

Depression as bargaining: the case postpartum

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Abstract

It was recently hypothesized that depression might function, in part, as a bargaining strategy when cooperation imposes a net cost but there are social constraints on defection (Hagen 1999). If so, such social constraints should be associated with depression, and depression in one partner should be associated with increased investment by other partners. Several predictions of this hypothesis were tested using postpartum depression (PPD) as a model for depression in general. The depression levels, abortion attitudes, additional mating opportunities, and investment in childrearing of 240 mothers and fathers with a new child were measured using self report instruments. Mothers were also asked whether the new child was planned and whether it was wanted. Perceived constraints on abortion correlated significantly with PPD levels, but, as predicted, only for mothers with an unplanned or unwanted child. Contrary to predictions, perceived constraints imposed by family and friends did not correlate with PPD levels. Social constraints on the pursuit of extra-pair copulations also correlated significantly with PPD levels, but, as predicted, only for men. As predicted, PPD levels in one spouse correlated significantly with increased investment in childrearing as reported by the other spouse. PPD levels correlated positively with parity for older women with few future reproductive opportunities, as predicted.

Keywords: postpartum depression, abortion, evolutionary psychology, bargaining, parental investment

The psychological pain hypothesis and its limitations

The most strongly supported adaptationist hypothesis for postpartum depression (PPD) is that sad or depressed mood (i.e., psychological pain) informs the mother that she is experiencing (or has recently experienced) circumstances that were reliably associated with net fitness costs over evolutionary time, functionally shaping her parental investment decision-making (Hagen 1999; Thornhill and Furlow 1998; Wilson and Daly 1994). There is compelling evidence that problems with the pregnancy, delivery, or infant, and perceived lack of the social support necessary to raise an offspring are closely associated with PPD. Further, longitudinal studies show that prepartum measures of infant viability and perceived levels of social support among non-depressed women predict depression postpartum, and may therefore cause PPD. Finally, mothers suffering PPD significantly reduce their investment in their new baby. See Hagen (1999) for an extensive review of this evidence.

Although the psychological pain hypothesis provides an excellent account of minor depression, it does not explain the most debilitating symptoms of depression like a marked loss of interest in virtually *all* activities, significant weight loss, hypersomnia, psychomotor retardation, fatigue, loss of energy, and suicidal ideation. These symptoms would have impeded ancestral mothers from engaging in critical, beneficial activities unrelated to childrearing. The close association of apparently functional symptoms with seemingly dysfunctional symptoms calls into question a functional account of depression as a whole.

The bargaining model of depression

When simple defection from a costly cooperative venture is socially constrained because, for example, each participant has a monopoly on essential resources or can impose costs on defection, individuals suffering net costs from their participation may benefit by withholding the benefits they are providing until better terms are offered; that is, they may benefit by bargaining or ‘going on strike.’ Bargaining also allows participants to credibly signal their true valuation of the cooperative venture to their partners by demonstrating their willingness to suffer the costs of delay imposed by repeated rounds of bargaining—a greater willingness to delay credibly signaling a lower valuation of the venture. Once participants have credibly signaled their true valuations, the costs and benefits of the venture can be fairly apportioned (see Kennan and Wilson 1993). The apparently pathological symptoms of depression may in fact function to reduce the benefits an afflicted individual is providing to others until more benefits are forthcoming. This hypothesis (Hagen 1999) was partially tested, and the results will be presented here (see also Watson and Andrews in press and Mackey and Immerman 2000).

Predictions

This study addressed two major questions: 1) are social constraints on reproductive decision-making correlated with PPD? and 2) are PPD symptoms correlated with increased investment in childrearing by one’s spouse? In the US, there is unlikely to be much variance in social constraints against such extreme defections from parenting as child neglect and infanticide; research ethics also preclude inquiring about subjects’ criminal behavior. In contrast, social constraints against abortion vary considerably in their severity (Bowman 2000). Mothers with an unwanted pregnancy who face no social constraints against abortion may simply defect from parenting; those who face strong prohibitions against abortion, however, will have little choice but to proceed with the pregnancy—but they can still bargain over terms by reducing, or

threatening to reduce, their investment in the new offspring via an increase in depressive symptoms.

Men's reproductive decisions are also constrained. Men, but not women, can substantially increase their reproductive success by mating with multiple partners. The opportunity cost of socially imposed monogamy is therefore predicted to be much higher for men, especially during the postpartum period when their nursing wives are infertile, encumbered with a new infant, and therefore significantly hindered from finding other mates. This cost, however, will only be borne by men who have additional mating opportunities.

Prediction 1: Social constraints on abortion imposed by husbands should correlate strongly with PPD, but only for mothers facing unexpected costs from an unwanted or unplanned pregnancy.

Prediction 2: Social constraints imposed by family and friends should correlate with maternal PPD, but less strongly than those imposed by husbands because, in the US, these parties were expected to have less ability to constrain the mother, and, in the case of friends, to have few or no fitness interests in the mother's new infant.

Prediction 3: Sexually successful men, but not women, are predicted to be at increased risk for PPD under socially imposed monogamy, even after controlling for relationship quality.

Prediction 4: PPD in one spouse should be associated with increased parental investment in childcare by the other spouse.

One prediction of the psychic pain model was also tested.

Prediction 5: Individuals with no other children and few future chances to invest in offspring (i.e., older mothers) have extremely low opportunity costs associated with investing in the new baby, even if social support and infant viability are low, and should be less inclined to reduce investment in a new offspring. They should therefore have lower levels of PPD.

Methods

The data were collected in conjunction with a larger study of parenting costs and benefits as perceived by both mothers and fathers. Data relevant to the bargaining hypothesis will be analyzed here; analyses of the other data are forthcoming.

Subjects

Recruitment

Parents with infants between 3 and 32 weeks of age were recruited from three sources in 1998: local pediatric offices, a postpartum stress center in Pennsylvania, and popular parenting and postpartum depression web sites. Fifteen families were recruited from pediatric offices and two from the postpartum stress center. One hundred sixty nine families responding to the internet postings were mailed surveys by regular mail, and 118 (70%) were returned (families not living in either the US or Canada were excluded). Families were paid \$10 or \$15 each.

Sample description

The initial sample consisted of 135 families. Five families (4%) had infants who were less than three weeks old. Because postpartum 'blues' (a minor mood disturbance) can persist for up to two weeks, these families were excluded. One family had an infant that was over a year old, and was also excluded. The final sample consisted of 129 families. Fifteen (11.6%) returned only the maternal survey, and 114 returned both surveys (88.4%). The demographic characteristics of the sample are listed in table 1, along with comparable 1998 figures for the US

(US Census Bureau). The study sample was similar to the US population, but average family income was about \$11,500 greater, and significantly more mothers were married (95% vs. 69%).

Sample description, data collected in 1998	US Census Bureau figures for 1998
Infants' age range: 3-32 weeks; M=11, SD=4.9, n=129.	Not applicable
Mothers' age range: 18-40 years; M=29, SD=4.9, n=128.	Average age of women who had a child in 1998: 28.4 (approximated by averaging across US Census Bureau age categories).
Fathers' age range: 19-51 years; M=31, SD=5.8, n=112.	Average age of a man who was absent from work due to paternity leave in 1998: 31.7
95% of mothers were married.	69% of women who had a child in 1998 were married.
67% of the pregnancies were planned and 30% were unplanned (maternal report; 3% of mothers did not respond).	74% of pregnancies carried to term in 1994 were intended, and 26% were unintended (Henshaw 1998).
43% of the mothers and 97% of the fathers were employed.	53% of women who had a child in 1998 were employed; 95% of fathers were in the labor force.
Total family income ranged from \$3000-200,000 a year, M=\$53,937, SD=\$29,911, n=107. Mean income for families with incomes below \$75,000: \$43,323, n=87.	Average family income for women who had a child in 1998: \$31,800 (approximated by averaging across the income brackets, omitting the \$75,000 and over category).

Table 1: Demographic characteristics of the study sample.

Measures

Depression: The Edinburgh Postnatal Depression Scale (EPDS), is a self-report instrument specifically designed for use in postpartum populations (Cox et al. 1987). One mother and two fathers failed to complete the EPDS. These cases were excluded from analyses involving this instrument, leaving a total of 240 individuals with EPDS scores in the sample.

Comfort with, and constraints on, abortion (Appendix, items 1-4): Parents were asked to rate, on a seven point Likert scale, their personal comfort with abortion, and the damage to their relationships with their spouse, family, and friends if the wife had decided to have an abortion. Abortion questions were asked with regard to abortions for both medical and personal reasons.

Sexual opportunities (Appendix, items 5-8): Parents were asked to rate their past and present sexual opportunities, to state their total number of sex partners, and to estimate the number of individuals available to them for a serious relationship (not including their current spouse). A 'sexual opportunity cost' score was created by summing the Z-scores of these items.

Relationship quality (Appendix, items 9-11): A composite 'relationship quality' score was computed by summing the Z-scores of the relationship quality items.

Changes in investment (Appendix, items 12-21): Each spouse was asked to rate the amount of effort invested in childcare, and four types of household chores both before and after the

pregnancy. The change in investment for each chore was then calculated by subtracting the pre-pregnancy investment score from the postpartum investment score.

Unplanned and unwanted pregnancies (Appendix, items 22-23): Parents were asked if the recent pregnancy was planned, and how much they wanted to be pregnant (or wanted their partners to be pregnant).

Procedures

Each survey packet contained a maternal and paternal survey in separate, postage paid return envelopes. Subjects were asked to complete the survey alone and in one sitting, to seal the completed survey in the return envelope when they were done, and to mail it as soon as possible. All statistics were computed using SPSS 10 for Windows. Unless otherwise noted, tests of significance were one-tailed. Variables used in parametric tests were examined for outliers, normality, and homogeneity of variance. Pearson's r and t -tests were used when variables conformed to the assumptions of these tests (after a transformation if necessary); otherwise the nonparametric Spearman's ρ (r_s), Wilcoxon signed rank test (Z), and Mann Whitney U test (U) were used.

Results

Depression scores

EPDS scores can range from a low of 0 to a high of 30. Maternal EPDS scores ranged from 1 to 24 ($M=9.1$, $SD=5.3$, $n=128$). Paternal scores ranged from 0 to 19 ($M=6.8$, $SD=4.7$, $n=112$).

Social constraints on abortion and depression

Personal vs. medical abortions

Both mothers and fathers were significantly less comfortable with abortion for personal reasons than they were for medical reasons (mothers: $Z=-2.48$, $n=127$, $p=.007$; fathers: $Z=-6.24$, $p<.001$, $n=112$). Both mothers and fathers also perceived that the damage to their social relationships would be significantly greater if the mother got an abortion for personal reasons than if she got an abortion for medical reasons (mothers: $Z=-8.46$, $p<.001$, $n=117$; fathers: $Z=-7.74$, $p<.001$, $n=110$).

Mothers and fathers were even less comfortable with putting the child up for adoption than they were with a personal abortion (mothers: $Z=-1.97$, $p=.049$, $n=126$; fathers: $Z=-3.10$, $p=.002$, $n=110$; two-tailed). These results justify a focus on the moderate but not extreme social constraints on abortion for personal reasons which lie between the low constraints on medical abortions and the high discomfort with adoption, thus avoiding floor and ceiling effects. No further analyses of constraints on abortion for medical reasons or adoption were conducted.

Spousal abortion attitudes should correlate with each other

If parents have a social contract with each other to raise a new child, then they should have a similar understanding of the costs of defecting from the contract. As expected, spouses tended to agree on the damage to the relationship that would result if the mother got an abortion for personal reasons ($r_s=.42$, $p<.001$, $n=107$). If parents disagreed on whether abortion *should* be constrained, however, their *personal* comfort scores might differ. Consistent with this view, maternal and paternal comfort levels were significantly correlated, but less so than perceptions of damage to the relationship ($r_s=.25$, $p=.004$, $n=111$).

Unplanned or unwanted pregnancies

Thirty four mothers stated that the pregnancy was unplanned. Mothers were also asked to rate how much they wanted to be pregnant on a 7-point Likert scale (0-6). Thirty two mothers (25%) responded with a four or below, but only 14 with a three or below so, in order to define a group with relatively low maternal desire for pregnancy but an adequate sample size, I defined mothers who responded with a four or less as having ‘unwanted’ pregnancies. Because this subgroup overlapped considerably with the unplanned pregnancy subgroup—21 mothers with unwanted pregnancies (66%) also had unplanned pregnancies—the unplanned and unwanted subgroups were combined to form a ‘costly pregnancy subgroup’ (n=45).

Perceived abortion constraints vs. depression scores: Figure 1 reveals that, for mothers in the costly pregnancy subgroup, the relationship between perceived constraints on abortion and maternal PPD did not increase monotonically, contrary to predictions (the mean depression score of mothers with constraint scores equal to six, $M=19.4$, $SD=5.38$, $n=22$, was *less* than the mean depression score for mothers with constraint scores less than six, $M=19.8$, $SD=6.13$, $n=23$). A rank correlation test confirmed that for mothers perceiving less than the maximum constraint, there was a significant, positive relationship between mothers’ PPD scores and their perception that having an abortion for personal reasons would damage their relationship with their spouse ($r_s=.41$, $p=.026$, $n=23$).

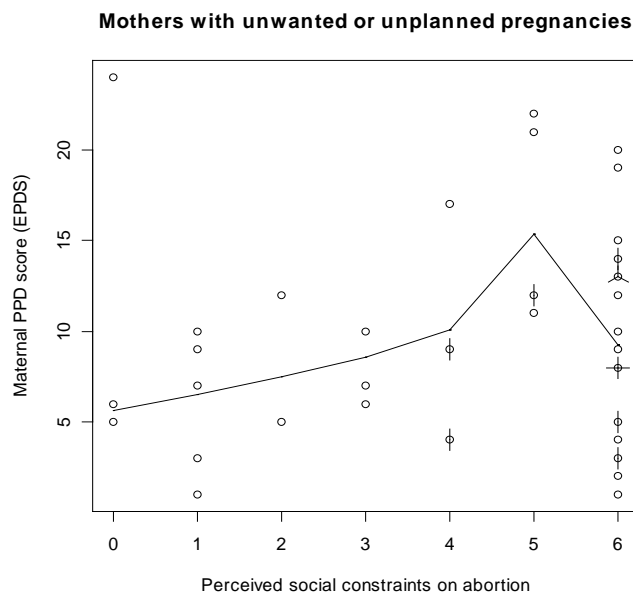


Figure 1: Relationship between maternal depression score and maternal perceptions of the damage to her relationship with her spouse if she had chosen to have an abortion for personal reasons, for mothers with unplanned or unwanted pregnancies. ‘Petals’ indicate the number of overlapping data points. The curve is a locally-weighted, piecewise linear regression model (Cleveland 1979) with a smoothing parameter=2/3. Note the outlier in the upper left-hand corner.

For mothers with planned and wanted pregnancies, perceived constraints did not significantly correlate with PPD ($r_s=.036$, $p=.38$, $n=74$), as predicted (nor did inspection of the scatterplot reveal a non-linear relationship). To test whether the apparent interaction of costly pregnancies

with constraints was significant, the constraints variable, the costly pregnancy factor, and the interaction term were entered into a GLM model (type III sum-of-squares, outlier removed, increasing region only). Each main effect significantly correlated with (log) maternal PPD in the predicted direction (costly pregnancies marginally so), as did the interaction term ($F(1,62)=4.48$, $p=.038$; $F(1,62)=3.48$, $p=.067$; $F(1,62)=6.33$, $p=.014$; respectively); the overall F was also marginally significant ($F(3,62)=2.74$, $p=.051$). To test whether the correlation between social constraints and PPD for mothers with costly pregnancies in the increasing region was an artifact of the quality of their relationships with their spouses, Pearson's r was compared to the partial r after controlling for relationship quality; there was little difference ($r=.58$, $p=.002$, $n=22$ vs. $r_{\text{partial}}=.63$, $p=.001$, $n=22$; outlier removed).¹

The decreasing region of figure 1: Mothers facing the maximum social constraint against abortion were themselves (marginally) significantly less comfortable with abortion than other mothers ($U=196$, $Z=-1.45$, $p=.075$, $n=45$), and conceivable did not feel as constrained by their husbands on this issue. Contrary to this post-hoc hypothesis, mothers in the decreasing region with a comfort score of zero had a mean (log) depression score that was (marginally) significantly *higher* than other mothers in this region ($M=3.00$ vs. $M=2.76$ respectively; $t(20)=-2.02$, $p=.057$, two-tailed).

Family and friends: Contrary to predictions, the depression scores of mothers with costly pregnancies were not significantly correlated with their perceptions of damage to their relationships with either their parents ($r_s=.12$, $p=.22$, $n=44$) or their friends ($r_s=.14$, $p=.18$, $n=43$) from a personal abortion.

Fathers' actual views on abortion: Mothers with costly pregnancies had depression scores that were also significantly correlated with their *husbands'* perception that having an abortion for personal reasons would significantly damage their relationship ($r_s=.39$, $p=.020$, $n=28$; increasing region only, as above).

Social constraints on polygyny and depression

As predicted, none of the maternal sexual opportunity cost items correlated significantly with maternal depression scores, nor did the composite score ($r_s=-.021$, $p=.41$, $n=120$). In contrast, each of the paternal sexual opportunity cost items was significantly positively correlated with paternal depression scores, as was the composite score ($r_s=.36$, $p<.001$, $n=102$). To test whether the apparent interaction of sex with sexual opportunities was significant, I dichotomized sexual opportunities about the median. (Dichotomization reduces statistical power, but was necessary because sexual opportunities could not be normalized.) A 2X2 ANOVA revealed a main effect for sex ($F(1,218)=14.8$, $p<.001$), a not quite significant main effect for sexual opportunities ($F(1, 218)=2.98$, $p=.086$), and, as predicted, a significant interaction ($F(1,218)=5.78$, $p=.017$).

Because, for fathers, perceived sexual opportunities were correlated with the 'poor relationship' score ($r_s=.45$, $p<.001$, $n=103$), it was necessary to test whether the latter accounted for the association between sexual opportunities and fathers' depression. Regression coefficients (but not p -values), are accurate—and effect sizes can be compared—even when variables fail the assumptions of the test. A hierarchical regression model in which the relationship quality score

¹ Although the outlier was retained in the rank correlation test above, the follow-up multivariate tests were quite sensitive to outliers, and were not significant with the outlier included. The outlier may well represent an important, albeit unidentified factor in the relationship between social constraints and maternal PPD, however, so the latter results should be interpreted cautiously.

was entered first, followed by paternal perceptions of sexual opportunities, found that paternal perceptions of sexual opportunities accounted for an additional 6% of the variance in paternal PPD scores, $F_{inc}(1,97)=6.85$, compared to 13% if relationship quality was not controlled for. Thus, 46% of the sexual opportunity effect appears to be independent of relationship quality.

Changes in investment

Parents' changes in childcare investment pre-pregnancy to postpartum were inversely correlated—if one parent reported increased investment, the other reported decreased investment ($r_s=-.41$, $p=.002$, $n=46$), suggesting that a depression-induced decrease in investment might be correlated with increased investment by the non-depressed spouse. The distributions of the changes-in-investment scores were all highly skewed and could not be normalized with standard transformations. If the nonparametric test was used, only fathers' depression scores correlated significantly with increased investment by mothers' ($r_s=.35$, $p=.007$, $n=49$). Inspection of the histograms of the change scores revealed that the source of the non-normality was the very large number of change scores equal to zero: 42 of the 58 fathers with two or more children reported no change in childcare pre- to postpartum. When fathers with no change in investment were omitted from the analyses, the distributions of all variables were normal, and depression in mothers correlated (marginally) significantly with an increase in investment in childcare, as reported by fathers ($r=.42$, $p=.055$, $n=16$). Parents' depression scores did not correlate significantly with increased investment in the four household chores (seven of the latter eight non-significant r -values ranged from $-.12$ to $.067$, mean $=-.029$, and one was $-.25$).

Future reproductive opportunities

As predicted, mothers over the age of 35 with one child had (log) PPD scores ($M=2.73$, $SD=.30$, $n=9$) that were significantly less than mothers 35 and under with one child ($M=2.89$, $SD=.24$, $n=68$), $t(75)=-1.75$, $p=.044$. A corollary of this prediction is that the PPD scores of mothers over the age of 35 should be more sensitive to parity. For mothers age 35 and under, number of biological offspring showed only a mild correlation with PPD ($r_s=.17$, $p=.032$, $n=114$). However, this correlation increased significantly for mothers over the age of 35 ($r_s=.68$, $p=.005$, $n=13$), as predicted. To test whether the apparent interaction of age with parity was statistically significant, mothers were dichotomized on age (35 and younger vs. over 35) and on parity (new baby only vs. two or more children). A 2x2 ANOVA revealed no main effect for age ($F(1,123)=.008$, $p=.93$), a significant main effect for parity ($F(1,123)=9.71$, $p=.002$), and, as predicted, a (marginally) significant interaction term ($F(1,123)=3.82$, $p=.053$). The overall F was also significant ($F(3,123)=3.82$, $p=.012$).

Study limitations

Under the bargaining model parenting costs and social constraints should cause depression, and depression should cause an increase in investment by one's spouse. The present study was cross-sectional, however, and causation cannot be inferred from the significant correlations found for each of these relationships. Similarly, the study could not determine whether the detected increase in childcare was reversed when the depression remitted. The relationship between abortion constraints and maternal PPD was also unexpectedly non-monotonic.

One prediction relied on maternal and paternal correlations of the same item—that parents should agree on the costs to the relationship from a personal abortion—a correlation that may have been inflated if, contrary to instructions, some parents filled out the survey together. Maternal responses to this item predicted 18% of the variance in paternal responses. For the

closely related item on comfort with abortion, a question where self-presentation biases would be likely, maternal responses predicted only 6% of the variance in paternal responses. A small possible inflation of the abortion cost correlation remains a limitation, however. New parents may also have found it difficult to accurately indicate their prepartum abortion attitudes.

The correlation of depression in one spouse with increased investment in childcare by the other spouse required that parents with no changes in investment pre- to postpartum be removed from the analysis so that the parametric Pearson's r test could be used. Even so the results were at the margin of significance and must therefore be interpreted cautiously.

The simple bargaining model presented here assumes two discrete strategies: depressed and not depressed. The depression data used to test this model, however, were relatively continuous depression levels. The bargaining model can probably be extended to include continuous strategies (e.g., a 'work slow-down' instead of a 'strike'), but a definitive answer to this question must await a more rigorous development of the model. It should be noted that of the hundreds of studies of PPD, few qualitative differences have been found between those that assessed PPD by clinical diagnosis (discrete) and those that employed self-report measures (continuous).

Finally, the results presented here may also be consistent with, for example, the psychological pain hypothesis: social constraints on defection would certainly increase the probability of suffering fitness costs, and thus experiencing 'psychic pain'. Unfortunately, the psychological pain hypothesis cannot account for most symptoms of depression, symptoms associated with increased childcare benefits received by depressed parents in this study.

Discussion & conclusions

Cooperative failure was, without doubt, a cardinal selection pressure on the evolution of human psychology. In particular, individuals who were suffering costs in a cooperative venture but were constrained from defecting would have benefited by bargaining with their partners, perhaps by experiencing depression. Perceived social constraints on personal abortions were strongly associated with maternal PPD, but, as predicted, only for mothers who were likely to have higher parenting or opportunity costs. Contrary to predictions, the relationship was not monotonically increasing. For mothers perceiving less than the maximum constraint, however, there was a significant, positive correlation ($r_s=.41$), as predicted. Fifty percent of mothers felt maximally constrained from having a personal abortion. This may reflect a sampling bias, but it is consistent with a May 2001 Gallup poll that found that 45% of Americans felt abortion to be morally wrong, and a 1998 CBS News/New York Times poll that found that 50% of Americans equate abortion with murder. Although mothers perceiving the maximum constraint were themselves less comfortable with personal abortions, this did not appear to account for the non-monotonic relationship in figure 1. Perhaps mothers facing the maximum constraint against defection were less likely to become depressed because bargaining in these circumstances was unlikely to succeed.

Also as predicted, the depression scores of these mothers correlated significantly with their *husbands'* perceptions of constraints on personal abortion ($r_s=.39$), reducing the probability that the relationship between perceived constraints and PPD is an artifact of depression-induced biases in cognition. Contrary to predictions, maternal perceptions of damage to relationships with parents or friends did not correlate with PPD scores for the subsample.

Sexual opportunities were significantly positively correlated with paternal depression scores ($r_s=.36$) but, as predicted, not with maternal depression scores ($r_s=-.021$). About half the effect for males was due to poor relationship quality, and the remainder to sexual opportunities.

As predicted, fathers' PPD levels were correlated with reported increases in childcare investment by mothers ($r_s=.35$); mothers' PPD levels were correlated with reported increases in childcare investment by fathers ($r=.41$), as long as fathers who reported no changes were excluded from the analysis so that a parametric test could be used. These results are consistent with the finding by Campbell et al. (1992) that high levels of help from spouses and better interactions with infants were the only variables associated with remission of PPD.

Although parity was mildly correlated with maternal depression for mothers age 35 and younger ($r_s=.17$), for mothers over the age of 35 the correlation increased substantially ($r_s=.68$); older mothers with no children had significantly lower depression scores, as predicted. The apparent interaction of age with parity was marginally significant.

The bargaining hypothesis was supported by all but one of the results presented here, but these results are by no means conclusive. The limitations of the current study will have to be addressed by longitudinal studies with larger samples sizes and fully validated instruments examining a much broader array of tests of the hypothesis.

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References

- Bowman, K. Abortion Attitudes Today, (Vol. 2000): *The Gallup Organization*. 2000.
- Campbell, S.B., Cohn, J.F., Flanagan, C., Popper, S., and Meyers, T. Course and correlates of postpartum depression during the transition to parenthood. *Development and Psychopathology* 4: 29–47. 1992.
- Cleveland, W.S. Robust Locally Weighted Regression and Smoothing Scatterplots. *Journal of the American Statistical Association* 74: 829-836. 1979.
- Cox, J. L., Holden, J. M. and Sagovsky, R. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry* 150: 782-786. 1987.
- Hagen, E. H. The functions of postpartum depression. *Evolution and Human Behavior* 20: 325-359. 1999.
- Kennan, J. and Wilson, R. Bargaining with Private Information. *Journal of Economic Literature* 31: 45-104. 1993.
- Mackey W. C. and Immerman R. S. Depression as a counter for women against men who renege on the sex contract. *Psychology, Evolution & Gender* 2: 47-71. 2000.
- Thornhill, R. and Furlow, B. Stress and human reproductive behavior: Attractiveness, women's sexual development, postpartum depression, and baby's cry. In *Stress and behavior*. A. P. Moller, M. Milinski, and P. J. B. Slater (Eds.). San Diego, California: Academic Press. 1998. pp. 319-369.
- Watson, P. J. and Andrews, P. W. Depression and human social life: The social navigation functions of depression. *Journal of Affective Disorders*. In press.
- Wilson, M. and Daly, M. The Psychology of Parenting in Evolutionary Perspective and the Case of Human Filicide. In *Infanticide and parental care*. S. Parmigiani and F. S. vom Saal (Eds.). Chur, Switzerland: Harwood Academic Publishers. 1994. pp.

Appendix of the Survey Questions

All items but #22 were Likert scales that ranged from 0 (low) to 6 (high). Item 22 was Yes/No. Abortion questions were asked separately for ‘personal’ abortions and ‘medical’ abortions (indicated below by ‘personal/medical’).

Abortion attitudes	
1. How comfortable would you have been getting an abortion if you [your spouse] needed one for your [her] own personal/medical reasons?	2. If you [your spouse] had decided to get an abortion for personal/medical reasons how much would this have damaged your relationship with your spouse [you]?
3. If you [your spouse] had decided to get an abortion for personal/medical reasons how much would this have damaged your relationship with your parents?	4. If you [your spouse] had decided to get an abortion for personal/medical reasons how much would this have damaged your relationship with your friends?
Sexual opportunities	
5. How often are you sexually attracted to people other than your spouse or partner?	6. How much attention do you currently get from members of the opposite sex (not including your spouse)?
7. How many people including your current spouse or partner have you had sexual intercourse with even once?	8. Other than your spouse or partner how many men [women] are there in your life who would be possibilities for a serious relationship?
Relationship quality	
9. How often do you think about finding a better partner or spouse?	10. How good is your relationship with your spouse or partner?
11. How “in love” are you with your spouse or partner?	
Investment in childcare and household chores	
12. If you have children living with you how much of the childcare did you personally perform before the pregnancy?	13. If you have children living with you how much of the childcare do you currently perform?
14. Before the pregnancy how much of the housecleaning did you personally perform?	15. Currently how much of the housecleaning do you personally perform?
16. Before the pregnancy how much of the shopping did you personally perform?	17. Currently how much of the shopping do you personally perform?
18. Before the pregnancy how much of the cooking did you personally perform?	19. Currently how much of the cooking do you personally perform?
20. Before the pregnancy how much of other necessary household chores (gardening laundry paying bills auto and household repairs etc.) did you personally perform?	21. Currently how much of other necessary household chores (gardening laundry paying bills auto and household repairs etc.) do you personally perform?
Unplanned and unwanted pregnancies	
22. Was this a planned pregnancy?	23. How much did you want [your spouse] to be pregnant?