



## Cues of paternal uncertainty and father to child physical abuse as reported by mothers in Rio de Janeiro, Brazil<sup>☆</sup>

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### ABSTRACT

**Objective:** Paternity is uncertain, so if paternal feelings evolved to promote fitness, we might expect them to vary in response to variables indicative of paternity probability. We therefore hypothesized that the risk of lapses of paternal affection, including abusive assaults on children, will be exacerbated by cues of non-paternity.

**Methods:** Cross-sectional study of 331 Brazilian mothers, interviewed about 1 focal child (age 1–12) residing with her and the putative father. Child physical abuse was assessed using the *Conflict Tactic Scales: Parent Child* (CTSPC). Two potential cues of (non) paternity were (1) whether the parents co-resided when the child was conceived, and (2) whether third parties allegedly commented on father–child resemblance. Data were analyzed through multiple logistic regressions.

**Results:** Mothers reported child physical abuse by 15.9% (95% CI 4.6–27.1) of fathers who had not cohabited with them at conception, compared to 5.9% (95% CI 3.1–8.7) of those who had. The odds ratio for abuse by fathers who had not cohabited at conception in relation to those who had—adjusted for income, education, age, sex of child, whether child was first born, household size, time father spent with child, and alcohol abuse and drug use by father—was 4.3 (95% CI 1.4–13.8). Mothers reported abuse of 7.0% (95% CI 4.0–10.0) of children who purportedly resembled their fathers, versus 8.7% (95% CI 0.2–17.1) of those who did not.

**Conclusion:** According to maternal reports, not having co-resided at conception quadrupled the chance of child physical abuse by currently co-residing Brazilian fathers. The reported prevalence of abuse was unrelated to reported allegations of father–child resemblance.

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### Introduction

Children suffer physical abuse all over the world, in developed and developing countries alike. Reports of severe physical abuse of children by parents have varied, for example, from 9% to 22% in the USA (Briere & Elliott, 2003; Brown, Cohen, Johnson, & Salzinger, 1998; Finkelhor & Dzuibaleatherman, 1994; Hussey, Chang, & Kotch, 2006; Straus & Gelles, 1986), 7% to 15% in the UK (May-Chahal & Cawson, 2005), 10% in Ontario, Canada (MacMillan, Fleming, Troome, Boyle, Wong, & Racine,

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1997), 8% in Finland (Sariola & Uutela, 1992), 12% in northern Portugal (Machado, Goncalves, Matos, & Dias, 2007), 10% in a sample of an economically disadvantaged population in Embu (SP), Brazil (Bordin, Paula, do Nascimento, & Duarte, 2006) and 8% in a health service sample in Rio de Janeiro, Brazil (Moura & Reichenheim, 2005).

In order to address this worldwide problem of domestic violence against children, it is important to investigate circumstances that affect the risk. A number of risk factors for child abuse have been identified including socio-economic status, education, single parenthood, age of the mother, age of the child, substance abuse, and the parents' own history of victimization (Bordin et al., 2006; Brown et al., 1998; Machado et al., 2007; Stephenson, Sheikhattari, Assasi, Eftekhari, Zamani, & Maleki, 2006; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). Most of these risk factors are apparently relevant to both maternal and paternal abuse of the child, but the fact that men may be unsure of their paternity suggests the possibility of additional risk factors peculiar to paternal abuse, whose triggers remain relatively little known (Brown et al., 1998).

Parental affection and care presumably evolved in the service of promoting parental fitness, and hence to promote the welfare of one's own children rather than the welfare of any child. These considerations suggest that caring for stepchildren (i.e., genetically unrelated children) is motivated by inclinations to invest in the new marital relationship rather than in the children themselves (Anderson, 2000), and that such care will be less reliable and "selfless" than care for one's own children, an hypothesis for which there is abundant support (Daly & Wilson, 2008). According to many studies, stepparents, especially stepfathers, often abuse children at higher rates than their birth parent counterparts (Daly & Wilson, 2008; Wilson & Daly, 1992; Apicella & Marlowe, 2004; May-Chahal & Cawson, 2005; Burch & Gallup, 2000; Daly & Wilson, 1982).

In any animal species with internal fertilization, males cannot reliably identify their own offspring. Because natural selection favours preferential investment of limited parental resources in one's genetic relatives (Hamilton, 1964), the rarity of paternal care in mammals has been attributed to paternity uncertainty. In the minority of species in which fathers nevertheless provide care, they sometimes adjust investment in relation to statistical cues of paternity probability (Wilson & Daly, 1992), and there is some evidence that this is the case in *Homo sapiens*, too (Anderson, Kaplan, & Lancaster, 2006; Anderson, Kaplan, & Lancaster, 2007; Apicella & Marlowe, 2004; Bellis, Hughes, Hughes, & Ashton, 2005). There is evidence, for instance, in yellow baboons, another typical multimale primate society, that males discriminate their own offspring from those of other males and provide care to them differentially (Buchan, Alberts, Silk, & Altmann, 2003), and that this paternal care enhances offspring fitness (Charpentier, Van Horn, Altmann, & Alberts, 2008); this can be considered true parental discriminative care.

Current estimates of misattributed paternity in humans vary substantially, from around 2% to 30% (Anderson, 2006; Bellis et al., 2005). The highest estimates are suspect, deriving from non-representative samples such as contested paternity cases; however, there is no question that some incidence of extra-pair paternity is cross-culturally ubiquitous, and if this has been a chronic circumstance during the evolution of the human psyche, men who secured female fidelity and/or allocated their parental investment according to reliable cues of paternity would have been favoured by selection (Wilson et al., 1992).

At least two kinds of cues may inform a father's paternity confidence. One is the quality of the putative parents' relationship, which affects the likelihood of sexual infidelity (Anderson et al., 2007; Apicella et al., 2004). Paternity confidence is lower among unmarried than married couples, and lower when the pregnancy was unplanned (Anderson et al., 2006). The second type of cue is the phenotypic resemblance of the child to the putative father or his relatives (Alvergne, Faurie, & Raymond, 2007; Apicella et al., 2004; DeBruine, 2004; Platek, Raines, Gallup, Mohamed, Thomson, & Myers, 2004). Others' comments as to whether the baby resembles the father may also affect paternity confidence (Apicella et al., 2004; Daly & Wilson, 1982; Regalski & Gaulin, 1993). In a US study, men's ratings of their children's resemblance to themselves and of the quality of their relationships with those children were positively correlated. Moreover, the degree to which the same men thought they looked like their fathers was correlated with the physical punishment they claimed to have experienced during childhood (Burch & Gallup, 2000).

The hypothesis is that a father may be more likely to act aggressively towards a child when cues indicate that it might not be his own. The aim of this study was to assess whether two cues of paternal uncertainty—a potential indicator of sexual (in) fidelity and a potential indicator of father-child resemblance—affect the incidence of paternally perpetrated physical abuse as reported by mothers.

## Methods

### *Study population and settings*

A cross-sectional study was conducted in 2 public outpatient paediatric services in Rio de Janeiro, Brazil, between September 2006 and January 2007. While mothers and children waited for a doctor's appointment, trained interviewers performed a multidimensional face-to-face structured interview with mothers who had children aged 1–12; the screening interview was conducted in the waiting room, but the structured complete study interview was conducted in a private room lasting approximately 20 to 25 minutes. For mothers who had multiple children aged 1–12, the focal child for this study was the one who was taken to the medical appointment on the day of the interview.

A total of 745 mothers was approached by the interviewers, of whom 278 were deemed ineligible for the study on the grounds that the child had a chronic disease, was outside the designated age range, or spent fewer than 6 of 21 periods per week with the mother's partner (the week being divided into 21 morning, afternoon and night periods), or if the partner had not resided with the mother for at least 3 of the previous 12 months. Of the 467 eligible women, 92 (19.7%) refused

**Table 1**

Prevalence of mothers' reports of father to child physical abuse and mother to child abuse in the previous 12 months by two cues of paternal uncertainty, among a health service sample of Brazilian mothers in Rio de Janeiro. Percent reporting the affirmative (95% confidence intervals).

	Cues of paternal uncertainty			
	Living together <sup>b</sup>		Resemblance <sup>d</sup>	
	Yes % (n = 287)	No % (n = 44)	Yes % (n = 284)	No % (n = 47)
<i>Physical abuse or severe physical abuse by the father against child reported by mother</i>				
1 - Hit him <sup>a</sup> with a fist or kicked him hard?	0.3 (–0.3–1.0)	4.5 <sup>c</sup> (–1.9–10.9)	0.7 (–0.3–1.7)	2.2 (–2.2–6.5)
2 - Hit him on some other part of the body besides the bottom with something like a belt, hairbrush, a stick or some other hard object?	4.2 (1.8–6.5)	11.4 <sup>c</sup> (1.6–21.1)	4.9 (2.4–7.5)	6.5 (–0.9–13.9)
3 - Threw or knocked him down?	0.3 (–0.3–1.0)	0	0.3 (–0.3–1.0)	0
Physical abuse (items 1, 2 or 3)	4.5 (2.1–7.0)	13.6 <sup>c</sup> (3.1–24.2)	5.3 (2.7–8.0)	8.5 (0.2–17.1)
4 - Grabbed him around the neck and choked him?	0.3 (–0.3–1.0)	4.5 <sup>c</sup> (–1.9–10.9)	0.7 (–0.3–1.7)	2.2 (–2.2–6.5)
5 - Beat him up, that is you hit him over and over as hard as you could?	1.7 (0.2–3.2)	2.3 (–2.3–6.8)	1.7 (0.2–3.2)	2.2 (–2.2–6.5)
6 - Burned or scalded him on purpose?	0	0	0	0
7 - Threatened him with a knife or gun?	0	0	0	0
Severe physical abuse (items 4, 5, 6 or 7)	2.1 (0.4–3.8)	4.5 (–1.9–10.9)	2.5 (0.6–4.2)	2.2 (–2.2–6.5)
Physical abuse or severe physical abuse (items 1, 2, 3, 4, 5, 6 or 7)	5.9 (3.1–8.7)	15.9 <sup>c</sup> (4.6–27.1)	7.0 (4.0–10.0)	8.7 (0.2–17.1)
<i>Physical abuse or severe physical abuse by the mother against child reported by mother</i>				
Physical abuse (items 1, 2 or 3)	11.9 (8.1–15.7)	13.6 (3.1–24.2)	12.0 (8.2–15.8)	13.0 (2.9–23.1)
Severe physical abuse (4 or 5 or 6 or 7)	4.2 (1.8–6.5)	4.5 (–1.9–10.9)	3.9 (1.6–6.1)	6.5 (–0.9–13.9)
Physical abuse or severe physical abuse (items 1, 2, 3, 4, 5, 6 or 7)	14.7 (10.5–18.8)	15.9 (4.7–27.1)	14.4 (10.3–18.5)	17.4 (6.0–28.8)

<sup>a</sup> "him" shorthand for "him or her."

<sup>b</sup> Did putative genetic father live with the mother when she found out she was pregnant of the focal child? Mother answered "yes" or "no."

<sup>c</sup> Significant difference between "yes" and "no," Chi-square  $P < .05$ .

<sup>d</sup> Did people around (friends and neighbours) say that the focal child resembles the putative genetic father facially? Mother answered "always," "almost always" or "sometimes" = "yes;" "almost never" or "never" = "no."

to participate, and a further 44 (9.4%) did not complete the interview due to interruption. The sample used in the analyses therefore consisted of 331 women.

### Variables

The interview covered the following themes: (a) socioeconomic circumstances; (b) alcohol abuse and drug use by the father; (c) violence against the child by the father or mother in the previous 12 months; and (d) the following proxy measures for cues of paternal uncertainty.

### Explanatory variables (cues of paternal uncertainty)

Cues of paternal uncertainty were assessed through two questions. The first, intended to reflect the man's confidence in the exclusivity of his sexual relationship with the mother when the focal child was conceived, was "Did you live with the child's father when you found out that you were pregnant?" (yes/no). The impetus for considering this question a proxy for fidelity confidence was a prior report (Anderson et al., 2006) that paternity confidence of US fathers was reduced when the parents were unmarried at the time of conception and when the pregnancy was unplanned.

The second question, intended to reflect father–child resemblance, was "How often do people around you (neighbors, friends) say that the child resembles your partner facially?" ("always," "many times," "sometimes," "nearly never," "never"). For analysis, these responses were recoded dichotomously: "yes," the child resembled the father, if mothers answered "always," "almost always" or "sometimes," and "no" if they answered "almost never" or "never."

### Outcome variables (father to child physical abuse as reported by the mother)

Child physical abuse was assessed using the "basic module" of the *Conflict Tactic Scales: Parent Child* (CTSPC), in which 22 items are divided into 3 scales: non-violent discipline; psychological abuse; and physical assault. The latter is further split into 3 subscales, according to severity, labeled corporal punishment, physical abuse, and severe physical abuse (Straus et al., 1998). This instrument has been adapted for use in Brazil (Reichenheim & Moraes, 2003; Reichenheim & Moraes, 2006). The present study analysed the physical abuse and severe physical abuse subscales (7 of the 22 items; see Table 1). The CTSPC was introduced to the mothers in the following manner: "Children often do things that are wrong, disobey, or make their parents angry. We would like to know what your partner has done when your child did something wrong or made him upset or angry." Then the interviewer read the 22 items, and mothers were asked if their partners had done each act "never," "once" or "more than once" in the past year. Then the same list was repeated with mothers asked about their own, rather than their partners', behaviour. Cases were considered positive if the answer was "once" or "more than once" for any question in the

**Table 2**

Co-variables included in the study according to proxy indices of cues of paternal uncertainty (living together and resemblance) in a health service sample of Brazilian mothers in Rio de Janeiro.

Co-variables included in the study	Living together <sup>h</sup>		Resemblance <sup>i</sup>	
	Yes (n = 287)	No (n = 44)	Yes (n = 284)	No (n = 47)
	<b>Mean<sup>a</sup></b>	<b>Mean<sup>a</sup></b>	<b>Mean<sup>a</sup></b>	<b>Mean<sup>a</sup></b>
Household per capita income in Brazilian Reais <sup>b</sup>	300.9 (268.5–333.3)	301.8 (234.0–369.6)	296.2 (265.5–326.9)	330.6 (234.3–426.8)
Number of people in the household	3.8 (3.6–4.0)	3.4 (3.0–3.8)	3.7 (3.5–3.9)	3.9 (3.4–4.4)
Father's number of years of schooling <sup>c</sup>	1.7 (1.6–1.8)	1.9 (1.6–2.2)	1.7 (1.6–1.8)	1.9 (1.6–2.2)
Father's age	35.3 (34.3–36.3)	34.7 (31.5–37.9)	35.0 (34.0–36.0)	36.5 (33.7–39.3)
Time father spent with child (periods/week) <sup>d</sup>	11.3 (10.8–11.8)	10.7 (9.5–11.9)	11.3 (10.8–11.8)	10.3 (9.6–11.4)
Child's age	4.5 (4.2–4.8)	5.4 (4.4–6.4) <sup>g</sup>	4.5 (4.2–4.8)	5.1 (4.2–6.0)
Number of siblings including focal child	2.1 (1.9–2.2)	1.9 (1.5–2.3)	2.1 (1.9–2.3)	2.2 (1.9–2.5)
	<b>Percentage<sup>a</sup></b>	<b>Percentage<sup>a</sup></b>	<b>Percentage<sup>a</sup></b>	<b>Percentage<sup>a</sup></b>
Father's drug use (yes) <sup>e</sup>	11.8 (8.3–16.1)	13.6 (5.2–27.3)	12.0 (8.4–16.3)	12.8 (4.8–25.7)
Father's alcohol abuse (yes) <sup>f</sup>	62.0 (56.1–67.6)	59.1 (43.2–73.7)	63.0 (57.1–68.7)	53.2 (38.1–67.9)
Child's sex (male)	48.0 (42.2–54.0)	54.5 (38.8–69.6)	49.2 (43.3–55.3)	44.6 (30.2–59.9)
Child first born (yes)	45.4 (39.4–51.2)	69.8 <sup>g</sup> (54.8–83.2)	48.8 (44.0–54.9)	46.8 (32.1–61.9)

<sup>a</sup> In brackets: 95% confidence intervals.

<sup>b</sup> Two Brazilian Reais quoted at approximately one American Dollar.

<sup>c</sup> Years of schooling: 1 = 0 to 4 years, 2 = 5 to 8 years, 3 = 9 to 11 years, and 4 = more than 11 years.

<sup>d</sup> Number of periods in the week the father spent with the child (range from 6 to 21 periods – a morning, an afternoon or a night is defined as a period).

<sup>e</sup> Drug use: assessed using the NSDUQ screening test (Smart et al., 1981). The mother was asked to report on her partner's use of the following: 1 – anxiety lowering drugs, 2 – shoemaker's glue, 3 – cannabis, 4 – cocaine, 5 – other types of drugs. Answering yes to any one of these five defined a case for drug use.

<sup>f</sup> Alcohol abuse: assessed using the TWEAK screening test. The mother was asked: 1 – Did your partner ever feel that he should cut down or cut off drinking (1 point)? 2 – Do you or your parents worry or complain when your partner drinks (2 points)? 3 – How many drinks does it take to make your partner feel high (three or more drinks defined a positive case – 2 points)? 4 – Does your partner usually drink in the morning in order to reduce nervousness or hangover (1 point)? 5 – Has your partner ever awakened the morning after drinking the night before and found that he could not remember a part of the evening before (1 point)? The alcohol abuse score could vary from 0 to 7 points. A score of 2 or more points defined a positive case (Moraes et al., 2005).

<sup>g</sup> Significant difference between "yes" and "no,"  $P < .05$ .

<sup>h</sup> Did putative genetic father live with the mother when she found out she was pregnant with the focal child? Mother answered "yes" or "no."

<sup>i</sup> Do people around (friends and neighbours) say that the focal child resembles the putative genetic father facially? "Yes" if mother answered "always," "almost always" or "sometimes;" "No" if mother said "almost never" or "never."

subscale, such that one positive item in the physical abuse sub-scale (for example) was enough to define a case of physical abuse.

### Co-variables (potential confounders)

Several social and family variables that might modulate paternal uncertainty or otherwise influence child abuse were collected (Table 2). Father's education was categorized into 4 levels representing significant stages in the Brazilian education system: (1) 0 to 4 years of schooling, (2) 5 to 8 years, (3) 9 to 11 years, and (4) more than 11 years. Alcohol abuse was assessed using the TWEAK screening test (Moraes, Viellas, & Reichenheim, 2005; Russell, Martier, Sokol, Mudar, Bottoms, & Jacobson, 1994) applied here to detect abuse by fathers. Drug use was evaluated by the "Non-student Drug Use Questionnaire" (NSDUQ) supported by the World Health Organization (Smart, Arif, Hughes, Medina Mora, Navaratnam, & Varma, 1981). Household per-capita income was calculated by dividing disposable household income by the number of household members. Time father spent with the child was assessed as the number of "periods" out of a possible 21 (see above) per week.

### Statistical analyses

Prevalence estimates for child physical abuse were obtained with exact confidence limits. Prevalence of the co-variables in relation to the putative paternal uncertainty cues was assessed, in order to verify the comparability of the groups. Multiple logistic regressions were carried out to assess the association between cues of paternal uncertainty and child physical abuse, holding the co-variables constant. Initially, several unconditional bivariate multiple logistic regression models were fitted in search of interactions between each covariate and the explanatory variables. Based on the likelihood ratio test, a cutoff point for acceptance was set at the 5% significance level. Variables detected as effect modifiers were retained in the model (child's age and whether child was first born). The remaining variables were then gradually introduced in the model, guided by parallel univariate regression analyses scrutinizing those with  $P$  values of .25 (father's education, number of siblings, number of people in the household) or lower according to the theoretical model (time father spent with the child, household per-capita income, sex of the child, alcohol abuse and drug use by the father). Regardless of the significance level, the final models also included variables that changed the exposure-related odds ratio by 10% or more, once other variables were included (father's age). We examined the correlations among all co-variables and found that the inclusion of all of them in the

**Table 3**

Odds ratios (OR) and 95% confidence intervals (CI) for mothers' reports of father to child physical abuse in the previous 12 months by two cues of paternal uncertainty, among a health service sample of Brazilian mothers in Rio de Janeiro.

	Physical abuse		Severe physical abuse		Physical abuse or severe physical abuse	
	Unadjusted OR (95% CI)	Adjusted <sup>c</sup> OR (95% CI)	Unadjusted OR (95% CI)	Adjusted <sup>c</sup> OR (95% CI)	Unadjusted OR (95% CI)	Adjusted <sup>c</sup> OR (95% CI)
Living together <sup>a</sup>						
Yes (reference)	1.00	1.00	1.00	1.00	1.00	1.00
No	3.3 (1.2–9.2) <sup>d</sup>	4.5 (1.3–15.5) <sup>e</sup>	2.2 (0.4–11.4)	3.7 (0.5–26.2)	3.0 (1.2–7.7) <sup>d</sup>	4.3 (1.4–13.8)
Resemblance <sup>b</sup>						
Yes (reference)	1.00	1.00	1.00	1.00	1.00	1.00
No	0.6 (0.2–1.8)	0.7 (0.2–3.2) <sup>f</sup>	1.1 (0.1–9.5)	0.9 (0.1–9.7)	0.8 (0.3–2.4)	0.9 (0.2–3.8) <sup>g</sup>

Logistic regression,  $df = 12$ .

<sup>a</sup> Did putative genetic father live with the mother when she found out she was pregnant with the focal child? Mother answered “yes” or “no.”

<sup>b</sup> Do people around (friends and neighbours) say that the focal child resembles the putative genetic father facially? “Yes” if mother answered “always,” “almost always” or “sometimes;” “No if mother said “almost never” or “never.”

<sup>c</sup> Models were adjusted for household per-capita income, father's education, age of the father and of the child, sex of the child, whether the child was the first born, number of siblings, number of people in the household, time that father spent with the child, and alcohol abuse and drug use by the father (i.e., all co-variables in Table 2).

<sup>d</sup> Likelihood ratio Chi-square test ( $LR \chi^2 = 4.5, P < .05$ ).

<sup>e</sup>  $LR \chi^2 = 25.8, P < .01$ .

<sup>f</sup>  $LR \chi^2 = 20.9, P < .05$ .

<sup>g</sup>  $LR \chi^2 = 22.6, P < .05$ .

model is not violating analytic assumptions, that is, they are not highly correlated with each other in our sample. We also examined for the presence of outliers and found that they did not influence the results, when excluded from the analysis.

Data entry and quality control were conducted, respectively, in Epi Info 6.04 (Centers for Disease Control and Prevention, Atlanta, GA, USA) and Stata Statistical Software, release 9. The latter was also used for data processing and analysis.

#### Ethics and data protection

This study was approved by the Research Ethics Committee of the Institute of Social Medicine at the State University of Rio de Janeiro in conformity with the principles embodied in the declaration of Helsinki. Participation in the study followed voluntary informed consent. Confidentiality of information was guaranteed and all the women received information on where to seek help if they so desired.

#### Results

In describing the results, what is called “physical abuse or severe physical abuse” in the last line of Table 1 will be referred simply as “abuse.” There were no reported cases of the most severe physical abuse (burning, scalding, or threatening with a weapon).

Among the 331 putative genetic fathers, 287 (86.7%) lived with the respective mother when the child was conceived, and 44 did not (13.3%). Paternally perpetrated abuse was reported by 5.9% of the 287 mothers who had co-resided at conception, and by 15.9% of the 44 who had not (Table 1;  $\chi^2 = 5.66, df = 1, P = .017$ ).

Two hundred and eighty four mothers (85.8%) reported that people said the focal child resembled the putative genetic father facially, while 47 (14.2%) reported that they did not. Paternally perpetrated abuse was reported by 7.0% of the former group of 284, and by 8.7% of the latter group of 47, a non-significant difference (Table 1;  $\chi^2 = .13, P = .72$ ). There was no significant association between the 2 hypothetical paternity cues, namely the reported resemblance claims and co-residency at conception ( $\chi^2 = 1.09, df = 1, P = .30$ ).

In general, the characteristics of fathers and children did not differ in relation to the two hypothetical paternity cues. The only significant differences were unsurprising: children conceived when their parents lived apart were slightly older than those conceived while parents co-resided, and were more likely to be first born (Table 2).

The unadjusted odds ratio was 3.0 for alleged abuse by fathers not co-residing at conception versus those co-residing. When adjusted for potential confounders (i.e., for all variables in Table 2), this odds ratio increased to 4.3. In the adjusted model, being a first born child reduced the chance of abuse, and as the prevalence of first born children was higher in the not-cohabiting-at-conception households, the adjustment for this variable was the main reason why the adjusted odds ratio was higher. The non-resemblance cue did not significantly affect the mothers' reports of paternally perpetrated abuse (Table 3).

Overall, 14.8% of mothers reported that they themselves had abused the focal child, compared to 7.3% reporting that the fathers had done so (Table 1;  $\chi^2 = 9.71, P = .002$ ). Neither cohabitation at conception nor resemblance reports were significantly associated with maternal reports of maternally perpetrated abuse (Table 1).



## Discussion

This study found that not cohabiting at conception predicted a large increase (more than fourfold) in mother's reports of paternal physical abuse, after adjusting for various characteristics that have been shown to predict child abuse in previous studies (Brown et al., 1998; Hussey et al., 2006; Machado et al., 2007; May-Chahal et al., 2005; Straus et al., 1998). This effect of co-residency at conception may reflect paternity confidence, which has previously been found to vary with marital status at conception and whether the pregnancy was planned (Anderson et al., 2006). However, this study found no evidence for the relevance of another possible paternity cue, namely whether other people comment that the child resembles the father facially (at least according to the mother).

Although living apart at conception may be interpreted as a threat to paternity confidence, it could instead be a proxy for some other relevant family circumstance, such as low social support which is also a predictor of child maltreatment (Hashima & Amato, 1994; Kotch, Browne, Dufort, & Winsor, 1999). Such hypotheses, however, arguably predict that living apart at conception should be associated with elevated abuse by mothers as well as by fathers, and that was not found (see Table 1); moreover, such an effect for paternal abuse but not maternal abuse cannot be explained away as due to underreporting of the latter, since maternal abuse allegations greatly outnumbered paternal abuse allegations.

In the present Brazilian study, no evidence of an association between alleged father–child resemblance and paternal abuse was found, but the results are not necessarily contradictory in relation to a US study that indicated a positive association between these variables (Burch et al., 2000), since there were many differences between the studies, including the sources of the allegations about resemblance claims and paternal behaviour (mother versus father) and the fact that the US sample consisted of men who had been convicted of assaulting their wives.

In this study, all data were derived from interviews with the mothers and were not otherwise validated. It is quite possible that the reports of abuse by one or both parents are biased, and the same may be true of the claims about allegations of paternal resemblance (Daly et al., 1982), or even the claims about time the fathers spent with the children. It is not obvious, however, why any such biases would occur differentially in such a way as to create a spurious association between co-residency at conception and paternal abuse.

The interpretation of this association as being due to differences in paternity confidence must at this point be tentative. One alternative possibility is that having dwelt apart at conception is a proxy for having been forced into marriage after an unplanned pregnancy, with subsequent resentment of the marriage and of the child who necessitated it. Further research is needed before robust conclusions can be drawn about why living apart at conception is a risk factor for subsequent paternal, but not maternal, abuse.

This study identifies a novel risk factor for child maltreatment, namely having lived apart at the time of conception, and provides initial evidence that this risk factor's impact may be large. Regardless of whether the reasoning about the possible relevance of cues of paternity is upheld by future research, the discovery of this risk factor demonstrates the heuristic utility of such theorizing.

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