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Are non-verbal facial cues of altruism cross-culturally readable?

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ABSTRACT

Although both dynamic (i.e., facial expressions) and static facial traits are used as cues of altruism, only static facial traits have been shown to be cross-culturally readable with respect to altruism detection skills. To investigate whether dynamic facial cues of altruism are also cross-cultural, we asked French subjects to estimate the altruism of Japanese individuals on the basis of silent video clips. These video clips were taken from a previous experiment, which found that Japanese raters were able to accurately estimate the altruism of a videotaped Japanese individual. By using the same design and stimuli in France, we found that French raters were unable to assess the altruism of a Japanese individual. Hence, our results suggest that dynamic facial cues of altruistic intent are culturally specific rather than universally readable.

1. Introduction

Humans are thought to have evolved unique cognitive mechanisms to maintain large-scale cooperation between unrelated individuals (Melis & Semmann, 2010). One of these mechanisms is the “Darwinian algorithm” for cheater detection (Cosmides, 1989), which refers to the capacity to discriminate between cheaters and cooperators. This mechanism is argued to be one of the most ancient of the evolved mechanisms for interpersonal decision-making (Cosmides & Tooby, 1992; Todorov, 2008). The capacity to distinguish altruists from egoists by potential partners enables an individual to assort with other individuals according to their propensity to cooperate (D. S. Wilson & Dugatkin, 1997). This assortment has been suggested to lead to the evolution of cooperation if the advantages of selfish individuals are outweighed by the benefits of mutual cooperation between altruists.

Discriminating between high and low altruistic individuals and estimating trustworthiness and cooperativeness is a fast, spontaneous and intuitive process (Bonnenon, Hopfensitz, & De Neys, 2013, 2017; Dzhelyova, Perrett, & Jentsch, 2012; Todorov, 2008) that could be based on both static and dynamic facial traits (e.g., Bonnenon et al., 2017; Fetchenhauer, Groothuis, & Pradel, 2010; Oda, Yamagata, Yabiku, & Matsumoto-Oda, 2009; Tognetti, Berticat, Raymond, & Faurie, 2013). For example, in trust games, decisions regarding whom to trust are biased by static traits, such as attractiveness (R. K. Wilson & Eckel, 2006), similarity to kin (DeBruine, 2002) and the facial width-to-height ratio (Stirrat & Perrett, 2010, 2012). Dynamic facial cues, such

as expressions and movements, have also been implicated in the detection of altruism. Using silent video clips of individuals' faces while they were talking about themselves, several studies found that people can predict the altruistic intent of a target individual (Brown, Palameta, & Moore, 2003; Fetchenhauer et al., 2010; Oda, Yamagata et al., 2009). While static facial cues of altruism have been shown to be inter-culturally readable (Tognetti et al., 2013), dynamic facial cues of altruism have only been studied intra-culturally. Therefore, investigate whether the detection of altruism based on facial expressions was cross-culturally possible, or not, was thus a crucial next step. To fill this gap, we conducted a study in which we asked French subjects to estimate the altruism of Japanese individuals on the basis of silent video clips during which the Japanese individuals spoke about themselves.

Facial emotional expressivity, particularly related to positive emotions, has been shown to be among the non-verbal traits that serve as cues of altruistic intent in several populations (Brown et al., 2003; Mehu, Grammer, & Dunbar, 2007; Mehu, Little, & Dunbar, 2007; Schug, Matsumoto, Horita, Yamagishi, & Bonnet, 2010). Genuine (Duchenne) smile, characterized by the activity of the *orbicularis oculi* (surrounding the eyes) in combination with the *zygomatic major* (raising the corners of the mouth) muscles, seems particularly important in the detection of altruism. This smile is associated with genuine feelings of positive emotion and is difficult to produce deliberately (Ekman, Davidson, & Friesen, 1990; Ekman, Friesen, & O'sullivan, 1988), thereby ensuring its honesty.

In addition, several studies have shown the following: (i) highly

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altruistic individuals exhibit more genuine smiles than less altruistic individuals (Brown et al., 2003; Centorrino, Djemai, Hopfensitz, Milinski, & Seabright, 2015; Oda et al., 2009); and (ii) genuine smiles play a role in the assessment of trustworthiness and altruism (Centorrino et al., 2015; Oda, Yamagata et al., 2009; Reed, Zeglen, & Schmidt, 2012) and (iii) influence individuals' decisions regarding with whom to cooperate (Centorrino et al., 2015; Johnston, Miles, & Macrae, 2010; Oda, Naganawa, Yamauchi, Yamagata, & Matsumoto-Oda, 2009; Reed et al., 2012). For example, Oda, Yamagata et al. (2009) used the self-report altruism scale (Johnson et al., 1989) to measure the altruism of Japanese students, and they recorded the highest and lowest altruistic individuals with a video camera during a self-presentation. By showing 30-second silent video clips of these self-presentations, they found that Japanese raters accurately estimated the altruism of the videotaped Japanese (Oda, Yamagata et al., 2009), and that highly altruistic individuals were more trusted than less altruistic individuals in a faith game (Oda, Naganawa et al., 2009). They also coded these videos to examine which traits the raters used to assess the target's altruism. The results showed that altruists and non-altruists differed in their number of genuine smiles exhibited in the videos, but not for the other cues recorded such as head nods, time per smile, and smile symmetry (Oda, Yamagata et al., 2009). Hence, genuine smile seems to be the main dynamic trait advertising altruism in the Japanese culture.

Using a trust game, a study conducted in France found similar results (Centorrino et al., 2015); the French participants were able to predict their partner's trustworthiness based on the presence of genuine smiles that were exhibited during the silent video clips. Genuine smiles influenced the participant's willingness to send money to the partner. In addition, those partners who were rated as smiling more genuinely returned more money on average to the senders, inducing a higher payoff for both partners.

Overall, these studies conducted in several populations strongly suggest that humans have cognitive architecture for assessing altruism and that dynamic facial traits are common cues of social behaviors that might be shared across cultures. Therefore, in our study we predicted that French raters would be able to correctly assess Japanese' altruism based on dynamic facial traits, such as genuine smiles.

However, although facial expressions have long been considered as universal signals, recent studies challenged this conjecture by showing that internal representations of emotions differed between Easterners and Westerners (Jack, Caldara, & Schyns, 2012; Jack, Garrod, Yu, Caldara, & Schyns, 2012, 2011). For example, Easterners show a preference for expressive information in the eye region, whereas westerners predominantly feature the mouth (Jack, Caldara, et al., 2012). This cultural difference in facial expressions is likely to affect the perception of some personality traits, such as trustworthiness and altruism. Indeed, it has been found that Japanese participants perceived faces with greater upper-half (around the eyes) smile intensity as more trustworthy, whereas American participants perceived faces with greater lower-half smile intensity as more trustworthy but they were not influenced by the upper-half smile intensity (Ozono et al., 2010). Although genuine smile influence perceived trustworthiness in both cultures, these results suggest that the way smiles are dynamically and physically expressed in the face and interpreted by others differs across cultures. Hence, we also predicted that the French raters would be less accurate than the Japanese raters in their assessments of Japanese' altruism.

To sum up, the aim of the current study was to question the cross-cultural validity regarding altruism detection skills based on dynamic facial cues. To this aim, we asked French subjects to estimate the altruism of Japanese individuals on the basis of silent video clips during which the Japanese individuals spoke about themselves. These video clips were taken from a previous experiment (Oda, Yamagata et al., 2009), in which the authors found that altruists exhibited more genuine smiles than non-altruists, enabling Japanese raters to accurately estimate a target's altruism (see above). Because genuine smiles seem to be

used as cues of altruistic intent in different populations, such as in Japan (Oda, Yamagata et al., 2009; Oda, Naganawa, et al., 2009), France (Centorrino et al., 2015) or the USA (Reed et al., 2012), and thus could be a universal cue of altruistic intent, we predicted that French raters would estimate the altruism of Japanese individuals correctly. Nevertheless, because cultural difference is likely to affect facial expressions (Jack et al., 2012) and their perception (Ozono et al., 2010), we also predicted that the French raters would be less accurate than the Japanese raters in their assessments of altruism.

2. Methods

2.1. Videotaping of Japanese individuals

We used the same video clips of natural conversations that were used by Oda, Naganawa, et al. (2009) and Oda, Yamagata, et al. (2009) as stimuli. To select the most versus the least altruistic individuals for videotaping, we used the self-report altruism scale employed by Johnson et al. (1989). This scale was previously validated by showing significant differences in the number of lottery tickets shared in the dictator game between those who scored in the top 10th percentile and the bottom 10th percentile (Brown et al., 2003).

Male Japanese undergraduates ($n = 69$; mean age: 18.7 years \pm 0.9 s.d.) were asked to indicate how often they performed each altruistic act described in the 56 statements of the altruism scale from 1 (never) to 5 (very often). All the participants were volunteers from a class at the Nagoya Institute of Technology, Japan. The participants' scores were then transformed into percentiles. The 90th percentile and above on the scale represented the most altruistic individuals, while the 10th percentile and below represented the least altruistic individuals. Using these criteria, we chose the seven most and seven least altruistic individuals. These 14 people were called and asked to participate in the videotaping. Six among the most and four among the least altruistic individuals agreed to participate. They were brought to the laboratory one at a time. The experimenter, who was unaware of each person's category, sat just beside a video camera in front of the target person who was asked to make a self-presentation discussing his likes and dislikes. Close shots of the target (above the shoulder) in front of a white screen were videotaped. The videos were transformed into digital files and the first 30 s of each presentation was selected. Then, the video clips were edited into a sequence of the 10 targets' presentations. The sound was deleted to control for the verbal content.

2.2. The detection of altruism by French raters

To test whether French raters are able to estimate Japanese altruism, 151 French men and 252 French women (non-French were excluded for the analyses), ranging from 18 to 26 years old (mean age: 19.5 years \pm 1.4 s.d.) were recruited on a voluntary basis from 11 classes at the University of Montpellier, France. We obtained written informed consent from all of the participants.

The procedure followed that of Oda, Yamagata et al. (2009). First, the raters were asked to indicate how often they had performed each altruistic act described in the seven statements of the altruism scale (Table 1) that were previously found to have the greatest effect sizes for distinguishing the six most and the four least altruistic individuals (Oda, Yamagata et al., 2009). Then, the participants were told that they would be viewing a series of videotaped people making self-presentations. The video clips were always projected on screens of similar sizes that were located in the classrooms. We explained to the perceivers that these people, like themselves, had filled out the seven-item questionnaire. The perceivers were then asked to predict the altruism scores of each target for each of the seven items of the questionnaire. The series of video clips was then presented a second time. All the groups observed the same ten targets, but the order of the presentation was randomized for each group.

Table 1

The seven items of the altruism scale given to the French raters. The French version, which was given to the participants, is available upon request.

Items of the altruism scale
As a part of a group of people, I have done menial jobs that needed doing without being asked even though they were not part of my responsibilities.
I have donated goods or clothes to a charity.
I have helped an acquaintance obtain something important that he or she needed (e.g., a job, a place to live).
I have 'picked up the slack' for another worker when he or she couldn't keep up the pace.
I have helped a classmate whom I did not know that well with a homework assignment when my knowledge was greater than his or hers.
I have helped a new fellow-employee at work get settled on the job and learn the tasks involved, even though it was not part of my job.
I have helped someone I didn't know get up when (s)he slipped or tripped and fell down.

2.3. Statistical analyses

We implemented linear mixed models (*lmer* function of the *lme4* package in R) to test whether the French raters (non-French raters were excluded) were able to estimate the self-reported altruism score of the Japanese targets. We included both the identities of the Japanese targets and those of the French raters as random-effect variables to prevent potential pseudoreplication problems. The response variable was the predicted altruism scores assessed by the raters (sum of the 7 items of the questionnaire). We included the following three explanatory variables in the models: the actual altruism score of the Japanese target (sum of the 7 items of the questionnaire), and the rater's sex and the raters' altruism score (sum of the 7 items). We also tested the interactions between the actual Japanese targets' altruism scores with both the raters' sex and the raters' altruism scores to examine whether the ability to detect altruistic intent was influenced by a rater's sex and his/her own altruism score. We included all the main effects and interaction terms in the initial model, which was then simplified by sequentially removing all the non-significant interaction terms to achieve the minimal adequate model.

All the statistical analyses were performed using the R software, version 3.1.2 (R Core Team, 2017).

3. Results

On average, each rater's self-reported altruism score (sum of the 7 items of the questionnaire) was 9.9 for the men and 10.7 for the women. The Japanese targets' altruism scores (sum of the 7 items) assessed by the men and women raters were, on average, 9.8 and 10.3, respectively.

None of the interaction terms tested in the initial linear mixed model were significant (interaction with the raters' sex: $\chi^2 = 0.49$, $df = 1$, $P = 0.48$, with the raters' self-reported altruism scores: $\chi^2 = 0.01$, $df = 1$, $P = 0.93$), suggesting that the raters' sex and altruism did not influence their ability to assess the altruism of the Japanese targets. The minimal linear mixed model (interaction terms excluded) showed no effect of the actual target altruism ($\chi^2 = 1.34$, $df = 1$, $P = 0.25$; Table 2), suggesting that the French raters did not correctly assess the altruism of the Japanese targets. In addition, the raters' sex did not influence the altruism scores given to the Japanese targets ($\chi^2 = 1.89$, $df = 1$, $P = 0.17$; Table 2). However, the raters' altruism significantly influenced their perception of the targets' altruism: the more altruistic raters gave higher altruism scores to the targets ($\chi^2 = 57.41$, $df = 1$, $P < 0.0001$; Table 2).

4. Discussion

Although dynamic facial traits, such as a genuine smile, have been repeatedly shown to be a cue of altruistic intent (Bonnefon et al., 2017),

Table 2

Linear mixed model of the Japanese targets' altruism score as rated by the French raters. For each factor, the estimate, standard error of the mean (SE), degrees of freedom (df), χ^2 statistic and *P*-value of the likelihood ratio test of the comparison between the full model and the model without the factor, are given. For categorical variables, the estimates are for one category compared to the reference category (underlined term). Both the identities of the Japanese target and the French raters were included as random-effect variables.

Predictor variables	Estimate	SE	χ^2	df	<i>P</i> -value
(Intercept)	6.28	1.16			
Japanese's altruism scores	0.07	0.06	1.34	1	0.25
French rater's altruism scores	0.25	0.03	57.41	1	< 0.0001
Rater's sex					
Women/Men	0.28	0.21	1.89	1	0.17

only static facial traits have been shown to be interculturally readable with respect to altruism detection skills (Tognetti et al., 2013). To investigate whether dynamic facial cues of altruism could also be cross-cultural, we showed silent video clips of Japanese individuals to French raters and examined the French raters' altruism detection skills. A previous study using the same video clip stimuli found that Japanese raters were able to correctly assess the altruism of the videotaped Japanese (Oda, Yagamata et al., 2009). They also found that altruists and non-altruists differed in their number of genuine smiles exhibited in the videos. However, by using the same design and the same stimuli in France, our results showed that the French raters were unable to assess the altruism of the Japanese targets. This result suggests that dynamic facial cues of altruistic intent are intra-culturally rather than universally readable.

The original study, from which we used the video clips, found that the videotaped Japanese likely advertised their altruistic intent through genuine smiles (Oda, Naganawa et al., 2009; Oda, Yagamata et al., 2009). During a trust game, the French raters' decisions regarding whom to trust were also influenced by their partners' genuine smiles (Centorrino et al., 2015). Genuine smile is thus a likely candidate as universal cue of altruism. It is, therefore, surprising that the French raters did not correctly assess the Japanese individuals' altruism based on their genuine smiles in the current study. However, recent evidence has emphasized the complexities of designating smiles as genuine or false (Krumhuber & Manstead, 2009). In addition, the marker of a genuine smile by itself (i.e., activity of the *orbicularis oculi* muscle) seems not always reliable for inferring whether a smile is spontaneous and genuine (Krumhuber & Manstead, 2009; Reed et al., 2012). The difficulty in distinguishing between smile types (genuine or false), and thus, in detecting altruistic intent, could be reinforced by the potential existence of cultural differences in facial expressions between the French and Japanese.

Facial expressions have long been considered as universal signals to convey emotional states that are recognized across all cultures. The *universality hypothesis* proposes that six basic internal human emotions (i.e., happiness, surprise, fear, disgust, anger, and sadness) are expressed using the same facial movements across all cultures (Ekman & Friesen, 1986; Ekman, Sorenson, & Friesen, 1969), supporting the idea of universal recognition. However, several studies challenged this conjecture by showing that internal representations of emotions differed between east Asian (i.e., Chinese) and western Caucasian (i.e., Europeans) individuals (Jack, Caldara, et al., 2012; Jack et al., 2012; Jack, Garrod, Yu, Caldara, & Schyns, 2011). For example, there is evidence showing that easterners show a preference for expressive information in the eye region, whereas westerners predominantly feature the eyebrows and mouth (Jack, Caldara, et al., 2012). Similarly, east Asians represent emotional intensity essentially with eyes movements in happiness, fear, disgust, and anger, whereas west Caucasians represent emotional intensity with other parts of the face (Jack et al., 2012). These results suggest that facial expressions of emotions are culturally specific.

This cultural difference in facial expressions is likely to affect the perception of some personality traits, such as trustworthiness and altruism. Indeed, it has been found that Japanese participants perceived faces with greater upper-half (around the eyes) smile intensity as more trustworthy, whereas they perceived faces with greater lower-half (around the mouth) smile intensity as less trustworthy (Ozono et al., 2010). In contrast, American participants perceived faces with greater lower-half smile intensity as more trustworthy, but there was no influence of the upper-half smile intensity (Ozono et al., 2010). Hence, both subtle culturally specific variations in the expression of genuine smile and the way in which they are culturally perceived might explain the inability of the French raters in detecting altruism from Japanese facial expressions.

Dynamic facial traits were not the only potential cues of altruism available to the French raters on the video clips. Static facial traits were also available to them. Several studies have shown that static facial traits influence the detection of trustworthiness and altruism (Bonnefon et al., 2013; Stirrat & Perrett, 2010, 2012; Tognetti et al., 2013). In addition, one study showed that some of these traits are interculturally readable between France and Senegal (Tognetti et al., 2013). Although the French raters did not correctly assess Japanese altruism, we cannot rule out the existence of such intercultural cues between France and Japan. Indeed, detection rates based on static facial cues are highly sensitive to noise. For example, the presence of nonfacial traits, such as hair and clothing, impairs cooperation detection based on facial photographs (Bonnefon et al., 2013), whereas displaying only the inner features of the face (i.e., using facial photographs that are cropped at the ears, eyebrows and chin) improve it (Bonnefon et al., 2013, 2017). In the video clips used in the current study, clothing, hairstyle, skin tone and even body movements were available to the raters and could then impede the processing of the French raters. Further studies using facial photographs are necessary to examine whether Japanese static facial cues of altruism are readable by French raters.

This study presents several strengths and limitations. Although it is the first to investigate whether dynamic cues of altruism could be interculturally readable, the investigation is restricted to only two populations and therefore should be extended to other cultures in order to provide broader conclusions. Indeed, the fact that French raters did not correctly assess Japanese altruism does not exclude the possibility that altruistic intent would be readable across cultures that are closer, either geographically or historically. For example, anthropological research has highlighted other cultural differences than facial expressions between Eastern and Western cultures, such as differences in the relative importance of inner versus outward expression of moral beliefs (as described in: (Benedict, 1967; Frost, 2017)). In addition, it would be also interesting to carry out the reverse design with French videos and Japanese raters to examine to which extent genuine smile and its perception vary across cultures. Indeed, because Caucasian versus Japanese raters perceive smiles with greater intensities in the mouth as more and less trustworthy, respectively (Ozono et al., 2010), we can expect that high altruist Caucasian individuals would be perceived as low altruists by Japanese raters.

In conclusion, although dynamic facial traits, such as genuine smiles, do advertise altruistic intent in several populations (e.g., France: Centorrino et al., 2015; Japan: Oda, Yagamata et al., 2009; USA: Reed et al., 2012) and could thus be universal cues of altruism, the subtle variations in their dynamic and physical expressions in the face, which are strongly influenced by culture (Jack et al., 2012; Ozono et al., 2010), seem to impede their interculturally readability.

Declarations of interest

None.

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