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

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19 **Summary**

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

29

30 **Highlights**

- 31 • We examined whether dynamic facial cues of altruism are cross-culturally readable.
- 32 • French and Japanese raters observed silent video clips of Japanese individuals.
- 33 • The Japanese raters correctly assessed Japanese altruism; the French raters did not.
- 34 • Dynamic facial cues of altruism are culturally rather than universally readable.

35

36

37 **Keywords:** Cooperation, Facial expressions, Intercultural cues, Smile, Detection

38

39 **Introduction**

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

50 Discriminating between high and low altruistic individuals and estimating trustworthiness
51 and cooperativeness is a fast, spontaneous and intuitive process (Bonnefon, Hopfensitz, & De Neys,
52 2013, 2017; Dzhelyova, Perrett, & Jentsch, 2012; Todorov, 2008) that could be based on both
53 static and dynamic facial traits (e.g., Bonnefon et al., 2017; Fetchenhauer, Groothuis, & Pradel,
54 2010; Oda, Yamagata, Yabiku, & Matsumoto-Oda, 2009; Tognetti, Berticat, Raymond, & Faurie,
55 2013). For example, in trust games, decisions regarding whom to trust are biased by static traits,
56 such as attractiveness (R. K. Wilson & Eckel, 2006), similarity to kin (DeBruine, 2002) and the
57 facial width-to-height ratio (Stirrat & Perrett, 2010, 2012). Dynamic facial cues, such as expressions
58 and movements, have also been implicated in the detection of altruism. Using silent video clips of

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

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

77 In addition, several studies have shown the following: (i) highly altruistic individuals
78 exhibit more genuine smiles than less altruistic individuals (Brown et al., 2003; Centorrino, Djemai,

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

95 Using a trust game, a study conducted in France found similar results (Centorrino et al.,
96 2015); the French participants were able to predict their partner's trustworthiness based on the
97 presence of genuine smiles that were exhibited during the silent video clips. Genuine smiles
98 influenced the participant's willingness to send money to the partner. In addition, those partners

99 who were rated as smiling more genuinely returned more money on average to the senders,
100 inducing a higher payoff for both partners.

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

106 However, although facial expressions have long been considered as universal signals,
107 recent studies challenged this conjecture by showing that internal representations of emotions
108 differed between Easterners and Westerners (Jack, Caldara, & Schyns, 2012; Jack, Garrod, Yu,
109 Caldara, & Schyns, 2012, 2011). For example, Easterners show a preference for expressive
110 information in the eye region, whereas westerners predominantly feature the mouth (Jack, Caldara,
111 et al., 2012). This cultural difference in facial expressions is likely to affect the perception of some
112 personality traits, such as trustworthiness and altruism. Indeed, it has been found that Japanese
113 participants perceived faces with greater upper-half (around the eyes) smile intensity as more
114 trustworthy, whereas American participants perceived faces with greater lower-half smile intensity
115 as more trustworthy but they were not influenced by the upper-half smile intensity (Ozono et al.,
116 2010). Although genuine smile influence perceived trustworthiness in both cultures, these results
117 suggest that the way smiles are dynamically and physically expressed in the face and interpreted by
118 others differs across cultures. Hence, we also predicted that the French raters would be less accurate

119 than the Japanese raters in their assessments of Japanese' altruism.

120 To sum up, the aim of the current study was to question the cross-cultural validity
121 regarding altruism detection skills based on dynamic facial cues. To this aim, we asked French
122 subjects to estimate the altruism of Japanese individuals on the basis of silent video clips during
123 which the Japanese individuals spoke about themselves. These video clips were taken from a
124 previous experiment (Oda, Yamagata, et al., 2009), in which the authors found that altruists
125 exhibited more genuine smiles than non-altruists, enabling Japanese raters to accurately estimate a
126 target's altruism (see above). Because genuine smiles seem to be used as cues of altruistic intent in
127 different populations, such as in Japan (Oda, Naganawa, et al., 2009; Oda, Yamagata, et al., 2009),
128 France (Centorrino et al., 2015) or the USA (Reed et al., 2012), and thus could be a universal cue of
129 altruistic intent, we predicted that French raters would estimate the altruism of Japanese individuals
130 correctly. Nevertheless, because cultural difference is likely to affect facial expressions (Jack,
131 Garrod, et al., 2012) and their perception (Ozono et al., 2010), we also predicted that the French
132 raters would be less accurate than the Japanese raters in their assessments of altruism.

133

134 **Methods**

135

136 *Videotaping of Japanese individuals*

137 We used the same video clips of natural conversations that were used by Oda, Naganawa,
138 et al. (2009) and Oda, Yamagata, et al. (2009) as stimuli. To select the most versus the least

139 altruistic individuals for videotaping, we used the self-report altruism scale employed by Johnson,
140 Danko, Darvill, Bochner, Bowers, Huang, et al. (1989). This scale was previously validated by
141 showing significant differences in the number of lottery tickets shared in the dictator game between
142 those who scored in the top 10th percentile and the bottom 10th percentile (Brown et al., 2003).

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

158

159 *The detection of altruism by French raters*

160 To test whether French raters are able to estimate Japanese altruism, 151 French men and
161 252 French women (non-French were excluded for the analyses), ranging from 18 to 26 years old
162 (mean age: 19.5 years \pm 1.4 s.d) were recruited on a voluntary basis from 11 classes at the
163 University of Montpellier, France. We obtained written informed consent from all of the
164 participants.

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

176

177

178

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.

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.

179

180 *Statistical analyses*

181 We implemented linear mixed models (*lmer* function of the *lme4* package in R) to test
182 whether the French raters (non-French raters were excluded) were able to estimate the self-reported
183 altruism score of the Japanese targets. We included both the identities of the Japanese targets and
184 those of the French raters as random-effect variables to prevent potential pseudoreplication
185 problems. The response variable was the predicted altruism scores assessed by the raters (sum of
186 the 7 items of the questionnaire). We included the following three explanatory variables in the
187 models: the actual altruism score of the Japanese target (sum of the 7 items of the questionnaire),
188 and the rater’s sex and the raters’ altruism score (sum of the 7 items). We also tested the
189 interactions between the actual Japanese targets’ altruism scores with both the raters’ sex and the
190 raters’ altruism scores to examine whether the ability to detect altruistic intent was influenced by a

191 rater's sex and his/her own altruism score. We included all the main effects and interaction terms in
192 the initial model, which was then simplified by sequentially removing all the non-significant
193 interaction terms to achieve the minimal adequate model.

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

196

197 **Results**

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

202 None of the interaction terms tested in the initial linear mixed model were significant
203 (interaction with the raters' sex: $\chi^2=0.49$, $df=1$, $P=0.48$, with the raters' self-reported altruism
204 scores: $\chi^2=0.01$, $df=1$, $P=0.93$), suggesting that the raters' sex and altruism did not influence their
205 ability to assess the altruism of the Japanese targets. The minimal linear mixed model (interaction
206 terms excluded) showed no effect of the actual target altruism ($\chi^2=1.34$, $df=1$, $P=0.25$; Table 2),
207 suggesting that the French raters did not correctly assess the altruism of the Japanese targets. In
208 addition, the raters' sex did not influence the altruism scores given to the Japanese targets ($\chi^2=1.89$,
209 $df=1$, $P=0.17$; Table 2). However, the raters' altruism significantly influenced their perception of
210 the targets' altruism: the more altruistic raters gave higher altruism scores to the targets ($\chi^2=57.41$,

211 df=1, $P < 0.0001$; Table 2).

212

213

Predictor variables	Estimate	SE	χ^2	df	P -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/ <u>Men</u>	0.28	0.21	1.89	1	0.17

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.

214

215

216 Discussion

217 Although dynamic facial traits, such as a genuine smile, have been repeatedly shown to be a cue of
218 altruistic intent (Bonneton et al., 2017), only static facial traits have been shown to be
219 interculturally readable with respect to altruism detection skills (Tognetti et al., 2013). To
220 investigate whether dynamic facial cues of altruism could also be cross-cultural, we showed silent
221 video clips of Japanese individuals to French raters and examined the French raters' altruism
222 detection skills. A previous study using the same video clip stimuli found that Japanese raters were
223 able to correctly assess the altruism of the videotaped Japanese (Oda, Yamagata, et al., 2009). They

224 also found that altruists and non-altruists differed in their number of genuine smiles exhibited in the
225 videos. However, by using the same design and the same stimuli in France, our results showed that
226 the French raters were unable to assess the altruism of the Japanese targets. This result suggests that
227 dynamic facial cues of altruistic intent are intra-culturally rather than universally readable.

228 The original study, from which we used the video clips, found that the videotaped
229 Japanese likely advertised their altruistic intent through genuine smiles (Oda, Naganawa, et al.,
230 2009; Oda, Yamagata, et al., 2009). During a trust game, the French raters' decisions regarding
231 whom to trust were also influenced by their partners' genuine smiles (Centorrino et al., 2015).
232 Genuine smile is thus a likely candidate as universal cue of altruism. It is, therefore, surprising that
233 the French raters did not correctly assess the Japanese individuals' altruism based on their genuine
234 smiles in the current study. However, recent evidence has emphasized the complexities of
235 designating smiles as genuine or false (Krumhuber & Manstead, 2009). In addition, the marker of a
236 genuine smile by itself (i.e., activity of the *orbicularis oculi* muscle) seems not always reliable for
237 inferring whether a smile is spontaneous and genuine (Krumhuber & Manstead, 2009; Reed et al.,
238 2012). The difficulty in distinguishing between smile types (genuine or false), and thus, in detecting
239 altruistic intent, could be reinforced by the potential existence of cultural differences in facial
240 expressions between the French and Japanese.

241 Facial expressions have long been considered as universal signals to convey emotional
242 states that are recognized across all cultures. The *universality hypothesis* proposes that six basic
243 internal human emotions (i.e., happiness, surprise, fear, disgust, anger, and sadness) are expressed

244 using the same facial movements across all cultures (Ekman & Friesen, 1986; Ekman, Sorenson, &
245 Friesen, 1969), supporting the idea of universal recognition. However, several studies challenged
246 this conjecture by showing that internal representations of emotions differed between east Asian
247 (i.e., Chinese) and western Caucasian (i.e., Europeans) individuals (Jack, Caldara, et al., 2012; Jack,
248 Garrod, et al., 2012; Jack et al., 2011). For example, there is evidence showing that easterners show
249 a preference for expressive information in the eye region, whereas westerners predominantly feature
250 the eyebrows and mouth (Jack, Caldara, et al., 2012). Similarly, east Asians represent emotional
251 intensity essentially with eyes movements in happiness, fear, disgust, and anger, whereas west
252 Caucasians represent emotional intensity with other parts of the face (Jack, Garrod, et al., 2012).
253 These results suggest that facial expressions of emotions are culturally specific.

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

263 Dynamic facial traits were not the only potential cues of altruism available to the French

264 raters on the video clips. Static facial traits were also available to them. Several studies have shown
265 that static facial traits influence the detection of trustworthiness and altruism (Bonnenfon et al., 2013;
266 Stirrat & Perrett, 2010, 2012; Tognetti et al., 2013). In addition, one study showed that some of
267 these traits are interculturally readable between France and Senegal (Tognetti et al., 2013).
268 Although the French raters did not correctly assess Japanese altruism, we cannot rule out the
269 existence of such intercultural cues between France and Japan. Indeed, detection rates based on
270 static facial cues are highly sensitive to noise. For example, the presence of nonfacial traits, such as
271 hair and clothing, impairs cooperation detection based on facial photographs (Bonnenfon et al.,
272 2013), whereas displaying only the inner features of the face (i.e., using facial photographs that are
273 cropped at the ears, eyebrows and chin) improve it (Bonnenfon et al., 2013, 2017). In the video clips
274 used in the current study, clothing, hairstyle, skin tone and even body movements were available to
275 the raters and could then impede the processing of the French raters. Further studies using facial
276 photographs are necessary to examine whether Japanese static facial cues of altruism are readable
277 by French raters.

278 This study presents several strengths and limitations. Although it is the first to investigate
279 whether dynamic cues of altruism could be interculturally readable, the investigation is restricted to
280 only two populations and therefore should be extended to other cultures in order to provide broader
281 conclusions. Indeed, the fact that French raters did not correctly assess Japanese altruism does not
282 exclude the possibility that altruistic intent would be readable across cultures that are closer, either
283 geographically or historically. For example, anthropological research has highlighted other cultural

284 differences than facial expressions between Eastern and Western cultures, such as differences in the
285 relative importance of inner versus outward expression of moral beliefs (as described in: (Benedict,
286 1967; Frost, 2017)). In addition, it would be also interesting to carry out the reverse design with
287 French videos and Japanese raters to examine to which extent genuine smile and its perception vary
288 across cultures. Indeed, because Caucasian versus Japanese raters perceive smiles with greater
289 intensities in the mouth as more and less trustworthy, respectively (Ozono et al., 2010), we can
290 expect that high altruist Caucasian individuals would be perceived as low altruists by Japanese
291 raters.

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

298

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