

Maternal Resemblance Comments and Stepfather Investment: A Byproduct of the Paternal Uncertainty Mechanism

Guansheng Lin^{1†}, Jiawen Li^{2*†}, Ruihan Zhang³, Xi Chen⁴, Yuyan Tang⁵

¹*Zhixing High School, Guangzhou, China*

²*Department of Psychology, Middlebury College, Middlebury, USA*

³*Saint Bede Academy, Peru, USA*

⁴*YK Pao School, Shanghai, China*

⁵*International Department of the First High School of Changsha, Changsha, China*

**Corresponding Author. Email: jiawenl@middlebury.edu*

†These authors contributed equally to this work and should be considered as co-first author.

Abstract. In a world where stepfamilies are increasingly common, uncovering what motivates stepfather investment is critical for children's well-being. While traditional theories that accompany these findings are mating effort, we propose a complementary explanation that stepfather investment is influenced by a misfiring of the resemblance detector. This psychological mechanism may have originally evolved to help putative biological fathers feel more certain the child was theirs. To test it, we conducted two experiments. In Experiment 1, a longitudinal survey will be used to trace stepfather investment changes caused by these remarks. In Experiment 2, we use fMRI to measure neural responses to resemblance comments from stepfathers, biological fathers, and non-parents. This research may have practical significance for stepfamilies and even holds relevance in foster care and adoption settings. We anticipate using convergent evidence to support our hypothesis and aim to offer new insights into stepfather-child dynamics.

Keywords: Maternal Resemblance Cues, Maternal Comments, Stepfather Investment, Paternal Uncertainty, Evolutionary Psychology

1. Introduction

In modern society, stepfamilies are increasingly common [1]. Therefore, understanding how stepfathers engage with children is crucial for children's welfare as research shows that paternal involvement, whether from the biological father or stepfather, significantly improves children's cognitive development and self-control [2].

From an evolutionary perspective, paternal involvement is greatly influenced by paternal uncertainty - fathers can not be certain of their biological connection with the child [3]. Studies show that more paternal uncertainty is related to less willingness to invest in a child [4]. To counter this, natural selection evolved adaptations in mothers, their kin, and fathers. One possible adaptation

in mothers and their kin is remarking on the similarities between the father and child [5]. By emphasizing resemblance, they may activate the resemblance detector, which might be an adaptation in putative biological fathers, to reduce paternal uncertainty and in turn encourage greater investment [6,7].

Although evolutionary psychology has explored how putative biological fathers respond to such comments, far fewer studies focused on stepfathers. The dominant explanation for stepfathers' positive responses, which can be shown as substantial investment, has been mating effort. This suggests that stepfathers invest in order to enhance their relationship with the child's mother [8]. While this explanation is plausible, we propose that stepfathers' positive responses to resemblance comments may be a byproduct of the resemblance detector, a mechanism used to assess paternal uncertainty. Although stepfathers do not face paternal uncertainty, this mechanism may still misfire, leading to increased affinity and investment even when no genetic bond exists. This idea is supported by two lines of evidence: First, societal and contextual cues can influence paternal behaviors [7]. Second, adults show a preference for children who resemble themselves – even when no biological relationship exists [9].

In this paper, we test our hypothesis with two experiments.

Experiment 1 is a longitudinal survey that examines whether maternal resemblance comments can directly influence stepfathers' involvement with their stepchildren. Experiment 2 employs neuroimaging to compare stepfathers, putative biological fathers, and non-fathers to assess whether resemblance comments elicit similar neural responses associated with paternal investment across these groups. By combining a behavioral measure with an objective neural assessment, we aim to test our hypothesis convergently and provide robust evidence for the potential misfiring of evolved paternal mechanisms in non-biological contexts.

2. Method

2.1. Experiment 1: survey-based longitudinal study

2.1.1. Participants

We will recruit 200 stepfathers in newly remarried families assuming a parental role and no maternal or maternal kin emphasis on resemblance has occurred prior to the study. Eligibility criteria include a positive relationship with the mother, absence of previous paternal investment in the stepchildren, stepchildren under 18, no biological child, and no preexisting surname change or other strong kinship cues.

2.1.2. Procedure

At the start, stepfathers will complete the same baseline survey questionnaire to assess their initial willingness to invest in their stepchildren (e.g., emotional engagement, time commitment, financial investment) and beliefs about resemblance with the child.

Follow-up surveys will be conducted after a designated period. During this time, the participants and their families will report how often resemblance comments appear. Stepfathers will update their levels of emotional, time-based, and financial investment. Based on their responses, participants will be divided into a Resemblance-emphasis group and a No-emphasis group. Selective semi-structured interviews will explore how resemblance cues affected their feelings and behavior. Additionally,

third-party raters will evaluate actual physical resemblance between each pair of stepfather and stepchild.

2.1.3. Testing environment

To minimize social desirability bias, each participant will take surveys alone in a comfortable room with an appropriate time limit (try best to get results from first impression) and results will be anonymous.

2.1.4. Data analysis

We will use descriptive and analytical statistics to evaluate data and compare differences between the two groups.

2.2. Experiment 2: fMRI study

2.2.1. Participants

We will recruit three participant groups: Group 1: Stepfathers living with their partner's children ($n \approx 50$); Group 2: Biological fathers residing with their own children ($n \approx 50$); Group 3: Men without children ($n \approx 50$). To mitigate potential confounding variables, participants across groups will be matched on relevant background.

2.2.2. Procedure

All groups of participants will undergo fMRI scanning while viewing photos of children on the screen in each trial. Each photograph will be accompanied by a verbal prompt that either highlights physical similarity (e.g., "She has your eyes") or serves as a neutral control (e.g., a description of the photo background). Each participant will complete a certain number of randomized trials distributed across both conditions, with standard fMRI methods recording brain activity.

With consent, we will collect a picture of each pair in Group 1 (stepfather) and analyze the physical similarity data which will be used to generate the pictures of children for participants in Group 3 (men without children). This procedure will ensure comparability between groups.

2.2.3. Data analysis

We will examine participants' brain activity in response to children's images paired with resemblance comments. Group-level analyses will examine the brain activation among stepfathers, biological fathers, and non-parents, concentrating on brain regions associated with paternal investment (e.g., regions responsible for reward and social bonding).

3. Discussion

3.1. Expected results

3.1.1. Byproduct effect in stepfathers (both studies support the hypothesis)

In Study 1, if stepfathers in the emphasis group report significantly higher investment over time compared to those in the non-emphasis group according to statistical analysis. In Study 2, fMRI

scans show that only stepfathers and biological fathers show a similar brain activity in areas linked to paternal investment. These results would provide convergent evidence for the hypothesis that resemblance comments from the maternal family can misfire the resemblance detector even in non-biological stepfather contexts.

3.1.2. Negative impact of maternal emphasis

In Study 1, resemblance comments might be associated with lower stepfather investment in some cases. One reason could be that the cues were said too often or in a way that felt forced. This overemphasis may have caused discomfort or doubt. The stepfather might feel pressured or manipulated, which lead to distance and not closeness. Also, if the stepfather has doubts about the relationship or feels insecure, strong or repeated cues might trigger negative emotions. These emotions could lower motivation to invest.

3.1.3. Other factors may be more important

In some cases, there may be no strong relationship between resemblance cues and stepfather investment, which may suggest that other influential factors play a larger role.

If one study supports the hypothesis but the other does not, two possible classifications emerge. First, if Study 1 supports but Study 2 does not (stepfathers show increased investment in behavior, but neural data do not show similar brain activity in areas linked to paternal investment in stepfathers and biological fathers), one possible explanation is that resemblance comments influence behavior through social or contextual channels rather than through evolved psychological mechanisms. Second, if Study 2 supports but Study 1 does not, this would indicate a disconnect between the evolved psychological mechanism and real-world behavior. This might be caused by other factors such as financial limitations.

If both studies do not support the hypothesis, the interpretation changes. In Study 1, a lack of significant difference in investment between groups according to statistical analyses could suggest that resemblance comments do not strongly influence stepfather behavior. In Study 2, two possible outcomes could emerge: first, only biological fathers might show activation in brain regions related to paternal involvement, while stepfathers and non-fathers show no such activation; second, all three groups might display similar activation patterns. The latter would imply that resemblance sensitivity is a general human trait rather than a paternal-specific adaptation, with the response being most pronounced in men with biological ties.

In either case, these results would be partially consistent with our hypothesis but also highlight the influence of other social or contextual processes on paternal investment.

- Stronger Predictor 1: Behavioral Similarity

Compared to looks, stepfathers may care more about the similarity of behaviors, such as facial expressions and ways of thinking, with the child [10]. A child who acts like the stepfather may feel more “real” than one who just looks like him.

- Stronger Predictor 2: Shared Surname

Taking on the same surname can serve as a strong symbolic marker of family unity [11]. This shared identity may make stepfathers feel more legitimate in their parental role, thereby increasing emotional closeness and commitment to the child. Such symbolic kinship markers can be especially powerful in societies where surnames carry cultural weight [11].

- Stronger Predictor 3: Shared Hobbies

When stepfathers and stepchildren engage in the same activities—such as playing sports, making music, or working on projects together—they create shared experiences that deepen emotional bonds [10]. These may foster a sense of partnership and belonging that goes beyond physical resemblance.

3.2. Limitations & future directions

These findings might be promising; however, they must be understood with caution due to several limitations. First, our longitudinal design examines changes over a relatively short duration, rendering it unclear whether the effects would persist for years. Second, even after accounting for numerous confounding background factors, some inevitable unmeasured variables such as the child's temperament may still influence paternal investment. Third, our study primarily focused on physical resemblance cues; other forms of resemblance, such as shared behaviors, mannerisms, or hobbies, as expected result three suggested, may provoke stronger or more enduring affiliative responses. Fourth, since mothers were not instructed on how to make the remarks, factors such as their manner of communication (e.g., playful vs. serious tone) may influence the outcome. Lastly, although the fMRI component is beneficial for identifying neural correlates, it examines a limited number of selected stepfamilies and may not represent the whole spectrum of stepfamily contexts.

Future studies could extend beyond physical resemblance comments to examine whether behavioral similarities—such as similar behaviors, shared hobbies or matching clothing—yield impacts on stepfather investment. Also, children's reactions when informed about their resemblance to a parent should be recorded as a factor, as their responses may affect mutual connection and investment. Comparative studies of these cues may elucidate which elements of similarity exert the most influence. Moreover, further research should broaden this methodology to include more family types such as same-sex families to determine if the same mechanisms are universally applicable. Researchers may also investigate whether training caregivers to deliberately utilize resemblance comments can enhance familial connections and paternal investment. Longitudinal studies over several years would elucidate the permanence of these benefits, while cross-cultural comparisons could determine their consistency across varying kinship standards. Ultimately, considering more factors and broadening the research scope could provide a more comprehensive, multi-dimensional understanding of paternal involvement.

4. Conclusion

This study seeks to examine whether maternal resemblance comments augment stepfathers' commitment to stepchildren, despite the absence of genetic relatedness. By integrating a longitudinal survey of behavioral changes (Study 1) with neural activation assessment (Study 2), our approach offers convergent insight into the potential misfiring of evolved psychological mechanisms in stepfamily contexts. If both studies generate supportive evidence, it would suggest that a mechanism originally evolved to ensure paternal confidence in biological fathers might also be activated by constructed cues in stepfathers.

Such findings could present practical significance for stepfamilies, or even in foster care and adoption settings, where these strategies may offer a low-cost, easily implemented method to encourage caregiving behaviors and emotional stability.

Ultimately, whether the results confirm or challenge our hypothesis, this research will deepen understanding of how evolved psychological mechanisms can operate beyond their original adaptive environments and functions.

References

- [1] Spearin, C. E., & Torr, B. M. (n.d.). An historical perspective of step-parenting in the United States: Exploring changes in the American family using an age-period-cohort model. Brown University.<https://paa2005.populationassociation.org/papers/51388>
- [2] Choi, J., Kim, H. K., Capaldi, D. M., & Snodgrass, J. J. (2021). Long-term effects of father involvement in childhood on their son's physiological stress regulation system in adulthood. *Developmental Psychobiology*, 63(6), e22152. <https://doi.org/10.1002/dev.22152>
- [3] Trivers, Robert. (1974). Parent-Offspring Conflict. *American Zoologist*. 14. 249-264. https://www.researchgate.net/publication/223995721_Parent-Offspring_Conflict
- [4] Alvergne, A., Faurie, C., & Raymond, M. (2009). Father-offspring resemblance predicts paternal investment in humans. *Animal Behaviour*, 78(1), 61–69. <https://doi.org/10.1016/j.anbehav.2009.03.019>
- [5] Daly, M., & Wilson, M. I. (1982). Whom are newborn babies said to resemble? *Ethology and Sociobiology*, 3(2), 69–78. [https://doi.org/10.1016/0162-3095\(82\)90002-4](https://doi.org/10.1016/0162-3095(82)90002-4)
- [6] Alexander, R. D. (1974). The Evolution of Social Behavior. *Annual Review of Ecology and Systematics*, 5(1), 325–383. <https://doi.org/10.1146/annurev.es.05.110174.001545>
- [7] Chang, L., Lu, H. J., Lee, L. N. Y., Li, T., & Sui, S. S. (2010). Patrilocal Residence and Father-Child Resemblance Beliefs in Relation to Paternal Investment. *Parenting*, 10(4), 274–285. <https://doi.org/10.1080/15295192.2010.492039>
- [8] Pettay, J. E., Danielsbacka, M., Helle, S., Perry, G., Daly, M., & Tanskanen, A. O. (2023). Parental Investment by Birth Fathers and Stepfathers. *Human Nature*, 34(2), 276–294. <https://doi.org/10.1007/s12110-023-09450-6>
- [9] Platek, S. M., Burch, R. L., Panyavin, I. S., Wasserman, B. H., & Gallup, G. G. (2002). Reactions to children's faces: Resemblance affects males more than females. *Evolution and Human Behavior*, 23(3), 159–166. [https://doi.org/10.1016/S1090-5138\(01\)00094-0](https://doi.org/10.1016/S1090-5138(01)00094-0)
- [10] Apicella, C. L., & Marlowe, F. W. (2004). Perceived mate fidelity and paternal resemblance predict men's investment in children. *Evolution and Human Behavior*, 25(6), 371–378. <https://doi.org/10.1016/j.evolhumbehav.2004.06.003>
- [11] Šaffa, G., Štěrbová, Z., & Prokop, P. (2021). Parental Investment Is Biased toward Children Named for Their Fathers. *Human Nature*, 32(2), 387–405. <https://doi.org/10.1007/s12110-021-09396-7>