

MENSTRUAL CYCLE EFFECTS ON JEALOUSY: A STUDY IN CURAÇAO

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Abstract. Most studies on changes in female behavior and preferences across the menstrual cycle have been conducted in samples comprised of largely white undergraduate students from Western populations. The present study examined cyclical shifts in reactive, preventive and anxious jealousy in a sample of 71 Afro-Caribbean women from Curaçao, a country in the Caribbean. We expected that, because of the risk of conceiving, especially preventive jealousy would be relatively high when fertile to safeguard the male's protection, provisioning and investment. The results showed that, when fertile, women experienced indeed particularly more preventive jealousy, and also somewhat more anxious jealousy, but not more reactive jealousy, than when non-fertile. In addition, preventive jealousy was higher the later the age of the first menarche. We discuss possible explanations for the functionality of preventive jealousy during the fertile phase of the cycle, and for the functionality of such jealousy among women with a slow life history strategy.

Keywords: Menstrual cycle, Curaçao, ovulatory shift, jealousy, first menarche

INTRODUCTION

There is increasing evidence that women's mating behavior and preferences are systematically influenced by the stage of the menstrual cycle. For example, several studies have shown that when fertile, women show an increased sexual interest (e.g., Brown, Calibuso, & Roedl, 2011; for a review, see Gangestad, Thornhill, & Garver-Apgar, 2005), and a heightened attraction to males, especially to males with masculine and dominant characteristics (e.g., Haselton & Miller, 2006; Penton-Voak & Perrett, 2000; Puts, 2005; Feinberg et al., 2006; Havlíček, Roberts, & Flegr, 2005; for a recent meta analysis, see Gildersleeve, Haselton, & Fales, 2014). These latter findings are often interpreted as indicating that through mating with masculine and dominant men, women may obtain

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better genes for their offspring, especially when their steady partner has a relatively low genetic quality (Cobey et al., 2012; Gangestad et al. 2005; Gildersleeve et al., 2014).

When a woman would engage in extra-pair sex when fertile, securing the investment of one's steady partner may be very important. Probably more important, when fertile, the likelihood of conceiving a child from one's own partner will be particularly high, as women's interest in sex is enhanced (e.g., Brown et al., 2011), and men will feel more sexually attracted to their female partner. Therefore, given the importance of male investment, protection and provisioning during and after pregnancy (for a review, see Geary, 2005), when fertile, the risk of losing, or not receiving, the necessary investment from one's mate would be especially threatening for women. Consequently, women will be especially keen at preventing the involvement of their partner with another woman. In general, a man's infidelity, particularly when the man forms an emotional bond with another woman, poses the risk that a woman may be abandoned by her partner who begins to invest in another woman (e.g., Buss, Larsen, Westen, & Semmelroth, 1992; Buunk, Angleitner, Oubaid, & Buss, 1996; Buunk & Dijkstra, 2000; Pietrzak, Laird, Stevens, & Thompson, 2002; Schützwohl, 2007; Wiederman & Kendall, 1999). One might argue that the real time of vulnerability and necessity for ongoing commitment of one's partner would be once the infant is born. However, given the dependency of the woman and her child during that period, and the lessened mutual sexual attraction, it may simply be too late to safeguard one's partner's investment

In line with the present reasoning, there is evidence that jealousy fluctuates over the menstrual cycle. Gaulin, Silverman, Phillips, and Reiber (1997) were the first to show, in a between-subjects design, that estrogen levels, but not progesterone levels, were positively correlated with jealousy among women. Building upon this work, Geary, DeSoto, Hoard, Skaggs Sheldon, and Cooper (2001) showed that jealousy correlated with estrogen concentration assessed in the second week of the cycle. This suggests that periods of high fertility are associated with increased levels of jealousy. Cobey et al. (2012) replicated this finding using a within-subjects sample from a Dutch population. Interestingly, the shift in jealousy was larger among single women than among partnered women. This is in itself not surprising, as for partnered women the partner has at least shown some degree of willingness to invest, while single women are much less secure about this, and may become particularly possessive to safeguard the investment of the father of one's potential child. Single women may experience more jealousy when fertile because they must compete not only to keep, but also to attract a mate in the first place, while partnered women have already accomplished this (Cobey, 2013).

Unlike previous research that used overall measures of jealousy, we examined the three types of jealousy distinguished by Buunk (1997). Many researchers have operationalized jealousy by asking individuals how upset they would respond when their partner would engage in certain intimate behaviors with a third person (e.g., Buunk, 1982; Bringle, 1991). This type of operationalization of jealousy was labeled *reactive* jealousy by Buunk, 1997; see also emotional jealousy as distinguished by Pfeiffer & Wong, 1989). The second type of jealousy is *preventive* jealousy, in which the person responds overly reactive to indications of interest of the partner in a third person, and goes to considerable efforts to prevent intimate contact of the partner with a third person. Preventive jealousy can be considered as equivalent to mate guarding. Similar phenomena in the psychological literature have been labeled suspicious jealousy by Bringle (1991), behavioral jealousy by Pfeiffer and Wong (1989), and unprovoked jealousy by Hoaken (1976). A focus upon the possibility of sexual and emotional involvement of one's partner with someone else, may also take the form of the more inner-directed *anxious* jealousy. This implies an active cognitive process of the individual, in which the individual generates images of the partner becoming involved with someone else, which leads to more or less obsessive anxiety, upset, suspiciousness and worrying (cf. cognitive jealousy as distinguished by Pfeiffer & Wong, 1989, and neurotic jealousy as distinguished by Mathes, Roterand, and Joerger (1982; see also Guerrero, Eloy, Jorgensen, & Andersen, 1993).

Thus far, all studies investigating menstrual cycle effects on jealousy have been conducted within white undergraduate student populations from the Western world, and only a few studies have examined cyclical changes in mating preferences within non-white or non-Western populations (e.g. Flinn, 1988). Given the fact that many males in Curaçao do not provide resources to their offspring, in the present research, we examined cyclical shifts in jealousy among a group of women from Curaçao, an island in the South Caribbean Sea off the coast of Venezuela that is ethnically comprised of an Afro-Caribbean majority. The population of Curaçao is around 150,000. The population is biased towards women with a sex ratio of 84 men to 100 women. In Curaçao men may have children with multiple female partners, without always taking on the responsibility towards the women and her children (e.g., Marcha & Verweel, 2005). Girls who grew up without a father in Curaçao tend to experience relatively higher levels of anxious and preventive jealousy (van Brummen-Girigori, Buunk, Dijkstra, & Girigori, 2016). Therefore, women in this cultural context may be particularly keen in the fertile stage of the cycle to secure that their partner will invest in his offspring, and that he will not invest his resources in another woman. We therefore predicted, in line with our theoretical reasoning, that the fertile phase of the cycle will be associated with more jealousy than the non-fertile stages. This would be particularly true for

preventive jealousy that is primarily aimed at preventing an involvement of one's partner with another individual. Replication is essential for the verification and generalization of previous findings (Muma, 1993). The replication within Curaçao of results previously found in predominantly white Western societies would suggest that female menstrual cycle shifts in jealousy may be a universal human characteristic. Further, our sample was substantially older (about ten years) than samples in previous investigations, and a considerably larger proportion of the sample consisted of non-students (Gaulin et al., 1997; Geary et al., 2001; Cobey et al., 2012). Given the conditions under which the research needed to be conducted, we employed the crude, albeit commonly used (e.g. Havlíček et al., 2005), forward counting method to assess participants' conception risk. While physiological measures such as transvaginal ultrasonography are much more adequate (Cobey et al., 2012), research by Brown et al. (2011) suggests that there is no difference in the results of studies in which researchers use biological measures (e.g., Clearblue tests) versus self-measures to assess the stage of the menstrual cycle.

MATERIALS AND METHODS

Participants

The sample consisted of 71 females between the age of 18 and 45 ($M = 29.13$, $SD = 9.08$) and none were using any form of hormonal contraception, were pregnant, or reported to have been lactating at the time of the survey. A total of 76 women were initially recruited, but one participant was excluded from analysis because she indicated that she had a reproductive disorder. To prevent a confounding effect of cultural differences, a second individual was excluded because she indicated that she had not been born in Curaçao. On the island of Curacao there are several nationalities with their own specific cultural backgrounds and practices that differ from that of the population of Curacao. A further three women reported cycles greater than 40 days, suggesting the possibility of pregnancy, and were therefore also excluded. Thus, all participants were of Curaçaoan descent, 87% reported to be heterosexual, while for 12% the answer to this question was missing. One respondent reported to be lesbian. As the results remained qualitatively the same when excluding this participant, there was no reason to exclude her. Of the sample 49% indicated that they were non-students who were presently working. The educational level varied considerably: the majority (55%) had a lower vocational training, 20% high school, and 25% a higher education. The majority (61%) was in a relationship.

Procedure

This study was approved by the Ethical Committee Psychology (ECP) at the University of Groningen and from every participant a written consent was obtained. The participants were recruited by three female interviewers at several public locations in Curaçao, such as Gomez Plein, Wilhaminaplein and Brion Plein. Every 30 minutes the interviewers simultaneously approached the first three women who passed by. The participants were completely blinded to the purpose of the study, which was announced as a study on relationships. The participants could choose to complete the questionnaire in Papiamentu or in Dutch, and were asked to fill out an informed consent form. If the contact with a participant lasted longer than 30 minutes, the other interviewers waited until she was finished before simultaneously approaching the next participants.

Questionnaire

Participants completed a short pen and paper questionnaire containing basic demographic measures, a question to assess fertility status, as well as a 15-item scale for jealousy (Buunk, 1997) consisting of three subscales. *Reactive jealousy* refers to the extent to which one anticipates a negative affective response to various intimate and sexual behaviors of the partner. Subjects were asked how upsetting they would find it if their partner would have sexual contact with someone else, would discuss personal things with someone else, would flirt with someone else, would dance intimately with someone else, and would kiss someone else. The five possible answers varied from “not at all upsetting” to “extremely upsetting”. The coefficient alpha was .74, and could not be raised by omitting an item. The scale for *anxious jealousy* consisted of five items that all referred to the frequency of worrying over the potential sexual and intimate contact of the partner with someone of the opposite sex: “I am concerned about my partner finding someone else more attractive than me”; “I worry about the idea that my partner could have a sexual relationship with someone else”; “I am afraid that my partner is sexually interested in someone else”; “I am concerned about all the things that could happen if my partner meets members of the opposite sex”; “I worry that my partner might leave me for someone else”. The possible answers ran from “never” to “always”. The reliability of the scale was .92, and could not be raised by omitting an item. The scale for *preventive jealousy* assessed the degree to which one was inclined to prevent even innocent, superficial contact between the partner and members of the opposite sex, i.e., “I don’t want my partner to meet too many people of the opposite sex”; “It is not acceptable to me if my partner sees people of the opposite sex on a friendly basis”; “I demand from my partner that he/she does

not look at other women/men”; “I am quite possessive with respect to my partner”, “I find it hard to let my partner go his/her own way”. For each item, the five possible answers ranged from “not applicable” to “very much applicable”. The scale had a reliability of .85, which could not be raised by omitting an item.

Fertility status was assessed as part of a series of questions on health and demographic characteristics. As noted above, we employed the commonly used (e.g. Havlíček et al., 2005), forward counting method to assess participants’ conception risk, and asked participants for the day of their last period. Participants who were recruited on days 9–14 of the cycle were assumed to be in a stage of high conception risk, while those outside this window were assumed to be in a low conception risk stage. Based on this classification it was determined that 20 participants were in a high conception risk stage, while 51 participants were in a low conception risk stage at the time of recruitment. While our methodology is far from perfect, the context of our study did not allow a more sophisticated way of assessing fertility.

A professional translator of the University of Curacao translated the questionnaire from Dutch in Papiamentu. Next, the translation was checked by members of the research team who were fluent in both Dutch and Papiamentu. Papiamentu is the native language of Aruba, Bonaire and Curaçao. On March 6, 2007 Papiamentu was declared as an official language of the Netherlands Antilles. Papiamentu is indeed the most commonly spoken language in Curaçao followed by Dutch, Spanish and English. Papiamentu is a Creole language with considerable influences from Portuguese, Spanish, Amerindian, English, French and Dutch.

Data analysis

The data were analyzed with the PC version of SPSS/20.

RESULTS

Descriptive findings

Reactive jealousy did not correlate with either preventive or anxious jealousy (r 's = .05, p 's > .67), but the correlation between preventive and anxious jealousy was $r = .57$, $p < .001$, suggesting that these two types of jealousy have much more in common with each other than both have with reactive jealousy. A within-subjects analysis with type of jealousy (reactive, anxious, preventive) as a factor, showed that the three types of jealousy differed significantly from each other, $F(2, 70) = 176.00$, $p < .001$. Both the linear, $F(1, 140) = 98.11$, $p < .001$ as well as

the quadratic, $F(1, 70) = 22.73$, $p < .001$ effects were significant, indicating that each type of jealousy differed from the other two. The level of reactive jealousy was the highest, $M = 22.59$, $SD = 3.09$, followed by anxious jealousy, $M = 14.45$, $SD = 6.51$, and next by preventive jealousy, $M = 12.62$, $SD = 5.69$. None of the jealousy types correlated with age, r 's $< .17$, p 's $> .15$, or with being involved in a relationship, F 's < 1.63 , p 's $> .20$. However, the age at first menarche was positively correlated with preventive jealousy, indicating that the later one's first menarche, the more preventive jealousy one showed, $r = .30$, $p < .05$. The two other types of jealousy were not associated with the age at first menarche, for reactive jealousy, $r = -.10$, $p = .39$, and for anxious jealousy, $r = .17$, $p = .15$.

Main findings

To examine the effect of the fertility status on jealousy response we conducted three independent samples t -tests. Given the explicit predictions, and the low number of participants, conducting one-tailed test seemed justified. The Levene's tests showed that the variances in both groups did not differ, F 's $< .69$, p 's $> .40$. There was no effect of fertility status on reactive jealousy, $t(69) = .35$, $p = .36$ (non-fertile, $M = 22.51$, $SD = 3.29$; fertile, $M = 22.80$, $SD = 2.55$). However, the effects of fertility status on anxious jealousy, $t(69) = 1.90$, $p < .05$ (non-fertile, $M = 13.55$, $SD = 6.42$; fertile, $M = 16.75$, $SD = 6.33$), and particularly on preventive jealousy were significant, $t(69) = 2.17$, $p < .05$ (non-fertile, $M = 11.73$, $SD = 5.21$; fertile, $M = 14.90$, $SD = 6.35$). Thus, participants in the fertile cycle showed more anxious and more preventive jealousy than participants in the non-fertile stage of the menstrual cycle. When applying a two-tailed test, the effect on preventive jealousy was also significant, $p < .05$, whereas the effect on anxious jealousy was only marginally significant, $p = .06$. Additional analyses showed that there were no interactions between fertility status and relationship status on jealousy, F 's $< .76$, p 's $> .38$.

DISCUSSION

The present results showed that especially preventive jealousy was higher among women who are in the fertile phase of their cycle than among women in the non-fertile phases of the cycle. With the exception of a study by Flinn (1988), the present research is unique in that it investigates the effects of cyclical variation in an Afro-Caribbean population. Further, many participants were non-students, about half had a level of education lower than regular high school, and participants were on average older than in other studies on the

effects of the menstrual cycle. Previous research has shown that fertile periods are associated with a heightened attraction to males and an increased sexual interest, especially in other men than one's own mate (e.g., Gangestad et al., 2005). Our findings suggest that these behaviors are accompanied by enhanced levels of anxious and especially preventive jealousy: when fertile, women showed an increased fear of infidelity of their partner, and, concurrently, engaged more in attempts to prevent their partner from becoming involved with another woman. It must be noted that preventive jealousy was in general less prevalent than both other types of jealousy, probably because this type of jealousy carries some costs (e.g. the time and energy required to stay vigilant and to control one's partner). Unlike both other types of jealousy, preventive jealousy involves behaviors, i.e., active attempts to prevent contact between one's partner and members of the opposite sex, behaviors that during the fertile stages may have a clear adaptive function.

The present research showed that higher levels of especially preventive jealousy during the fertile period occurred among partnered as well as single women. While in an earlier study (Cobey et al., 2012) it was found that there was a greater increase in jealousy among single women when fertile, the present research suggests that an enhanced level of jealousy tends in general to be characteristic of women in the fertile stage of their cycle. Women with a partner will be primarily oriented towards safeguarding the investment of their current partner, and single women towards obtaining such a type of investment by trying to monopolize the attention of the man with whom they become sexually involved. The present findings complement the extensive literature on the effects of cyclical variation by showing that securing the investment of one's partner maybe a very prominent concern during the fertile stage of the cycle.

An unexpected, though interesting finding was that preventive jealousy was higher, the later the age of the first menarche. From a life history perspective, a late age of the first menarche is indicative of a slow life history, characterized by later reproduction, focusing on a few high quality off-spring, and establishing a stable long-term relationship (e.g., Ellis, Figueredo, Brumbach, & Schlomer, 2009; Figueredo et al., 2005; Gangestad, 2005). As part of such a strategy, one might indeed expect a relatively strong tendency to safeguard the commitment and investment of one's partner by engaging in attempts to prevent contact of one's partner with other women. Thus, this finding is nicely in line with our theoretical reasoning concerning the function of preventive jealousy.

The present research has a number of potential limitations. First, we used the forward counting method that has modest validity to identify fertility status, and, of course, physiological measures such as transvaginal ultrasonography are more adequate (Gangestad et al., 2016; Cobey et al., 2012). However, as noted

in the Introduction, there is evidence that there is no difference in the results of studies in which biological measures versus self-report measures are used to assess the stage of the menstrual cycle (but see also the recent review by Gangestad et al., 2016). Second, it is not completely clear which hormonal changes are responsible for the obtained effects. The level of estrogen is an obvious candidate, given the pattern of results with respect to shifts across the menstrual cycle, but also considering evidence indicating a dose dependent effect of estrogen concentration in combined oral contraceptive pills (Cobey, Pollet, Roberts, & Buunk, 2011). However, it remains plausible that the pattern found here is the result of more complex hormonal changes, including, for example, the relative ratio of estrogen to other hormones. Third, one may argue that an increase in jealousy when fertile is just an aspect of an overall increase in negative emotions. However, our data speak against that: there was no difference between fertile and non-fertile women in reactive jealousy, a variable that clearly implies negative emotions, and the strongest difference between fertile and non-fertile women was found in preventive jealousy, that more than the other two types of jealousy involves behavior rather than emotions. Fourth, while we specifically asked single women to imagine themselves in a relationship, it is not entirely clear how this was interpreted. For example, we cannot disentangle if these participants imagined a previous partner or a hypothetical partner. Fifth, given that the sex ratio in Curacao is 84 men to 100 women, men are a limited resource for which women must compete. This may have amplified the effect of the menstrual cycle, and possibly in a culture with a sex ratio biased in the other direction women, even when fertile, might be less concerned about keeping their partner. Sixth, it should be acknowledged that the use of a within-subjects design, as in Cobey et al. (2012) is of course preferable to the between subjects design utilized herein for convenience in sampling. However, given the difficulty of conducting field research in an Afro-Caribbean population as Curaçao, the results are an important step in replicating the experimental research by Cobey et al. in a very different setting, and thus providing evidence for the generalizability of the finding that among women not using hormonal contraception, jealousy shifts in a predictable way across the menstrual cycle and seems to function primarily to safeguard the commitment and investment of one's partner.

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