

For Your Local Eyes Only: Culture-Specific Face Typicality Influences Perceptions of Trustworthiness

Perception

2017, Vol. 46(8) 914–928

© The Author(s) 2017

Reprints and permissions:

sagepub.co.uk/journalsPermissions.nav

DOI: 10.1177/0301006617691786

journals.sagepub.com/home/pec



Carmel Sofer

Behavioural Science Institute, Radboud University, Nijmegen,
The Netherlands; Department of Psychology, Ben-Gurion University
of the Negev, Beer-Sheva, Israel

Ron Dotsch

Behavioural Science Institute, Radboud University, Nijmegen,
The Netherlands; Department of Psychology, Utrecht University,
The Netherlands

Masanori Oikawa and Haruka Oikawa

Department of Psychology, Doshisha University, Kyoto, Japan

Daniel H. J. Wigboldus

Behavioural Science Institute, Radboud University, Nijmegen,
The Netherlands

Alexander Todorov

Department of Psychology, Princeton University, NJ, USA

Abstract

Recent findings show that typical faces are judged as more trustworthy than atypical faces. However, it is not clear whether employment of typicality cues in trustworthiness judgment happens across cultures and if these cues are culture specific. In two studies, conducted in Japan and Israel, participants judged trustworthiness and attractiveness of faces. In Study 1, faces varied along a cross-cultural dimension ranging from a Japanese to an Israeli typical face. Own-culture typical faces were perceived as more trustworthy than other-culture typical faces, suggesting that people in both cultures employ typicality cues when judging trustworthiness, but that the cues, indicative of typicality, are culture dependent. Because perceivers may be less familiar with other-culture typicality cues, Study 2 tested the extent to which they rely on available facial information other than typicality, when judging other-culture faces. In Study 2, Japanese and Israeli faces varied from either Japanese or Israeli attractive to unattractive with

Corresponding author:

Carmel Sofer, Ben-Gurion University of the Negev, Building 98, Beer-Sheva 84105, Israel.

Email: carmelso@post.bgu.ac.il

the respective typical face at the midpoint. For own-culture faces, trustworthiness judgments peaked around own-culture typical face. However, when judging other-culture faces, both cultures also employed attractiveness cues, but this effect was more apparent for Japanese participants. Our findings highlight the importance of culture when considering the effect of typicality on trustworthiness judgments.

Keywords

face perception, face typicality, cross-cultural perception, trustworthiness, attractiveness, familiarity

People make personality judgments from faces (Willis & Todorov, 2006; Zebrowitz & Montepare, 2008) and are highly confident in these judgments (Hassin & Trope, 2000; Todorov, Olivola, Dotsch, & Mende-Siedlecki, 2015). Face-based trustworthiness judgments are especially important as they are highly correlated with general face evaluation, accounting for 60% of the variance of social judgments from faces (Oosterhof & Todorov, 2008). These judgments are made spontaneously (Klapper, Dotsch, van Rooij, & Wigboldus, 2016) and after as little as 33 milliseconds exposure to a face (Todorov, Pakrashi, & Oosterhof, 2009).

Models of face evaluation (Oosterhof & Todorov, 2008; Sutherland et al., 2013; Todorov, Said, Engell, & Oosterhof, 2008) posit that trustworthiness judgments are influenced by subtle cues of emotional expressions and by feminine or masculine facial cues. Recently, it has been established that trustworthiness judgments are also influenced by face typicality (Dotsch, Hassin & Todorov, 2016; Sofer, Dotsch, Wigboldus, & Todorov, 2015; Todorov et al., 2015). Faces altered using morphing techniques (Sofer et al., 2015) or three-dimensional computer graphics software (Todorov et al., 2015) were judged as more trustworthy to the extent that they resembled a typical face—the average of faces in a person's environment (e.g., Rhodes, Jeffery, Watson, Clifford, & Nakayama, 2003; Todorov et al., 2015). This is consistent with prior studies showing that typical faces are judged also as more familiar than atypical faces and that familiarity predicts trustworthiness (Faerber, Kaufmann, Leder, Martin, & Schweinberger, 2016) and safety judgments (Zebrowitz, Bronstad, & Lee, 2007). Given the importance of culture for social perception (Kashima, 2000), an important question concerns the cross-cultural generalizability of this typicality effect. After all, most people are exposed to primarily own-culture faces. If the typical face is formed from repeated exposure to local faces (e.g., Apicella, Little, & Marlowe, 2007; Bar-Haim, Ziv, Lamy, & Hodes, 2006; Valentine, 1991; Zebrowitz et al., 2007), then people from different cultures should form different typical faces. This hypothesis raises two distinct questions. First, because previous studies (Sofer et al., 2015; Todorov et al., 2015) tested for typicality effects only within a single culture, the question remains to what extent people from other cultures also employ typicality cues when judging trustworthiness from faces. This question pertains to whether the process of employing typicality cues in trustworthiness judgments can be generalized across cultures. The second question pertains to the culture specificity of typicality cues. Even if the process of employing typicality cues in trustworthiness judgments is generalizable across cultures, what is considered to be a typical face may differ across cultures. This is because people from different cultures are exposed to different sets of faces (predominantly culture-specific faces; Jaquet, Rhodes, & Hayward, 2008; Little, DeBruine, Jones, & Waitt, 2008).

Here, we test (a) whether the face typicality effect on perceived trustworthiness is a process generalizable across cultures and (b) whether the typicality cues used in trustworthiness

judgments are culture specific. To the extent that trustworthiness judgments depend on face typicality (Sofer et al., 2015; Todorov et al., 2015), they should be influenced by the variation in face typicality cues across cultures. In other words, if the typical face is formed from repeated exposure to local faces, other-culture faces should be more distant (as a group) from the typical face than own-culture faces and consequently, should be judged as less trustworthy. This is consistent with prior studies showing that atypical faces are also judged as less familiar than typical faces, and that familiarity leads to a positive attitude toward the in-group and a negative attitude toward out-groups (Zebrowitz et al., 2007).

To examine the hypotheses that typicality-based trustworthiness judgment is culturally universal in terms of process and culture dependent in terms of the specific typicality cues driving trustworthiness judgment, we conducted two studies in Japan and Israel. In Study 1, female participants judged either trustworthiness or attractiveness of the same set of female faces, varying along a cross-cultural continuum of morphs ranging from a Japanese to an Israeli typical face. In Study 2, female participants judged trustworthiness or attractiveness of either own-culture or other-culture faces, varying between atypical-attractive and atypical-unattractive face composites with the corresponding typical face located at the midpoint. The objectives of Study 2 were to (a) replicate the findings of Study 1 for own-culture faces and (b) to test whether perceivers rely on attractiveness cues when judging other-culture faces on trustworthiness. To the best of our knowledge, this is the first time that the influence of face typicality on perceived trustworthiness was compared between two cultures.

Study 1

Our primary hypothesis is that own-culture typicality cues drive trustworthiness judgments in both cultures (process generalizability) and that those typicality cues are culture specific. If people from both cultures employ typicality cues in trustworthiness judgments and those cues are culture specific rather than universal, in both cultures we should observe that the own-culture typical face is judged as more trustworthy than the other-culture typical face.

For attractiveness judgments, given their cultural universality (e.g., Cunningham, Roberts, Barbee, Druen, & Wu, 1995; Langlois et al., 2000; Perrett, May, & Yoshikawa, 1994), we expected the same faces to be judged as attractive across cultures. Moreover, in line with earlier research indicating that mixed-culture faces were judged as more attractive than own-culture faces, we expected mixed-culture faces to be judged as more attractive than culture-specific typical faces (Little, Hockings, Apicella, & Sousa, 2012; Rhodes et al., 2005).

Method

Participants. Japanese female students ($n = 35$)¹ from the Doshisha University of Kyoto aged 19 to 23 years old ($M = 20.26$) completed the study in the lab for course credit. Israeli female students ($n = 42$) from Hebrew University of Jerusalem and from Tel Aviv University, aged 19 to 28 years old ($M = 23.64$) completed the study from their homes at their own pace for either course credit or for participation in a drawing of three \$10 prizes.

Stimuli. The stimuli consisted of a Japanese typical face (Figure 1, left) and an Israeli typical face (Figure 1, right) plus 9 transforms derived from them, resulting in 11 faces that varied from 100% Japanese (0% Israeli) to 0% Japanese (100% Israeli; Figure 1) in shape and reflectance. The Japanese typical face was a digital average of the shape and reflectance of 76 Japanese faces aged 20 to 26 years old. The Israeli typical face was the average of 92 Israeli faces aged 23 to 31 years old. The original images were cropped, scaled, and preprocessed to

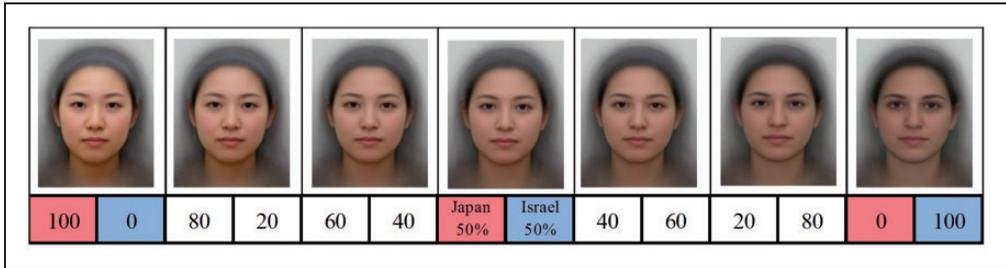


Figure 1. Face transformation between Japanese (left image) and Israeli (right image) typical faces. The number on the left below the image indicates the Japanese contribution (in %) while the number on the right below the image indicates the Israeli contribution to the image. For example, the face on the extreme left is 100% Japanese to 0% Israeli, the face on the extreme right is 0% Japanese to 100% Israeli, and the face in the middle is 50% Japanese to 50% Israeli.

remove earrings and marked with 180 corresponding points before being averaged, using PsychoMorph 5 software (Tiddeman, Burt, & Perrett, 2001).

Design and procedure. Participants, randomly assigned to a condition, were asked to judge the 11 face transforms on either trustworthiness ($n_{Japanese}=19$, $n_{Israeli}=19$) or attractiveness ($n_{Japanese}=16$, $n_{Israeli}=23$) using 9-point scales ranging from 1 (*definitely not trait*) to 9 (*definitely trait*). Faces were judged in random order within a set, and the same set was judged three times.

Instructions were written in English, translated to the local language, and then translated back to English for verification by another English speaker.

Results. We analyzed our data using SPSS statistics 20. We averaged the three trustworthiness or attractiveness judgments of each face for each participant (Cronbach's alphas were $>.95$).

The independent variable, distance from the own-culture typical face (DFT), was coded such that 0% reflected the own-culture typical face (the 100% Japanese typical face for Japanese participants and the 100% Israeli typical face for Israeli participants), whereas 100% reflected the other-culture typical face (the 100% Israeli typical face for Japanese participants and the 100% Japanese typical face for Israeli participants).

Figure 2(a) and (b) shows the average trustworthiness and attractiveness judgments, respectively, as a function of the DFT.

As predicted, trustworthiness judgments of both Japanese and Israeli participants increased as faces moved closer to the own-culture typical face, with a slight decrease very near the own-culture typical face. Attractiveness judgments peaked around the middle of the face continuum, although Israeli judgments were nearly flat.

These observations were supported by two separate analyses of variance for trustworthiness and attractiveness judgments with DFT (11 levels) as repeated measures, and participant culture (Japanese vs. Israeli) as between-subject factors.

Trustworthiness judgment. The main effect of DFT was significant, $F(2.27, 81.69)=18.08$, $p < .001$, $\eta_p^2 = .33$,² showing that participants in both cultures used typicality information in their trustworthiness judgments.

We observed no main effect of participant culture, $F(1, 36)=2.04$, $p = .162$, nor an interaction between DFT and participant culture, $F(2.27, 81.69)=1.09$, $p = .348$, indicating that DFT similarly influenced Japanese and Israeli judgments of own- and other-culture faces.

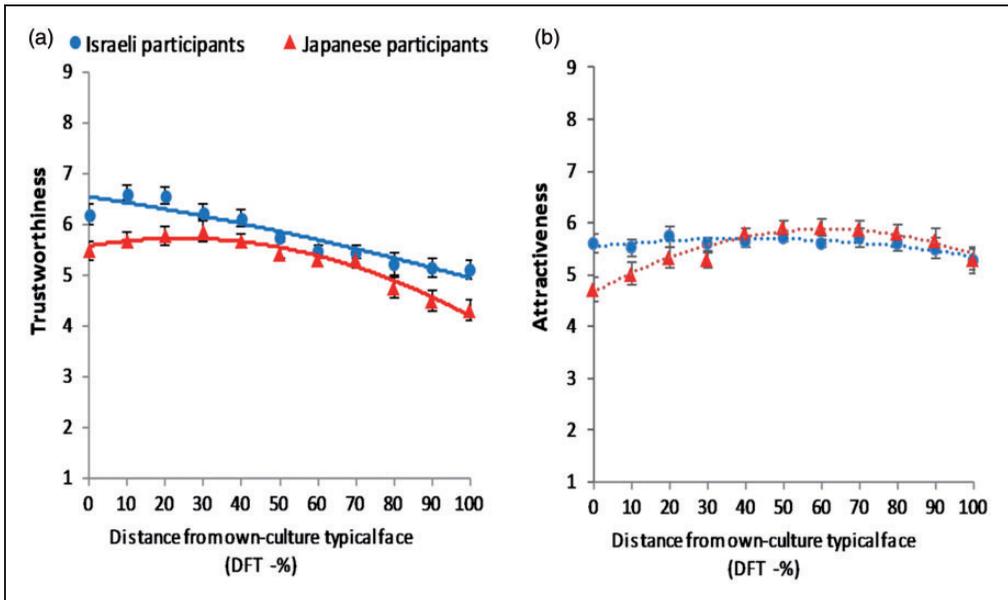


Figure 2. (a) Trustworthiness judgments of Japanese and Israeli participants as a function of the distance (DFT) from own-culture typical face. (b) Attractiveness judgments of Japanese and Israeli participants as a function of the distance (DFT) from own-culture typical face. In both figures, error bars (some too short to be seen here) represent within-subjects standard errors calculated in accordance with Cousineau (2005).

Follow-up analyses of Japanese participants showed a linear effect for trustworthiness judgments, $F_{linear}(1, 18) = 10.20$, $p = .005$, $\eta_p^2 = .36$, indicating that Japanese participants judged faces as more trustworthy when they resembled the typical Japanese face than when they resembled the typical Israeli face. A quadratic effect, $F_{quadratic}(1, 18) = 18.26$, $p < .001$, $\eta_p^2 = .50$, indicated that judgments slightly decreased near the Japanese typical face.

For Israelis, there was only a significant linear effect of trustworthiness judgments, $F_{linear}(1, 18) = 16.36$, $p < .001$, $\eta_p^2 = .48$; $F_{quadratic}(1, 18) = 1.02$, $p = .326$, indicating that Israeli participants judged faces as more trustworthy when they resembled the typical Israeli face than when they resembled the typical Japanese face. In both cultures, trustworthiness judgments dropped slightly near the own-culture typical face. It is possible that these drops result from a competition between early experience which shapes the perception of own-culture typicality in one's environment and the tendency to rapidly learn the average of a specific face set (Dotsch et al., 2016; Todorov et al., 2015). Accordingly, in the present study, it is possible that rapid adaptation to the stimulus faces (Rhodes et al., 2003) shifted the judgment a bit toward the set's midpoint.

Attractiveness judgment. The main effect of DFT was significant, $F(1.93, 71.53) = 3.70$, $p = .031$, $\eta_p^2 = .09$,² indicating that both Japanese and Israeli participants employed culture-specific typicality cues in their attractiveness judgments. We observed no main effect of participant culture, $F(1, 37) = .003$, $p = .85$, nor an interaction between DFT and participant culture, $F(1.93, 71.53) = 1.51$, $p = .27$, indicating that DFT similarly influenced Japanese and Israeli judgments of own- and other-culture faces.

Follow-up analyses of Japanese participants showed a quadratic effect, $F_{quadratic}(1, 15) = 17.66$, $p < .001$, $\eta_p^2 = .54$, but no significant linear effect, $F_{linear}(1, 15) = 2.38$, $p = .144$. Similarly, for Israelis there was a small quadratic effect, $F_{quadratic}(1, 22) = 6.40$, $p = .019$, $\eta_p^2 = .23$, and no significant linear effect ($F_{linear}(1, 23) < 1$). Statistically, these results indicate that both Japanese and Israeli participants judged the mixed-culture face as more attractive than either the typical Japanese face or the typical Israeli face, although, as shown in Figure 2(b), this pattern was not pronounced for Israeli participants. The findings are in line with Rhodes et al. (2005) and Little et al. (2012) who found that mixed-culture faces were judged as more attractive than own-culture composite faces, due to their healthier appearance (Rhodes et al., 2005).

Study 2

In Study 1, own-culture typical faces were judged as more trustworthy than other-culture typical faces. These findings support our two primary hypotheses: Participants in both cultures employed typicality information in their trustworthiness judgments, and the typicality cues that they used were culture specific. In contrast, attractiveness judgments followed similar patterns in both cultures, peaking around the mixed-culture face, although the peak was more pronounced for Japanese judgments.

We conducted a second study in Japan and Israel to examine whether perceivers may use attractiveness cues when judging other-culture faces on trustworthiness because in such cases they would have less access to typicality information. Because previous studies have demonstrated that judgments of trustworthiness and attractiveness are generally highly correlated (Oosterhof & Todorov, 2008), it was critical to use a set of faces that follows different trends on these two judgments. Sofer et al. (2015) demonstrated that these judgments can be dissociated in a continuum of faces ranging from atypical attractive to atypical unattractive with a typical face midpoint. In the current studies, we used the same approach to create an Israeli and a Japanese continuum: Japanese and Israeli female participants judged trustworthiness or attractiveness of either own-culture or other-culture faces, varying between atypical-attractive and atypical-unattractive face composites with the corresponding typical face located at the midpoint.

In line with previous findings (Sofer et al., 2015), we expected that perceivers would judge their own-culture typical face as the most trustworthy in a set of own-culture faces. We hypothesized that trustworthiness judgments of other-culture faces would follow a different trend. If participants would employ only own-culture typicality cues, they would judge every other-culture face equally untrustworthy given that they are all distant from the own-culture typical face. Alternatively, perceivers could rely on other-culture typicality cues, if they have knowledge of those cues. However, when knowledge of those cues is reduced, for instance, due to a limited exposure to other-culture faces, we propose that perceivers would rely on other available valenced cues, which can serve as heuristic cues for trustworthiness. Assuming that the participants in our sample are indeed less familiar with other-culture typical facial cues, we expected both Japanese and Israeli participants to rely on attractiveness cues, given the general preference for attractive faces (Dion, Berscheid, & Walster, 1972) and the cultural universality of attractiveness judgment (e.g., Cunningham et al., 1995; Rhodes et al., 2001). Specifically, we expected that trustworthiness judgments of other-culture faces would track attractiveness, as indicated by a shift of the trustworthiness peak toward the atypical-attractive face, while trustworthiness judgments of own-culture faces would mainly track own-culture typicality, peaking at the typical face. For attractiveness judgments, given their cultural universality, we expected the judgments in

both cultures to linearly increase from the atypical-unattractive composite face toward the atypical-attractive one, past the typical face.

Method

Participants. Japanese female students ($n = 114$)¹ from the Doshisha University of Kyoto, aged 20 to 22 years old ($M = 20.38$), completed the study in the lab for course credit. Israeli female students ($n = 112$) from the Hebrew University of Jerusalem and from Tel Aviv University, aged 17 to 30 years old ($M = 23.98$), completed the study from their homes at their own pace for either course credit or for participation in a drawing of three \$10 prizes.

Stimuli. We used Japanese and Israeli typical faces and their respective attractive-composite faces to create two sets of face transforms, ranging from atypical-attractive to atypical-unattractive faces, following the procedure of Sofer et al. (2015). Each stimulus set consisted of a typical face and the respective attractive-composite face, plus nine face transforms. The faces were created by adding to or subtracting from the typical face a percentage (varying between 0% and 100% in increments of 20%) of the difference in shape and reflectance between the typical and attractive-composite faces.

Japanese stimuli set. The Japanese stimuli set (Figure 3) consisted of 11 face transforms, which varied between a Japanese atypical-attractive face (100% DFT) and an atypical-unattractive face (−100% DFT), with the Japanese typical face located at the midpoint (0% DFT). The Japanese attractive-composite face (Figure 3, DFT = 100%) was developed by a digital averaging process (PsychoMorph ver 5; Tiddeman et al., 2001). This attractive-composite face was a shape and reflectance average of the faces of five out of six Miss Japan beauty pageant winners from 2008 to 2013 taken from the Internet. The sets were averaged to create six candidate attractive composites of five faces each (leaving a different face out in every composite).

Each of the six face composites were judged on attractiveness by 26 Japanese female judges, using 9-point scales ranging from 1 (*definitely not attractive*) to 9 (*definitely*

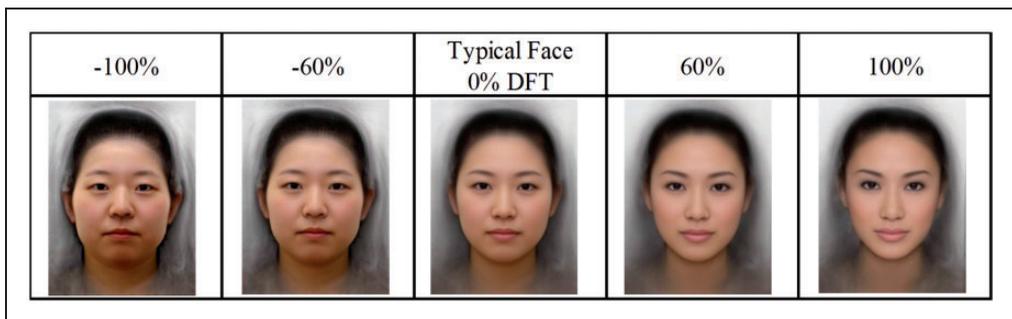


Figure 3. A subset of the Japanese face stimuli, used in Study 2. The faces were created by adding to or subtracting from the typical face a percentage (varying between 0% and 100% in increments of 20%) of the difference in shape and reflectance between the Japanese typical and Japanese attractive-composite faces. Thus, the typical face was at the midpoint of the continuum, and the endpoints of the continuum were an atypical-unattractive composite face (difference from the typical face, or DFT = 100%) and the atypical-attractive composite face (DFT = +100%).



Figure 4. A subset of the Israeli face stimuli, used in Study 2. The faces were created by adding to or subtracting from the typical face a percentage (varying between 0% and 100% in increments of 20%) of the difference in shape and reflectance between the Israeli typical and Israeli attractive-composite faces. Thus, the typical face was at the midpoint of the continuum, and the endpoints of the continuum were an atypical-unattractive composite face (difference from the typical face, or DFT = 100%) and the atypical-attractive composite face (DFT = +100%).

attractive), $M = 5.01$, $SD = 1.24$. The most attractive composite ($M = 5.54$, $SD = 1.22$) was selected. The original images were cropped, scaled, preprocessed to remove earrings and excess makeup and marked with 180 corresponding points before being averaged. The Japanese typical face (Figure 3, DFT=0%) was developed by a digital averaging process akin to that of Study 1, using 76 Japanese faces representative of the experiment's sampled population plus the five attractive faces from the attractive-composite face.

Israeli stimuli set. The Israeli stimuli face set (Figure 4) was created similarly to the Japanese set. The Israeli attractive-composite face (Figure 4, DFT=100%) was developed using images of five Miss Israel beauty pageant winners from the same years (2008–2013). Images were preprocessed and digitally averaged similarly to the Japanese attractive composite. The Israeli typical face (Figure 4, DFT=0%) was developed in a similar manner but consisted of 92 Israeli faces used in Study 1 plus the five attractive faces from the attractive-composite face.

Design and procedure. The design for either trustworthiness or attractiveness was a 2 (Face culture: own culture vs. other culture) \times 2 (Participant culture: Japanese vs. Israeli) between-subjects design.

In each of the two cultures (Japanese and Israeli), participants were randomly assigned to a condition and asked to judge a range of 11 face transforms of own-culture or other-culture faces on either trustworthiness (Japanese participants, $n_{\text{own}} = 28$, $n_{\text{other}} = 29$; Israeli participants, $n_{\text{own}} = 28$, $n_{\text{other}} = 26$) or attractiveness (Japanese participants, $n_{\text{own}} = 28$, $n_{\text{other}} = 29$; Israeli participants, $n_{\text{own}} = 27$, $n_{\text{other}} = 29$), using 9-point scales ranging from 1 (*definitely not trait*) to 9 (*definitely trait*). Faces were judged in random order within a set, and the same set was judged three times. Instructions were written in English, translated to the local language, and then translated back to English for verification by another English speaker.

Results. We averaged the three trustworthiness or attractiveness judgments of each face for each participant except for 4% of the Israeli cases in which fewer judgments were averaged

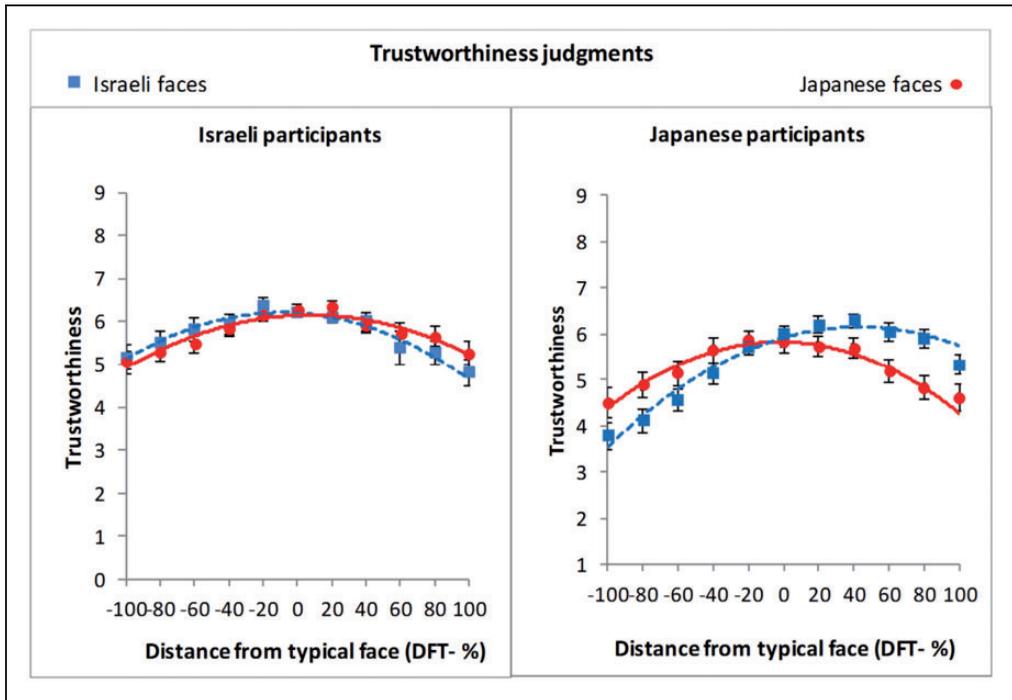


Figure 5. The influence of distance from typical face (DFT) on perceived trustworthiness in Japanese and Israeli cultures. Error bars (some too short to be seen here) represent within-subjects standard errors calculated in accordance with Cousineau (2005).

because some observations of 13 participants were unrecorded due to either a technical issue or because participants did not finish the experiment.

In two other cases, only two judgments were averaged because an implausible data point was recorded (a value of 11 on a 1–9 scale). All Cronbach's alphas were greater or equal to .80.

Figure 5 shows the average trustworthiness judgments of Japanese and Israeli participants judging own-culture and other-culture faces as a function of DFT. For both Japanese and Israeli participants, trustworthiness judgments of own-culture faces peaked very close to the own-culture typical face. Moving away from the typical face in either direction along the typicality-attractiveness dimension decreased the perceived trustworthiness of the face. In contrast, trustworthiness judgments of other-culture faces peaked not around the typical face, but closer to the atypical-attractive face. This effect was more apparent for Japanese participants.

Figure 6 shows the average attractiveness judgments of both Japanese and Israeli participants judging attractiveness of own-culture and other-culture faces as a function of DFT. Attractiveness judgments of both Japanese and Israeli participants kept increasing from the unattractive face (–100% DFT) past the typical faces as faces moved closer to the attractive face (100% DFT).

These observations were supported by two separate analyses of variance for trustworthiness and attractiveness judgments with DFT (11 levels) as repeated measures, face culture (other-culture faces vs. own-culture faces), and participant culture (Japanese, Israeli) as between-subject factors.

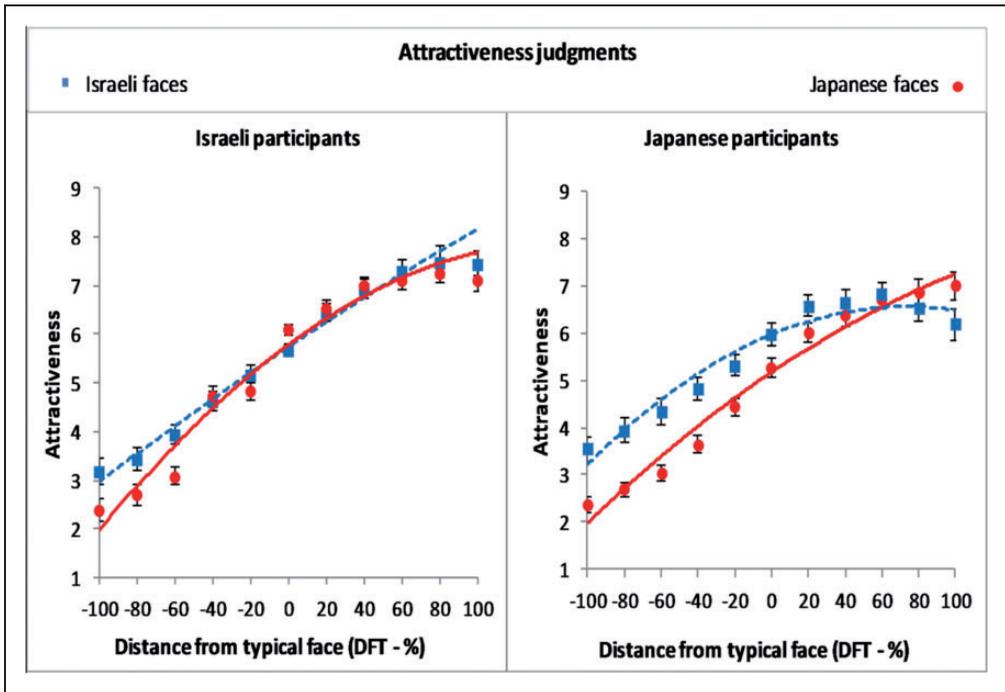


Figure 6. The influence of distance from a typical face (DFT) on perceived attractiveness in Japanese and Israeli cultures. Error bars (some too short to be seen here) represent within-subjects standard errors calculated in accordance with Cousineau (2005).

Trustworthiness judgment. For trustworthiness judgment, the main effect of DFT was significant, $F(1.91, 204.84) = 24.04$, $p < .001$, $\eta_p^2 = .18$.² We observed no significant main effects of participant culture, $F(1, 107) = 3.72$, $p = .058$, or face culture, $F(1, 107) = .24$, $p = .622$.

Importantly, we observed an interaction between DFT and face culture, $F(1.91, 204.84) = 4.64$, $p = .012$, $\eta_p^2 = .04$, suggesting that both Japanese and Israeli participants, differentially judged trustworthiness of own- versus other-culture faces as a function of DFT, employing attractiveness cues when judging trustworthiness of other-culture faces. We observed no other interactions.

We conducted follow-up tests to analyze the trustworthiness judgment trends of Japanese and Israeli participants. For Japanese participants, trustworthiness judgments of own-culture faces showed a significant quadratic effect of DFT, $F_{quadratic}(1, 27) = 50.98$, $p < .001$, $\eta_p^2 = .65$, indicating that perceived trustworthiness was affected by distance from the typical face and not by attractiveness (along the typicality-attractiveness dimension; $F_{linear}(1, 27) < 1$). For other-culture faces, there was a strong quadratic effect, $F_{quadratic}(1, 28) = 54.47$, $p < .001$, $\eta_p^2 = .66$, and a weaker linear effect, $F_{linear}(1, 28) = 21.62$, $p < .001$, $\eta_p^2 = .44$, indicating that both distance from the typical face and attractiveness affected perceived trustworthiness.

For Israeli participants, trustworthiness judgments of own-culture faces showed a significant quadratic effect of DFT, $F_{quadratic}(1, 27) = 45.50$, $p < .001$, $\eta_p^2 = .63$; $F_{linear}(1, 27) < 1$. This was similar for other-culture faces, $F_{quadratic}(1, 25) = 35.25$, $p < .001$, $\eta_p^2 = .58$; $F_{linear}(1, 25) < 1$. These results suggest that Israeli participants judging

trustworthiness of both own- and other-culture faces were affected by (respective) typicality cues and much less so by attractiveness cues.

Attractiveness judgment. For attractiveness judgments, the main effect of DFT was significant, $F(2.14, 232.74) = 311.56$, $p < .001$, $\eta_p^2 = .74$.² We observed no significant main effects of participant culture, $F(1, 109) = 2.13$, $p = .15$, or face culture, $F(1, 109) = 0.60$, $p = .44$.

We observed interactions between DFT and participant culture, $F(2.14, 232.74) = 4.74$, $p < .010$, $\eta_p^2 = .04$, as well as between DFT and face culture, $F(2.14, 232.74) = 4.82$, $p < .010$, $\eta_p^2 = .02$. Also we observed an unexpected significant three-way interaction between DFT, participant culture, and face culture, $F(2.14, 232.74) = 4.02$, $p = .017$, $\eta_p^2 = .04$, suggesting that Japanese and Israeli participants differentially judged attractiveness of own- versus other-culture faces as a function of DFT.

Therefore, we conducted follow-up tests to analyze the attractiveness judgment trends of Japanese and Israeli participants. For Japanese's attractiveness judgments of own-culture faces, there was a strong linear effect, $F_{linear}(1, 27) = 182.05$, $p < .001$, $\eta_p^2 = .87$, and a much weaker quadratic effect, $F_{quadratic}(1, 27) = 6.39$, $p < .001$, $\eta_p^2 = .19$. Similarly, for other-culture faces, there was a linear effect, $F_{linear}(1, 27) = 43.52$, $p < .001$, $\eta_p^2 = .58$, and a quadratic effect, $F_{quadratic}(1, 27) = 31.91$, $p < .001$, $\eta_p^2 = .58$.

For Israelis' attractiveness judgments of own-culture faces, there was a strong linear effect, $F_{linear}(1, 26) = 180.53$, $p < .001$, $\eta_p^2 = .87$, and a much weaker quadratic effect, $F_{quadratic}(1, 26) = 10.38$, $p < .005$, $\eta_p^2 = .29$. For other-culture faces, there was a linear effect, $F_{linear}(1, 28) = 119.61$, $p < .001$, $\eta_p^2 = .81$, and a quadratic effect, $F_{quadratic}(1, 26) = 72.13$, $p < .001$, $\eta_p^2 = .72$.

Thus, across all four trend analyses, the linear effect of attractiveness was strong. This is also consistent with the high correlation between the attractiveness judgments of the two cultures, $r_{(Israeli_faces)} = .96$, $p < .001$; $r_{(Japanese_faces)} = .98$, $p < .001$. These findings suggest that (a) in both cultures, attractiveness judgments of both own- and other-culture faces included mostly linear (and weaker quadratic) components within the testing range of the study and (b) attractiveness was judged similarly across cultures, consistent with previous studies (e.g., Langlois et al., 2000; Perrett et al., 1994).

Model fitting—trustworthiness and attractiveness judgments. To find the predicted DFT where trustworthiness and attractiveness judgments reached a maximum, we fitted a quadratic model using the Levenberg–Marquardt algorithm for nonlinear curve fitting (Levenberg, 1944; Marquardt, 1963) to the mean trustworthiness and attractiveness judgments of both own-culture and other-culture face-sets. For Japanese participants, trustworthiness judgments of own-culture faces peaked at -2.5% DFT, at the own-culture typical face. However, trustworthiness judgments of other-culture faces peaked at 55% DFT (distant from the other-culture typical face), indicating that for the Japanese participants, the Israeli typical face is yet another face in a face continuum. For Israeli participants, trustworthiness judgments peaked at -8.8% DFT, close to the own-culture typical face. However, trustworthiness judgments of other-culture faces were estimated to peak at 7.5% DFT, only slightly farther from the other-culture typical face toward the atypical-attractive face, another indication that for Israeli participants, the trustworthiness judgment peak was close to the other-culture typical face.

Attractiveness judgments of both Japanese and Israelis, judging own- and other-culture faces, were estimated to peak well outside of the tested range of the present experiment,³ indicating that attractiveness judgments include a highly linear component within the range of the present study. This corresponds to previous studies (DeBruine, Jones, Unger, Little, &

Feinberg, 2007; Sofer et al., 2015), which found that the maximal attractiveness judgment is at DFTs higher than 100%.

General Discussion

In two bicultural studies, face typicality proved to be an important determinant of perceived trustworthiness within a culture and across cultures. In both studies, when the own-culture typical face was present, people judged it as more trustworthy than other faces, including the other-culture typical face. Within a culture, moving away from the own-culture typical face in either direction decreased its perceived trustworthiness. These results support our primary hypotheses that typicality drives trustworthiness judgments across cultures (process generalizability), while at the same time, the specific features that are perceived to be typical differ across cultures (culture specificity), at least in the two cultures considered here.

In our second study, we once more found support for our primary hypotheses when participants judged own-culture faces: Trustworthiness peaked around the own-culture typical face. When judging other-culture faces, presumably without any variation in own-culture typicality cues, we expected that in both cultures people would employ attractiveness cues and rely on these cues of valence for their trustworthiness judgments. As predicted, we found that both Japanese and Israelis employed attractiveness cues when judging trustworthiness of other-culture faces, but the effect was more apparent for Japanese participants. As predicted, for Japanese participants judging Israeli faces, the trustworthiness judgments peak shifted away from the typical face and toward the atypical-attractive face. For Israeli participants judging Japanese faces, this shift was significant, although smaller.

Judgment of other-culture faces as less trustworthy can also be attributed to negative attitudes toward out-groups. According to the attitudinal explanation, the more someone looks like a member of an out-group, the more negative he or she is evaluated (e.g., Zebrowitz et al., 2007), regardless of typicality. Typicality and attitudinal hypotheses are not mutually exclusive. The attitudinal hypothesis may explain the findings of Study 1, but it cannot explain the findings of Study 2. In Study 2, Israeli participants judged their own- and other-culture faces (including the typical faces) as equally trustworthy, and Japanese participants judged the most trusted Israeli face as more trustworthy than any of the Japanese faces, contradicting the attitudinal explanation. Furthermore, in both cultures, participants judged the other-culture typical face as more trustworthy than other, other-culture faces, indicating that typicality matters.

In the present study, we used female faces as stimuli (DeBruine et al., 2007; Perrett et al., 1994; Sofer et al., 2015). Men and women evaluate feminized faces differently (Rhodes, Hickford, & Jeffery, 2000), and this differential evaluation can affect trustworthiness judgments. To avoid such effects, we chose a priori to use only female judges. Using only female faces and judges is a limitation of the present study. However, in a recent study (Sofer, Dotsch, Wigboldus, & Todorov, under review), face typicality predicted trustworthiness judgments in both female and male participants. These findings are in line with other studies in which no gender differences in judgments of trustworthiness of female or male faces were observed (Stirrat & Perrett, 2010). The findings also corroborate previous studies that combined male and female results, implicitly assuming that there are no gender differences in recognition and judgment of face typicality (e.g., DeBruine et al., 2007; Vokey & Read, 1992), as well as perceived trustworthiness within and across cultures (e.g., Birkás, Dzhelyova, Lábadi, Bereczkei, & Perrett, 2014; Oosterhof & Todorov, 2008; Van't Wout & Sanfey, 2008). Nevertheless, future research should explicitly test for gender differences in an experimental setting, using male and female faces judged by both genders.

Another possible limitation is the artificial nature of the stimuli. Although it can be considered a standard approach in this research field, it may pose a boundary condition for our findings.

Prior work that tested the influence of facial cues on perceived trustworthiness of faces has focused on inferences from faces from one's own culture, implicitly assuming that trustworthiness judgments are based on the same universal cues (e.g., Oosterhof & Todorov, 2008; Walker & Vetter, 2009; Zebrowitz, Voinescu, & Collins, 1996). Therefore, the most important contribution of the present studies is to demonstrate that (a) face typicality influences trustworthiness judgment in a cultural-specific manner, in that cultures may differ on what facial cues are considered typical—and consequently, trustworthy and (b) the face typicality effect on trustworthiness judgments is general in that all cultures may employ own-culture typicality cues in trustworthiness perception (at least for own-culture faces). An important methodological implication of the present studies is that researchers who study the influence of typicality on face perception should use face stimuli, which are representative of the participants' face environments. The most important theoretical implication of our results is that formal models of social attributions from faces need to integrate specific cultural variables to fully account for the determinants of perceived trustworthiness.

Acknowledgement

All data and material have been made publicly available via Open Science Framework and can be accessed at <https://osf.io/9w2vf>.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by the U.S.–Israel Binational Science Foundation, 2013417 (to A. T.), the Young Scientist (A)–Grant 246–83–020 of the Japan Society for the Promotion of Science (JSPS; to M. O.), and the research fellow grant of the Japan Society for the Promotion of Science (JSPS; to H. O.).

Notes

1. In four previous studies that tested the effect of face typicality on perceived trustworthiness (Sofer et al., 2015; Sofer et al., under review), sample size ranged between $n = 22$ and $n = 33$, yielding an observed power approaching one for all quadratic contrasts of face typicality.
2. Sphericity assumption was not met. Results are reported with Greenhouse-Geisser correction.
3. Although the model predicts the DFT by which attractiveness judgments of own- and other-culture faces could peak (e.g., 480%), according to the model, these peaks could only be reached at a judgment values >9 , above the ceiling of our scale. Therefore, we can only estimate the judgment to peak well outside of the tested range.

References

- Apicella, C. L., Little, A. C., & Marlowe, F. W. (2007). Facial averageness and attractiveness in an isolated population of hunter-gatherers. *Perception, 36*, 1813.
- Bar-Haim, Y., Ziv, T., Lamy, D., & Hodes, R. M. (2006). Nature and nurture in own-race face processing. *Psychological Science, 17*, 159–163.
- Birkás, B., Dzhelyova, M., Lábadi, B., Bereczkei, T., & Perrett, D. I. (2014). Cross-cultural perception of trustworthiness: The effect of ethnicity features on evaluation of faces' observed trustworthiness across four samples. *Personality and Individual Differences, 69*, 56–61.
- Cousineau, D. (2005). Confidence intervals in within-subject designs: A simpler solution to Loftus and Masson's method. *Tutorials in Quantitative Methods for Psychology, 1*, 42–45.
- Cunningham, M. R., Roberts, A. R., Barbee, A. P., Druen, P. B., & Wu, C.-H. (1995). Their ideas of beauty are, on the whole, the same as ours: Consistency and variability in the cross-cultural perception of female physical attractiveness. *Journal of Personality and Social Psychology, 68*, 261.
- DeBruine, L. M., Jones, B. C., Unger, L., Little, A. C., & Feinberg, D. R. (2007). Dissociating averageness and attractiveness: Attractive faces are not always average. *Journal of Experimental Psychology: Human Perception and Performance, 33*, 1420.
- Dion, K., Berscheid, E., & Walster, E. (1972). What is beautiful is good. *Journal of Personality and Social Psychology, 24*, 285–290.
- Dotsch, R., Hassin, R., & Todorov, A. (2016). Statistical learning shapes face evaluation. *Nature Human Behaviour, 1*, 0001.
- Faerber, S. J., Kaufmann, J. M., Leder, H., Martin, E. M., & Schweinberger, S. R. (2016). The role of familiarity for representations in norm-based face space. *PloS One, 11*, e0155380.
- Jaquet, E., Rhodes, G., & Hayward, W. G. (2008). Race-contingent aftereffects suggest distinct perceptual norms for different race faces. *Visual Cognition, 16*, 734–753. doi:10.1080/13506280701350647
- Hassin, R., & Trope, Y. (2000). Facing faces: Studies on the cognitive aspects of physiognomy. *Journal of Personality and Social Psychology, 78*, 837.
- Kashima, Y. (2000). Conceptions of culture and person for psychology. *Journal of Cross-Cultural Psychology, 31*, 14–32.
- Klapper, A., Dotsch, R., van Rooij, I., & Wigboldus, D. H. J. (2016). Do we spontaneously form stable trustworthiness impressions from facial appearance? *Journal of Personality and Social Psychology, 111*, 655–664.
- Langlois, J. H., Kalakanis, L., Rubenstein, A. J., Larson, A., Hallam, M., & Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychological Bulletin, 126*, 390.
- Levenberg, K. (1944). A method for the solution of certain problems in least squares. *Quarterly of Applied Mathematics, 2*, 164–168.
- Little, A., Hockings, K. J., Apicella, C. L., & Sousa, C. (2012). Mixed-ethnicity face shape and attractiveness in humans. *Perception, 41*, 1486–1496.
- Little, A. C., DeBruine, L. M., Jones, B. C., & Waitt, C. (2008). Category contingent aftereffects for faces of different races, ages and species. *Cognition, 106*, 1537–1547. Retrieved from <http://dx.doi.org/10.1016/j.cognition.2007.06.008>
- Marquardt, D. W. (1963). An algorithm for least-squares estimation of nonlinear parameters. *Journal of the Society for Industrial & Applied Mathematics, 11*, 431–441.
- Oosterhof, N. N., & Todorov, A. (2008). The functional basis of face evaluation. *Proceedings of the National Academy of Sciences, 105*, 11087.
- Perrett, D., May, K., & Yoshikawa, S. (1994). Facial shape and judgements of female attractiveness. *Nature, 368*, 239–242.
- Rhodes, G., Hickford, C., & Jeffery, L. (2000). Sex-typicality and attractiveness: Are supermale and superfemale faces super-attractive? *British Journal of Psychology, 91*, 125–140.
- Rhodes, G., Jeffery, L., Watson, T. L., Clifford, C. W. G., & Nakayama, K. (2003). Fitting the mind to the World. *Psychological Science, 14*, 558.

- Rhodes, G., Lee, K., Palermo, R., Weiss, M., Yoshikawa, S., Clissa, P., ... Jeffery, L. (2005). Attractiveness of own-race, other-race, and mixed-race faces. *Perception*, *34*, 319–340.
- Rhodes, G., Yoshikawa, S., Clark, A., Lee, K., McKay, R., & Akamatsu, S. (2001). Attractiveness of facial averageness and symmetry in non-Western cultures: In search of biologically based standards of beauty. *Perception*, *30*, 611–625.
- Sofer, C., Dotsch, R., Wigboldus, D. H., & Todorov, A. (2015). What is typical is good: The influence of face typicality on perceived trustworthiness. *Psychological Science*, *26*, 39–47.
- Sofer, C., Dotsch, R., Wigboldus, D. H., & Todorov, A. (under review). Towards a more complete model of face evaluation: Face typicality and subtle emotional expressions both influence perceived trustworthiness. Manuscript submitted for publication.
- Stirrat, M., & Perrett, D. I. (2010). Valid facial cues to cooperation and trust: male facial width and trustworthiness. *Psychological Science*, *21*, 349–354.
- Sutherland, C. A., Oldmeadow, J. A., Santos, I. M., Towler, J., Michael Burt, D., & Young, A. W. (2013). Social inferences from faces: Ambient images generate a three-dimensional model. *Cognition*, *127*, 105–118.
- Tiddeman, B., Burt, M., & Perrett, D. (2001). PsychMorph version 5; prototyping and transforming facial textures for perception research. *Computer Graphics and Applications, IEEE*, *21*, 42–50.
- Todorov, A., Olivola, C., Dotsch, R., & Mende-Siedlecki, P. (2015). Social attributions from faces: Determinants, consequences, accuracy, and functional significance. *Annual Review of Psychology*, *66*, 519–545.
- Todorov, A., Pakrashi, M., & Oosterhof, N. N. (2009). Evaluating faces on trustworthiness after minimal time exposure. *Social Cognition*, *27*, 813–833.
- Todorov, A., Said, C. P., Engell, A. D., & Oosterhof, N. N. (2008). Understanding evaluation of faces on social dimensions. *Trends in Cognitive Sciences*, *12*, 455–460.
- Valentine, T. (1991). A unified account of the effects of distinctiveness, inversion, and race in face recognition. *The Quarterly Journal of Experimental Psychology*, *43*, 161–204.
- Van't Wout, M., & Sanfey, A. (2008). Friend or foe: The effect of implicit trustworthiness judgments in social decision-making. *Cognition*, *108*, 796–803.
- Vokey, J. R., & Read, J. D. (1992). Familiarity, memorability, and the effect of typicality on the recognition of faces. *Memory & Cognition*, *20*, 291–302.
- Walker, M., & Vetter, T. (2009). Portraits made to measure: Manipulating social judgments about individuals with a statistical face model. *Journal of Vision*, *9*, 12.
- Willis, J., & Todorov, A. (2006). First impressions: Making up your mind after a 100-ms exposure to a face. *Psychological Science*, *17*, 592–598.
- Zebrowitz, L. A., Bronstad, P. M., & Lee, H. K. (2007). The contribution of face familiarity to ingroup favoritism and stereotyping. *Social Cognition*, *25*, 306–338.
- Zebrowitz, L. A., & Montepare, J. M. (2008). Social psychological face perception: Why appearance matters. *Social and Personality Psychology Compass*, *2*, 1497–1517.
- Zebrowitz, L. A., Voinescu, L., & Collins, M. A. (1996). Wide-Eyed and Crooked-Faced: Determinants of perceived and real honesty across the life span. *Personality and Social Psychology Bulletin*, *22*, 1258–1269.