LEBS
Vol. 2 No.1 (2011) 9-12.
Letters on Evolutionary Behavioral Science

Facial Resemblance and Attractiveness: An Experimental Study in Rural Indonesia

Saori Nojo[1], Yasuo Ihara[1,*], Hana Furusawa[1], Shigeru Akamatsu[2], Takafumi Ishida[1]

1 The University of Tokyo, Hongo 7-3-1, Bunkyoku, Tokyo 113-0033, Japan

2 Hosei University, Kajinocho 3-7-2, Koganeishi, Tokyo 184-8584, Japan

* Author for correspondence (iharay@biol.s.u-tokyo.ac.jp)

Previous studies suggest that humans use facial characteristics as a cue of kinship in a context-dependent manner: a self-resembling face is preferred as a target of cooperation because cooperating with kin enhances inclusive fitness, but avoided as a mating partner because mating with kin increases the risk of inbreeding. Another line of evidence indicates that children internalize faces of their family members and later use them as a referent with which faces of others are compared. Using digital morphing techniques, we conducted an experiment in a village in Sumba, Indonesia, to investigate effects of facial self- or parent-resemblance on perceived attractiveness of opposite-sex faces in the context of a long-term or short-term relationship. Our results show that females prefer a male face not resembling themselves and males prefer a female face not resembling their mothers, both in the long-term context.

Keywords
mate choice, parent-resemblance, self-resemblance, sexual imprinting

Introduction

Studies have documented facial resemblance in married and unmarried couples (e.g., Bereczkei, Gyuris, Koves, & Bernath, 2002; Bereczkei, Gyuris, & Weisfeld, 2004; Nojo, Tamura, & Ihara, 2011). Considering negative consequences of inbreeding, homogamy for facial characteristics is puzzling since facial similarity may partially reflect genetic similarity between individuals. Indeed, it has been argued that humans, as well as other animals, prefer potential mates who are *dissimilar* to them for certain physical characteristics: for example, some evidence suggests that humans may have odor preference for others who are dissimilar at the major histocompatibility complex loci (e.g., Wedekind, Seebeck, Bettens, & Paepke, 1995).

DeBruine (2005) investigated how people's perception of opposite-sex faces may be affected by self-resemblance, using facial images that were digitally transformed to resemble them. It turned out that self-resembling opposite-sex faces were judged as more trustworthy, but less attractive in the context of a "short-term" relationship. A possible interpretation is that humans use facial resemblance as a cue of kinship in a context-dependent manner: a self-resembling face is preferred as a target of cooperation (prosocial context) because cooperating with kin enhances inclusive fitness, but avoided as a mating partner (sexual context) because mating with kin increases the risk of inbreeding (DeBruine, Jones, Little, & Perrett, 2008).

Marriage involves both prosocial and sexual contexts and thus choice of marriage partner can be regarded as a balance of the two conflicting aspects, which may explain DeBruine's (2005) finding that self-resemblance did not increase or decrease attractiveness of an opposite-sex face in the context of a "long-term" relationship. However, the optimal balance may not be the same for everyone: it may vary depending on sex of individuals as well as cultural/ecological factors. Therefore, even if humans indeed use facial resemblance as a cue of kinship, its effect on perceived attractiveness may vary between sexes and across populations. The present study investigates the relationship between facial resemblance and attractiveness in male and female residents of a rural village in Indonesia.

To detect facial self-resemblance, an individual must have a mental template of own face with which other faces are compared. Some authors have suggested that the mental template is shaped by imprinting-like mechanisms, that is, through interaction with family members (Bereczkei et al., 2002, 2004; Wiszewska, Pawlowski, & Boothroyd, 2007; Watkins et al., 2011). In other words, individuals may be in fact sensitive to facial similarity to their close kin, rather than to themselves. Considering this, we examine the effects of both self-resemblance and parent-resemblance on perceived facial attractiveness.

Methods

Participants were 48 residents, 24 males and 24 females between the ages of 16 and 31 years old (mean age 24), of a village in East Sumba, Indonesia. We digitally photographed the faces of participants and their opposite-sex parents. Photographs were taken from anterior view with neutral facial expressions. From these, we created the averaged faces of four categories, sons, daughters, fathers, and mothers, using digital

doi: 10.5178/lebs.2011.11
Received 7 May 2011.
Accepted 10 May 2011.
Published online 3 June 2011.

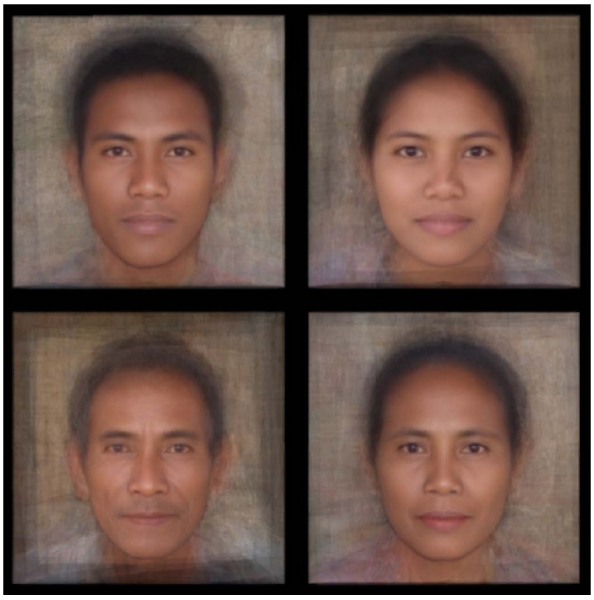

Figure 1. Averaged faces of male participants (sons, upper left), female participants (daughters, upper right), female participants' fathers (fathers, lower left), and male participants' mothers (mothers, lower right).

morphing techniques. The averaged face of each category was generated by averaging the shape and color of the 24 images in that category (figure 1). All manipulated images were generated by FUTON software (Mukaida et al., 2002).

For each participant, an image of young opposite-sex face resembling the participant was created. Briefly, 50% of shape differences between the participant's face and the averaged face of the participant's category (sons or daughters) were added to the averaged face of opposite-sex young (daughters or sons, respectively; DeBruine, 2004, 2005). Similarly, for each participant, a young opposite-sex face resembling the participant's opposite-sex parent was created using the parent's face, the averaged face of the parent's category (mothers or fathers), and the averaged face of opposite-sex young (daughters or sons, respectively).

Participants were divided into four groups of six males and four groups of six females in a way that minimizes within-group variation in age. There were four sessions (A-D), in each of which all participants in a group viewed the same six images of faces and evaluated their attractiveness in a given context. Each evaluation was made as a two-alternative forced choice: two of the six faces were presented simultaneously on a computer screen and participants chose the one that was more attractive. All possible pairs of the six faces were compared and as a result each session consisted of 15 decisions per participant.

Facial attractiveness was judged in the context of either a long-term or short-term relationship (DeBruine, 2005). To be concrete, we asked participants either of the following: Choose the face you wish to make an eternal couple as a family partner (husband/wife) (the long-term attractiveness), or Choose the face you feel affection toward as a lover (boyfriend/girlfriend) (the short-term attractiveness).

In session A, participants in a group evaluated the long-term attractiveness of six faces resembling themselves. In session B, they evaluated the long-term attractiveness of faces resembling their opposite-sex parents. In sessions C and D, the same images as in sessions A and B, respectively, were evaluated in terms of the short-term attractiveness. The order of sessions was chosen at random for each participant. No participant seemed to realize the source of the photographs.

A participant's "self score" for a given session was defined as the number of times (0-5) the participant chose the self-resembling face (A and C) or the parent-resembling face (B and D). Likewise, a participant's "control score" was determined for each session as the mean number of times (0-5) the other participants in the group chose the same image. A participant's "preference score" was obtained by subtracting control score from self score (DeBruine, 2004, 2005). We examined whether the observed preference scores were significantly different from zero.

We obtained facial measures of participants and their opposite-sex parents from photographs and calculated 15 proportions that represent the relative size and shape of the face (Wiszewska et al., 2007). Principal components (PCs) were extracted from the facial proportions.

Of the 48 participants, 11 males and 14 females were married (both wife and husband were included in two cases). For the 25 married participants, we photographed their spouses, and when possible, the spouses' opposite-sex parents. We also took facial photographs of six additional married couples in the same village. We investigated whether any of the PCs extracted from the facial measures were correlated between these pairs. Since first-cousin marriage was traditionally preferred in the village, we also collected data on marriage form, consanguineous or free-choice marriage. All p-values reported are two-tailed.

Table 1. Mean Preference Scores

	Participants		
Session	Male	Female	Pooled
A (self/long-term)	-0.35	-0.65*	-0.50*
B (parent/long-term)	-0.75**	0.00	-0.38
C (self/short-term)	0.20	0.10	0.15
D (parent/short-term)	-0.12	0.47	0.18

*$p < .05$. **$p < .01$.

Table 2. Principal Component Loading Values

Proportions		Principal components				
Definition	Description	PC1	PC2	PC3	PC4	PC5
n-sn/tr-gn	nose/face height	.875				
n-sn/zy-zy	nose height/face width	.863				
n-sto/tr-gn	mouth-brow/face height	.836				
n-sto/zy-zy	mouth-brow height/face width	.775				.400
n-sn/al-al	nose height/width	.669	-.648			
al-al/zy-zy	nose/face width		.978			
al-al/go-go	nose/jaw width		.909			
ch-ch/al-al	lip/nose width		-.668	.705		
ch-ch/zy-zy	lip/face width			.921		
ls-li/ch-ch	lip fullness/width			-.430		.582
tr-gn/ch-ch	face height/lip width			-.938		
go-go/zy-zy	jaw/face width				.822	
n-gn/tr-gn	brow/face height				.714	
n-gn/go-go	brow height/jaw width					.514
zy-zy/{[(ex-ex)-(en-en)]/2}	face/eye width					-.709
Eigenvalues		4.177	3.182	2.496	1.677	1.123
Variance explained (%)		26.2	20.5	17.1	10.6	9.5

Note. Loading values with absolute values smaller than .4 are omitted. For the definition of the proportions see Wiszewska et al. (2007).

Table 3. Spearman's Correlation Coefficients in Principal Component Loading Values

	N	PC1	PC2	PC3	PC4	PC5
Wife/Husband	29	-.009	.224	.029	.224	.008
Husband/Wife's father	14	.458	.540*	.165	-.502	-.148
Wife/Husband's mother	13	.044	-.063	.481	.330	.619*

*$p < .05$.

Results

Table 1 shows mean preference scores of the four sessions. In session A, the mean preference score of males was not significantly different from zero (Wilcoxon: n = 24, z = -1.002, p = .32), while a significant negative preference score was found for females (n = 24, z = -2.035, p = .042). In session B, males showed a significantly negative preference score (n = 24, z = -2.620, p = .0088), while females did not exhibit any preference (n = 24, z = -0.043, p = .97). These results suggest that males tend to find a female less attractive as a long-term partner if she resembles their mothers, while females tend to find a male less attractive as a long-term partner if he resembles themselves. When males and females were pooled, the negative preference in session A was still statistically significant (n = 48, z = -2.084, p = .037), whereas the negative preference in session B was only marginally significant (n = 48, z = -1.739, p = .082).

In sessions C and D, mean preference scores were not significantly different from zero when males and females were tested separately (n = 24, p > .05) or when pooled (n = 48, p > .05). This indicates that facial resemblance does not affect perceived attractiveness of opposite-sex faces in the short-term context.

Five PCs with eigenvalues larger than unity were extracted from facial measures using 15 proportions (Table 2). Table 3 shows Spearman's correlation coefficients in PC loading values between wives and husbands, husbands and wives' fathers, and wives and husbands' mothers. No similarity was detected between wives and husbands (n = 29, p > .05). Husbands and wives' fathers were positively correlated in PC2 (n = 14, p = .046), but not in any of the other PCs (n = 14, p > .05). Wives and husbands' mothers were positively correlated in PC5 (n = 13, p = .024), but not in others (n = 13, p > .05).

Of the 29 marriages, 23 were free-choice and six were consanguineous. Considering the possibility that the observed correlations in facial PCs were due to kinship, we repeated the same analysis as above using only the free-choice marriages. The positive correlation in PC2 between husbands and wives' fathers was still statistically significant (Spearman: ρ = .629, n = 11, p = .038), but the positive correlation in PC5 between wives and husbands' mothers was no longer significant (ρ = .400, n = 9, p = .286). None of the other correlations were statistically significant (p > .05).

Discussion

This study explores possible influence of self- and parent-resemblance on perceived attractiveness of opposite-sex faces. The results indicate the following. First, the effect of facial resemblance is context-dependent: facial resemblance matters in the context of a long-term relationship, but not in the context of a short-term relationship. Second, for the long-term context, the effect of facial resemblance is sex-dependent: females prefer a male face not resembling them, while males prefer a female face not resembling their mothers. Third, faces of wives and husbands do not resemble each other, whereas there may be resemblance in some facial aspects between husbands and wives' fathers and between wives and husbands' mothers.

Our result is consistent with DeBruine (2005) in that self-resemblance has a negative impact on

perceived attractiveness of opposite-sex faces. In DeBruine (2005), however, the negative impact was found only for the short-term context, which contradicts with our result. Though the reason for the discrepancy is unclear, we should keep in mind the possibility that our participants and those of the previous study (i.e., university students) might hold crucially different concepts of a "short-term relationship." Additionally, avoiding self- and parent-resembling mates may be less advantageous in a larger population, in which inbreeding is rare even if mating is random. That is, the optimal balance of the prosocial and sexual aspects may depend on population size. Since our participants represent a relatively small and endogamous population, it is plausible that the sexual aspect was more dominant in them than in the previously studied populations.

Our result suggests that the facial template to be compared with other faces may be acquired from different sources depending on sex of individuals. In theory, avoiding self-resembling mates is a more reliable way to prevent inbreeding depression than avoiding parent-resembling mates, for parents and offspring share only one-half of the genome. Thus, a possibility is that inbreeding avoidance is of greater importance to females, who generally invest more on offspring than males do, and consequently females are more restrictive about the source of the facial template. Alternatively, the result may be also explained if females see mirrors more frequently than males do, or if mothers spend more time with their children than fathers do.

Although we detected facial resemblance between husbands and wives' fathers and between wives and husbands' mothers, this result should be viewed as tentative, because the observed positive correlations would lose statistical significance after Bonferroni corrections. Nevertheless, facial resemblance of the same kind has been also found in previous studies (Bereczkei et al., 2002, 2004). Further investigation is needed.

Acknowledgment

This work was supported by Grant-in-Aid for Scientific Research (B) (18406025).

References

Bereczkei, T., Gyuris, P., Koves, P., & Bernath, L. (2002). Homogamy, genetic similarity, and imprinting; parental influence on mate choice preferences. Personality and Individual Differences, 33, 677-690. (doi:10.1016/S0191-8869(01)00182-9)

Bereczkei, T., Gyuris, P., & Weisfeld, G. E. (2004). Sexual imprinting in human mate choice. Proceedings of the Royal Society B, 271, 1129-1134. (doi:10.1098/rspb.2003.2672)

DeBruine, L. M. (2004). Facial resemblance increases the attractiveness of same-sex faces more than other-sex faces. Proceedings of the Royal Society B, 271, 2085-2090. (doi:10.1098/rspb.2004.2824)

DeBruine, L. M. (2005). Trustworthy but not lust-worthy: context-specific effects of facial resemblance. Proceedings of the Royal Society B, 272, 919-922. (doi:10.1098/rspb.2004.3003)

DeBruine, L. M., Jones, B. C., Little, A. C., & Perrett, D. I. (2008). Social perception of facial resemblance in humans. Archives of Sexual Behavior, 37, 64-77. (doi:10.1007/s10508-007-9266-0)

Mukaida, S., Kamachi, M., Oda, M., Kato, T., Yoshikawa, S., Akamatsu, S., & Chihara, K. (2002). Facial image synthesis system: FUTON - evaluation as tools for cognitive research on face processing -. IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences, J85-A, 1126-1137 (in Japanese).

Nojo, S., Tamura, S., & Ihara, Y. (in press). Human homogamy in facial characteristics: Does sexual imprinting-like mechanism play a role? Human Nature.

Watkins, C. D., DeBruine, L. M., Smith, F. G., Jones, B. C., Vukovic, J., & Fraccaro, P. (2011). Like father, like self: emotional closeness to father predicts women's preferences for self-resemblance in opposite-sex faces. Evolution and Human Behavior, 32, 70-75. (doi:10.1016/j.evolhumbehav.2010.09.001)

Wedekind, C., Seebeck, T., Bettens, F., & Paepke, A. J. (1995). MHC-dependent mate preferences in humans. Proceedings of the Royal Society B, 260, 245-249. (doi:10.1098/rspb.1995.0087)

Wiszewska, A., Pawlowski, B., & Boothroyd, L. G. (2007). Father-daughter relationship as a moderator of sexual imprinting: a facialmetric study. Evolution and Human Behavior, 28, 248-252. (doi:10.1016/j.evolhumbehav.2007.02.006)