Reactions to children's faces
Resemblance affects males more than females

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Abstract

Since cuckoldry risk is asymmetrical, we hypothesized that parental investment would be more affected by paternal than maternal resemblance. To test this hypothesis, we asked subjects hypothetical questions about investing in children under conditions in which their faces or those of other people had been morphed with photographs of children. Males were more likely to choose a face they had been morphed with as the most attractive, the child they were most likely to adopt, the child they would like to spend the most time with, the child they would spend US$50 on, and the child they would least resent having to pay child support for. Reactions to children's faces by females were much less affected by resemblance. © 2002 Elsevier Science Inc. All rights reserved.

1. Introduction

Males invest less in children that they are not biologically related to and in many cases are more likely to abuse step or otherwise unrelated children (Anderson, Kaplan, Lam, & Lancaster, 1999; Daly & Wilson, 1988, 1996; Marlowe, 1999). According to Daly and Wilson (1998) there are two ways in which a male can increase the probability that the children he is caring for are carrying his genetic material: he can monitor and/or

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sequester the female partner during the period that she is fertile to reduce the risk of being cuckolded, or he can attempt to assess paternity based on the degree to which the children resemble him.

There are two forms that a paternal resemblance mechanism might take: (1) the degree to which a male is told a child resembles him (i.e., a "social mirror") and (2) the degree to which the child actually resembles him. Daly and Wilson (1982) recorded spontaneous remarks in maternity wards regarding the appearance of newborn children. Mothers and their friends and relatives were more likely to comment on how children resembled their fathers than they were to say the child resembled the mother or any other family member. When fathers displayed any doubt, the mothers were quick to reassure them of the child's resemblance. Regalski and Gaulin (1993) have replicated these findings using Mexican families.

In a population of males convicted of domestic violence, Burch and Gallup (2000) found the more males felt that their children looked like them, the better the children were treated. The childhood of the abusive males themselves were also associated with how much they thought they resembled their fathers. Perceptions of paternal resemblance were correlated with the incidence of physical and sexual abuse they experienced as children, as well as feelings of closeness to their fathers.

Christenfeld and Hill (1995) found that objective raters did no better than chance at matching pictures of 1-year-old infants to their mothers, but could more accurately match the pictures of infants to their fathers. Other studies have failed to replicate these findings (Brédart & French, 1999; McLain, Setters, Moulton, & Pratt, 2000; Nesse, Silverman, & Bortz, 1990), but in these studies, actual paternity was never determined (e.g., by DNA testing). Since the incidence of cuckoldry may be appreciable (see Baker & Bellis, 1995, for a review), it is easy to see how instances of failed paternity could statistically mask/obscure paternal resemblance.

A more compelling test of the paternal resemblance hypothesis would be to experimentally manipulate resemblance to determine the effect it has on treatment and attitudes toward children. In this study, facial resemblance was manipulated using computerized facial morphing based on combinations of subjects and children and reactions to these images were measured with hypothetical investment scenarios.

2. Methods

2.1. Subjects

Forty (20 males, 20 females) undergraduates were recruited from the State University of New York at Albany as subjects and received course credit for their participation. Subjects were informed ahead of time that they would be participating in a study that required having their picture taken and that they were going to be asked questions about childcare. The study was approved by the local institutional review board and all subjects gave written informed consent.

2.2. Pictures

Pictures of subjects were taken using a Hewlett Packard Model 315 digital camera. Subjects were asked not to smile or frown for the picture and to try to maintain a neutral unexpressive face. The images were processed using a 233-mHz PC and Paint Shop Pro (version 3.11) software. All images were converted to 256 shades of gray, cropped just under the chin, from ear to ear, and just below the hairline, and images were centered. All images were made the same size (200×150 pixels) and brightness using the color editor and histogram rectification properties in Paint Shop Pro. The images were mounted on a white background.

While they waited, each subject's picture was morphed (Ulead Morph Editor, version 1.0) with the image of either a female or male 2-year-old child so that the stimulus picture represented a combination of the subject and the child in a 50:50 ratio. Twenty subjects (10 males, 10 females) were morphed with the image of the female child and 20 subjects (10 males, 10 females) were morphed with the image of the male child. The morphing program allowed us to set reference points to combine two images (a start and an end image) into one. For example, on the starting image (e.g., the subject's face), one can place a reference point over the pupil and the computer automatically places a corresponding reference point over the end image (e.g., the child's face). However, the point on the child's face may not be aligned with the pupil (it may fall on the cheek or the forehead). Using the computer mouse, the reference point in the end image can be moved, without affecting the reference point in the start image, to align it with the pupil so that in the morph image these two points are merged together into one. In the morphing/merging process, we used approximately 40 reference points for each image. Presets were used to control the number of pixels from a starting and an ending image that was entered into the morphed image and these values could be changed actively. As shown in Fig. 1, the program then rectifies the image on a two-dimensional plane so that it appears as a real and undistorted combination of the two faces.

2.3. Design

The entire experiment was computerized using SuperLab (Cedrus, version 2.01). As shown in Fig. 2, each trial consisted of the subject being shown five faces on the computer screen arranged in a semicircular array with a question embedded in the middle (e.g., "Which of these children would you spend the most time with?"). Each face was also labeled with a letter and subjects made their choices by pressing the corresponding letter on a computer keyboard (see Fig. 2).

There were two types of arrays. Both involved five faces. The first contained one image of the subject's face morphed with the image of a toddler and four other people's faces morphed with that same toddler's face. The second array contained five other people's faces morphed with the toddler's face. Each face array was presented 10 times; once with each of 10 questions (see Table 1). All face position coordinates within an array were randomized between questions so that no face appeared in the same position
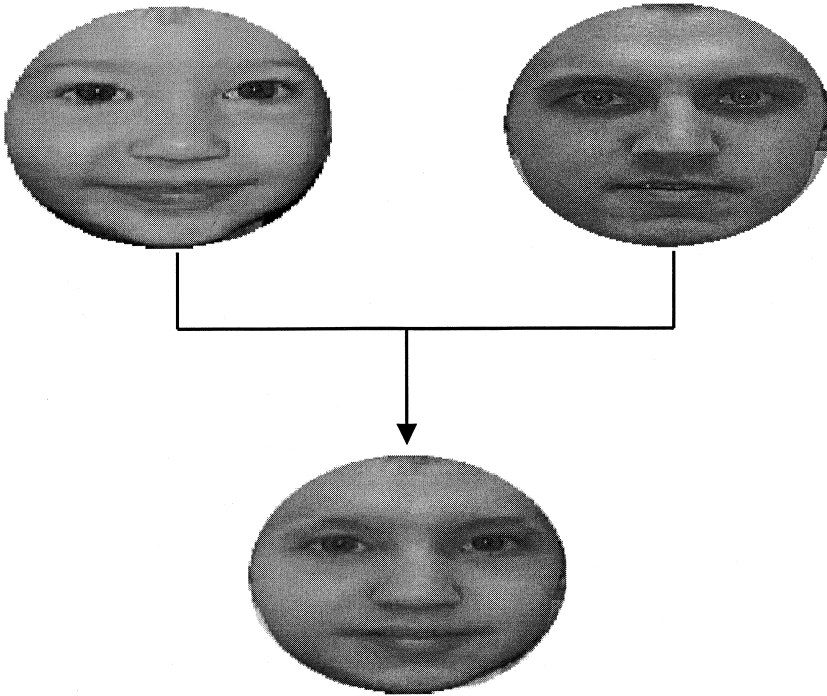
Fig. 1. A representative 50% self–child morph constructed from the image of (on the right) a subject and a male child (on the left).

on every trial. The two face arrays were sampled randomly until each question had been presented within each array.

Latency to respond was recorded for all questions by SuperLab as the elapsed time (ms) between presentation of an array and a subject's response. At the end of the experiment, subjects were asked how they made their choices and whether they used any particular strategy when selecting a face out of the array. They were also asked whether it was difficult to choose faces out of the arrays.

3. Results

There was no effect of the sex of the toddler's face. A binomial test revealed that males chose the face that they had been morphed with more often than chance in response to the questions: "Which one of these children would you be most likely to adopt?", $P < .001$; "Which one of these children do you find to be the most attractive?", $P < .001$; "Which one of these children would you be MOST comfortable spending time with?", $P < .001$; "Which one of these children would you spend US$50 on if you could only spend it on one child?", $P < .001$; and "If you were forced to pay child support to these children, which one would you LEAST resent having to pay child support for?", $P < .05$. The binomial test also showed that
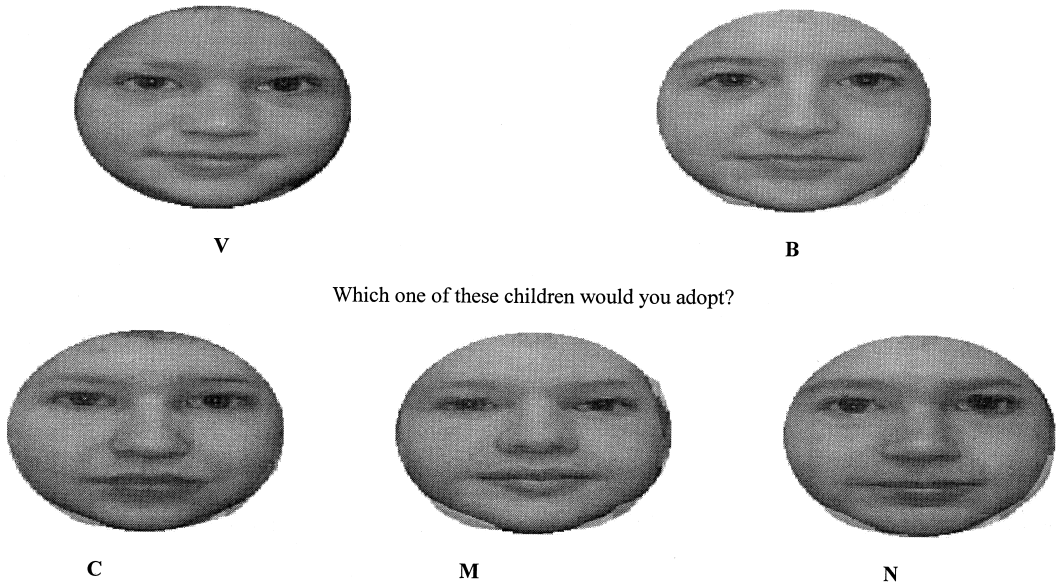
Fig. 2. A typical stimulus face array and question as it appeared on the computer screen.

males were less likely to select a face they had been morphed with in response to the question: "If one of these children damaged something valuable of yours, which one would you punish the MOST?", $P < .05$. In contrast, females only selected a face that they had been morphed with more often than chance in response to one question: "Which one of these children would you spend US$50 on if you could only spend it on one child?", $P < .05$ (see Table 1).

Table 1
Percentage of males and females who picked their self-morph in response to the different questions

	Males (%)	Female (%)
Which one of these children would you be most likely to adopt?	90**	35
Which one of these children do you find to be the most attractive?	85**	35
Which one of these children would you be comfortable spending the MOST time with?	70**	35
Which one of these children would you spend the LEAST time with?	10	10
Which one of these children would you spend US$50 on if you could only spend it on one child?	80**	40*
Which one would you spend US$50 on last?	15	30
If one of these children damaged something valuable of yours, which one would you punish MOST?	0*	15
Which one would you punish LEAST?	20	15
If you were forced to pay child support to these children, which one would you MOST resent having to pay child support for?	10	5
Which one would you LEAST resent having to pay child support for?	40*	25

* $P < .05$.
** $P < .001$.

Males were also more prone than females to choose their own face–toddler morphs. Fisher's exact probability tests showed that males were more likely than females to choose their self-morph in response to the questions: "Which one of these children would you be most likely to adopt?", $P < .001$; "Which one of these children do you find to be the most attractive?", $P < .001$; "Which one of these children do you think that you would spend the most time with?", $P < .01$; and "Which one of these children would you spend US$50 on if you could only spend it on one child?", $P < .01$. There were no questions where females were more likely than males to choose their own face–toddler morph.

Composite scores reflecting favorable responses toward morphs were created by subtracting the number of times a subject selected a self-morph in response to negative items (e.g., "If one of these children damaged something valuable of yours, which one would you punish MOST?") from the number of times a subject selected a self-morph in response to positive items (e.g., "Which one of the children would you be most likely to adopt?"). A Mann–Whitney U test applied to these scores showed that men (mean rank = 26.25) exhibited significantly more favorable reactions toward self-morphs than females (mean rank = 14.75), $P < .01$.

In the second array of faces, where the subject's face was not morphed with the child's, there were no sex differences in the likelihood of selecting any particular face and a binomial test showed that neither males nor females chose any face more often than chance.

More women (80.0%) indicated that it was difficult to choose faces from the arrays than men (45.0%), $\chi^2 = 7.20$, $P < .01$. Females also took longer to respond to all questions. When analyses were performed on individual questions, females took longer to respond ($M = 21.15$ s) to "Which one of these children would you resent most if you were forced to pay child support?" than males ($M = 12.43$ s), $F(1,36) = 4.579$, $P < .01$. By calculating the mean reaction time for each question and then counting across all questions to determine if a subject was slower or faster than average, a Fisher's exact probability test showed that females took significantly longer to respond across all questions than males, $P < .001$.

At the end of the experiment when subjects were asked how they chose faces out of the arrays, there was little consensus. Some reported using the eyes, while others reported using the mouth or nose. Some reported making attributions about the faces, such as "I selected the face that I thought needed my help most, or looked most/least depressed."

4. Discussion

When subjects were shown their own faces morphed with a child's in an array of four other people's faces morphed with that child, males were more likely to choose the face that resembled their own as the one they would be most likely to adopt, the most attractive, the child they would spend the most time with, the child they would spend money on, and the child they would least resent having to pay child support for.

Unlike males, females were relatively indifferent to whether the children's faces resembled their own. There were no questions where females were more likely than males to choose a face that they had been morphed with. In fact, females took longer to respond to all questions,

and more women than men expressed difficulty in choosing faces. Whereas in self-morph arrays males chose which child to support or punish quickly and easily, females took longer to deliberate and attempted to distribute their choices across faces.

It is interesting to note that the subjects were unaware of the effect resemblance had on their choices. When queried about their choices at the conclusion of the experiment, none identified resemblance as a factor in how they chose which child to support or punish, nor did they even realize that their faces had been morphed with the child. During debriefing, subjects were told that their face had been morphed with some of the faces, and they were given the opportunity to view the faces again. But none could pick their self-morph out of the array. It was not until the real, unmorphed picture of the subject and the self-morph were aligned next to each other on the computer screen that they could identify their morph, and subjects expressed surprise that they had been unable to see their own features embedded in the face of the child.

During human evolutionary history, it would have behooved females to ascribe paternal resemblance for purposes of securing paternal investment. However, it is possible that the degree to which a female ascribes resemblance to the ostensible father may correlate with her sexual infidelity. In other words, increasing the chances of successfully cuckolding her mate may have rested on the female's ability to deceive the male into believing that he was the child's father. As a result, one might expect males to have evolved a counter strategy, i.e., assessing the actual degree to which a child resembles him in order to make a more accurate determination about paternity. Our data suggest that males do use resemblance as a factor in their reactions towards children and it appears that this may be operating at a relatively unconscious level.

The fact that resemblance plays a greater role on how males react toward children is consistent with the literature regarding treatment of unrelated children and how paternal resemblance impacts child abuse and investment (Anderson et al., 1999; Burch & Gallup, 2000; Daly & Wilson, 1996; Marlowe, 1999; but see Case, Lin, & McLanahan, 2001). It is interesting to note that the largest difference between males and females in our study was in response to the question ''Which one of these children would you be most likely to adopt?'' As shown in Table 1, 18 out of 20 males, or almost three times as many men as women picked the self-morph picture of the child as the one they would most likely adopt. Not only are these results consistent with expectations based on paternal resemblance theory, but they may have important implications for adoption policy. Our data suggest that by matching characteristics of an adopted child to those of an adoptive father, the likelihood of achieving a long-term positive outcome might be enhanced. In the context of the prominent role that males play in instances of child abuse and family violence, it is also interesting to note that none of the males picked children's faces that resembled their own as the child they would the most likely to punish.

Acknowledgments

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