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Do Babies Resemble Their Fathers More Than Their Mothers? A Failure to Replicate Christenfeld and Hill (1995)

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Contrary to Christenfeld and Hill (1995), we find that children aged 1, 3, and 5 do not appear to resemble their fathers significantly more than their mothers. We provide an explanation as to why this should be. In addition, we note that any father–child resemblance that does exist, although better than chance, is far from overwhelming. **© 1999 Elsevier Science Inc.**

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In a short article that received considerable attention, both in the scientific as well as the popular press, Christenfeld and Hill (1995) reported greater facial resemblance between 1-year-old children and their fathers than between 1-year-old children and their mothers. They argued that for 1-year-old children there may be an evolutionary rationale (Gaulin and Schegel 1980) for greater father–child resemblance than mother–child resemblance, viz, "While a mother can be quite sure that the baby is hers, no matter what it looks like, the father cannot. It could then be to a baby's advantage to look like the father, to encourage paternal investment."

We will start by examining the consequences of greater facial resemblance between 1-year-old children and their fathers than between these children and their mothers. According to the scenario outlined by Christenfeld and Hill, greater father–child resemblance would be to the baby's advantage because it would encourage the father's investment in its survival, because he would be able to clearly identify the

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child as his own. Although this no doubt is correct, we believe this analysis is incomplete. To see why, we must return to the fundamental postulate of Darwinian evolution, namely, that the ultimate winners in the game of evolutionary competition are those individuals who succeed in passing on the greatest amount of their genetic material to subsequent generations, and the phenotypic characteristics of those genetic winners are what we see at any given time.

There is little obvious evolutionary pressure for a child to resemble its mother, because maternity of a child is never in doubt. Thus, in terms of the degree to which a child resembles a parent, we can take the mother–child resemblance as a baseline. (It is reasonable to assume that children will look *something* like their parents, assuming there is some relationship between genotypes and phenotypes.) However, we will attempt to explain why evolution would *not* have produced greater resemblance between fathers and their children than the baseline resemblance observed between mothers and their children.

If 1-year-old babies unambiguously resembled their fathers, the father would be certain when a child was his, but, by the same token, he also would be certain when a child was *not his*. In the event a child was not his, the chances of his withholding resources from the child (or very possibly killing the child outright) would be high. Even today, step-children are far more likely to be killed by step-parents than by natural parents. In the U.S. in 1976, for example, Daly and Wilson (1988) found that children living with one or more substitute parents were *sixty-five times* as likely to be fatally abused as children living with their biological parents. Other related studies showed similar patterns of child mistreatment [for a recent short review see Daly and Wilson (1996)]. Animal research also has clearly demonstrated the prevalence of infanticide by male rodents, carnivores, and, in particular, primates (Hrdy 1979).

For much of the 2 million year pre-agricultural course of human existence in the "environment of evolutionary adaptiveness" (EEA), three important conditions prevailed: male parental investment (Trivers 1972) was necessary to ensure the survival of offspring, males were not able to control completely all possible sexual contact of their mates, and, finally, few individual males were able to provide resources for many females (Symons 1987). Under these conditions, if babies had unambiguously resembled their fathers, a highly monogamous society would likely have emerged because few females would have risked the possibility of fathering another male's child, given that the bastard child would have been recognized as not belonging to her "official" (investing) mate [see also comments by R. Dawkins and other discussants following a paper by Wilson and Daly (1997)] and thus would have risked maltreatment and, quite possibly, death. In short, few females would have engaged in extra-pair copulation (EPC). However, in reality, this is contradicted by the fact that occasional EPCs by both sexes seems to be a universal feature of monogamous species (Mock and Fujioka 1990), including humans. For example, rates of human misassigned paternity (based on blood typing tests) of 6% to 30% have been reported in studies done in southern England (Edwards 1957; Philipp 1973), 9% among the Venezuelan Yanomanö (Neel and Weiss 1975; Smith 1984), and 10% in rural Michigan (Smith 1984). Baker and Bellis (1995) estimated a cross-cultural

median EPC figure of 9%, with a range from 1.4% to 30%. Further, in a survey of 2078 English women, Bellis and Baker (1990) found that EPCs are significantly more likely to be timed just before ovulation than in-pair copulations. From his model of parent–infant resemblance, Pagel (1997) recently concluded that "even small amounts of paternity uncertainty are sufficient to select against parent–infant resemblance" (p. 973).

We initially anticipated that we would replicate Christenfeld and Hill's empirical results and our aim was to examine the age at which greater facial resemblance between children and their fathers as opposed to their mothers began to disappear. However, the data reported here clearly support the conclusion that there is no significant difference in young children's resemblance to their fathers compared to their mothers.

EXPERIMENT METHOD

Subjects

One hundred eighty undergraduate students at the University of Liège participated in the experiment. Thirty subjects (15 female and 15 male) were randomly assigned to each condition. Their ages ranged from 18 to 30 years (mean 21.84).

Stimuli

Twenty-eight Caucasian families provided five photographs: three photographs of the same child at 1, 3, and 5 years, as well as one photograph of the mother and one photograph of the father taken when the child was approximately 1 year old. For 14 families, the child was a girl; for the other 14 families the child was a boy. The stimuli presented to subjects were scanned versions of these photographs (256 gray levels, 300 DPI, size $= 5 \times 4$ cm) of faces. None of the faces had glasses, beards, or moustaches.

Procedure

On each trial, participants were presented with the face of a child and, according to the condition, the faces of three women or three men. Their task was to identify the child's parent among the three present adult faces. There were 28 trials (14 different girls and 14 different boys). The photographs were displayed in the same way as in the study by Christenfeld and Hill: the child's face was presented in an upper position and the three adults' faces were placed beneath the child's face. The materials were designed to ensure with equal probability that the good match was the adult face placed on the left, placed in the central position, or placed on the right. Partici-

pants were tested individually. Each participant was presented with the 28 sets, which included one child and three possible parents in a different random order.

RESULTS

The design of the experiment was as follows. The age of the child (1, 3, or 5 years old) and the sex of the parent were between-subjects factors, whereas the sex of the child was a within-subjects factor. A 3 (age of the child) $\times$ 2 (sex of the parent) $\times$ 2 (sex of the child) ANOVA with repeated measures on the last factor revealed a significant main effect of the age of the child [$F(2, 174) = 6.614$, $p < .01$], no main effect of the sex of the parent [$F(1, 174) < 1$], and no main effect of the sex of the child [$F(1, 174) < 1$]. The analysis revealed no significant interaction between the first two factors [$F(2, 174) < 1$], no significant interaction between the second and third factors [$F(1, 174) < 1$], and no three-way interaction [$F(2, 174) < 1$]. The main effect of the age of the child was qualified by a significant interaction between this factor and the sex of the child [$F(2, 174) = 5.988$, $p < .01$], but the magnitude of this interaction effect is low ($\eta^2 = .064$). This interaction was analyzed using Tukey HSD post-hoc tests. These tests showed that, although the level of parent identification from pictures of girls did not change across the three ages, it did for pictures of boys. Parent identification was better for 5-year-old boys than for 1-year-old boys ($p < .0001$) and 3-year-old boys ($p < .01$). No significant difference appeared between 1-year-old and 3-year-old boys ($p = .559$). Post-hoc tests indicated no significant effect of the sex of the child on parent identification at age 1, 3, or 5 years (all $p > .10$).

A control analysis taking the items as the random factor was carried out. This analysis did not reveal any significant main effect of the sex of the child [$F(1, 26) < 1$], and the sex of the parent [$F(1, 26) < 1$], and the age of the child [$F(2, 52) = 1.982$, $p = 0.148$]. Nor did it reveal any interaction effect (all $p > .20$). The results of this control analysis confirmed that the significant interaction effect obtained in the preceding analysis was not a strong effect.

To reiterate, our analyses showed *no significant difference between the level of correct identification of mothers and the level of correct identification of fathers from children's faces* (Figure 1). Christenfeld and Hill (1995) did not perform a direct comparison between levels of identification of mothers and fathers. They simply compared the level of identification of mothers and fathers to the chance level of 33.3% by means of Student *t*-tests, with *the items being the random factor*. We also carried out this analysis for our data by comparing the mean number of identifications to chance ($1/3 \times 30$ subjects $= 10$). Table 1 shows the mean number of correct identifications of mothers and fathers in the different conditions, as well as the corresponding *t*-tests and *p* values. At all ages tested, our results indicate that, although correct identification of mothers and fathers was significantly, although not overwhelmingly, higher than chance, there is no significant difference between the degree of father identification and mother identification.

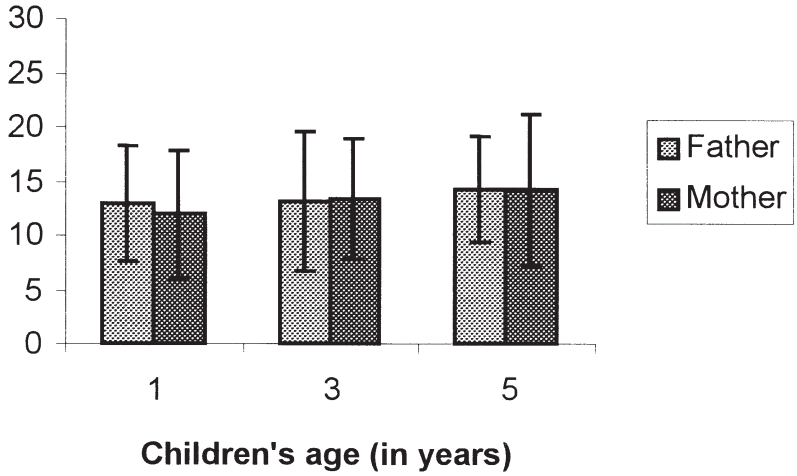

FIGURE 1. Mean number of correct identifications (out of 30) of parents at various ages (1 SD error bars). There is no significant difference in the level of correct identification of mothers versus fathers based on children's faces.

It is particularly important to note that, although the degree of correct association of parents with children is anywhere between 7% and 14% higher than chance, it remains surprisingly poor. In all cases, *nonidentification exceeds 50%*.

DISCUSSION

The present results do not replicate those of Christenfeld and Hill (1995). Young children aged 1, 3, and 5 years do not appear to resemble their fathers significantly more than they resemble their mothers.

It could be objected that the sample of faces used in this experiment is not a representative one. In fact, there is no clear reason why our sample of items would not be representative of the larger Caucasian population in general and, crucially, would be less representative than Christenfeld and Hill's original sample. We used

Table 1. Mean Number of Correct Identifications (out of 30) as a Function of the Child's Age and the Parent's Sex

Child's age	Parent	Mean no. (SD) of Identifications	Student *t*-test (df = 27)	*p* Value
One-year-old	Father	12.893 (5.363)	2.854	$< .01$
	Mother	11.929 (5.937)	1.719	$< .05$
Three-year-old	Father	13.178 (6.464)	2.602	$< .01$
	Mother	13.321 (5.644)	3.114	$< .01$
Five-year-old	Father	14.143 (4.859)	4.512	$< .001$
	Mother	14.143 (6.996)	3.134	$< .01$

Note the absence of any significant difference in levels of correct identification of fathers and mothers based on a child's facial appearance.

photographs from 28 families, whereas Christenfeld and Hill's stimuli were drawn from 24 families. Our stimuli were collected in the same way as those in the study by Christenfeld and Hill, i.e., by asking friends, colleagues, and acquaintances for photographs. We do not see any a priori reason why such a procedure would lead to the construction of an unrepresentative set of faces.

Is our failure to replicate the results of Christenfeld and Hill possibly attributable to an inappropriate sample of pictures that allowed *no* null hypothesis to be rejected? No, because in *all six cases* of mothers and fathers for 1-, 3-, and 5-year-old children, we found that the resemblance of parent to child is, as one would expect, significantly better than chance. In other words, our sample *did* allow us to conclude that there was a significant resemblance between parents and children, but *not that there was a significantly greater* resemblance between fathers and their children compared to mothers and their children. This means that our failure to find a significant difference in the resemblance of fathers to children versus mothers to children was not simply due to an insufficient amount of detail to be able to make resemblance assessments of any kind.

Further studies are necessary, but there are theoretical arguments that go against the existence of a father–child facial resemblance stronger than a baseline resemblance represented by mother–child resemblance. The main argument was developed in the introduction. In short, if father–child resemblance is strong enough to enable a father to be certain when a child in his, it would presumably also permit a father to identify that a child is not his. Given the risk of maltreatment or resource withholding for a "bastard" child, it is difficult to explain why engaging in EPC is an apparently universal feature of monogamous species, particularly, in humans, as demonstrated by a significant degree of misassigned paternity.

Moreover, if relatively high father–child resemblance were the norm, evolution would tend to produce progressively greater degrees of father–child resemblance, because any degree of resemblance significantly below that norm would engender suspicions on the part of the resource-providing male concerning the child's paternity. This likely would lead to a higher degree of resource withholding than if the child had unambiguously resembled the father, which ultimately would translate into a lower rate of survival among those children who did not closely resemble their fathers. In other words, once evolution had established a trend of father–child resemblance in excess of baseline resemblance, there would be evolutionary pressure toward ever greater resemblance. One would therefore expect, after 3 million years of selection, that there would now be a very *strong* tendency of father–child resemblance with respect to mother–child resemblance. However, both our results—as well as those by Christenfeld and Hill—demonstrate that this is not the case. Indeed, in Christenfeld and Hill's study, correct identification of fathers from infant faces occurred only in 49.2% of cases. In the present study, the mean rate of correct identification over all three ages of children is 44.7%. In both studies, misidentification of fathers is around 50%.

For these reasons, we believe that the original results reported by Christenfeld and Hill (1995) of greater father–child than mother–child resemblance in young children most likely are incorrect.

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