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Research Report

Women seek more variety in rewards when closer to ovulation ☆

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Abstract

We propose that women's increased generalized sensitivity to rewards during the fertile phase of the menstrual cycle causes them to seek more variety in rewards when they are in the fertile phase than when they are not in the fertile phase of the cycle. In Studies 1–3, across the reward domains of mating and hedonic food, we show that women seek more variety in rewards when closer to ovulation. Moreover, we provide support for the proposition that women's increased reward sensitivity during the fertile phase of the menstrual cycle causes their greater variety seeking. Specifically, in Study 3, we show that fertile women's greater variety seeking does not extend to non-rewards, such as non-hedonic food. Our findings suggest that behavioral effects of women's hormonal shifts during the menstrual cycle are not limited to the mating domain and may extend to a wide category of reward domains.

Keywords: Fertility; Reward sensitivity; Variety seeking

Introduction

The effects of hormonal fluctuations during the ovulatory cycle on women's behavior have been subject to considerable research. For example, when in the menstrual cycle's fertile phase, women prefer partners who are more masculine (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Penton-Voak et al., 1999), have deeper male voices (Puts, 2005), and display greater social presence and dominance (Gangestad, Simpson, Cousins, Garver-Apgar, & Christensen, 2004). Fertile women are faster in categorizing masculine men (Macrae, Alnwick, Milne, & Schloerscheidt, 2002) and are more accurate in predicting men's sexual orientation (Rule, Rosen, Slepian, & Ambady, 2011). Women also prefer to wear more revealing clothing (Durante, Li, & Haselton, 2008) and show more attention to luxury products (Lens, Driesmans, Pandelaere, & Janssens, 2012) when closer to ovulation.

The effects of fertility on women's behavior, such as those reviewed above, have primarily been explained in accordance with women's increased mating motivations during the fertile period of the ovulatory cycle, and the evolutionary advantages of such behaviors. However, can hormonal fluctuations during the ovulatory cycle lead to behaviors not directly related to women's mating motives? In this research, building on previous evidence for fertile women's increased sensitivity to rewards (Dreher et al., 2007; Frank, Kim, Krzemien, & van Vugt, 2010; Terner & de Wit, 2006) we propose that the answer to this question is yes. Specifically, we propose that women seek more variety in rewards (vs. non-rewards), when in the fertile (vs. non-fertile) phase of the ovulatory cycle. By variety seeking we mean the tendency to choose a greater variety of rewards, while keeping the total amount of rewards constant (Goukens, Dewitte, Pandelaere, & Warlop, 2007; Levav & Zhu, 2009). Thus, variety seeking is not associated with wanting more rewards, but rather with wanting different kinds of the same reward.

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Reward sensitivity, ovulation, and variety seeking

One way our brain regulates and controls behavior is by producing a positive hedonic sensation (i.e., pleasure) in response to rewarding stimuli or outcomes. Research shows that a distinct dopaminergic neural circuit in the brain responds to rewarding stimuli, and processes rewards (Berridge & Kringelbach, 2008). Importantly, the brain's neural reward system is domain-independent. That is, the same dopaminergic reward circuitry processes a wide variety of rewards across different reward categories (Camerer, Loewenstein, & Prelec, 2005). For example, the same reward circuitry responds to rewarding food, psychoactive drugs, monetary rewards, beautiful faces, and erotic stimuli (Aharon et al., 2001; Stark et al., 2005; Wilson & Daly, 2004). The generalized nature of the brain's reward circuitry leads to reward-related behavioral outcomes that are domain-independent. For example, Van den Bergh, Dewitte, and Warlop (2008) observed that when men are exposed to rewarding stimuli in one particular reward domain (e.g., sexy cues), they show impatience in other reward domains (e.g., monetary rewards). Multiple sources of evidence suggest that women are more sensitive to rewarding stimuli when closer to ovulation. First, neuroimaging evidence demonstrates that women closer to ovulation show higher reward-related neural activity when facing rewarding stimuli such as monetary rewards (Dreher et al., 2007) and rewarding food (Frank et al., 2010). Second, research on drug abuse shows that women's subjective and behavioral responses to amphetamine and cocaine (commonly known rewarding stimuli) are greater when they are closer to ovulation (Terner & de Wit, 2006). Because of the generalized nature of the brain's reward processing system, women's heightened sensitivity to rewards during fertility may affect their behavior similarly across different reward categories.

How would women's generalized reward sensitivity during fertility cause more variety seeking in rewards? We believe increased reward sensitivity may, in two ways, induce women to seek more variety. First, research shows that when a desire is activated (e.g., hunger), more items from a choice set (e.g., different kinds of sandwiches) become attractive, and therefore people tend to choose a greater variety of items (Goukens et al., 2007). Increased generalized sensitivity to rewards during fertility may increase the attractiveness of a higher number of reward items in a choice set. The increased attractiveness of a higher number of items may lead women to choose a more widely varied set of items. Second, research shows that people seek more variety in their choices to reduce uncertainty and to minimize the risk of not being satisfied (Kahn & Lehmann, 1991; Simonson, 1990). Increased reward sensitivity during fertility may generate increased motivation to ensure reward delivery. Women may then attempt to reduce the risk of not receiving a minimal amount of reward by picking a greater variety of items in the set.

Given the above arguments, we predict that fertile (vs. non-fertile) women will seek more variety in rewards. However, we do not predict that fertile (vs. non-fertile) women will seek more variety in non-rewards. Moreover, because using contraceptive pills suppresses the natural flow of hormones during the ovulatory cycle, we do not predict that fertility will affect variety seeking among women using contraceptive pills. We present three studies designed to test our hypotheses. In the domains of mating (Study 1) and hedonic food (Studies 2 and 3), we show that fertile women seek more variety in rewards. Moreover, in the food domain, we show that fertile women seek more variety in hedonic food but not in non-hedonic food (Study 3).

Study 1

In Study 1, we test the proposition that non-pill using women seek greater variety in dating partners when in the fertile phase of the ovulatory cycle than when not in the fertile phase.

Participants and method

Through Amazon's Mechanical Turk, we recruited 300 US-resident women, as participants in Study 1 (M_{Age} = 27.4, $Range_{Age}$ = 18–43).

We first showed an array of nine male faces to participants and asked them to imagine they could go on exactly seven consecutive dates, one daily, with any combination of the men. We asked participants to report the number of days they would like to go out with each man. The number of days reported had to total exactly seven. We measured variety seeking by counting the number of men each participant wanted to go out with at least once. Then, participants reported the exact date when their last menstruation started (for currently menstruating participants, this date was the start date of their current menstruation). The reported date would be day one of participants' menstrual cycle. Using this information, we divided participants into fertile (cycle days 9–15) and non-fertile groups (cycle days 1–5 and 18–28) (Miller, Tybur, & Jordan, 2007). Participants also reported their sexual orientation and whether they used contraceptive pills.

Results

Preliminary analysis

Data from 120 participants who reported being homosexual (n = 13), did not enter a date on the menstrual cycle question (n = 18, because of no menstruation, medical conditions, etc.), fell between the two phases (n = 42), or indicated their last menstruation started at least 29 days before the experiment (n = 47) were removed from analysis.[1] Thus, the remaining analysis was conducted on 53 fertile (17 pill users and 36 non-pill users) and 127 non-fertile participants (35 pill users and 92 non-pill users).

[1] MTurk participants are more diverse, and on average, older than participants in typical student samples (Buhrmester, Kwang, & Gosling, 2011), and are more likely to have no or irregular menstruation (because of pregnancy, breastfeeding, menopause, medical condition, etc.). Thus, the rate of removal of participants in our studies is higher than that in studies with typical student samples, but is comparable with that in studies with MTurk samples (Durante et al., 2011, 2012).