

Relationship satisfaction and outcome in women who meet their partner while using oral contraception

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Summary

1 Hormonal variation over the menstrual cycle alters women's preferences for
2 phenotypic indicators of men's genetic or parental quality. Hormonal contraceptives
3 suppress these shifts, inducing different mate preference patterns amongst users and
4 non-users. This raises the possibility that women using oral contraception choose
5 different partners than they would do otherwise but, to date, we know neither whether
6 these laboratory-measured effects are sufficient to exert real-world consequences, nor
7 what these consequences would be. Here we test for differences in relationship quality
8 and survival between women who were using or not using oral contraception when
9 they chose the partner who fathered their first child. Women who used oral
10 contraception scored lower on measures of sexual satisfaction and partner attraction,
11 experienced increasing sexual dissatisfaction during the relationship, and were more
12 likely to be the one to initiate an eventual separation if it occurred. However, the same
13 women were more satisfied with their partner's paternal support, and thus had longer
14 relationships and were less likely to separate. These effects are congruent with
15 evolutionary predictions based on cyclical preference shifts. Our results demonstrate
16 that widespread use of hormonal contraception may contribute to relationship
17 outcome, with implications for human reproductive behaviour, family cohesion, and
18 quality of life.

19

20 **Keywords:** mate choice; contraceptive pill; oral contraception; attractiveness; mate
21 preference; relationship satisfaction, divorce

22

23

24 1. INTRODUCTION

25 Women express an increased periovulatory preference for traits that signal genetic
26 quality or compatibility [1-4]. Hormonal contraceptives suppress these shifts, leading
27 to different mate preference patterns amongst users and non-users [5-8] and changes
28 in women's preferences before and after initiating use [9]. To date, this evidence
29 comes from laboratory studies, but it suggests that hormonal contraceptive users
30 might make different actual partner choices than they otherwise would [9-12].
31 Because oral contraceptives are widely used (e.g. 82% of women in the United States
32 have used them at some time [13] and 40-54% of women aged 16-34 currently use
33 them in the UK [14]), such effects could be substantial and widespread.

34 Research on mate preferences for genetic complementarity at the major
35 histocompatibility complex (MHC) has provided the clearest evidence for these
36 effects. If preferences are typically for MHC-dissimilar partners [8,10], and use of
37 oral contraceptives shifts preferences towards MHC-similarity [9], then couples who
38 meet while the woman is using hormonal contraception may be more likely to be
39 relatively MHC-similar. This could have a negative impact on relationship quality,
40 because, once a partnership has formed, subsequent cessation of contraceptive use
41 could lead to realignment of a woman's preferences and reduction in attraction to her
42 partner. Indeed, women who are relatively MHC-similar to their partner report
43 reduced in-pair sexual satisfaction and increased interest in extra-pair relationships
44 [15]. Even if these effects are subtle, they could have measurable downstream
45 consequences for relationship quality and likelihood of separation or divorce [9-12].

46 However, other research suggests the potential for positive relationship
47 outcomes. Under conditions characterized by high progesterone levels and low
48 fertility (e.g. in the luteal phase or early pregnancy), women express stronger

49 preferences for social cues associated with direct benefits of mate choice. Because
50 some synthetic progestins have similar effects on brain activity and reproductive
51 behaviour as natural progesterone [16], oral contraceptive users would maintain a
52 higher level of preference for traits such as wealth and intelligence [17]. Similarly,
53 weaker preferences for facial masculinity in oral contraceptive users [4-6] could make
54 for more stable relationships, since men with less masculine features (indicative of
55 low testosterone levels) are perceived to be [18], and may actually be [19], less likely
56 to be unfaithful. Thus, this body of research would predict that use of hormonal
57 contraception during partner choice would be positively associated with women's
58 satisfaction with their partner's support and relationship commitment.

59 It is not known whether these laboratory-measured effects on women's
60 preferences are sufficiently powerful to influence actual choices that women make in
61 the real world. Furthermore, it is not known how these two kinds of effects interact in
62 determining the outcome of the relationship. Because this question is not amenable to
63 experiment in societies in which women exercise free choice, we here address these
64 issues using a quasi-experimental design in which we record relationship satisfaction
65 and survival in a large sample of women who met their partner while they were either
66 using or not using oral contraception. We collected data from 2519 parous women
67 about their relationship with their first child's biological father (hereafter, partner). We
68 selected women with at least one child to standardize (as far as possible) levels of
69 relationship commitment and experiences associated with pregnancy and childcare,
70 and to ensure that women had experienced changes to their hormonal profiles
71 associated with oral contraceptive use cessation and/or pregnancy during their
72 relationship. For each woman, we used established scales and items to construct

73 composite measures of both sexual and general (nonsexual) satisfaction in the
74 relationship with her partner.

75

76

77 **2. MATERIALS AND METHODS**

78 *(a) Participants*

79 At the time of partnership formation, 1514 women used no form of hormonal
80 contraception and 1005 used combined oral contraception. Users of other forms of
81 hormonal contraception (e.g. progestogen-only pill, implants, injection; $n = 278$) were
82 excluded from analyses because these represented a small proportion of the sample
83 and because these methods differ in hormonal formulation from oral contraceptives
84 (e.g. they usually employ only progestogens rather than an estrogen/progestogen
85 combination). Of the 2519 retained participants, 1761 were still in a partnership with
86 the biological father of their first child. Of the 758 women not still together with the
87 father, 734 had separated from him or formally divorced (we term both as separation);
88 the remaining 24 had been bereaved and were excluded from analyses concerning
89 relationship satisfaction and survival. Average age was 37.7 years (s.d. = 8.6). The
90 majority of the sample was drawn from the United States (1220) and the Czech
91 Republic/Slovakia (999); other participants were from the United Kingdom (159),
92 Canada (98), and other countries (43). Additional analyses (Electronic supplementary
93 material) confirmed that reported effects were not an artefact of regional variation in
94 behaviour.

95 Participants were recruited via personal contact, by advertisement on
96 pregnancy and parenthood forum websites, and through social networking websites.
97 Surveys were completed online. The only criteria for selection were that participants

98 should be women with at least one biological child. Most participants from the United
99 States were drawn from a participant research panel administered by Qualtrics.com.
100 Czech/Slovak participants were administered the questionnaire in the Czech language.
101 Participants were told that the study was about their experiences of pregnancy,
102 children, and their relationship satisfaction, but not the specific hypotheses under test.
103 The study was approved by the Ethics Committee of the University of Stirling's
104 Department of Psychology and conducted according to the principles expressed in the
105 Declaration of Helsinki.

106

107 ***(b) Measures***

108 *(i) Sexual satisfaction.*

109 Measures of sexual satisfaction were based on those previously used to test effects of
110 MHC-allele sharing on relationship quality by Garver-Apgar *et al.* [15]. To construct a
111 composite measure of sexual satisfaction within their relationship, we recorded
112 women's scores on (a) sexual arousal with their partner, (b) partner's sexual
113 adventurousness, (c) the frequency with which they experienced orgasm with their
114 partner during intercourse, (d) sexual attraction to their partner, and (e) sexual
115 responsiveness to their partner (the sexual proceptivity scale of Ellis's Partner-Specific
116 Investment Inventory [20]). Scores were given on anchored 9-point rating scales (e.g.
117 for sexual arousal, 1 = 'does not satisfy me at all', 9 = 'completely satisfied').
118 Correlation analysis show high concordance amongst these five measures (Spearman
119 $\rho = 0.42-0.85$, see ESM Table 1). Scores on each of these measures were then
120 normalized and summed.

121

122 *(ii) General satisfaction.*

123 Composite scores of general relationship satisfaction, stressing nonsexual aspects of
124 the women's relationship with their partner, were calculated in the same way. We
125 recorded women's scores (using 9-point rating scales, as above) to four questions used
126 by Garver-Apgar *et al.* [15], measuring the extent to which women were satisfied with
127 (a) their partner's provision of financial resources, (b) faithfulness and loyalty, (c)
128 intelligence, and (d) ambition. In addition, we recorded scores on (e) Brown's measure
129 of partner support behaviour [21]. Correlation analysis demonstrated high
130 concordance amongst these five measures ($\rho = 0.40-0.57$, see ESM Table 2). Scores
131 for each woman were normalized and summed.

132

133 *(iii) Sexual rejection and compliant sex.*

134 We recorded women's scores on these measures, also following Garver-Apgar *et al.*
135 [15]. The sexual rejection score was comprised of three items (e.g. "I rejected my
136 partner's attempts to initiate sex") and the compliant sex score was comprised of two
137 items (e.g. "had sexual intercourse with my partner even though I didn't want to
138 because I felt pressured by his continual arguments"). All items were scored on a 5-
139 point scale, from 1 = 'never' to 5 = 'very often'. Although these measures are to some
140 degree similar to those included in the sexual satisfaction composite measure, we
141 analysed them separately because they capture negative aspects of relationship
142 dynamics and include an element of partner's coerciveness.

143

144 *(iv) Attractiveness of partner.*

145 We also calculated a composite score of women's assessment of their partner's
146 attractiveness. We recorded scores (7-point rating scales, from 1 = 'much less than
147 average' to 7 = 'much more than average') on two measures of attractiveness used by

148 DeBruine *et al.* [22] (“compared to other men, how attractive do you consider your
149 partner’s [face/body] to be”, Spearman rho = 0.62), and Garver-Apgar *et al.*’s [15]
150 question “how satisfied are you with your partner’s physical attractiveness” (rho =
151 0.50 and 0.57, respectively).

152

153 *(v) Ratings of ex-partners.*

154 For those couples who had separated, we altered the wording of questions to reflect
155 this; for example, in place of obtaining levels of agreement with the statement “I feel
156 strong sexual attraction toward my partner” from Garver-Apgar *et al.*’s [15] attraction
157 to partner scale, we used the wording “Thinking back about my ex-partner, I felt
158 strong sexual attraction towards him”.

159

160 *(vi) Experience and attitudes towards extra-pair sex.*

161 To control for individual differences in the participant’s attitudes towards, desire for,
162 and engagement in extra-pair sex, we used a standard tool, the Sociosexual
163 Orientation Inventory – Revised (SOI-R) [23]. This comprises three subscales dealing
164 with past behavioural experiences (e.g. “With how many different partners have you
165 had sex within the past 12 months?”), attitude toward uncommitted sex (participants
166 indicate level of agreement with statements such as “I can imagine myself being
167 comfortable and enjoying “casual” sex with different partners”), and sociosexual
168 desire (e.g. “How often do you have fantasies about having sex with someone with
169 whom you do *not* have a committed romantic relationship?”). Each subscale contains
170 three items which are summed to yield an overall score.

171

172 **(c) Data Analysis**

173 *(i) Relationship satisfaction*

174 Differences in individual measures were first assessed using Mann-Whitney tests. In
175 order to control for possible confounding differences between groups of women (those
176 who were using oral contraceptives when they met their partner and those who were
177 not), we used ANOVA, with dependent variables being measures of relationship
178 satisfaction. Between-group factors were use of oral contraception/no hormonal
179 contraception (when couples met) and relationship duration (split by the median
180 relationship length because of skew in this variable). In addition, sociosexuality (SOI-
181 R score) was included in the model as a covariate. Sample sizes vary because some
182 women did not respond to all items.

183

184 *(ii) Relationship outcome*

185 We first used chi-square tests to test for associations between outcome measures
186 (women's responsibility for initiation of separation, absolute rates of separation) and
187 women's use of oral contraception when couples met. Subsequently, we used logistic
188 regression to check that associations were robust to key potential confounds (see
189 below).

190

191

192 **3. RESULTS**

193 *(a) Relationship satisfaction*

194 Amongst women whose relationship was ongoing ($n = 1761$), initial analysis revealed
195 several statistically significant differences between women who were using or not
196 using oral contraception when they met their partner (Table 1). Women who used oral
197 contraception during partner choice (compared with non-users) scored lower on sexual

198 arousal with their partner, on satisfaction with his sexual adventurousness, and on
199 sexual proceptivity and attraction towards him. They also rated their partner's body
200 lower in attractiveness compared to non-users. In contrast, these women appeared
201 more satisfied with general (non-sexual) aspects of their partner: they were
202 significantly more satisfied with his financial provision compared with women who
203 were not using oral contraception during partner choice, and they appeared to be more
204 satisfied with his intelligence and support (although these did not achieve statistical
205 significance, $p = 0.051$ and 0.058 , respectively).

206 Although the results of this initial analysis are consistent with predictions
207 generated by a body of laboratory studies (reviewed above) that suggest that oral
208 contraceptive use might alter mate preferences, it is possible that some or all of these
209 effects could alternatively arise as a result of between-group differences that are
210 unrelated to mate choice and any disruptive effects of oral contraception. For example,
211 lower sexual satisfaction associated with oral contraceptive use could instead be due to
212 differences in attitudes towards, or willingness to engage in, uncommitted, short-term
213 relationships (sociosexuality). Time since partnership formation is also likely to
214 influence relationship satisfaction [24]. Responses to satisfaction measures might also
215 be influenced by hormonal condition. We therefore carried out additional confirmatory
216 analyses using ANOVA to control for these variables. We included SOI-R scores as a
217 covariate, relationship duration as a factor, and we accounted for the possibility that
218 current hormonal condition contributes to women's perception of their partner by
219 excluding women who were pregnant or using hormonal contraception during data
220 collection (the corresponding analysis, including only current oral contraceptive users,
221 retained too few individuals to generate sufficient statistical power). In the analysis of
222 sexual satisfaction and partner attractiveness, we also included general relationship

223 satisfaction as a covariate since this could influence within-couple sexual satisfaction
224 and capture further unspecified aspects of partnership satisfaction that might vary
225 between groups (sexual and general satisfaction were positively correlated, $r = 0.600$,
226 $P < 0.0001$). In this analysis (Fig.1a), we again found significantly lower sexual
227 satisfaction in women who were using oral contraception when they met their partner
228 ($F_{1,1200} = 7.57$, $P = 0.006$), despite scoring higher in terms of general satisfaction
229 ($F_{1,1206} = 10.07$, $P = 0.002$). Women also scored their partner as less attractive ($F_{1,1203}$
230 $= 13.98$, $P < 0.001$) if they met while using oral contraception.

231 Other measures of sexual satisfaction [15] include the frequency of a woman's
232 acquiescence to sex under pressure from her partner (compliant sex) or with which she
233 rejects her partner's sexual advances. After controlling for sociosexuality, general
234 relationship satisfaction and current hormonal condition, we found significant
235 interactions between oral contraceptive use during partner choice and relationship
236 length (Fig.2): women who used oral contraceptives rejected sex ($F_{1,1204} = 8.08$, $P =$
237 0.005) and engaged in compliant sex ($F_{1,1204} = 6.12$, $P = 0.014$) less frequently than
238 non-users if the relationship was relatively new, but did so more frequently in longer
239 relationships. This interaction appears to explain why neither of these measures
240 approach statistical significance in the raw dataset (Table 1).

241

242 ***(b) Ex-partners and initiation of separation***

243 Women no longer with their partner retrospectively assessed the same relationship
244 attributes (Fig.1b). Amongst these women, there was no relationship between oral
245 contraceptive use during partner choice and recalled general relationship satisfaction
246 ($P = 0.41$), or frequencies of compliant sex ($P = 0.16$) and sexual rejection ($P = 0.18$).
247 However, women who used oral contraceptives during partner choice recalled being

248 less sexually satisfied (again, controlling for general satisfaction; $F_{1,724} = 5.52$, $P =$
249 0.019) and rated their ex-partner as less attractive ($F_{1,727} = 5.02$, $P = 0.025$), compared
250 with non-users, consistent with the women whose relationship was ongoing.

251

252 *(c) Relationship outcome*

253 Finally, we examined whether oral contraceptive use during partner choice was
254 associated with relationship outcome. Women who used oral contraceptives during
255 partner choice were disproportionately likely to have initiated the separation if it
256 occurred (84.8%: 196/231 of separations were initiated by the woman rather than the
257 male partner, excluding 6 where the woman reported equal responsibility between
258 partners) compared with non-users (73.6%: 349/474, excluding 23 women who
259 reported equal responsibility) (Chi-square = 11.14, $d.f. = 1$, $P = 0.001$). This effect
260 remained significant (logistic regression: $\exp B = 0.495$, $P = 0.001$) after controlling
261 for women's age ($\exp B = 1.0$, $P = 0.71$) and sociosexuality ($\exp B = 1.10$, $P = 0.46$).

262 However, despite this, we found that separation rate was lower if the woman
263 was using oral contraception during partner choice (Fig.3a): 237 of 1004 such couples
264 (23.6%) had separated, compared with 497 of 1491 couples (33.3%) in which women
265 were not using hormonal contraception (Chi-square = 27.34, $d.f. = 1$, $P < 0.0001$). A
266 logistic regression analysis, controlling for age and sociosexuality, confirmed that
267 couples were less likely to have separated if the woman used oral contraception during
268 partner choice ($\exp B = 0.62$, $P < 0.0001$), and that this was independent of the effects
269 of sociosexuality ($\exp B = 2.06$, $P < 0.0001$) and age ($\exp B = 1.06$, $P < 0.0001$).
270 Furthermore, amongst relationships that ended in separation, partnership duration was
271 longer when the woman used oral contraception during partner choice (Fig.3b; $z =$
272 3.39, $P = 0.001$), by two years on average (median relationship length: 60 and 84

273 months for non-users and users, respectively). This difference was robust to exclusion
274 of outliers and extreme values (defined as scores of between 1.5 and 3 times the inter-
275 quartile range, or more than 3 times the inter-quartile range), with median relationship
276 duration then being 60 and 81 months for non-users and oral contraceptive users,
277 respectively ($z = 3.50$, $P < 0.001$). Confirmatory analyses (Electronic supplementary
278 material) showed that these effects are unlikely to be due to a higher rate of unplanned
279 pregnancy amongst non-users.

280

281

282 **4. DISCUSSION**

283 Our results indicate that a woman's use of oral contraception at the time when she
284 meets her partner has measurable downstream consequences for partnership outcome.
285 The lower satisfaction with sexual aspects of the relationship and reduced attraction to
286 the primary partner that we report amongst women who met their partner while using
287 oral contraception are consistent with previous laboratory studies that indicate that oral
288 contraception might interfere with adaptive preferences, such as preference for MHC-
289 dissimilar men. Compared with normally cycling women, oral contraceptive users
290 prefer body odours of relatively MHC-similar men [8] and initiation of oral
291 contraceptive use shifts these preferences towards MHC-similarity [9]. Furthermore,
292 in couples who are relatively MHC-similar, women express lower sexual satisfaction
293 with their partner and higher interest in extra-pair sex [15]. Although the possibility
294 that disruption of preferences by oral contraception influences relationship outcome
295 has been the subject of considerable conjecture [9-12, 25, 26], our results provide the
296 first evidence for this outside of the laboratory, in actual long-term partnerships.

297 However, as predicted, the results also reveal that women who used oral
298 contraceptives during partner choice were more satisfied with nonsexual aspects of
299 their relationship, including the partner’s financial provision, faithfulness, and support.
300 Based on previous studies, we think it likely that this could arise through the
301 suppression by oral contraceptive use of periovulatory increases in preference for
302 putative markers of good genes, such as masculinity or dominance, that are evident in
303 women with normal menstrual cycles [1-4, 27,28], thus leading to a maintained
304 preference (during a woman’s actual partner choice) for markers of high-quality
305 paternal investment that characterizes low fertility phases of the menstrual cycle [17-
306 19, 29].

307 In combination, these effects mean that there may be both negative and
308 positive associations between oral contraceptive use during partner choice and
309 subsequent relationship satisfaction. Interpreting the interplay between them, we
310 suggest that, on average, higher general (nonsexual) relationship satisfaction in
311 women who meet their partner while using oral contraception might ameliorate or
312 outweigh the concomitant effects of reduced sexual satisfaction. Additionally, a
313 maintained preference for traits indicating high paternal investment may mean that, on
314 average, the men chosen by women using oral contraception are less disposed to seek
315 separation. Together, this could explain our finding of longer relationships in couples
316 who met while the woman used oral contraception.

317 However, as relationships progress there may potentially come a tipping point
318 at which a woman’s sexual dissatisfaction outweighs nonsexual satisfaction. Evidence
319 for this includes the finding that, among women using oral contraception during
320 partner choice, sexual dissatisfaction (compliant sex, sexual rejection) intensifies in
321 relatively long relationships, while there was no change in non-users. Furthermore,

322 there was a relatively small difference in recalled general satisfaction between former
323 users and non-users who had separated compared with the large difference in those
324 still together, indicating that sustained levels of general satisfaction may be important
325 for relationship survival. If changes in the balance between sexual and general
326 satisfaction contribute to the incidence of separation, women who used oral
327 contraception during partner choice may be more likely than non-users to be
328 responsible for initiating eventual separation. Our results support this conjecture.
329 While it is well-established that women (rather than their male partners) generally
330 initiate separation [30-31], we found that women who used oral contraception during
331 partner choice were even more likely to initiate the separation (if it occurred) than
332 women who had not.

333 We have hypothesised that the reported effects are due to effects of oral
334 contraception on women's partner choice, but it is also possible that oral contraceptive
335 use during relationships may also contribute to relationship satisfaction and outcome.
336 For example, differences in contraceptive use at the point of partner choice might also
337 reflect patterns of use after relationships are established. If so, it is possible that
338 suppression of cyclical preference shifts by oral contraceptives could lead to
339 stabilisation of relationship satisfaction in both male and female partners during the
340 relationship, in addition to the proposed effects on initial mate choice. Thus, women
341 who use oral contraceptives during the relationship would not experience mid-cycle
342 shifts in desire for attributes that might not be possessed by her partner, and men may
343 not experience changes in concern with partner fidelity or attractiveness (for a review
344 of such issues, see [2]). In this way, the association between oral contraceptive use and
345 initiation of relationship dissolution by women might alternatively be interpreted in

346 terms of higher initiation by men whose partner is a non-user. The distinction between
347 these ideas remains a point for further research.

348 Furthermore, although our results are consistent with the idea that oral
349 contraception may alter adaptive mate choice, with downstream consequences on
350 relationship satisfaction and outcome, it remains possible that any of the reported
351 effects may alternatively arise from other, as yet undetermined, associations between
352 oral contraceptive use and relationship satisfaction. However, we controlled for
353 several likely candidates. First, there may be differences between users and non-users
354 in attitudes towards sex and behaviour in sexual relationships, which we controlled for
355 using the sociosexual orientation index. It is also noteworthy that the interactions
356 between contraceptive use and relationship duration (Fig.2, showing that women using
357 oral contraception during partner choice were initially less likely to reject sex or
358 acquiesce to sex under pressure from their partner, but became increasingly likely to
359 do so, relative to non-users, as relationships progressed) demonstrate that relative
360 sexual satisfaction cannot be simply explained by previous use or non-use of oral
361 contraception. Second, assessment of current relationship satisfaction may be
362 influenced by current hormonal state, but we controlled for this in the relevant
363 analyses by excluding women using oral contraception and those who were pregnant
364 at the time of the survey. Third, in analyses probing sexual satisfaction, we controlled
365 for the effects of non-sexual aspects of relationship quality, including financial
366 provision and partner support. Fourth, we controlled for the duration of the
367 relationship. Finally, we checked that the reported effects held in two different
368 populations (the US and the Czech/Slovak populations) and that they were not
369 explained by between-group differences in commitment to the relationship potentially

370 induced by a higher frequency of unplanned pregnancy amongst the non-users (see
371 ESM).

372 In summary, after controlling for these possible confounds, we found that
373 women who met their partner while using oral contraception were more satisfied in the
374 nonsexual aspects of their relationship with their partner. This is consistent with
375 studies showing that women express stronger preferences for social cues associated
376 with direct benefits of mate choice at times of high progesterone levels and low
377 fertility. However, these benefits appear to be offset by costs in terms of lower
378 satisfaction in sexual aspects of the relationship. Women who used oral contraception
379 when they met their partner tended to find him less attractive, engaged in compliant
380 sex and rejected sexual advances more frequently as the relationship progressed, and
381 were more likely to initiate separation if it occurred. Although we do not know the
382 relative degree of genetic similarity between couples in this study, these effects are
383 also consistent with studies investigating mate preference for genetically
384 complementary partners. For each kind of effect, our results suggest that these
385 previously-described mate preferences are not restricted to the laboratory but are also
386 expressed in actual partner choices. More importantly, our data also provide evidence
387 that suppression of cyclical preference shifts by oral contraceptive use may disrupt the
388 expression of these adaptive preferences. We stress that the nature of this research
389 question precludes a true experimental approach and that we therefore remain cautious
390 about the causal link behind the associations we describe. We also recognise that
391 the reasons for any relationship's survival or dissolution are complex and not limited
392 to contraceptive choice at its inception. Nonetheless, our data provide important
393 evidence in support of the proposal that the use of oral contraception during partner

394 choice (and possibly beyond) has the potential to profoundly influence the outcome of
395 long-term relationships.

396

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404

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492

493 **Figure Legends**

494

495 Figure 1. Measures of relationship satisfaction in women who met their partner while
496 either using or not using oral contraceptives. Data show estimated marginal means of
497 standardized scores (\pm s.e.m), adjusted for SOI-R score, relationship duration, and
498 current hormonal condition. Estimates of sexual satisfaction and partner attractiveness
499 also control for general (nonsexual) relationship satisfaction. (a) Women still in a
500 current relationship with the biological father of their first child (749 were non-users
501 and 462 were oral contraceptive (OC) users at time of meeting). (b) Retrospective
502 scores of women no longer in a relationship with the father of their first child (492
503 were non-users and 236 were OC users at time when couples met). Significant
504 differences are indicated by * ($P < 0.05$) and ** ($P < 0.01$).

505

506 Figure 2. Relative frequency with which women rejected sex with their partner, or
507 undertook compliant sex with him, in still-partnered women who met their partner
508 while either using oral contraception (OC) ($n=461$) or not ($n=749$). Data are estimated
509 marginal means (\pm s.e.m), adjusted for SOI-R score, general relationship satisfaction
510 and current hormonal condition. Both interactions are statistically significant (sexual
511 rejection: $P = 0.005$; compliant sex: $P = 0.014$). Short and Long refer to current
512 relationship duration, split by the median relationship length of 142 months.

513

514 Figure 3. Effects of oral contraceptive use at the time of partner choice on relationship
515 outcome. (a) Frequency of separation is lower amongst women using oral
516 contraception (OC) when they met the biological father of their first child, compared
517 to those who were not ($P < 0.0001$). (b) Relationship duration is longer ($P = 0.001$)

518 amongst women who were using oral contraceptives when couples met (analysis
519 includes only separated couples). Horizontal lines are median number of months,
520 boxes indicate inter-quartile range. Circles and triangles represent outliers and extreme
521 values, respectively. Both analyses control for women's age and SOI-R score. The
522 difference in (b) was robust to exclusion of outliers (O) and extreme values (Δ) ($P <$
523 0.001).

Table 1. Differences in partner ratings according to oral contraceptive use during partner choice.

Measure	Non-users ¹	OC users ¹	Sample size ²		Z ³	P
			Non-users	OC users		
<i>Sexual satisfaction</i>						
Sexual arousal	6.07 ± 0.062	5.91 ± 0.068	991	766	2.34	0.020
Sexual adventurousness	5.82 ± 0.064	5.62 ± 0.071	990	765	2.52	0.012
Sexual proceptivity	3.80 ± 0.026	3.72 ± 0.028	993	766	2.84	0.005
Sexual attraction	3.35 ± 0.034	3.20 ± 0.037	990	765	3.20	0.001
Orgasm with partner	3.82 ± 0.040	3.79 ± 0.044	991	762	0.99	0.32
<i>General satisfaction</i>						
Financial provision	5.74 ± 0.064	6.02 ± 0.067	991	766	2.60	0.009
Faithfulness/loyalty	6.79 ± 0.051	6.84 ± 0.058	992	765	0.46	0.64
Intelligence	6.80 ± 0.046	6.96 ± 0.047	992	766	1.95	0.051
Ambition	5.89 ± 0.059	5.87 ± 0.064	991	764	0.80	0.42
Support	4.51 ± 0.035	4.45 ± 0.037	993	766	1.89	0.058
<i>Other measures</i>						
Partner rejection	2.03 ± 0.030	2.02 ± 0.032	992	765	0.53	0.59
Compliant sex	1.46 ± 0.026	1.40 ± 0.027	993	765	0.92	0.36
Facial attractiveness	5.01 ± 0.038	4.98 ± 0.038	992	767	0.41	0.68
Body attractiveness	4.69 ± 0.043	4.53 ± 0.047	991	765	2.46	0.014

¹In this table, oral contraceptive (OC) use is at time of meeting partner, irrespective of current usage (in-text additional analyses control for current usage)

²Note that sample sizes vary slightly across measures as a small number of women refrained from answering certain questions

³Statistical analyses used non-parametric Mann-Whitney tests; mean rating scores (± standard error) are shown for ease of interpretation. Statistically significant comparisons are highlighted in bold