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TALIS PATER, TALIS FILIUS: PERCEIVED RESEMBLANCE AND THE BELIEF IN GENETIC RELATEDNESS

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Abstract—*We hardly ever realize that our belief in our high rate of success in detecting family resemblances is affected by our knowledge of the actual genetic link between individuals. In the three studies reported here, 100 men and 100 women were requested to estimate the facial resemblance of photographically portrayed child/adult pairs, while being given either truthful or deceitful information, or none, about their relatedness. Believing that the members of a pair were parent and offspring was the main predictor of the perceived similarity between them. Men and women showed identical response patterns, but men gave higher ratings to pairs where the adult was allegedly a father. More than from a conscious desire to please or reassure the parents, common remarks on family resemblance appear thus to ensue from general hypothesis-testing biases in human reasoning, made perhaps more specific in men by a concern with the problem of uncertain paternity.*

Mothers and fathers are often told that their children look just like them. Comments on how much a newborn resembles either parent can be the prime topic of conversation, and one that tends to create considerable interest in all those present. Yet, accuracy in discriminating related from unrelated couples of adult and child has been shown to be only slightly higher than chance, regardless of the age of the child – from 6 months to 18 years (Nesse, Silverman, & Bortz, 1990). When asked to rate the resemblance between a child and three possible mothers or fathers, one of whom was the actual parent, people performed even worse; in general, children were judged no more similar to their parents than to random adults (Christenfeld & Hill,

1995), and even when they were, errors still exceeded 50% (Brédart & French, 1999).

Given such a discrepancy between self-declared and actual capacity for spotting facial similarities, it has been suggested that allegations of resemblance between children and parents could either be a way to please the parents (Christenfeld & Hill, 1995), or a tactic for reassuring the fathers (Daly & Wilson, 1982; Regalski & Gaulin, 1993). The real-world and the laboratory tasks differ, however, in a basic respect: friends and passersby happening to comment about the baby's family look have good grounds to suppose that these adults must be mum and dad, whereas judges asked to pick the correct parent from a set of possible parents have no such advantage. In other words, our normal confidence in our ability to detect resemblances is based on data that are flawed by our knowledge of the actual family link between individuals. The study we describe in this paper was stimulated by the wish to remove this confound, by separating true genetic relatedness and *belief* in genetic relatedness.

The problem of resemblance evaluation touches on the substantial issue of paternity confidence. In mail surveys and face-to-face interviews, babies are more often reported to look like their father than their mother (Daly & Wilson, 1982; Regalski & Gaulin, 1993). It has even been proposed that neutral-looking women would be attractive (and thus, rewarded by natural selection) because, by generating children that tend to look like their fathers, they help their husbands to distinguish their genetic offspring from those coming from extra-marital affairs (Salter, 1996). This evolutionary hypothesis entails the prediction that children will resemble their fathers more than their mothers, but the empirical evidence is limited to the finding that one-year-olds can be matched to their father more easily than to their mother (Christenfeld & Hill, 1995), a finding that has not been replicated (Brédart & French, 1999). In apparent contradiction, it has been reported that it is easier to identify family resemblance between mothers and children than between fathers and children (Nesse et al., 1990). Because the research literature on this point is currently unsettled, we controlled for both gender of adult and gender of child in our experiments.

In the three studies presented here, we investigated how belief in relatedness influences estimated facial resemblance. Participants were shown pairs of photographs depicting a child and an adult; in half of the cases the people portrayed were actually parent and child, in the other half they were not. In the first experiment (mixed-labels), each photograph was

accompanied by a label that indicated either that the two individuals were genetically related or that they were unrelated; the label was correct half of the time. In the second experiment (no-labels), participants had no information on the family link of the pairs to be judged. In the third experiment (related-labels), participants were made to believe that all the pairs depicted parents and offspring.

EXPERIMENT 1

Method

Participants

Sixty subjects (30 men, 30 women), ranging in age from 19 to 65 years (median 38), took part in the experiment. They were recruited in public places and examined individually.

Materials

We took outdoor color photographs of the members of ten families consisting of mother, father and one child aged about eight (a girl in five cases and a boy in the other five), using the same camera and choosing for each photo a different background. Each subject was photographed individually, from the shoulder up, directly facing the camera. All individuals had the same ethnicity (Italian), but varied in eye and hair color, and facial features in general.

The 10 children's photographs were printed in four copies each and the 20 parents' photographs in two copies each, and the 80 resulting pictures were coupled together to form a set of 40 child/adult pairs, that were inserted into clear photograph album pages, one pair for page. Each pair was accompanied by a label that indicated either that the two individuals were genetically related ("mother and daughter", "mother and son", "father and daughter", "father and son") or that they were unrelated ("non relatives"). In 10 of the 40 cases the two people were parent and child and the label indicated that they were parent and child; in 10 cases the two people were parent and child and the label indicated that they were unrelated; in 10 cases the two people were unrelated and the label indicated that they were parent and child; in 10 cases the two people were unrelated and the label indicated

that they were unrelated. Each unrelated pair was obtained by randomly pairing a child with another child's parent. Though the 40 pairs of photographs were the same for all participants, photo/description pairs were counterbalanced: two versions of the album were prepared so that each photo pair was paired with both descriptions.

Procedure

The two album versions were presented to two groups of raters. The order in which the pairs of photographs were shown was random and different for each rater.

Participants were asked to read aloud the label that accompanied each pair of photographs and then judge the degree of facial similarity between the child and the adult of each pair. Ratings were made on a 0 to 10 scale. There was no time limit; completion of the test took on average ten minutes.

Results and Discussion

General Performance

Since a preliminary ANOVA showed no significant effect of album version ($F<1$), the data from the two groups of raters were pooled.[1] A five-way analysis of variance was performed, with a between-subject variable of sex of rater and within-subject variables of relatedness between adult and child (genetically related vs unrelated), label (allegedly related vs unrelated), gender of adult (female vs male), and gender of child (girl vs boy). It will be recalled that our main questions were: are resemblance evaluations affected, first, by the existence of a genetic relationship, and second, by the belief thereof? The answer to both questions is yes. As can be gathered from Figure 1, children looked more similar to their parents (mean=5.12) than to unrelated adults (mean=4.22, $F(1,58)=84.18$, $p<0.0001$); even more markedly, however, they looked more similar to the adults of whom they were believed to be the children (mean=5.53) than to adults to whom they were believed to be unrelated (mean=3.81, $F(1,58)=132.83$, $p<0.0001$).

[1] Album interacted significantly with label, $F(1,58)=8.38$, $p=0.005$, and with relatedness and label, $F(1,58)=34.95$, $p<0.0001$. The reason was that, following the random assignment of unrelated pairs to the "related" and "unrelated" labels, the pairs that received the "unrelated" label in album 1 and the "related" label in album 2 turned out to be less similar than the pairs that received the "related" label in album 1 and the "unrelated" label in album 2.

Indeed, the effect size was larger for the main effect of label (eta squared=0.72; Cohen's *d*=1.25) than for the main effect of biological relatedness (eta squared=0.59; Cohen's *d*=0.69; see Cohen, 1988).

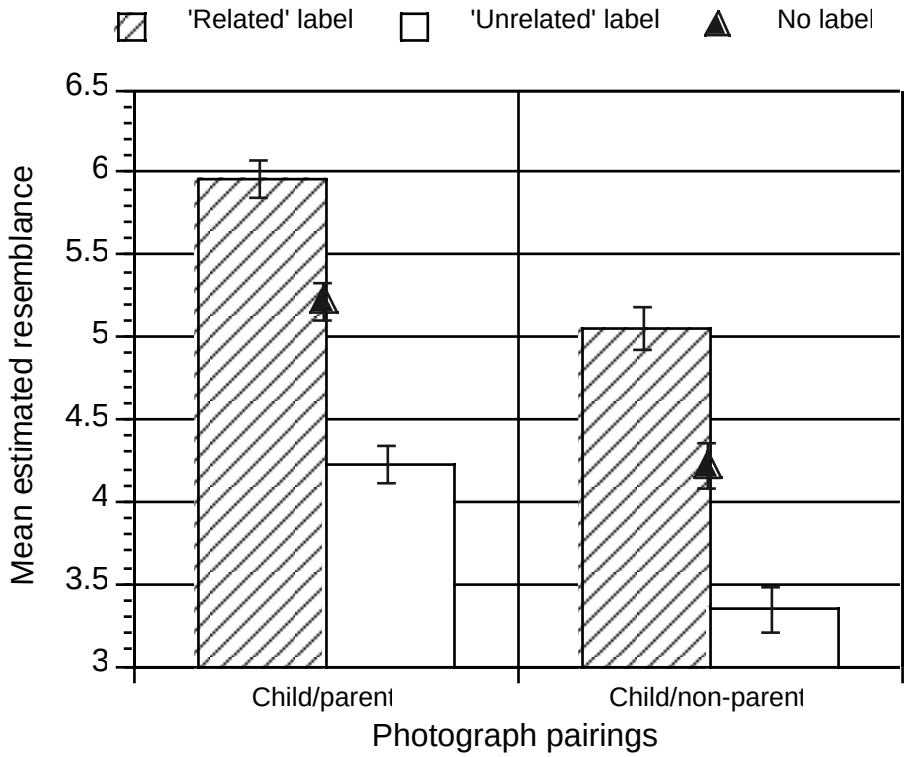

Figure 1. Mean estimated resemblance as a function of genetic relatedness (child/parent vs child/non-parent) and belief in relatedness ("related" label vs "unrelated" label). Filled triangles represent the condition of lack of information about relatedness (data from Experiment 2: no labels). Bars indicate the standard error of the mean.

An additional question was, do children tend to resemble men more than they resemble women? Our data indicate quite the opposite: overall, children were judged as more similar to female (mean=4.92) than to male adults (mean=4.42, $F(1,58)=52.19$, $p<0.0001$). A simple explanation could be that the facial features of women are more infantile than those of men. Compared to men, women tend to have more upright foreheads and shorter chins, larger eyes and higher eyebrows, smaller and less protrusive noses, fuller lips, and a lighter skin tone (see Zebrowitz, 1997).

Girls resembled women more than men and mothers more than fathers; boys resembled women more than men, but mothers and fathers to the same extent, which explained the significant interaction of gender of adult with relatedness, $F(1,58)=11.94$, $p=0.001$, and with relatedness and gender of child, $F(1,58)=39.20$, $p<0.0001$. This need not be regarded as evidence that

girls resemble their mothers more than their fathers: if the explanation of the general effect is the femininity of children's traits, we would expect this quality to be particularly pronounced on girls' faces (that are feminine in two separate respects). This result is inconsistent with the popular belief that girls take after fathers, and boys after mothers.

Differences between male and female raters

The main effect of sex of rater (overall, men tended to use slightly higher values than women) was marginally significant, $F(1,58)=4.02$, $p=0.049$; means were separated by less than 0.3 standard deviations. However, when we analyzed the data corresponding to the two levels of label separately for women and men, we stumbled upon an unexpected finding: regardless of whether the label was faithful or deceitful, women and men behaved differently when (and only when) they were led to believe that the two people in the photograph were parent and child. More specifically, when the label indicated that the two people were unrelated, raters of both sexes judged the child as more similar to the female than to the male adult. When the label indicated that the two people were related, women still judged the child as more similar to the female than to the male adult; men, however, now judged the child as resembling the alleged mother and father to the same extent. In other words, the superiority in estimated resemblance to the female adult (resemblance to female minus resemblance to male, which we will call "female superiority index") was not statistically different for men (mean=0.42) and women (mean=0.51) when the pairs were allegedly unrelated, $t<1$, but was larger for women (mean=0.90) than for men (mean=0.15) when the pairs were allegedly related, $t(58)=-2.93$, $p=0.005$, two-tailed (Figure 2). The extent of the difference was the same for related (means=0.76 vs 0) and unrelated (means=1.05 vs 0.29) pairs.

The first question that comes to mind when considering the strong effect of label on estimated resemblance concerns the baseline value. Our data do not allow us to specify whether it is the belief in relatedness that inflates judgments, or else the belief in unrelatedness that depresses them; these alternatives have different implications on the nature of the underlying cognitive bias. Also, the difference between men and women emerged in front of pairs allegedly related, but not in front of pairs allegedly unrelated. Both points lead to a single question: how would our pairs of pictures score if judges had no idea of whether the people portrayed were related or not? A separate experiment was run to find out.

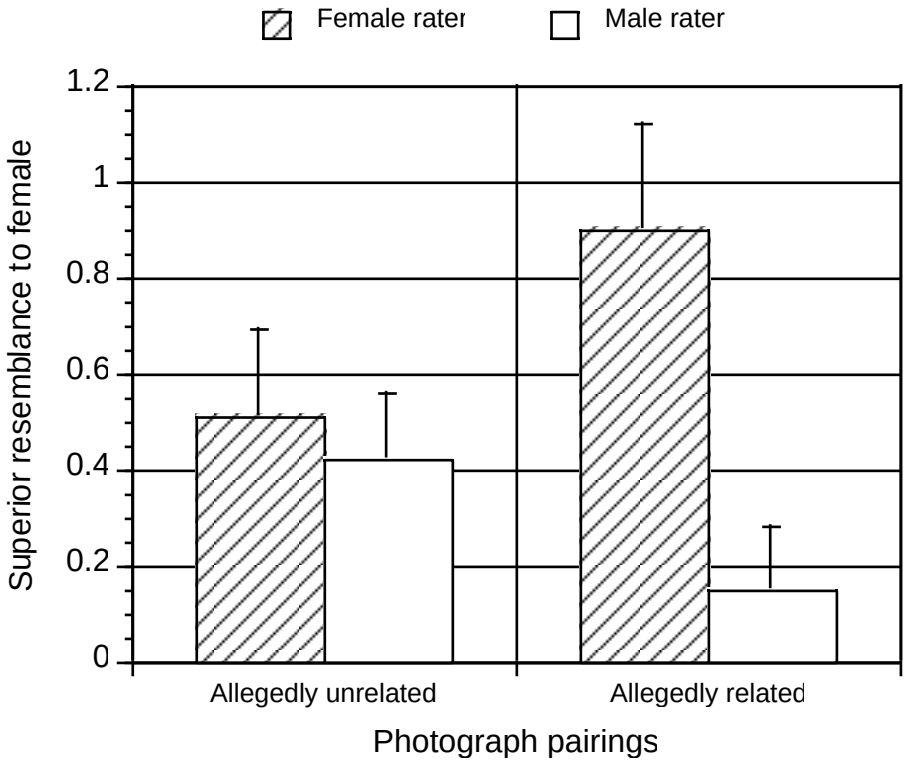

Figure 2. Mean superiority in estimated resemblance to the female adult in the photograph (resemblance to female minus resemblance to male) plotted as a function of presumed existence, or lack thereof, of genetic relatedness between this adult and the child (alleged stranger vs alleged parent), separately for female and male raters. Data are collapsed across genetically related and unrelated pairs. Bars indicate the standard error of the difference.

EXPERIMENT 2

Method

Participants

A new sample of 60 subjects (30 men, 30 women), ranging in age from 18 to 70 years (median 36), took part in the experiment. They were recruited in public places and examined individually.

Materials

We used the same 40 pairs of photographs of the previous study (20 related pairs, 20 unrelated pairs).

Procedure

The procedure was the same as in Experiment 1, except that there were no labels; participants were asked to rate the facial similarity of each pair on a 0 to 10 scale.

Results and Discussion

General Performance

As in Experiment 1, children were judged more similar to their parents (mean=5.21) than to unrelated adults (mean=4.21, $F(1,58)=81.84$, $p<0.0001$); and to female (mean=5.13) than to male adults (mean=4.29, $F(1,58)=55.18$, $p<0.0001$).

Remarkably, the mean estimated resemblance, when judges were told nothing as to the existence of a family link, fell exactly between the mean values obtained under the "related" and "unrelated" labels in Experiment 1 (the means of the no-label condition are represented by the filled triangles in the two panels of Figure 1).

Signal Detection Analysis

How much of the resemblance judgments in Experiments 1 and 2 is due to perceptual factors (sensitivity to genetic relatedness), and how much to a response bias? We addressed this issue by performing separate signal detection analyses (Green & Swets, 1966/1974) on the data from trials where the label said "related" (Experiment 1), where the label said "unrelated" (Experiment 1), and where there was no label. Resemblance ratings were dichotomized by recoding responses 1 to 4 as "low" resemblance, 5 to 10 as "high" resemblance (we chose this recoding since it left us with roughly as many "low" responses as "high" responses). We then tabulated how often the rater responded "high" when the pairs were either genetically related (a hit in signal detection terminology) or unrelated (false alarm), and how often the rater responded "low" when the pairs were either genetically related (miss) or unrelated (correct rejection).

The values of d' (the sensitivity parameter) were almost identical in the three cases (0.343 when the photographs were labeled as related, 0.334 when they were labeled as unrelated, 0.376 when there was no label). Performance, then, was quite poor and did not change with label. The values of the bias parameter *beta* were instead markedly different: 0.849 ("related" label),

0.947 (no label), and 1.069 (“unrelated” label). The increase in *beta* denotes a change from a liberal bias (a tendency to say “high resemblance” more than “low resemblance”) to a conservative bias (a tendency to say “low resemblance” more than “high resemblance”).

Differences between male and female raters

Men and women did not show any appreciable difference when evaluating the resemblance between an adult (either male or female) and a child (either a girl or a boy). The mean “female superiority index” was 0.97 for women and 0.73 for men, $t<1.1$, which corroborates the idea that the gap between the sexes only appears when raters are made to believe that the two people in the picture are parent and child. The next experiment was devised to test the complementary hypothesis directly, by providing a situation where all pairs were said to be related.

EXPERIMENT 3

Method

Participants

A new sample of 80 subjects (40 males, 40 females), ranging in age from 19 to 62 years (median 30), took part in the experiment. They were recruited in public places and examined individually.

Materials

We used 40 pairs of photographs, each depicting an adult and a child. In 20 cases the two people were genetically related (5 girls, 5 boys, and their parents) and in 20 cases they were not. The 20 related pairs were the same of the previous studies. The 20 unrelated pairs were new, and were obtained by randomly pairing two identical sets of 10 new pictures of children aged about eight (5 girls, 5 boys) with 10 new pictures of women and 10 new pictures of men. There were no labels.

Procedure

The procedure was the same as in Experiment 1, except that participants were told that all pairs depicted parents and offspring.

Results and Discussion

General Performance

Children were judged more similar to their parents (mean=5.46) than to unrelated adults (mean= 4.48, $F(1,78)=157.52$, $p<0.0001$); and to female (mean=5.19) than to male adults (mean=4.75, $F(1,78)=31.27$, $p<0.0001$). This replicated the main findings of the first two experiments.

Differences between male and female raters

The effect of sex of rater went in the same direction as in Experiment 1 ($p=0.07$), and interacted significantly with both gender of adult, $F(1,78)=4.14$, $p=0.04$, and gender of child, $F(1,78)=18.05$, $p<0.0001$. The overall "female superiority index" was larger for women (mean=0.60) than for men (mean=0.28, $t(78)=-2.03$, $p=0.045$, two-tailed), which replicated the sex bias found in Experiment 1.

Figure 3. Mean differences in estimated resemblance to either (presumed) parent, resemblance to mother minus resemblance to father, plotted as a function of child gender (daughter vs son), separately for female and male raters. Data are collapsed across genetically related and unrelated pairs. Bars indicate the standard error of the difference.

Further analysis of these data revealed that the difference between the sexes concerned only the couples where the child was a male (Figure 3): in this case, for male raters, the superior resemblance to the female adult disappeared (mean "female superiority index"= 0.05). In other words, male and female raters did not significantly differ when evaluating alleged mother/daughter, mother/son, and father/daughter pairs (all t's<1.5), but they did when evaluating alleged father/son pairs, $t(78)=3.68$, $p<0.0001$, two-tailed. This finding cannot be interpreted as a sign of greater accuracy by male raters (after all, boys do supposedly take after their dads as much as after their mums), since it went in the same direction for related ($t(78)=2.61$, $p=0.01$) and unrelated ($t(78)=3.71$, $p<0.0001$) pairs. Indeed, the effect size was if anything larger for unrelated pairs (means are separated by 0.83 vs 0.58 standard deviations).

GENERAL DISCUSSION

We found that children are judged as more similar, first, to their parents than to strangers, and second, to women than to men. Both results are, of course, stimulus-dependent. Our total photograph sample consisted of 60 different pairs of pictures, 20 of which depicted related and 40 unrelated (randomly formed) couples. While we cannot claim that this sample is representative of the general population, we took care to avoid any obvious bias in collecting the pictures. We have no reason to think that our related pairs were more similar than average parent-child pairs, or that we picked women who looked abnormally similar to the children.

Our two other main findings are independent of the specific photograph sample we used, and can be interpreted in terms of cognitive biases. First, children are judged as more similar to their presumed parents than to presumed strangers, regardless of the actual genetic relationships. Second, pairs of photographs where the adult is allegedly a father receive significantly higher scores from male, vs female, raters.

Effect of Label

A wealth of research has shown that, in general, data relevant to a belief are not processed impartially: when presented with mixed evidence, people tend to notice whatever reinforces their initial belief and dismiss contradictory information (Nisbett & Ross, 1980; see also Wason, 1966). The

reluctance to appreciate evidence that might prove one wrong is understandable when self-esteem or other motivational issues are at stake. No emotional investment, however, is likely to come into play when evaluating resemblances between perfect strangers. Yet, the expectation that children and parents must be more similar than children and unrelated adults is strong enough to affect judgment grossly. Pairs of photographs that, when labeled "unrelated", yielded mean similarity estimates close to 2 produced mean ratings ranging between 4 and 5 when labeled "related". For female raters, one specific woman/girl pair that had received 10 "zero" ratings out of 15 (mean rating 1), obtained only 1 "zero" (mean rating 4.8) from raters told that the two were mother and daughter.

The evaluation of facial resemblance, then, is highly biased by the presumed relationship between the individuals who are compared. Scrutiny of Figure 1 indicates that this is a two-way, symmetrical process: belief in relatedness increases estimated resemblance about as much as belief in unrelatedness decreases it. The underlying process appears to echo hypothesis-testing fallacies in human reasoning: for one thing, judges entertaining the relatedness hypothesis may seek confirming evidence, by looking for common traits rather than for differences. In addition, or alternatively, they may give a disproportionate weight to any similarities they happen to find. When they believe that the members of the pair do not belong to the same family, on the other hand, they may pay special attention to differences, making very little of similarities.

Effect of Sex of Rater

The accuracy in assessing family resemblance, measured as the difference between mean ratings given to related and unrelated pairs in the no-labels experiment, was identical for male and female raters ($t<1$, *n.s.*). This confirms, with a different method, subjects and photograph samples, the finding by Nesse et al. (1990).

Unexpectedly, we found that the belief that a child and an adult were related did not simply increase the perceived resemblance between them, but revealed a bias associated with the rater's sex. When led to believe that a child and an adult had no blood relationship, or ignorant of the actual relationship, female and male raters did not differ: for both sexes, children resembled women more than men. As soon as the same two people were claimed to be parent and child, however, agreement was lost. Female raters still judged the child as more similar to the alleged mother than to the alleged

father, but male raters did not. Our data show that, for women, children looked more similar to females than to males in all conditions. For men, children looked more similar to females than to males in all conditions except one: when this female or this male was believed to be the child's parent. In this case the perceived resemblance of children to their parents increased more for fathers than for mothers, and the female resemblance superiority became zero.

This difference between the sexes – which appears essentially a male bias, if the base-line is the pattern of data obtained under conditions of ignorance, i.e. in the no-label experiment – applies to both father/son and father/daughter pairs in the mixed-label experiment, but only to father/son pairs in the related-label experiment. We have no explanation for this shift in bias specificity. If we interpret the bias as the expression of a preoccupation with paternity, this male exaggeration of a child's estimated resemblance to a "*semper incertus*" father might, in a culture where men traditionally transfer wealth to their sons, be understandably stronger when a male heir is concerned. One might further speculate that the bias may become more general, and be thus extended to daughters, when the matter of paternity is directly at stake – as in our mixed-label experiment, where the opposition between related and unrelated pairs represents an explicit issue.

CONCLUSIONS

Our work presents empirical data relevant to different domains of psychology, such as visual perception (face perception and comparison), cognition (cognitive biases), social and evolutionary psychology (kin recognition accuracy and sex differences).

Our data show that the effect of genetic relatedness on resemblance evaluation, although statistically significant, is so small, and so easily counterbalanced by *belief* in relatedness, that one wonders whether postulating the existence of a specialized ability is at all warranted. Figure 1 shows that, on average, two genetically related, but allegedly unrelated, individuals (dark bar in left-hand panel) are judged as resemblant as two genetically *unrelated* individuals (triangle in right-hand panel). Likewise, two genetically unrelated, but allegedly related, individuals (light bar in right-hand panel) are judged as resemblant as two genetically *related* individuals (triangle in left-hand panel).

Overall, our results are consistent with the idea that allegations of parental resemblance may represent the outcome of a cognitive bias ultimately directed to reassure the fathers (though control studies, where the paired stimuli are not parent-child, are needed to establish this claim). By increasing paternal investment, such a bias would certainly benefit children and mothers, and it has been suggested that, paradoxically, it is also in the interest of fathers (Bressan, in press). Clearly, any strategy based on an accurate estimation of resemblances would defy its primary purpose in all the cases in which the official and the biological fathers do not coincide. Thus, a truly efficient evolutionary strategy would combine a poor sensitivity to actual relatedness with a strong effect of presumed relatedness. Note that an automatic exaggeration of perceived child-father (or, much more practically, child-parent) resemblance on the mere basis of belief in relatedness – twice as effective if accompanied by a symmetrical decrease of perceived resemblance on the basis of belief in unrelatedness – works exactly to this effect.

Whether or not one chooses to take an evolutionary stance, and regard this bias as advantageous, our data conclusively show that common allegations of family resemblance are not a form of conscious deception, but the result of a real, if weak, sensitivity to actual similarities – accompanied by pervasive hypothesis-testing fallacies in human reasoning.

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