was influenced by the nature and degree of autism and the inherent level of trust, using the Autism Spectrum Quotient (AQ) and the Trust Scale (Yamagishi and Yamagishi, 1994), respectively. Moreover, since individuals with ASD are more likely to experience difficulties with socio-emotional adjustment (Bohnert et al., 2016), we also assessed the level of loneliness in both groups.

2. Methods

2.1. Participants

The present study included adults with ASD (n = 30, 21 men, 9 women; mean age: 32.0 years, *SD*: 9.4 years, range: 20–50 years) and TAs (n = 30, 20 men, 10 women; mean age: 33.8 years, *SD*: 5.6 years, range: 24–48 years).

Participants with ASD were recruited from the outpatient clinic of Showa University Karasuyama Hospital and Showa University East Hospital in Tokyo, Japan. The diagnostic procedure used to identify patients with ASD was the same as that utilized in our previous study (Itahashi et al., 2014; Watanabe et al., 2014; Yamada et al., 2012). Participants were diagnosed in accordance with criteria outlined in the DSM-5 (American Psychiatric Association, 2013). The assessment consisted of clinical interviews with participants and their parents regarding developmental history, present illness, life history, and family history, which were conducted independently by a psychiatrist and a clinical psychologist from the research team. Furthermore, clinicians differentiated between different pervasive developmental disorders, including intellectual disability not associated with a pervasive developmental disorder, specific language disorders, and attention-deficit/hyperactivity disorder. Exclusion criteria included a history of other major psychiatric disorders (e.g. schizophrenia, schizoaffective disorder, bipolar disorder, anxiety disorder, substance-related disorder) or any neurologic illness affecting the central nervous system. Participants were also asked to bring suitable informants who had known them in early childhood. At the end of the interview, if there was consensus between the psychiatrist and the clinical psychologist, the participants were formally diagnosed with ASD by the psychiatrist. In addition, the diagnosis was reconfirmed after a minimum of 2 months. Regarding education, 29 of the individuals with ASD attended a regular 4-year college/university, while one attended a specialized professional university.

TAs were recruited through advertisements and acquaintances, and all were enrolled in a 4-year college or university. None of the TAs reported any psychiatric history. Further, none of the TAs included satisfied diagnostic criteria for any psychiatric disorder or neurologic illness affecting the central nervous system. All information regarding TAs was obtained based on self-reports and psychiatric interviews.

2.2. Ethical considerations

The Ethics Committee of the Faculty of Medicine of Showa University approved all procedures used in the present study, including the method of obtaining consent, in accordance with the Declaration of Helsinki as revised in 2013. Written informed consent was obtained from all participants following a full explanation of the purpose of the study. No concerns regarding the possibility of reduced capacity to consent were voiced by the ethics committee or the primary care physicians of the patients.

2.3. Assessment

Prior to engaging in the UG, all participants were required to complete the following assessments.

2.3.1. Autism Spectrum Quotient

The AQ is a self-report questionnaire developed by Baron-Cohen et al. (2001) that is used to screen for autism in individuals without significant intellectual impairment. The AQ—which has been applied in both general and clinical populations, including patients with ASD (Zhang et al., 2016)—consists of 50 items, each of which requires participants to indicate their level of agreement with a particular statement. The total score is computed by adding scores for each of the following five categories: Social Skills, Attention Switching, Attention