

## Exposure to Mother's Pregnancy and Lactation in Infancy is Associated with Sexual Attraction to Pregnancy and Lactation in Adulthood

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### ABSTRACT

**Introduction.** Several theories, including psychodynamic theories, sexual imprinting and early conditioning have been formulated to explain sexual development. Empirical data, however, remain insufficient for a thorough evaluation of these theories.

**Aim.** In this study, we test the hypothesis that a critical period exists for the acquisition of sexual preferences, as suggested by empirical findings in birds and mammals (sexual imprinting).

**Methods.** An Internet questionnaire was used.

**Main Outcome Measures.** We gather data from individuals with a sexual preference for pregnant and/or lactating women, under the hypothesis that pregnancy or lactation may become sexually attractive in adulthood following an exposure to pregnant or lactating women in infancy.

**Results.** We find that these preferences are more common in older siblings, i.e., in individuals who have been exposed to more maternal pregnancy and lactation. This result is independent of respondent and sibling sex. In addition, only maternal pregnancies and lactations experienced between 1.5 and 5 years of age are associated with the preferences.

**Conclusions.** We discuss our findings in relation to theories of sexual development and to earlier reports of birth order effects on sexual behavior. We suggest that this age range may constitute a sensitive period for the acquisition of sexual preferences. **Enquist M, Aronsson H, Ghirlanda S, Jansson L, and Jannini EA. Exposure to mother's pregnancy and lactation in infancy is associated with sexual attraction to pregnancy and lactation in adulthood. J Sex Med 2011;8:140–147.**

**Key Words.** Sexual Imprinting; Sexual Development; Sexual Stimuli; Paraphilia; Fetishism; Birth Order; Exposure to Pregnancy and Lactation

### Introduction

Theories of sexual development [1–4] have hypothesized many possible causes of sexual preferences, ranging from genetic determinants [5,6], to interactions between innate and environmental factors [7,8], to individual experiences [9–12]. These hypotheses have been difficult to test empirically for practical and ethical reasons. Here we report on a questionnaire study designed to investigate whether two specific sexual prefer-

ences, for pregnant and for lactating women, are associated with exposure to pregnant or lactating women early in an individual's life.

The study is inspired by studies of sexual development in animals. A major finding of such studies is that the acquisition of sexual preferences occurs predominantly during a restricted time period early in life. Such sexual imprinting has been extensively documented in birds [13] as well as in some mammal species [14,15]. Although later experiences can influence sexual behavior [16],

imprinted preferences often dominate [13,15]. In humans, sexual imprinting has been suggested to contribute to the development of both common and rare preferences, including intercultural diversity in sexual practices [17–19] and paraphilias [20–22]. A few studies, prompted by sexual imprinting theory or Freudian theory, have reported correlations between an individual's preferences and parental characteristics [23–30], but results have often been hampered by methodological difficulties (see Materials and Methods section). In addition, there is so far no evidence of a critical period during which exposure to a particular stimulus can cause a specific sexual preference in adulthood.

Sexual imprinting is usually demonstrated by exposing animals to a specific stimulus early in life and then showing that the stimulus elicits sexual behavior when the animal reaches sexual maturity [13]. For instance, goats who are raised by sheep mothers become sexually responsive to sheep rather than to goats [15]. Our study follows similar logic, but rather than manipulating children's experiences we must rely on "natural experiments." That is, we try to identify a sexual preference in adults that can plausibly be linked to childhood exposure to a specific stimulus. The sexual imprinting hypothesis predicts that adults with the preference have a higher probability of childhood exposure. To test this hypothesis, the preference studied should fulfill two requirements. First, it must be possible ascertain whether the individual has been exposed to the stimulus in childhood, precluding a reliance on the recall of very early experiences. Ideally, the exposure should cover only a part of childhood, and it should be possible to estimate when it occurred. Second, it must be possible to find individuals lacking the exposure. Previous studies have not considered these requirements, by studying sexual preferences for characteristics such as eye color that are permanent (precluding identification of a critical period) and/or very common in the population (confounding the source of exposure). In this study, we determine the likelihood of exposure to maternal pregnancy or lactation in adults who have a preference for pregnant and/or lactating women. These preferences satisfy the aforementioned requirements. Exposure to maternal pregnancy and lactation is limited in time, and it can be inferred easily asking individuals their own age and their siblings' age without relying on early memories. Maternal (as opposed to non-maternal) pregnancy and lactation were chosen because the

mother has such a prominent role in the child's life that, were imprinting to occur, it would likely involve the mother.

## Methods

We obtained data through an Internet questionnaire, which we advertised in newsgroups (e.g., alt.sex.fetish and alt.sex.fetish.breastmilk) and Yahoo! discussion groups (e.g., *Lactaters* and *Pregnant Ladies*). Individuals participating in these communities often describe themselves as "fetishists," which typically indicates a strong sexual interest but need not meet criteria for a clinical diagnosis of fetishism [31]. Our message invited individuals with the two preferences to take the survey. The questionnaire asked for the respondent's age, sex, whether the respondent is sexually attracted by lactating and/or pregnant women, and at what age the respondent became aware of these preferences. It also asked for the sex and age of each sibling, and whether the sibling is a full sibling or not (half-sibling or adopted child). The introduction to the questionnaire stated that we were conducting academic research on sexuality. The survey ran from October 24, 2003 to October 14, 2009. In February, 2005, we revised it to gather some additional information, e.g., months of birth of respondents and their siblings, in addition to years of birth. See Appendix for the complete questionnaire.

Internet surveys are increasingly used for research on human sexual behavior because they allow to gather a large sample, even for rare traits, and because anonymity encourages respondents to freely express themselves about their sexual interests [31–35]. However, they may also suffer from sampling biases and deliberately inaccurate reporting [35–38]. Our experimental design considerably reduces the problem of sampling biases because it is not based on estimating and comparing population frequencies. Instead, we rely on the fact that, under the null hypothesis that early exposure does not influence sexual development, individuals with the preferences should be equally frequent in all birth orders. The sexual imprinting hypothesis, on the other hand, predicts that individuals with the preference should preferentially appear in early birth orders, i.e., have more younger siblings than expected by chance. In a family with two children, for example, only the older child has been exposed to the mother's pregnancy and/or lactation. A statistically significant skew of respondent's birth order distribution, in the direction of early birth

orders, would thus provide support for the sexual imprinting hypothesis. Inaccurate reporting, in our case, would consist of false information on an individual's preferences, own age, and siblings' age. Unless respondents were aware of our hypothesis, inaccurate reporting would introduce random data and favor the null hypothesis.

To test the hypothesis that respondents with either, or both, preferences have more younger siblings than expected from chance, we first grouped respondents according to number of siblings. Within each group, we performed a Wilcoxon signed-rank test of the null hypothesis that the median number of younger siblings is different from half the total number of siblings. Although the sexual imprinting hypothesis predicts a directional effect, we report two-tailed probabilities for conservativeness. We ascertain whether the direction of the effect is consistent or inconsistent with the sexual imprinting hypothesis by inspecting the data. Additionally, we used binomial tests (two-tailed) to evaluate the effect of respondent-sibling birth interval on the development of the preferences studied. We used  $\chi^2$  tests of homogeneity (two-tailed) to check for differences in results between groups of respondents (e.g., males and females). Statistical calculations were performed with R, version 2.10.1, distributed by the R Foundation for Statistical Computing, Vienna, Austria [39].

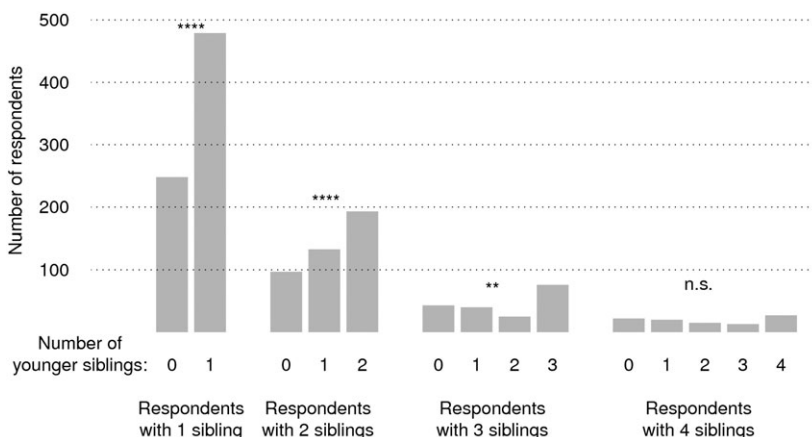
**Results**

We obtained 2190 questionnaires. We excluded from analysis respondents who reported an age less than 18 (N = 26) or greater than 80 (N = 8), respondents who did not report the age of one or more full siblings (N = 81), respondents who did

not report until what age they lived with their mothers (N = 10), and respondents who reported having a sibling of the same age and who took the survey before we included questions about months of birth (N = 34), as we could not ascertain whether the sibling was younger, older, or a twin. Respondents' twins, identified as full siblings with the same year and month of birth as the respondent, were excluded from analysis (N = 23). Twins among siblings (N = 41) were counted as one sibling because they are born of the same pregnancy.

Average reported age of the remaining 2082 questionnaires was 36.7 years, with a standard deviation of 12.3 years. Most respondents reported both a pregnancy and a lactation preference (N = 1474, 71%); a minority reported only one of the two (pregnancy: N = 296, 14%; lactation: N = 223, 11%). Eighty-seven respondents (4%) reported having neither preference and were excluded from further analysis. The average age at which respondents became aware of their preference was 18.8 years (standard deviation [SD] = 10.2 years) for lactation, and 18.0 years (SD = 9.5 years) for pregnancy. Among respondents with both preferences, 62% reported the same age of awareness for both preferences, 19% reported an earlier awareness of the lactation preference, and 19% reported an earlier awareness of the pregnancy preference.

Respondents with either, or both, preferences have significantly more younger siblings than expected by chance (Figure 1). Respondents with one sibling (N = 560) were older than their sibling in 66% of cases ( $P < 0.0001$ ,  $U = 53856$ , two-tailed Wilcoxon's signed-rank test). Respondents with two (N = 423) or three siblings (N = 184) have also more younger siblings than expected from chance

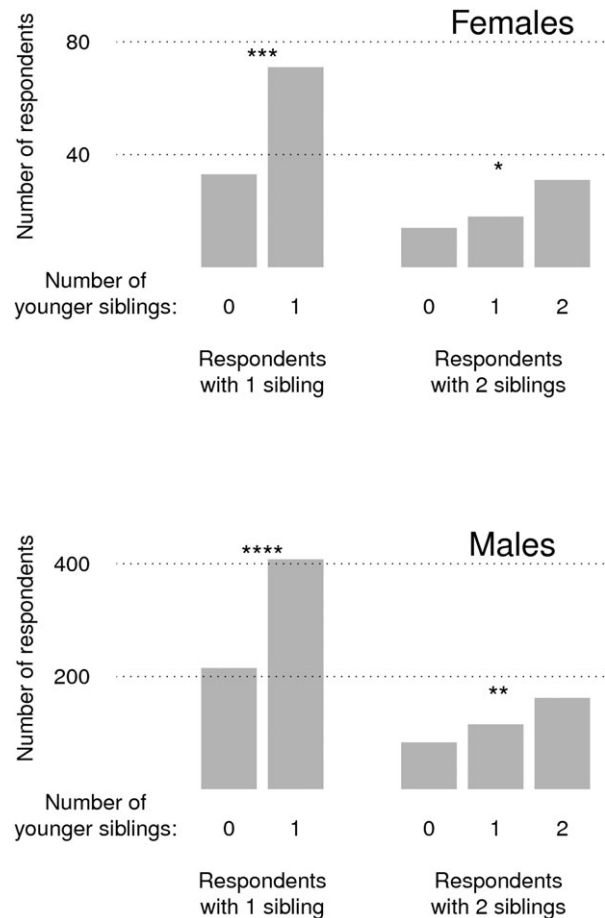


**Figure 1** Excess of younger siblings among respondents with a sexual preference for pregnant and/or lactating women. The straight lines represent the expected frequency of subjects with zero or more younger siblings under the null hypothesis that a preference for pregnant and/or lactating women is unrelated to the number of pregnancies witnessed by the respondent. Observed frequencies show more younger and less older siblings than expected.

(respectively,  $P < 0.0001$ ,  $U = 8585.5$ , and  $P < 0.01$  and  $U = 4278.5$ , two-tailed Wilcoxon's signed-rank tests). The number of younger siblings in subjects with four siblings ( $N = 79$ ) or more than four siblings ( $N < 30$ ) is as expected from chance. This analysis considered only subjects who reported living with their mother until at least 15 years of age ( $N = 1826$ ), including respondents' full siblings and half-siblings born of the same mother ( $N = 2844$ ), and excluding siblings born of a different mother ( $N = 706$ ). Number of siblings born of a different mother does not appear to be related to respondents' preferences. Among respondents with one such sibling ( $N = 148$ ), for example, the respondent was older than the sibling in 44% of cases ( $P = 0.14$ ,  $U = 4842$ , two-tailed Wilcoxon signed-rank test).

The pattern of results appears the same in both male ( $N = 1687$ , 85%) and female ( $N = 306$ , 15%) respondents (Figure 2). Male respondents with only one siblings ( $N = 623$ ) are older than their sibling in 65% of cases ( $P < 0.0001$ ,  $U = 127296$ , two-tailed Wilcoxon signed-rank test); female respondents with only one sibling ( $N = 104$ ) are older than their sibling in 68% of cases ( $P < 0.001$ ,  $U = 3727.5$ , two-tailed Wilcoxon signed-rank test). The same pattern is apparent also in male and female respondents with two full siblings (Figure 2). Female respondents with three full siblings ( $N = 25$ ) or more were not enough for statistical analysis. Males and females are also equally represented among respondents' younger and older siblings ( $P = 0.41$ ,  $c^2[1] = 0.66$ , two-tailed  $c^2$  test of homogeneity).

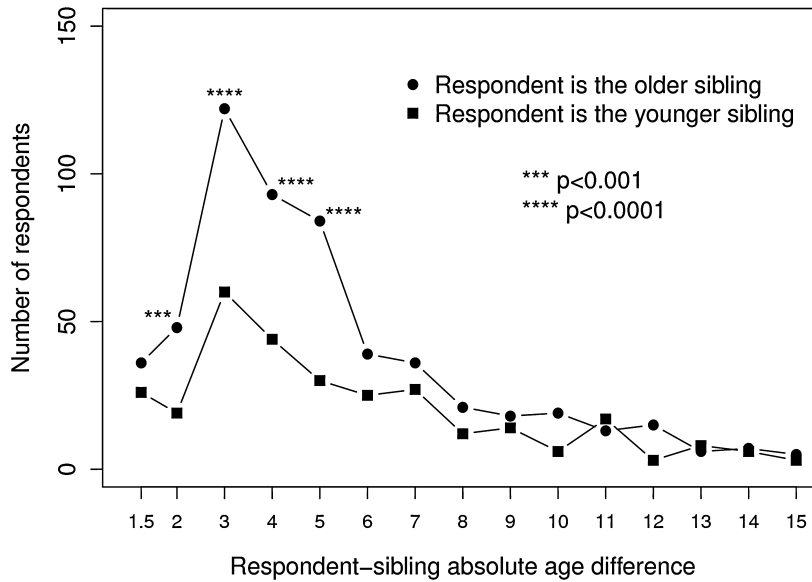
We have not detected any differences in number of younger siblings between respondents reporting only a pregnancy or a lactation preference, although this may be caused by the co-occurrence of the two preferences in most respondents. Among respondents reporting only a pregnancy preference, and having only one sibling ( $N = 134$ ), the respondent was older than the sibling in 69% of the cases ( $P < 0.0001$ ,  $U = 1770$ , two-tailed Wilcoxon signed-rank test). Respondents with one sibling who reported only a lactation preference ( $N = 86$ ) were older than their sibling in 69% of cases ( $P < 0.0001$ ,  $U = 4278$ , Wilcoxon signed-rank test). Those reporting both preferences ( $N = 547$ ) were older than their sibling in 64% of cases ( $P < 0.0001$ ,  $U = 62128$ , two-tailed Wilcoxon signed-rank test). These percentages are not significantly different from one another ( $P = 0.53$ ,  $c^2[4] = 1.28$ ,  $c^2$  test of homogeneity).



**Figure 2** Excess of younger siblings in female and male respondents with a sexual preference for pregnant and/or lactating women. Same data as in Figure 1, split by respondent sex and limited to respondents with one or two full younger or older siblings (female respondents with more siblings are too few for analysis).

To identify a sensitive period during which exposure is associated with preference, we considered respondents with only one full sibling and divided them into groups based on the age difference between respondent and sibling. For example, the 3-year age group consists of respondent-sibling pairs separated by an age difference greater than 2 years and up to 3 years. Because very few full sibling pairs have age differences of 1 year or less, we extended the first age group to include age differences between 0 and 1.5 years, and contracted the second age group to include age differences between 1.5 and 2 years. Figure 3 shows the number of respondent-sibling pairs in each age group, distinguishing between pairs in which the respondent is older from those in which the respondent is younger. Respondents are older than their sib-





**Figure 3** Excess of respondents with a younger vs. an older siblings as a function of the age difference between respondent and sibling. Only respondents reporting one full sibling and no half- or step-siblings are included. Data are grouped in 1-year bins, except the first two data points, which include respondent-sibling pairs separated by 0–1.5 and 1.5–2 years, respectively. Significance of differences is evaluated by binomial tests. The peaks in both curves stem from the fact that age differences between 2 and 5 years are the most common.

lings significantly more often when the age difference ranges between 1.5 and 5 years. Within this range, there is no significant difference between years ( $P = 0.46$ ,  $c^2[3] = 3.623$ ,  $c^2$  test of homogeneity; percentage of older respondents between 61% and 74%). Outside of this range, there is no significant effect of exposure on preference. These conclusions hold also if data grouped differently, e.g., in 6-month, 2- or 3-year periods.

Data from respondents with two or three siblings may suggest that firstborn children may develop the studied preferences more often than later-borns (Figure 1). Among respondents with two siblings, for instance ( $N = 423$ ), those with two younger siblings ( $N = 193$ ) are more than those with one younger sibling ( $N = 133$ ,  $P < 0.01$ , two-tailed binomial test), who are more than those without younger siblings ( $N = 97$ ,  $P < 0.05$ , two-tailed binomial test). The sexual imprinting hypothesis suggests several possible causes of this pattern. Firstborns, for example, see more pregnancies than later-borns. Among respondents with two siblings, for example, those with two younger siblings had on average 0.83 younger siblings born within the estimated sensitive period, to be compared with 0.58 for respondents with one younger sibling ( $P < 0.001$ ,  $N_1 = 193$ ,  $N_2 = 133$ ,  $U = 10,314.5$ , two-tailed Wilcoxon rank-sum test). Additionally, firstborns may spend more time with their mothers than later-borns, thus getting more exposure to potential imprinting stimuli.

## Discussion

Our results are consistent with the hypothesis that specific sexual preferences may be acquired through exposure to particular stimuli during a specific period early in life, similar to sexual imprinting in birds and mammals [13–15]. The results are also relevant to other theories of sexual development.

Freud's "oedipal phase," from about 3 to about 5–6 years of age, overlaps with the critical period suggested by our data, albeit only partially. The mechanism Freud suggested for the development of sexual preferences, however, differs radically from sexual imprinting [40,41]. Freud attributed to the young child a strong sexual desire toward the parent of the other sex (the Oedipus complex), while sexual imprinting occurs not because of sexual drive but because the individual is predisposed to learn the characteristics of surrounding individuals, typically the parents [13–15,42,43]. Although those seeking sexual partners who resemble the parents is the normal outcome of sexual imprinting, Freud considered it a pathology caused by an "unresolved" oedipal conflict. Freud also believed that partialism and fetishism would occur only in males, as a consequence of fear of castration ("castration complex"), whereas our data suggest that it can also occur in females (301 respondents to our survey, or 15%, are female, see also [31]). Many post-Freudian psychodynamic theorists rejected the notion that young children have powerful sexual drives, and were influenced by ethology in their study of how early relation-

ships affect adult relationships [44–46]. To our knowledge, however, they did not specifically address physical characteristics in acquired mate preferences.

Sexual conditioning theory [11,12] suggests that sexual preferences are acquired by Pavlovian conditioning when stimuli are experienced in conjunction with pleasurable genital stimulation, acting as a reinforcer. In the present study, sexual conditioning theory would predict that older siblings have more opportunities to associate a pregnant/lactating mother with genital stimulation, but it cannot explain why sexual conditioning would only occur when such stimuli are experienced between 1.5 and 5 years of age. Accounting for this finding would require to assume that young children up to 5 years of age are sensitive to sexual rewards, but that older children are not.

In conclusion, our results add new insights to growing issue of the correlation between pregnancy, lactation, and sexuality [47–49], and suggest the existence of sexual imprinting in humans and identify a possible sensitive period in which it occurs. That sexual imprinting occurs in humans is also supported by studies finding correlations between parental characteristics and partner preferences [23,24,27–30]. Further research is needed to confirm our findings and to elucidate the conditions under which imprinting occurs, i.e., to identify on which stimuli individuals can imprint, to confirm the sensitive period found in our data, and to investigate possible sex differences in the imprinting processes.

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*Conflict of Interest:* None.

#### Statement of Authorship

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#### References

- 1 von Krafft-Ebing R. Psychopathia sexualis. Stuttgart: Verlag Von Ferdinand Enke; 1886.
- 2 Freud S. Three essays on the theory of sexuality. In: Strachey J, ed. Freud standard edition. London: Hogarth Press; 1905:1953–65.
- 3 Money J. Love maps. New York: Irvington; 1986.
- 4 Bancroft J. Human sexuality and its problems. Oxford: Clarendon Press; 1989.
- 5 Bockland S, Hamer DH. Beyond hormones: A novel hypothesis for the biological basis of male sexual orientation. *J Endocrinol Invest* 2003;26(3 suppl):8–12.
- 6 Troisi A. Sexual disorders in the context of Darwinian psychiatry. *J Endocrinol Invest* 2003;26(3 suppl):54–7.
- 7 Wilson GD. Variant sexuality: Research and theory. Baltimore: Johns Hopkins University Press; 1987.
- 8 Abramson PR, Pinkerton SD. Sexual nature, sexual culture. Chicago: University of Chicago Press; 1995.
- 9 Rachman S. Sexual disorders and behavior therapy. *Am J Psychiatry* 1961;118:235–40.
- 10 Jaspers K. General psychopathology. Manchester: Manchester University Press; 1963.
- 11 McGuire RJ, Carlisle JM, Young BG. Sexual deviations as conditioned behaviour: A hypothesis. *Behav Res Ther* 1965;3:185–90.
- 12 Akins CK. The role of Pavlovian conditioning in sexual behavior: A comparative analysis of human and nonhuman animals. *Int J Comp Psychol* 2004;17:241–62.
- 13 Bischof HJ. Sexual imprinting as a two-stage process. In: Hogan J, Bolhuis JJ, eds. Causal mechanisms of behavioural development. Cambridge: Cambridge University Press; 1994:82–97.
- 14 D'Udine B, Alleva E. Early experience and sexual preferences in rodents. In: Bateson P, ed. Mate choice. Cambridge: Cambridge University Press; 1983:311–27.
- 15 Kendrick KM, Hinton MR, Atkins K, Haupt MA, Skinner JD. Mothers determine sexual preferences. *Nature* 1998;395:229–30.
- 16 Ferreira-Nuño A, Fernández-Soto C, Olayo-Lortia J, Ramirez-Carreto R, Paredes RG, Velázquez-Moctezuma J, Morales-Otal A. Copulatory pattern of male rats in a multiple partner choice arena. *J Sex Med* 2010; Mar 15. [Epub ahead of print] doi: 10.1111/j.1743-6109.2010.01746.x.

- 17 Morris D. The human zoo. London: Jonathan Cape; 1969.
- 18 Enquist M, Ghirlanda S, Lundqvist D, Wachtmeister CA. An ethological theory of attractiveness. In: Rhodes G, Zebrowitz LA, eds. Facial attractiveness: Evolutionary, cognitive, and social perspectives. Westport, CT: Ablex; 2002:127–51.
- 19 Laland KN. Sexual selection with a culturally transmitted mating preference. *Theor Popul Biol* 1994;45:1–15.
- 20 Gosselin C, Wilson G. Sexual variations. London: Faber & Faber; 1980.
- 21 Wilson GD. An ethological approach to sexual deviation. In: Wilson GD, ed. Variant sexuality: Research and theory. Baltimore: Johns Hopkins University Press; 1987:84–115.
- 22 Archer J. Ethology and human development. Hemel Hempstead: Harvester Wheatsheaf; 1992.
- 23 Bereczkei T, Gyuris P, Weisfeld GE. Sexual imprinting in human mate choice. *Proc Biol Sci* 2004;271:1129–34.
- 24 Perrett DI, Penton-Voak IS, Little AC, Tiddeman BP, Burt DM, Schmidt N, Oxley R, Kinloch N, Barrett L. Facial attractiveness judgements reflect learning of parental age characteristics. *Proc Biol Sci* 2002;269:873–80.
- 25 Jedlicka D. A test of psychoanalytic theory of mate selection. *J Soc Psychol* 1980;112:295–9.
- 26 Wilson GD, Barrett PT. Parental characteristics and partner choice: Some evidence for oedipal imprinting. *J Biosoc Sci* 1987;19:157–61.
- 27 Zei G, Astolfi P, Jayakar SD. Correlation between father's age and husband's age: A case of imprinting? *J Biosoc Sci* 1981;13:409–18.
- 28 Bereczkei T, Gyuris P, Kovcs P, Bernath L. Homogamy, genetic similarity, and imprinting: Parental influence on mate choice preferences. *Pers Individ Dif* 2002;33:677–90.
- 29 Little AC, Penton-Voak IS, Burt DM, Perrett DI. Investigating an imprinting-like phenomenon in humans. Partners and opposite-sex parents have similar hair and eye colour. *Evol Hum Behav* 2002;24:43–51.
- 30 Boothroyd LG, Perrett DI. Father absence, parent-daughter relationships and partner preferences. *J Evol Psychol* 2008;6:187–205.
- 31 Scorolli C, Ghirlanda S, Enquist M, Zattoni S, Jannini EA. Relative prevalence of different fetishes. *Int J Impot Res* 2007;19:432–7.
- 32 Rowland D, Perelman M, Althof S, Barada J, McCullough A, Bull S, Jamieson C, Ho KF. Self-reported premature ejaculation and aspects of sexual functioning and satisfaction. *J Sex Med* 2004;1:225–32.
- 33 Leiblum S, Brown C, Wan J, Rawlinson L. Persistent sexual arousal syndrome: A descriptive study. *J Sex Med* 2005;2:331–7.
- 34 Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: Increased reporting with computer survey technology. *Science* 1998;280:867–73.
- 35 Birnbaum MH. Human research and data collection via the internet. *Annu Rev Psychol* 2004;55:803–32.
- 36 Ross MW, Mansson SA, Daneback K, Cooper A, Tikkanen R. Biases in internet sexual health samples: Comparison of an internet sexuality survey and a national sexual health survey in Sweden. *Soc Sci Med* 2005;61:245–52.
- 37 Ross MW, Daneback K, Mansson SA, Tikkanen R, Cooper A. Characteristics of men and women who complete or exit from an on-line internet sexuality questionnaire: A study of instrument dropout biases. *J Sex Res* 2003;40:396–402.
- 38 Millstein SG, Irwin CE, Jr. Acceptability of computer-acquired sexual histories in adolescent girls. *J Pediatr* 1983;103:815–9.
- 39 R Development Core Team. R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing; 2008.
- 40 Freud S. The Ego and the Id. In: Strachey J, ed. Freud standard edition vol 19. London: Hogarth Press; 1958:1923–75.
- 41 Freud S. Fetishism. In: Strachey J, ed. Freud Standard Edition vol 21. London: Hogarth Press; 1964:1928–75.
- 42 ten Cate C. Perceptual mechanisms in imprinting and song learning. In: Hogan J, Bolhuis JJ, eds. Mechanisms of behavioural development. Cambridge: Cambridge University Press; 1994:116–46.
- 43 Vos DR. The role of sexual imprinting for sex recognition in zebra finches: A difference between males and females. *Anim Behav* 1995;50:645–53.
- 44 Bowlby J. The nature of the child's tie to his mother. *Int J Psychoanal* 1958;39:350–73.
- 45 Van der Horst FCP, van der Veer R, van Ijzendoorn MH. John Bowlby and ethology: An annotated interview with Robert Hinde. *Attach Hum Dev* 2007;9:321–35.
- 46 Mitchell SA, Black MJ. Freud and beyond. New York: Basic Books; 1995.
- 47 Pauleta JR, Pereira NM, Graça LM. Sexuality during pregnancy. *J Sex Med* 2010;7:136–42. Epub 2009 Oct 20.
- 48 Wannakosit S, Phupong V. Sexual behavior in pregnancy: Comparing between sexual education group and nonsexual education group. *J Sex Med* 2010;7:3434–8.
- 49 Safarinejad MR, Kolahi AA, Hosseini L. The effect of the mode of delivery on the quality of life, sexual function, and sexual satisfaction in primiparous women and their husbands. *J Sex Med* 2009;6:1645–67.

## Appendix

We have reproduced below the questionnaire used for our study. The study ran from October 24, 2003 to October 14, 2009. In February 2005 the questionnaire was revised to gather additional information. Such modifications marked as “Revision” and set in italic. Questions about age could be answered with a forced choice between 0 and 100. Only exception: before revision, respondent age had a minimum possible value of 18.

### Questionnaire page 1:

1. Do you find pregnant women sexually attractive? [Yes/No]
2. If you answered Yes to the previous question, at what age did you become aware of your preference? [Age]—Revision: Added question: *How strong is your attraction to pregnant women? [Forced choice between 0 and 10]*
3. Do you find lactating or breast-feeding women sexually attractive? [Yes/No]
4. If you answered Yes to the previous question, at what age did you become aware of your preference?—Revision: Added question: *How strong is your attraction to lactating or breast-feeding women? [Forced choice between 0 and 10]*
5. Revision: Added question: *Do you think the first attraction you became aware of caused or helped the development of the second? [Yes/No/Do not know]*
6. What is your sex? [Male/Female]
7. Revision: Added question: *You are interested in sex with: [Males/Females/Both]*
8. How old are you? [Age]—Revision: Changed question to: *When were you born? [Year and month of birth]*
9. Which country do you live in? [Forced choice from extensive list of countries]
10. Age of first sexual intercourse? [Age or Never]
11. Age of first stable relationship? [Age or Never]
12. How long did you live with your mother after you were born? [Forced choice between 0 and 100]

13. How many children do you have? [Forced choice between 0 and 20]
14. If you have children, at what age did you get your first child? [Forced choice between 0 and 100]—Revision: Questions 11 and 12 replaced by: *When was your first child born?* [No children / *Year of birth*]
15. Number of full siblings (brothers/sisters)? [Forced choice between 0 and 20]
16. Number of other siblings (half-siblings, step-siblings, adopted siblings, . . .)? [Forced choice between 0 and 20]

**Questionnaire page 2:**

For each full sibling:

Current age: [Age]—Revision: Changed question to: *When were you born?* [*Year and month of birth*]

Sex: [Male/Female]

Revision: Added question: *Did you grow up together?* [Yes/No/Only partly]

For each non-full sibling:

- Current age: [Age]—Revision: Changed question to: *When were you born?* [*Year and month of birth*]
- Sex: [Male/Female]
- Revision: Added question: *Did you grow up together?* [Yes/No/Only partly]
- Revision: Added question: *Parents:* [Same father, different mother/ Same mother, different father/Different father and mother]

**Questionnaire page 3:**

1. Comments [free text]