



Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

The influence of hormone replacement therapy on mating psychology among post-menopausal women

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ARTICLE INFO

Article history:

Received 14 February 2016
 Received in revised form 18 October 2016
 Accepted 19 October 2016
 Available online xxx

Keywords:

Hormone replacement therapy (HRT)
 Hormones
 Mate preferences
 Sexual fantasy
 Desire
 Extra-pair interest
 Menopause

ABSTRACT

Hormone replacement therapy (HRT) is a popular treatment for menopause-related symptoms and is associated with increased well-being and sexual function. Researchers have investigated the effects of synthetic hormones within hormonal contraceptives on preferences for masculine men, and on behaviors directed towards male partners. Yet, no studies have examined the impact of synthetic hormones in HRT on mate preferences or mate-directed behavior among post-menopausal women. Here we tested the influence of HRT on women's reported sexual motivation, partner-directed behaviors (i.e., jealousy and mate retention behaviors), and mate preferences. Post-menopausal women ($N = 213$) responded to an online survey and completed a two-alternative, forced-choice face preference task where they rated the attractiveness of male images manipulated in sexual dimorphism. We found that HRT use was positively associated with sexual satisfaction, attitudes towards unrestricted sex, and sexual interest towards extra-pair men. There were no differences between users versus non-users in partner-directed behavior or masculinity preferences. This study highlights the need for further investigations into hormonal influences on mate preferences and behavior among post-menopausal women.

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1. Introduction

There is growing evidence that hormones across the menstrual cycle influence mate preferences and partner-directed behavior in women (reviewed in Gildersleeve, Haselton, & Fales, 2014a,b). Women exhibit increased preferences for masculinity (a putative cue to genetic health; Rhodes, Chan, Zebrowitz, & Simmons, 2003; Thornhill & Gangestad, 2006) during their reproductive years (Little et al., 2010) and during the late follicular phase of the menstrual cycle, when conception is most likely to occur (e.g., Gangestad, Thornhill, & Garver-Apgar, 2010; Welling et al., 2007). Preference shifts across the female menstrual cycle correlate with specific hormones, although there is still debate surrounding which hormones are responsible for these shifts (reviewed in Welling & Puts, 2014). For example, the increased attraction to masculine facial traits at mid-cycle has been linked to increased levels of salivary testosterone (Welling et al., 2007) and estradiol (Roney & Simmons, 2008, 2013). Recent work has found that in-pair interest was positively associated with progesterone levels and negatively associated with estrogen levels (representing the low-fertility phase), whereas extra-pair interest was associated with elevated estradiol levels (representing high fertility; Grebe, Thompson, & Gangestad, 2015). However, the fertility-related shift in mate preferences may

depend in part on whether the woman's primary partner exhibits cues to genetic fitness; women partnered with less masculine men show significantly more interest in, and fantasies about, extra-pair men at peak fertility, whereas those with highly masculine partners reported greater attraction to and fantasies about their partner during peak fertility (Gangestad et al., 2010; see also Haselton & Gangestad, 2006; Pillsworth & Haselton, 2006). Similarly, other researchers have noted a mid-cycle peak in libido more generally (e.g., Matteo & Rissman, 1984), which has been positively linked with estradiol and negatively linked with progesterone (Roney & Simmons, 2013). Thus, changes in preferences across the cycle could be positively associated with estradiol and/or testosterone, negatively associated with progesterone, or the result of complex interactions between hormones. It is important to note, however, that some studies failed to find fluctuating preferences across the menstrual cycle (reviewed in Havlicek, Cobey, Barrett, Klapilova, & Roberts, 2015), highlighting the need for additional research.

Women using hormonal contraceptives (HCs) do not exhibit the same patterns of behavior or preferences as regularly-cycling women (reviewed in Welling, 2013). For instance, the mid-cycle shift in masculinity preferences is absent among HC users (Penton-Voak et al., 1999). Moreover, the initiation of HCs negatively impacts women's preferences for male facial masculinity (Little, Burriss, Petrie, Jones, & Roberts, 2013), and extended HC use is associated with weaker preferences for facial (Little, Jones, Penton-Voak, Burt, & Perrett, 2002) and vocal

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masculinity (Feinberg, DeBruine, Jones, & Little, 2008). These preference changes may influence partner choice, with women who met the father of their first child while using HCs (versus not using HCs) reporting lower sexual satisfaction with their partners (Roberts et al., 2012). The synthetic hormones found in HCs may influence partner-directed behavior; synthetic estrogen has been linked with increased sexual jealousy (Cobey, Pollet, Roberts, & Buunk, 2011) and use of mate retention behaviors (i.e., behaviors used to keep a partner faithful; Welling, Puts, Roberts, Little, & Burriss, 2012) in young partnered women. The investigation into the psychobehavioral effects of hormonal contraceptives is relatively new, but it suggests that the synthetic hormones found in combined HCs may alter fundamental aspects of relationships.

Although previous research investigating the influence of synthetic hormones on preferences and relationship-relevant behaviors has compared naturally-cycling women to HC users or compared different dosages within HC users, no studies have considered the impact of hormone replacement therapy (HRT) on mate preferences, sexual desire, or mate-directed behavior among post-menopausal women. Menopause is characterized by the decline of circulating estrogen and progesterone levels and the permanent cessation of menstruation (Hunter, 1990). Many physicians prescribe HRT in the form of synthetic estrogen and progestin to help alleviate physical and psychological discomforts associated with menopause (Stadberg, Mattsson, & Milsom, 1997). Indeed, one study reported that post-menopausal HRT users (versus non-users) fared better in all aspects of their sex life, including libido, sexual activity, sexual satisfaction, sexual pleasure, and frequency of orgasms (Taavoni, Kafshgiry, Shahpoorian, & Mahmoudie, 2005). Others, however, found that HRT improved sexual function, but not desire and arousal (González, Viáfara, Caba, & Molina, 2004). Synthetic hormones appear to alleviate sexual dysfunction for post-menopausal women (Kingsberg, 1998), but further research is clearly needed to determine effects of HRT on sexual desire and behavior. Also, unlike HCs, no research has investigated how HRT influences mate preferences or partner-directed behaviors.

The purpose of this study is to examine the influence of HRT on (1) sexual motivation, (2) partner-directed behaviors, and (3) mate preferences among post-menopausal women. We predicted that the synthetic hormones in HRT would cause similar behavioral changes as the synthetic hormones found in HCs. Specifically, because of the presence of synthetic estrogen in HRT used to treat menopausal symptoms (Stadberg et al., 1997), and because of previous research on behavioral effects of synthetic estrogen in HCs (Cobey et al., 2011; Welling et al., 2012), we predicted that HRT use would be associated with increased jealousy and mate retention behaviors. However, the higher estrogen relative to progesterone ratio of post-menopausal HRT users versus non-users mimics the fertile late-follicular phase of the menstrual cycle (e.g., Ross, Paganini-Hill, Wan, & Pike, 2000), whereas HCs have lower estrogen relative to progesterone and mimic the nonfertile mid-luteal phase of the menstrual cycle (e.g., Alvergne & Lummaa, 2009). Thus, as per previous research among naturally-cycling women tested at high and low fertility (e.g., Grebe et al., 2015; Penton-Voak et al., 1999; Roney & Simmons, 2008, 2013), we predicted that masculinity preferences and sexual motivation would be higher among HRT users versus non-users.

2. Methods

2.1. Participants

Heterosexual post-menopausal women ($N = 213$) who reported currently being in a committed, exclusive relationship participated in this online study. The reported racial composition was 54.92% White, 29.10% Asian Indian, 5.16% American Indian, 4.69% Black, 4.20% mixed race, and 1.93% Other. In order to hold age relatively constant, participation was limited to those between the ages of 45 and 65 years. Eighty reported using some form of HRT (age: $M = 50.52$ years, $SD = 4.31$,

range = 45–63). However, participants who listed an unrecognized HRT brand ($N = 7$), reported HRT use but listed non-hormonal supplements ($N = 3$), or used testosterone-only HRT ($N = 1$) were excluded from analyses, resulting in a final sample size of 69 HRT users (age: $M = 51.83$, $SD = 5.08$). Within HRT-users, 29 reported using combined estrogen and progesterone treatments (age: $M = 51.01$, $SD = 3.93$) and 29 reported using estrogen-only (age: $M = 50.87$, $SD = 4.17$). One hundred and thirty-three participants reported not using any hormonal supplements (age: $M = 51.87$ years, $SD = 5.14$, range = 45–64), however two participants were excluded who reported having experienced menstrual bleeding within the past year. This yielded a final sample of 131 non-users.

2.2. Stimuli

Ten pairs of male faces were made using previously established computer graphics methods (Tiddeman, Burt, & Perrett, 2001) for use in the 2-alternative forced choice face preference tasks outlined below. Briefly, composite male and female faces were made by averaging the shape, color, and texture of 60 Caucasian men and 60 Caucasian women, respectively. Next, $\pm 50\%$ of the differences in face shape between these composites was added to or subtracted from corresponding points on ten male identities (age: $M = 22.62$ years, $SD = 2.27$), leaving us with 10 pairs of faces where each pair consisted of a masculinized and a feminized version of the same individual (see Fig. 1). These manipulations have been shown to influence perceptions of masculinity in the predicted way (Welling et al., 2007).

2.3. Procedures

Participants were recruited online through social media (e.g., Facebook, Reddit) and Amazon's Mechanical Turk (MTurk). MTurk participants were compensated \$3.15 for their time (approximately 45 min). After clicking on the survey link, participants were directed to Qualtrics, an online survey platform. First, participants completed a basic demographics questionnaire (i.e., age, ethnicity, relationship status, sexual orientation), which included questions on last menstruation, HRT use, and HRT brand/dosage (if applicable). Next, participants completed a series of questionnaires in a random order. We investigated sexual motivation using three operational definitions: scores on the Revised Sociosexual Orientation Inventory (SOI-R; Penke & Asendorpf, 2008), scores on the Arizona Sexual Experience Scale (ASEX; McGahuey et al., 2000), and responses to Gangestad et al.'s (2010) measures of in-pair versus extra-pair interest. We investigated partner-directed behaviors using two operational definitions: the Revised Anticipated Sexual Jealousy Scale (Buunk, 1997) and the Mate Retention Inventory-Short Form (MRI-SF; Buss, Shackelford, & McKibbin, 2008).

2.3.1. Sociosexual orientation

The SOI-R measures an individual's openness to uncommitted sexual relationships. It consists of nine items, representing three facets: behavior ($\alpha = 0.78$) attitude ($\alpha = 0.81$), and desire ($\alpha = 0.82$; overall $\alpha = 0.83$). Scores are averaged, and higher scores indicate an unrestricted sociosexual orientation (i.e., a high willingness to engage in sexual activities with an uncommitted partner; Penke & Asendorpf, 2008).

2.3.2. Sexual experience

The ASEX is a five-item rating scale ($\alpha = 0.94$) that quantifies sex drive, arousal, vaginal lubrication, ability to reach orgasm, and satisfaction from orgasm. Higher average scores indicate higher sexual dissatisfaction (McGahuey et al., 2000).

2.3.3. In-pair versus extra-pair interest

Following Gangestad et al. (2010), participants responded to two questions assessing their sexual attraction to their primary partner ("I



Fig. 1. We created masculinized (A) and feminized (B) versions of 10 male adults using established methods (Tiddeman et al., 2001), leaving us with 10 pairs of faces where each pair consisted of a masculinized and a feminized version of the same individual. Methods changed 2D face shape only, whereas color, texture, and identity remained unaltered.

felt strong sexual attraction toward my primary current partner” and “I fantasized about sex with a current partner”) and three questions about their sexual attraction to extra-pair men (“I felt strong sexual attraction toward someone other than a current partner”, “I fantasized about sex with a stranger or acquaintance”, and “I fantasized about sex with a past partner”) using a five-point Likert scale (anchors: 1 = not at all, 5 = a great deal). Values are summed to create composite measures of attraction to a current partner and to extra-pair men.

2.3.4. Jealousy

The Revised Anticipated Sexual Jealousy Scale (Buunk, 1997) assesses feelings of jealousy within a romantic relationship. The scale of 15 items incorporates 5 items for each type of jealousy, including reactive ($\alpha = 0.64$), anxious ($\alpha = 0.78$), and possessive jealousy ($\alpha = 0.87$). Scores are averaged, and higher scores indicate more feelings of jealousy.

2.3.5. Mate retention

The MRI-SF (Buss et al., 2008) assesses the frequency and type of employed mate retention tactics ($\alpha = 0.90$). Higher average scores indicate more frequent use of mate retention tactics. The MRI-SF was completed twice: once reporting on their own mate retention behaviors and once reporting on their partner's behaviors.

2.3.6. Relationship satisfaction

We included the Relationship Assessment Scale (RAS; Hendrick, Dicke, & Hendrick, 1998) to control for general relationship satisfaction. The RAS contains seven Likert-type items measuring the quality of a romantic relationship on a five-point scale (anchors: 1 = not satisfied, 5 = very satisfied; $\alpha = 0.91$), whereby higher average scores indicate higher relationship satisfaction.

2.3.7. Mate value

Because previous research has found that women's in-pair versus extra-pair sexual motivation depends on their partner's mate quality (Gangestad et al., 2010), participants rated their partners' masculinity and dominance, and the masculinity and dominance of their ideal romantic partner, using a 9-point Likert scale (anchors: 1 = not at all masculine/dominant, 9 = extremely masculine/dominant). Responses on this measure are averaged to provide an estimate of mate quality.

Finally, we investigated mate preferences using a 2-alternative forced choice face preference task where participants indicated which male face in each pair (i.e., masculinized versus feminized) was more attractive. Participants rated each set of faces twice: once for preference in a long-term (i.e., committed) relationship and once for preference in a short-term (i.e., purely sexual) relationship. The order of pairs and the

side of the screen on which any image appeared were randomized within each task. The proportion of masculine faces chosen within each task was calculated.

3. Results

Independent-samples *t*-tests revealed no significant age differences between HRT-users and non-users, or between estrogen-only and combined estrogen and progesterone treatment HRT users (i.e., “dual” users; all $p > 0.39$). Differences between post-menopausal HRT users and non-users were assessed on each measure using independent-samples *t*-tests, and effect sizes were measured using Hedge's *g*. Inventory means and standard deviations are shown in Table 1. Analyses revealed a significant difference in reported sexual dissatisfaction as measured with the ASEX ($t(173) = -2.30, p = 0.02, g = 0.34$), with non-users reporting higher levels of sexual dissatisfaction than HRT users. HRT users also reported higher SOI-R scores ($t(212) = 2.37, p = 0.02$) and greater extra-pair ($t(212) = 1.99, p = 0.05, g = 0.27$) and in-pair ($t(212) = 2.28, p = 0.02, g = 0.32$) sexual interest (i.e., desires and fantasies measured as per Gangestad et al. (2010)) than non-users. No other significant differences were found between HRT users and non-users on any of the measured inventories, although results approached significance on reports of partner's mate-retention behaviors ($t(177) = 1.72, p = 0.09, g = 0.26$), with HRT users reporting that their partners perform more mate retention behaviors than women not using HRT, and on reports of relationship satisfaction (i.e., RAS scores; $t(212) = 1.68, p = 0.09$), with HRT users tending to report higher relationship satisfaction than non-users. Follow-up analyses controlling for relationship satisfaction using analysis of covariance (ANCOVA) did not change the pattern of results except for the main effect of in-pair interest, which was no longer significant ($F(1173) = 1.65, p = 0.20$).

Perception of partner masculinity significantly correlated with participants' in-pair interest (HRT users: $r(69) = 0.22, p = 0.04$; non-users: $r(131) = 0.18, p = 0.04$), but this effect did not differ between HRT users and non-users ($p > 0.63$). A multiple linear regression was run to determine whether masculinity and HRT use (or their interaction) predicted the rate of extra-pair interest. Step one included masculinity and HRT use and the interaction term was entered in step two. In our first model, both masculinity ($B = -0.14, t = -2.03, p = 0.04$) and HRT use ($B = -1.44, t = -2.13, p = 0.04$) significantly predicted extra-pair interest ($R^2 = 0.04, F(2211) = 4.07, p = 0.02$), however the interaction term in step two was non-significant ($B = -0.01, t = -0.07, p = 0.94, R^2 \text{ change} = 0.00, F(2,10) = 0.01, p > 0.94$). This regression analysis was repeated using in-pair interest as the outcome

Table 1
Inventory means and standard deviations.

Inventory	Users Mean (SD)	Non-users Mean (SD)	Estrogen-only users Mean (SD)	Dual users Mean (SD)
Sexual Dissatisfaction (ASEX)*	14.88 (3.94)	16.34 (4.25)	14.36 (3.50)	14.71 (4.71)
Sociosexual Orientation (SOI-R)*	2.42 (0.82)	2.15 (0.80)	2.28 (0.77)	2.39 (0.92)
Extra-pair Interest* ⁺	6.49 (2.45)	5.77 (2.63)	1.74 (0.67)	2.33 (0.87)
In-pair Interest*	6.11 (1.24)	5.66 (1.62)	6.21 (1.13)	6.25 (1.34)
Self-reported MRI-SF ⁺	1.33 (0.50)	1.24 (0.54)	1.05 (0.41)	1.49 (0.52)
Partner MRI-SF	1.36 (0.49)	1.25 (0.52)	1.42 (0.57)	1.20 (0.43)
Relationship Satisfaction (RAS)	33.68 (7.41)	31.74 (8.46)	36.18 (5.22)	35.18 (6.34)
Jealousy Scale	26.00 (6.54)	25.77 (6.24)	25.26 (7.24)	27.97 (5.04)

* Indicates a significant difference between HRT users and non-users ($p < 0.05$).

⁺ Indicates a significant difference between estrogen-only HRT users and dual (combined estrogen and progestin) HRT users.

variable, and no significant predictors or interactions were found (all $p > 0.23$).

We used one-way ANCOVA (covariate: RAS scores) to compare the effect of hormone therapy on each of the above dependent variables using three factor levels: (1) HRT dual users (i.e., combined estrogen and progesterone treatment; $N = 29$), (2) estrogen-only users ($N = 29$), and (3) non-users ($N = 131$). Nine more HRT users were excluded from these analyses because they did not list any brand or dose information. Analyses revealed that hormone therapy significantly affected extra-pair interest ($F(2194) = 4.47$, $p = 0.01$) and self-reported mate-retention behavior ($F(2194) = 3.23$, $p = 0.04$). Follow-up comparisons revealed that dual users showed increased extra-pair desires compared to both estrogen-only users ($t(56) = 2.12$, $p < 0.05$), and non-users ($t(158) = 2.58$, $p = 0.01$). There was no significant difference between estrogen-only users and non-users in reports of extra-pair interest ($t(158) = 0.04$, $p > 0.91$). Dual users also reported performing more mate-retention behaviors than estrogen-only users, ($t(56) = 2.32$, $p = 0.04$). However, applying Bonferroni correction (critical $p = 0.02$) for multiple comparisons rendered the differences between dual users and estrogen-only users nonsignificant, suggesting that these findings should be interpreted with caution. There were no other significant differences (all $p > 0.28$).

Although we did not find expected differences in facial masculinity preferences, we ran follow-up analyses to determine whether HRT use and type predicted preference for reported ideal partner's masculinity and dominance, and whether HRT use and type predicted discrepancy between ideal partner masculinity/dominance and the masculinity/dominance of the woman's current partner (i.e., rated partner masculinity/dominance subtracted from ideal partner masculinity/dominance such that positive numbers indicate a preference for a partner who is more masculine or dominant than their current partner). We found no differences between HRT users and non-users in reports of ideal partner traits or in discrepancy between ideal versus current partner traits (all $p > 0.33$), but we did find an influence of HRT type within HRT users; analyses show that the discrepancy between current and ideal partner masculinity ($t(58) = -2.14$, $p = 0.04$, $g = 0.56$) and dominance ($t(58) = 1.74$, $p = 0.09$, $g = 0.46$) is higher among dual users (i.e., they have a stronger preference for men with higher levels of these traits than their current partner) than among estrogen-only users, although the latter results fell short of significance.

4. Discussion

This study found that HRT leads to higher sexual satisfaction, increased interest in extra-pair men, and positive attitudes towards uncommitted sex. This is in-line with previous research finding that women who use HRT report higher sexual satisfaction overall, including increased libido, sexual activity, and frequency of orgasms (e.g., Taavoni et al., 2005). Moreover, women using any form of HRT expressed higher interest (i.e., fantasies and desires) towards their primary partner and towards men other than their primary partner compared to non-users. However, HRT users in this sample tended to report somewhat

higher relationship satisfaction, and when this was controlled for HRT use led to higher extra-pair interest only, indicating that the synthetic hormones found in HRT may affect one's target of sexual fantasy and desire by increasing interest in extra-pair partners. Furthermore, we found that HRT use influenced women's attitudes towards uncommitted sexual activity, which likely also reflects a greater acceptance towards extra-pair mating opportunities as a function of HRT use. Because HRT users will have higher levels of estradiol than non-users, these findings partially support recent work (Grebe et al., 2015), wherein extra-pair interest was associated with elevated estradiol levels among naturally-cycling young women. However, contrary to Grebe et al. (2015), we found no evidence of reduced in-pair interest among women with higher estradiol (i.e., HRT users). Similarly, we found no interaction between in-pair versus extra-pair interest and rated masculinity of participants' current partners as a function of hormonal profile, as would be predicted from research in naturally-cycling women (Gangestad et al., 2010; Haselton & Gangestad, 2006; Pillsworth & Haselton, 2006). Rather, we found a positive correlation between partner masculinity and in-pair interest, but this effect did not differ between HRT users and non-users.

Contrary to our hypothesis, we found no difference between HRT users and non-users in jealousy or mate retention behaviors. We had predicted this difference because HRT treatments for post-menopausal women contain synthetic estrogen, and the synthetic estrogen found in HCs has been linked to increases in these behaviors (Cobey et al., 2011; Welling et al., 2012). However, there was a nonsignificant trend whereby HRT users reported that their partners perform more mate retention behaviors than non-users. Also, follow-up analyses found that participants taking HRT containing both synthetic estrogen and progestin reported performing more mate-retention behaviors than those using estrogen-only therapy. These findings indicate that the relationship between synthetic hormones and partner-directed behavior may be complex and that perhaps the combination of synthetic estrogen and progestin has a unique influence on the behavior of post-menopausal women. However, this interpretation should be taken with caution because neither dual HRT users nor estrogen-only users differed significantly from non-users in their frequency of engaging in mate retention behaviors. Moreover, the difference between dual users and estrogen-only users was no longer significant after Bonferroni correction. Thus, future research should investigate this possibility more closely using a larger sample of post-menopausal HRT users.

We found no difference in reported sexual dissatisfaction between dual users and estrogen-only users in the current sample. We did find that dual users reported higher extra-pair interest compared to both estrogen-only users and non-users, whereas self-reported extra-pair attraction did not differ between estrogen-only users and nonusers. There were no differences in reported in-pair attraction. This compliments our earlier findings on HRT users reporting greater extra-pair attraction compared to non-users and likewise implies that the influence of combined estrogen-progesterone HRT increases some aspects of sexual motivation that are not influenced by estrogen therapy alone. Indeed, dual users (versus estrogen-only users) reported desiring a more masculine

and, relatedly, more dominant partner compared to their current partner, and masculinity is a putative indicator of genetic quality that is considered sexually attractive (Little et al., 2002). Altogether, these findings indicate that progestin may interact with synthetic estradiol to increase women's motivation to behave sexually with high quality extra-pair mates. However, this interpretation is tentative because the difference between dual users and estrogen-only users fell short of significance after Bonferroni correction.

4.1. Limitations and future directions

With the exception of research into sexual function, this is the first research to investigate synthetic hormone use and sexual psychology in post-menopausal women. Unfortunately this study was limited in sample size, particularly for HRT users ($N = 69$), and we were unable to run meaningful analyses on hormone dose because too few participants provided this information ($N = 22$). Furthermore, testosterone therapy was not considered in this study because of low reported use ($N = 1$), but testosterone has previously been shown to influence preferences for masculinity in young women (Welling et al., 2007). Thus, future research should collect a larger sample of HRT users, examine the influence of testosterone therapy on sexual psychology, consider the specific dose of each hormone, and could use measured hormone levels to run analyses. Future work could also examine changes in women's mating psychology using a within-subjects pre-post design. Such a design would allow for the investigation of agreement between preferences and desires pre- versus post-HRT initiation, similar to how others have investigated masculinity preferences during pregnancy and post-partum (Cobey, Little, & Roberts, 2015).

Not all of our hypotheses were supported, but our null findings may be due to design or sampling issues. For example, even though we found no influence of HRT use on masculinity preferences, it is possible that our stimuli were inappropriate for the target population. During face preference tasks, women viewed images of young, college-aged White men, which may not correlate to preferences for masculinity within their age group or ethnicity. However, we note that previous research that used the same computer graphics techniques to investigate circum-menopausal changes in women's masculinity preferences found equivalent preferences for peer-aged faces (Jones, Vukovic, Little, Roberts, & DeBruine, 2011) as they did for young adult faces (Vukovic et al., 2009). Nonetheless, in order to test hormonal mediation of attraction towards particular traits (e.g., masculinity) in older women, future research should incorporate face preference tasks using peer-aged stimuli that are matched with participant ethnicity.

In conclusion, our study found that HRT use is related to increased sexual satisfaction, more relaxed attitudes towards unrestricted sex, and increased interest towards extra-pair men among post-menopausal women. Our results also reflect that different types of HRT may influence mating psychology in unique ways, opening avenues for future research. Certainly, fluctuating behaviors and preferences are likely due to complex interactions between estradiol, progesterone, and possibly other hormones not considered in this study, highlighting the need for further research to determine potential psychological and behavioral effects of synthetic hormone use, especially in couples beyond their reproductive years.

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