

Commentary

Evidence for Menstrual Cycle Shifts in Women's Preferences for Masculinity: A Response to Harris (in press) "Menstrual Cycle and Facial Preferences Reconsidered"

Lisa DeBruine, School of Psychology, University of Aberdeen, Aberdeen, UK. Email: l.debruine@abdn.ac.uk (Corresponding author).

Benedict C. Jones, School of Psychology, University of Aberdeen, Aberdeen, UK.

David A. Frederick, Department of Psychology and FPR-UCLA Center for Culture, Brain, and Development, and UCLA Center for Behavior, Evolution, and Culture, UCLA, Los Angeles, USA.

Martie G. Haselton, Departments of Communication Studies and Psychology and UCLA Center for Behavior, Evolution, and Culture, UCLA, Los Angeles, USA.

Ian S. Penton-Voak, School of Psychology, University of Bristol, UK.

David I. Perrett, School of Psychology, University of St. Andrews, UK.

Abstract: Over the last decade, a growing literature has shown that women in the fertile phase of the menstrual cycle demonstrate stronger preferences for men with masculine traits than they do when in the non-fertile phases of the cycle (see Gangestad and Thornhill, 2008 and Jones et al., 2008 for recent reviews). In a recent article, Harris (in press; *Sex Roles*) failed to replicate this increase in women's preferences for masculine faces when women are near ovulation. Harris represented her study as one of only three studies on the topic, and as the largest of the existing studies. There are, however, many more studies on menstrual cycle shifts in preferences for facial masculinity in the published literature, including one that is 2.5 times larger in size than the Harris study. In this article, we review the evidence for cyclic shifts in mate preferences and related behaviors and discuss weaknesses of Harris's methods. Considered as a whole, the evidence for menstrual cycle shifts in women's preferences and behaviors is compelling, despite the failure of replication reported by Harris.

Keywords: menstrual cycle, masculinity, hormones, mate preferences, review.

Introduction

Scholars studying gender and sexuality have increasingly sought insights from biological theories and endocrinology. In large part, this is due to the value of these perspectives in guiding researchers to the discovery of new phenomena that might not have been discovered without such insight. The utility of this type of approach is demonstrated by recent work showing that women, like females in many non-human species, show theoretically meaningful changes in their mate preferences and sexuality according to variations in their fertility.

Two such studies (Penton-Voak et al., 1999; Penton-Voak and Perrett, 2000) reported that women's preferences for masculine characteristics in men's faces were stronger during the fertile phase of the menstrual cycle than during other phases. These findings support theories of strategic pluralism in women's mate choice (Gangestad and Simpson, 2000), which propose that women will show stronger preferences for short-term mates displaying exaggerated sex-typical characteristics when conception is likely to occur. In her recent article, "Menstrual Cycle and Facial Preferences Reconsidered", Harris (in press) did not replicate this effect of menstrual cycle phase on women's preferences for masculine characteristics in men's faces and concluded that "the general assumption in the literature that their [Penton-Voak et al., 1999; Penton-Voak and Perrett, 2000] findings and theoretical analysis are well established seems to require serious reconsideration". We wholeheartedly agree that, in all areas of science, it is important to continually reassess previously reported findings and the theoretical frameworks that they are thought to support. Nonetheless, we believe that Harris is perhaps unaware of the amount of evidence in support of variation in women's masculinity preferences and mating behaviors during the menstrual cycle, and that a more comprehensive review of the field in general is necessary to place her unsuccessful replication in context.

Previous Studies of Cyclic Shifts in Women's Masculinity Preferences

Harris exclusively compares her unsuccessful replication with the two studies reported by Penton-Voak and colleagues. In doing so, she overlooks many other studies in which women demonstrate stronger preferences for masculine men during the fertile phase of the menstrual cycle than during other phases (for reviews see Jones et al., 2008 and Gangestad and Thornhill, 2008). For example, many studies that were not considered by Harris have found that women showed stronger preferences for masculine male facial traits during the late follicular phase of the menstrual cycle (e.g., Johnston, Hagel, Franklin, Fink, and Grammer, 2001; Jones et al., 2005a; Little, Jones, and DeBruine, 2008; Vaughn, Bradley, Byrd-Craven, and Kennison, 2010). Furthermore, other research on hormone mediation of behavioral and neurobiological responses to male faces complements these findings (Johnston, Arden, Macrae, and Grace, 2003; Lacreuse, Woods, and Herndon, 2007; Macrae, Alnwick, Milne, and Schloerscheidt, 2002; Roney and Simmons, 2008; Rupp et al., 2009; Welling et al., 2007).

Although Harris focuses on the effect of menstrual cycle phase on *face* preferences, stronger attraction to masculine men during the fertile phase of the menstrual cycle is by no means unique to attractiveness judgments of faces. For example, women's preferences for masculine characteristics in men's voices (Feinberg et al., 2006; Puts, 2005; see also Puts, 2006) and body shapes (e.g., Little, Jones, and Burriss, 2007) are also stronger during the

fertile phase of the menstrual cycle than during other phases. Similarly, women's preferences for putative male pheromones (Grammer, 1993; Hummel, Gollisch, Wildt, and Kobal, 1991), dominant men's body odors (Havlicek, Roberts, and Flegr, 2005), videos of muscular and behaviorally dominant men (Gangestad, Simpson, Cousins, Garver-Apgar, and Christensen, 2004; Gangestad, Garver-Apgar, Simpson, and Cousins, 2007), dominant characteristics in men's personality descriptions (Lukaszewski and Roney, 2009), and masculine characteristics in point-light displays of biological motion (Provost, Troje, and Quinsey, 2008) are also stronger during the fertile phase of the menstrual cycle. Unsuccessful replications, such as those reported by Harris (in press) and Peters, Simmons, and Rhodes (2009), should be weighed against the much larger number of studies that have shown cyclic variation in women's preferences for male masculinity in many different domains and not weighed only against the two studies by Penton-Voak and colleagues (Penton-Voak et al., 1999; Penton-Voak and Perrett, 2000) that are Harris' sole focus.

Cyclic Shifts in Women's Desires for Men other than Primary Partners

In their papers, Penton-Voak and colleagues speculated that increased attraction to masculine men around ovulation may be linked to Bellis and Baker's (1990) proposal that women are more likely to engage in extra-pair mating around ovulation than at other times in the menstrual cycle, possibly to realize genetic benefits in offspring. Harris is critical of this proposal, noting that other researchers have criticized Bellis and Baker's study (e.g., Moore, Martin, and Birkhead, 1999). However, many other published studies present converging evidence that women's interest in extra-pair mating is greater as ovulation approaches than it is during other phases of the menstrual cycle. For example, women report more frequent sexual fantasies about men other than their primary partner near ovulation than at other times, while the reported frequency of sexual fantasies about their primary partner does not change (Gangestad, Thornhill, and Garver, 2002; Gangestad, Thornhill, and Garver-Apgar, 2005; see also Haselton and Gangestad, 2006 and Pillsworth and Haselton, 2006). A similar pattern of results has been observed for women's reported commitment to their romantic partner (Jones et al., 2005a). Women are also more receptive to men's courtship invitations (Guéguen, 2009a, 2009b), are more likely to dress attractively and express interest in revealing clothing (Durante, Giskevicius, Hill, Perilloux, and Li, in press; Durante, Li and Haselton, 2008; Haselton, Mortezaie, Pillsworth, Bleske-Rechek, and Frederick, 2007; Hill and Durante, 2009), report that they are more likely to attend social gatherings where they might meet men (Haselton and Gangestad, 2006), report greater extra-pair flirtation, and report greater mate guarding by their primary partner (Gangestad, Thornhill, and Garver, 2002; Haselton and Gangestad, 2006) as ovulation approaches relative to other times.

Moderators of Cycle Shifts in Women's Mate Preferences and Behaviors

Although Harris' review of the current state of the literature on cyclic shifts in women's masculinity preferences and extra-pair desires is clearly incomplete, her unsuccessful replication of a cyclic shift in women's face preferences certainly raises the question of why such shifts are more apparent in some studies than in others. One possibility is that the magnitudes of the effects of menstrual cycle phase on women's mate preferences and extra-pair desires vary systematically among women (see Perrett, 2010). Indeed, research has found that the magnitude of cyclic shifts in women's masculinity

preferences is related to factors such as women's femininity, family background, and baseline hormone levels (e.g., Boothroyd and Perrett 2008; Feinberg et al., 2006; Johnston et al., 2001; Welling et al., 2007). Relatedly, women with attractive partners show smaller cyclic shifts in extra-pair desire and mating behaviors than do women with relatively unattractive partners (Gangestad et al., 2005; Haselton and Gangestad, 2006; Pillsworth and Haselton, 2006). Findings such as these suggest that cyclic shifts in women's behavior may be more complex than was initially thought and that this additional complexity may contribute to variation in the magnitude of cyclic shifts across studies.

Additionally, age-related individual differences in hormonal fluctuations during the menstrual cycle and the prevalence of anovulatory cycles (Vitzthum, 2008) will affect the extent to which cyclic variation in women's mate preferences and mating behaviors are evident in a given sample. Notably, while more than a quarter of the women included in Harris' analysis were 40 years of age or older and more than half were over 30 years of age, most other studies of cyclic shifts in masculinity preferences have limited their sample to women under 30 years of age (e.g., Feinberg et al., 2006; Gangestad et al., 2004; Jones et al., 2005a; Provost et al., 2008; Puts, 2005, 2006; Rupp et al., 2009) or under 40 years of age, with the overwhelming majority of participants being younger than 30 (e.g., Little, Jones, and Burriss, 2007; Little, Jones, and DeBruine, 2008). Limiting the age range of the women tested in this way reduces potential problems associated with greater frequency of anovulatory menstrual cycles among older women (Harlow and Ephross, 1995) and age-related differences in hormonal changes during the menstrual cycle (Vitzthum, 2008). The high number of relatively older women in the sample raises concerns regarding how many of the women classified as "high fertility" were actually in a high-fertility state when they participated in Harris' study. Of course, the systematic study of how age (and age-related changes in fertility) influences cyclic variation in preferences is a topic worthy of further study to elucidate any putative biological function of such shifts, but Harris presents no such analysis.

Methodological Issues in Menstrual Cycle Research

By contrast with Harris' claim that her between-subjects study contains a larger number of women than past research on cyclic shifts in women's facial masculinity preferences, Jones et al. (2005a) used a between-subjects design to demonstrate cyclic shifts in women's masculinity preferences in a sample over 2.5 times larger than Harris' sample. Additionally, the emphasis that Harris places on the sample size of her between-subjects study is misleading; studies with smaller samples have often used more powerful within-subjects designs (e.g., Johnston et al., 2001; Penton-Voak et al., 1999; Welling et al., 2008) in order to control for the effects of other factors that predict variation in women's masculinity preferences (e.g., women's own attractiveness, Penton-Voak et al., 2003; Smith et al., 2009). More recently, research has used hormone tests, such as those assessing luteinizing hormone or progesterone peaks, to verify ovulation (see, e.g., Feinberg et al., 2006; Gangestad, Thornhill, and Garver, 2002; Haselton, Mortezaie, Pillsworth, Bleske-Rechek, and Frederick, 2007; Jones et al., 2005b). In studies using these methods, roughly one-third of women do not show hormonal evidence that ovulation has occurred and are excluded from analyses (Gangestad, Thornhill, and Garver, 2002; Haselton, Mortezaie, Pillsworth, Bleske-Rechek, and Frederick, 2007; Jones et al., 2005b). In combination with the relatively high percentage of older women in Harris's study, the

lack of confirmation of ovulation within the cycle makes interpreting the findings problematic.

A related problem concerns Harris's methods for screening out women using hormonal contraceptives. Harris asked women only whether they were currently using the contraceptive pill. However, because all hormonal contraceptives (e.g., Depo-Provera shots, patches, vaginal rings, and hormonal IUDs) dramatically alter hormone variations across the cycle, researchers typically ask about the current or recent use of any hormonal contraceptive. An unknown number of additional women in Harris's study could have been using these other hormone-altering medications.

Although studies can still have merit with one or more of the limitations described above, collapsing all of them into one study raises concerns about the validity of the methods used by Harris. Although it is difficult to see how a failure to consider these methodological issues could cause spurious cyclic shifts in women's behavior that are consistent across most studies, unsuccessful replications that do not consider these methodological issues are difficult to interpret.

Conclusion

In her article, Harris concludes that her unsuccessful replication of Penton-Voak and colleagues' studies poses serious questions about the reliability of the effect of menstrual cycle phase on women's masculinity preferences (and, somewhat curiously, about the validity of an entire theoretical perspective on human behavior). Unsuccessful replications such as Harris (in press) and Peters, Simmons and Rhodes (2009), should not be disregarded, but considered seriously in the context of the many other studies that have presented compelling evidence that women's preferences for masculine men do indeed change systematically over the menstrual cycle.

Received 9 November 2010; Revision submitted 16 November 2010; Accepted 16 November 2010

References

- Bellis, M.A., and Baker, R.R. (1990). Do females promote sperm competition? Data for humans. *Animal Behaviour*, 40, 997-999.
- Boothroyd, L.G., and Perrett, D.I. (2008). Father absence, parent-daughter relationships and partner preferences. *Journal of Evolutionary Psychology*, 6, 187-205.
- Durante, K.M., Griskevicius, V., Hill, S.E., Perilloux, C., and Li, N.P. (in press). Ovulation, female competition, and product choice: Hormonal influences on consumer behavior. *Journal of Consumer Research*.
- Durante, K.M., Li, N.P., and Haselton, M.G. (2008). Changes in women's choice of dress across the ovulatory cycle: Naturalistic and laboratory task-based evidence. *Personality and Social Psychology Bulletin*, 34, 1451-60.
- Feinberg, D.R., Jones, B.C., Law Smith, M.J., Moore, F.R., DeBruine, L.M., Cornwell, R. E., Hillier, S.G., and Perrett, D.I. (2006). Menstrual cycle, trait estrogen level, and masculinity preferences in the human voice. *Hormones and Behavior*, 49, 215-222.

- Gangestad, S.W., Garver-Apgar, C.E., Simpson, J.A., and Couins, A.J. (2007). Changes in women's mate preferences across the ovulatory cycle. *Journal of Personality and Social Psychology*, *92*, 151-163.
- Gangestad, S.W., and Simpson, J.A. (2000). The evolution of human mating: Trade-offs and strategic pluralism. *Behavioral and Brain Sciences*, *23*, 573-644.
- Gangestad, S.W., Simpson, J.A., Cousins, A.J., Garver-Apgar, C.E., and Christensen, P.N. (2004). Women's preferences for male behavioral displays change across the menstrual cycle. *Psychological Science*, *15*, 203-207.
- Gangestad, S.W., and Thornhill, R. (2008). Human oestrus. *Proceedings of the Royal Society of London B*, *275*, 991-1000.
- Gangestad, S.W., Thornhill, R., and Garver, C.E. (2002). Changes in women's sexual interests and their partners' mate-retention tactics across the menstrual cycle: Evidence for shifting conflicts of interest. *Proceedings of the Royal Society of London B*, *269*, 975-982.
- Gangestad, S.W., Thornhill, R., and Garver-Apgar, C.E. (2005). Women's sexual interests across the ovulatory cycle depend on primary partner developmental instability. *Proceedings of the Royal Society of London B*, *272*, 2023-2027.
- Grammer, K. (1993). 5- α -androst-16en-3 α -on: A male pheromone? A brief report. *Ethology and Sociobiology*, *14*, 201-208.
- Guéguen, N. (2009). The receptivity of women to courtship solicitation across the menstrual cycle: A field experiment. *Biological Psychology*, *80*, 321-324.
- Guéguen, N. (2009). Menstrual cycle phases and female receptivity to a courtship solicitation: an evaluation in a nightclub. *Evolution and Human Behavior*, *30*, 351-355.
- Harlow, S.D., and Ephross, S.A. (1995). Epidemiology of menstruation and its relevance to women's health. *Epidemiologic Reviews*, *17*, 265-286.
- Harris, C.R. (in press). Menstrual cycle and facial preferences reconsidered. *Sex Roles*.
- Haselton, M.G., and Gangestad, S.W. (2006). Conditional expression of women's desires and men's mate guarding across the ovulatory cycle. *Hormones and Behavior*, *49*, 509-18.
- Haselton, M.G., Mortezaie, M., Pillsworth, E.G., Bleske-Rechek, A., and Frederick, D.A. (2007). Ovulatory shifts in human female ornamentation: Near ovulation, women dress to impress. *Hormones and Behavior*, *51*, 40-5.
- Havlicek, J., Roberts, S.C., and Flegr, J. (2005). Women's preference for dominant male odour: Effects of menstrual cycle and relationship status. *Biology Letters*, *1*, 256-259.
- Hill, S.E., and Durante, K.M. (2009). Do women feel worse to look their best? Testing the relationship between self-esteem and fertility status across the menstrual cycle. *Personality and Social Psychology Bulletin*, *35*, 1592-601.
- Hummel, T., Gollisch, R., Wildt, G., and Kobal, G. (1991). Changes in olfactory perception during the menstrual cycle. *Experientia*, *47*, 712-715.
- Johnston, V.S., Hagel, R., Franklin, M., Fink, B., and Grammer, K. (2001). Male facial attractiveness: evidence for a hormone-mediated adaptive design. *Evolution and Human Behavior*, *22*, 251-267.
- Johnston, L., Arden, K., Macrae, C.N., and Grace, R.C. (2003). The need for speed: The menstrual cycle and personal construal. *Social Cognition*, *21*, 89-100.

- Jones, B.C., DeBruine, L.M., Perrett, D.I., Little, A.C., Feinberg, D.R., and Law Smith, M.J. (2008). Effects of menstrual cycle on face preferences. *Archives of Sexual Behavior*, *37*, 78-84.
- Jones, B.C., Little, A.C., Boothroyd, L.G., DeBruine, L.M., Feinberg, D.R., Law Smith, M. J., Moore, F.R., and Perrett, D.I. (2005a). Commitment to relationships and preferences for femininity and apparent health in faces are strongest on days of the menstrual cycle when progesterone level is high. *Hormones and Behavior*, *48*, 283-290.
- Jones, B.C., Perrett, D.I., Little, A.C., Boothroyd, L.G., Cornwell, R.E., Feinberg, D.R., Tiddeman, B.P., Whiten, S., Pitman, R.M., Hillier, S.G., Burt, D.M., Stirrat, M.R., Law Smith, M.J., and Moore, F.R. (2005b). Menstrual cycle, pregnancy and oral contraceptive use alter attraction to apparent health in faces. *Proceedings of the Royal Society of London B*, *272*, 347-354.
- Lacreuse, A., Woods, C.E., and Herndon, J.G. (2007). Effects of aging and hormonal status on bimanual motor coordination in the rhesus monkey. *Neurobiology of Aging*, *28*, 186-193.
- Little, A.C., Jones, B.C., and Burriss, R.P. (2007). Preferences for masculinity in male bodies change across the menstrual cycle. *Hormones and Behavior*, *52*, 633-639.
- Little, A.C., Jones, B.C., and DeBruine, L.M. (2008). Preferences for variation in masculinity in real male faces change across the menstrual cycle. *Personality and Individual Differences*, *45*, 478-482.
- Lukaszewski, A.W., and Roney, J.R. (2009). Estimated hormones predict women's mate preferences for dominant personality traits. *Personality and Individual Differences*, *47*, 191-196.
- Macrae, C.N., Alnwick, K.A., Milne, A.B., and Schloerscheidt, A.M. (2002). Person perception across the menstrual cycle: Hormonal influences on social-cognitive functioning. *Psychological Science*, *13*, 532-536.
- Moore, H.D., Martin, M., and Birkhead, T.R. (1999). No evidence for killer sperm or other selective interactions between human spermatozoa in ejaculates of different males in vitro. *Proceedings of the Royal Society B*, *266*, 2343-5230.
- Penton-Voak, I.S., and Perrett, D.I. (2000). Female preference for male faces changes cyclically: Further evidence. *Evolution and Human Behavior*, *21*, 39-48.
- Penton-Voak, I.S., Little, A.C., Jones, B.C., Burt, D.M., Tiddeman, B.P., and Perrett, D.I. (2003). Female condition influences preferences for sexual dimorphism in faces of male humans (*Homo sapiens*). *Journal of Comparative Psychology*, *117*, 264-271.
- Penton-Voak, I.S., Perrett, D.I., Castles, D.L., Kobayashi, T., Burt, D.M., Murray, L.K., and Minamisawa, R. (1999). Menstrual cycle alters face preference. *Nature*, *399*, 741-742.
- Perrett, D.I. (2010). In your face: The new science of human attraction. Palgrave Macmillan, London.
- Peters, M., Simmons, L.W., and Rhodes, G. (2009). Preferences across the menstrual cycle for masculinity and symmetry in photographs of male faces and bodies. *PloS One*, *4*, e4138.
- Pillsworth, E., and Haselton, M. (2006). Male sexual attractiveness predicts differential ovulatory shifts in female extra-pair attraction and male mate retention. *Evolution and Human Behavior*, *27*, 247-258.

Menstrual cycle shifts

- Provost, M.P., Troje, N.F., and Quinsey, V.L. (2008). Short-term mating strategies and attraction to masculinity in point-light walkers. *Evolution and Human Behavior*, 29, 65-69.
- Puts, D.A. (2005). Mating context and menstrual phase affect women's preferences for male voice pitch. *Evolution and Human Behavior*, 26, 388-397.
- Puts, D.A. (2006). Cyclic variation in women's preferences for masculine traits: Potential hormonal causes. *Human Nature*, 17, 114-127.
- Roney, J.R., and Simmons, Z.L. (2008). Women's estradiol predicts preference for facial cues of men's testosterone. *Hormones and Behavior*, 53, 14-19.
- Rupp, H.A., James, T.W., Ketterson, E.D., Sengelaub, D.R., Janssen, E., and Heiman, J.R. (2009). Neural activation in women in response to masculinized male faces: Mediation by hormones and psychosexual factors. *Evolution and Human Behavior*, 30, 1-10.
- Smith, F.G., Jones, B.C., Welling, L.L., Little, A.C., Vukovic, J., Main, J.C., and DeBruine, L.M. (2009). Waist-hip ratio, but not BMI, influences women's preferences for masculine male faces. *Personality and Individual Differences*, 47, 476-480.
- Vaughn, J.E., Bradley, K.I., Byrd-Craven, J., and Kennison, S.M. (2010). The effect of mortality salience on women's judgments of male faces. *Evolutionary Psychology*, 8, 477-491.
- Vitzthum, V.J. (2008). Evolutionary models of women's reproductive functioning. *Annual Review of Anthropology*, 37, 53-73.
- Welling, L.L., Jones, B.C., DeBruine, L.M., Conway, C.A., Law Smith, M.J., Little, A.C., Feinberg, D.R., Sharp, M.A., and Al-Dujaili, E.A.S. (2007). Raised salivary testosterone in women is associated with increased attraction to masculine faces. *Hormones and Behavior*, 52, 156-161.
- Welling, L.L., Jones, B.C., DeBruine, L.M., Smith, F.G., Feinberg, D.R., Little, A.C., et al. (2008). Men report stronger attraction to femininity in women's faces when their testosterone levels are high. *Hormones and Behavior*, 54, 703-708.