



# Female mate copying explored: an inconsistent effect

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## Abstract

Mate copying is a social phenomenon whereby individuals differentially evaluate opposite-sex others based on their relationship history. Here we report two studies that aimed to look at mate copying in closer detail. In Study 1, women ( $N = 121$ ) saw vignettes of men and women and made romantic evaluations of the pictured men. It was found that when women are evaluating prospective male romantic partners, they are aware of how much they consider the man's relationship history, suggesting an awareness of mate copying. Study 2 used a similar methodology and found that women ( $N = 736$ ) do not gain any additional information about a man's specific traits from seeing him pictured alongside another woman, although the age of the evaluator does significantly affect how they perceive the man. The findings contribute to our understanding of mate copying as a nuanced phenomenon.

**Keywords** Mate copying · Mate selection · Observable traits · Unobservable traits · Awareness · Nonindependent mate choice

Choosing a romantic partner is an important life decision and making a poor choice may be costly. Many factors influence whether a mate is perceived as desirable (Dunn & Doria, 2010; Ryan, 1997). Mate copying (MC) is the phenomenon whereby individuals are considered to be more attractive to others if they have already been chosen as a mate by another individual (Pruett-Jones, 1992). This is a type of non-independent mate choice where an individual (typically a woman) is influenced by the mate choices of same-sex others (Waynforth, 2007). When a woman is perceived to be romantically associated with a man, she is implicitly providing positive information to other women about the quality of that man, and thereby increasing the likelihood that he will be chosen as a mate by other women (Eva & Wood, 2006). The information provided is thought to be about the potential mate's unobservable traits (Kavaliars, Matta, & Choleris, 2017). While desirable, observable traits (e.g., being physically attractive) are easy to discern by simply observing the target mate, desirable, unobservable traits (e.g., intelligence) involve a potentially costly investment of time/energy to find out if the target possesses them (Little et al., 2008). In this way, MC means that those searching for a mate can minimise such

costly investments by targeting mates that have already been 'pre-screened' by another female (Pruett-Jones, 1992).

Research into MC has been firmly established over the past 20 years across various nonhuman species, with reports of it occurring in species such as the black grouse (Höglund, Alatalo, Gibson, & Lundberg, 1995), fruit fly (Mery et al., 2009), guppy (Dugatkin, 1992; Dugatkin & Godin, 1992), Japanese medaka (Grant & Green, 1996), Japanese quail (Galef & White, 1998), Norwegian rat (Galef, Lim, & Gilbert, 2008), and the sailfin molly (Schlupp, Marler, & Ryan, 1994; Witte & Ryan, 2002). In such studies, females are typically shown to increase interest in males after observing them interact with other females. Although many of these studies were conducted in laboratories, comparable results have also been observed in wild populations (Höglund et al., 1995; Witte & Ryan, 2002). The results from such research emphasise both the flexible nature of attraction and the power of social cues in mate selection.

## Mate Copying Research in Humans

One of the original human MC studies focused on the social advantages of being linked to an attractive person (Sigall & Landy, 1973). Participants (raters) encountered a man (target) with a woman (model) who was either attractive or unattractive, and was either the man's girlfriend or had no association with him. The target was rated more favourably when associated with an attractive model compared to an unattractive

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model. Yet when the model was not associated with the target, her presence, attractive or unattractive, had no impact on ratings. These results created a platform for future MC research on humans (Hill & Buss, 2008; Little, Burriss, Jones, DeBruine, & Caldwell, 2008; Rodeheffer, Proffitt-Leyva, & Hill, 2016).

Subsequent studies manipulated the relationship status of the target being evaluated (single vs. in a relationship), with mixed findings. Eva and Wood (2006) reported that women found married men to be more attractive than single men, yet Uller and Johansson (2003) reported no significant attraction difference between men when wearing or not wearing a wedding ring. These studies, however, did not include visual representation of the partners, and so raters could not know whether the partner was physically attractive or not, potentially influencing the studies' mixed results. To address this, recent research often includes photographs of men and women together. For example, Little et al. (2008) found that participants rated opposite-sex individuals as more desirable for long-term relationships when shown photographed next to an attractive individual the same sex as the participant. Participants provided different ratings depending on the attractiveness of the partner, highlighting the important influence of partner attractiveness on perceived desirability.

### Mate Copying Differences between the Sexes

Men and women experience MC differently, with some studies reporting MC to be stronger in women than men, and others finding no evidence for MC in men (for a review see Anderson & Surbey, 2018). This may be because women (seeking a mate with good parenting skills) place more importance on the unobservable traits of men when looking for a partner (Eagly & Wood, 1999), whereas men typically place more importance on a woman's observable traits (e.g., looks; Boxer, Noonan, & Whelan, 2015). Mate preferences also change depending on variables such as circumstance, and duration of relationship sought (Buss & Schmitt, 1993; Little et al., 2008).

While men can relatively easily assess women on their physical attractiveness, women have the more challenging task of assessing men on the quality of their reproductive traits and parenting ability (Rodeheffer et al., 2016). Although heritable physical traits like facial symmetry, general health and physical fitness can be observed, the parental ability of a man is harder to assess (Waynforth, 2007). This is where peer information from women who have been romantically involved with a man may be valuable, and why women may be more likely to mate copy than men (Graziano et al., 1993). An attractive (and therefore highly desirable) woman has a larger pool of men to choose from and therefore has an increased opportunity of securing a highly desirable man. Thus, judging a man on the attractiveness of his partner may be an

accurate assessment of his quality as a mate, as he presumably possesses at least *some* characteristics that appeal to a highly desirable woman (who can afford to be very selective).

For a woman to obtain information about a potential partner without external assistance, she must undertake a costly investment of time and energy to assess his qualities as a partner. Further, becoming romantically involved could also pose a personal safety risk. Among female undergraduate college students in the US, 23.1% reported experiencing rape or sexual assault (Cantor et al., 2015), and 5.1% of Australian women overall report experiencing sexual violence by a partner (Australian Bureau of Statistics, 2017). While partner abuse is not always visible, using information about a person's previous relationships to judge their suitability as a partner could potentially increase a woman's future safety. By pooling information from other women, the process of judging a man can become more efficient and reduces the chance of mistakes and potentially dangerous situations (Little, Jones, DeBruine, & Caldwell, 2011).

### Self-Awareness and Control over Mate Copying

Despite humans having consciousness, and therefore being aware of internal thoughts and emotions, there can still be a lack of awareness of one's own behaviour. The question of whether people have self-awareness of MC influencing their attraction introduces the complex relationship between copying and actively choosing. Discussing nonhumans, Vakirtzis (2011) suggested that the genetic disposition to copy or choose could be present in all females, resulting in some females displaying copying behaviour, and others actively choosing. However, little research has addressed this question in humans, and it is unknown whether or not participants are aware of MC occurring. One study did find that a target's initial rating (alone) increased when presented with models of varying attractiveness. This paired rating was repeated multiple times, and as the model attractiveness increased, so did the target's attractiveness rating (Yorzinski & Platt, 2010). This potentially indicates the participants were not aware of whom and how they were rating, given the change in ratings from when the target was pictured alone. However, a direct assessment of participants' self-awareness when engaging in MC has not been addressed within the research.

By understanding how much self-awareness and control people have over their attraction, one can make rational decisions on what is important to them in a relationship, beyond momentary attraction, helping them make better decisions in their romantic lives. Further, understanding how self-aware women are of MC when it occurs, and how much conscious control they have over their behaviour may be informative for future MC research.

## The Current Study

The current study initially aimed to investigate the effect that another woman has on the evaluation of a man. Specifically it was hypothesised that a man would be evaluated as less attractive when he was alone versus when he was pictured alongside a former romantic partner (H1). In a more exploratory vein, the study sought to assess the extent to which a woman evaluating a man considered another woman pictured alongside the man.

## Method

### Participants

This study comprised a convenience sample of 121 Australian women between the ages of 18 and 64 ( $M = 31.44$  years,  $SD = 9.48$  years). Eighty-eight percent of participants stated their primary sexual orientation as heterosexual, and the remaining participants bisexual. Sixty-six percent of participants indicated they were not currently single. Inferential analyses indicated that women's ratings did not differ depending on whether they were single or not, or as a function of their sexual orientation. Participants were recruited from social media and required to be at least 18 years of age, Australian citizens or residents, proficient in English, primarily identifying as female, and primarily identifying as either heterosexual or bisexual. Participants had the option of going in a prize draw to win one of four AUD\$20 gift vouchers.

### Materials and Procedure

Participants received a link to the online questionnaire which they were able to complete at a time and place convenient to them. Participants read a vague (but not untrue or wilfully deceptive) cover story before completing a brief demographics questionnaire and then proceeded to the experimental portion of the survey. The survey itself took approximately three minutes to complete.

MC was assessed by asking participants to rate how attractive they found a man in a photograph on a 9-point Likert scale from 1 (very unattractive) to 9 (very attractive). In the experimental group the man was shown photographed alone (Time 1; T1), and then again (after a filler task) shortly thereafter alongside a woman described as his former partner (Time 2; T2). Women were described as former (rather than the current) romantic partners so as to avoid the potentially confounding social proscriptions against desiring a romantically unavailable individual. Ratings of the attractiveness of the target were made at both T1 and T2. The control group saw only the target pictured alongside the woman. MC awareness was measured by asking participants to rate how much they

thought about the woman in the photo when deciding their rating for the man, on a six-point Likert-type scale from zero (not at all) to five (a great deal).

The photographs were sourced from the Face Research Lab London (DeBruine & Jones, 2017). The photographs chosen displayed the targets facing the camera, with a neutral expression, dressed in a white top on a grey background. The pictured man (age 26, photo 029\_03) was selected on the basis that he had previously been rated as being averagely attractive (rated 3.36 out of 7), while his female companion (age 28, photo 124\_03) had previously been rated as highly attractive (5.68 out of 7). Per Yorzinski and Platt (2010), the combined photographs were created in Adobe Photoshop by overlapping the woman's shoulder in front of the man and lowering the female photograph to make her appear slightly shorter than the man. The combined photographs background was blended to remove traces of the merge. Therefore, participants saw the same photograph of the man whether alone or with the woman.

## Results

### Descriptive Statistics

Descriptive statistics for the male attractiveness ratings, both with and without a model, and the female awareness ratings, split by the control and experimental group are presented in Table 1.

As can be seen in Table 1, male attractiveness ratings when pictured with a female model were higher for the experimental group compared to the control group. The female awareness ratings, however, were comparable.

### Inferential Statistics

To examine the hypothesis, that a target's perceived attractiveness would be elevated by the addition of a woman with whom he had been romantically involved, the rated attractiveness of the target without a model was compared to his rated attractiveness with a model. A paired samples t-test indicated

**Table 1** *M (SD) Ratings of the Man's Attractiveness (as given by women) and the Participant's Awareness of the Pictured Former Female Partner*

	Control	Experimental
<b>Rating without a partner</b>	–	5.55 (1.47)
<b>Rating with a partner</b>	5.1 (1.33)	5.67 (1.42)
<b>Female awareness</b>	1.80 (1.54)	1.89 (1.40)

**Note:** Ratings with and without a partner were measured on a nine-point scale whereas awareness was measured on a six-point scale

that although the trend was in the predicted direction, there was not a significant difference between the two,  $t(60) = .63$ ,  $p = .53$ ,  $\eta^2 < .01$ .

As participants' indications of how much they considered the pictured former female partner did not differ statistically between the control and experimental groups ( $t(89) = .27$ ,  $p = .79$ ,  $\eta^2 < .01$ ), the two were combined. On a scale from zero to five, participant's own awareness rating of their propensity to 'mate copy' was significantly greater than zero,  $t(113) = 17.76$ ,  $p < .001$ ,  $d = 1.30$ . A between-subjects G\*Power analysis (Faul et al. 2007) with two conditions suggested 102 participants would enable 80% power to detect a medium sized effect (not guided by any relevant literature),  $d = .5$ ,  $p < .05$ .

## Discussion

By using a frequently employed proxy measure of photographs of men and women, the current study initially aimed to determine women's MC propensity, and additionally aimed to examine how aware women are of a man's former partner when they are evaluating his attractiveness. Although they were in the predicted direction, results indicated that MC was not present among the current sample (H1). Women did, however, have some awareness of men's former partners.

### Conditions Required for Mate Copying

The results for the MC hypothesis (H1) were unexpected, and inconsistent with previous MC research (Hill & Buss, 2008; Waynforth, 2007; Yorzinski & Platt, 2010). Hill and Buss (2008) found men pictured with other women were rated significantly more desirable than men pictured alone. However, Hill and Buss (2008) did not present raters with a single woman pictured next to the men, as in the current study, but instead showed a group of four women surrounding the men. This may have contributed to the differing results when comparing the studies, as previous MC research has found the optimal number of previous partners for measuring desirability is between two and five (Anderson & Surbey, 2014).

Waynforth (2007) also found attractiveness ratings for a man pictured in a couple to be higher compared to a man pictured alone, but the difference was largest when the woman was highly attractive and the man was highly unattractive. One reason for the null finding in the current study may be that the attractiveness difference between the male and female images used may have been insufficient. Although the pictured woman had been pre-rated as highly attractive and the man pre-rated as only averagely attractive, it may be that MC only occurs when the target being evaluated is considerably unattractive. Future studies may wish to employ less attractive

male stimuli, or possibly increase the difference in attractiveness between the male target and model female.

Further, although MC has been demonstrated previously using within-subjects designs (Scammell and Anderson 2020; Zhuang, Xie, Hu, Fan, Zheng, 2016), the specific design employed here also may have been problematic. In MC research using a within-subjects measurement, often a target will be initially evaluated alone (T1), and then (at a later point; T2) alongside a model, often described as a former or current romantic partner. As raters are reluctant to considerably modify their initial evaluation if the ratings are made close together (Geller & Pitz, 1968), there is often a temporal removal of T2 from T1 (Waynforth, 2007). The lack of MC in the current study may be partially due to an insufficient temporal difference between the two stimuli presentations. Future research may wish to employ a more elaborative intermediary task and/or use a between-subjects methodology (as has been done in Study 2).

Additionally, much of the previous research reporting a MC effect has explicitly described pictured women as current partners of the men. The current study chose not to do so, partly in an attempt to avoid undesirable social proscriptions against wanting that which is romantically unavailable. It is possible that by describing women as former (rather than current) partners, any increase in desirability a man might normally receive from having the affection of a woman may be erased, by virtue of its temporal irrelevance. If the two are former (rather than current) partners, he hasn't been able to maintain the relationship, and therefore might be undesirable.

### Female Awareness

The results of the current study indicate that when evaluating a potential romantic prospect, women significantly consider other women pictured alongside a man. Previous qualitative research on attraction and dating has reported women describing their physical attraction to a man as changing based on their interaction with him and how others perceive him (Noel, Ogle, Maisto, & Jackson Jr., 2016). Women in that study were able to describe in detail what they found attractive in a man and why. The present study determined that female raters thought about the female former partner of the target a moderate amount, though without further investigation into what they were thinking or why. Future research develop a better understanding of MC awareness and control through studies exploring the qualitative nature of a woman's thoughts about a target's former partner(s) and whether this modifies her evaluation of the target.

### Implications

Although Vakirtzis (2011) hypothesised that women may have a genetic disposition to either copy or choose, the

awareness a woman has of her own thoughts (conscious or unconscious) in the attraction process has not previously been examined. The present study begins the discussion about whether MC results from a conscious or unconscious process. It is possible that women make an active decision to view the male as more attractive, rather than passively experiencing MC.

From a clinical and social perspective, understanding how much control and awareness women have over their attraction to men could assist women in gaining more control over, and awareness of, dating and relationships. If women are consciously aware of the impact another woman has on their judgement of a potential mate, they may be better equipped to reflect on past relationship decisions and patterns, which could help them make better, more informed decisions about future attraction and relationships. This is especially important for women who have experienced domestic violence, as having more understanding of attraction and past relationships could help them to avoid repeating patterns and potentially abusive partners.

While the current study was able to establish that women are aware of a man's previous/current partner, and presumably discerning mate-relevant information about him, the *specific* information gained about him is unclear. Study 2 sought to further investigate this.

## Study 2

Only one known study has attempted to directly assess whether MC provides information regarding unobservable traits over observable traits. Rodeheffer, Proffitt-Leyva, and Hill (2016) asked female participants to rate male targets shown with models labelled as a girlfriend, adopted sister, cousin, or ex-girlfriend. Participants rated targets shown with models labelled their girlfriend as significantly more desirable than when shown labelled as adopted sister/cousin/ex-girlfriend. The authors note using the label 'girlfriend' brings unobservable traits into direct consideration, as it confirms the target continues to be chosen as a *current* mate, rather than as part of a non- or ex-romantic relationship, and thus the target has sufficiently desirable unobservable traits to keep his girlfriend interested. However, this is an assumption about the type of information being considered by the rater, not a direct, controlled measure of transmission of unobservable trait information.

Rodeheffer et al. (2016) also went some way towards answering which specific unobservable traits are relevant to MC. Using a composite variable of unobservable traits (intelligent, trustworthy, humorous, wealthy, romantic, goal-driven, generous, and attentive to the needs of others), they found that female raters' perception of male target desirability was partially mediated by the raters' beliefs about the targets' unobservable, desirable characteristics. However, by using the

composite variable mentioned above, Rodeheffer et al. (2016) masked the specific details of what information is gained by female MC – which, while in line with their hypothesis and design, meant they tested *whether* unobservable information is gained, not *what specific type* of unobservable information.

## The Effects of Rater Age

Multiple studies have found that women with less sexual experience, or younger women, rely on MC more than older, more sexually experienced women (Anderson & Surbey, 2014; Bowers et al., 2012; Waynforth, 2007). This may be because younger, less experienced women are less confident when making independent mate choices. Vakirtzis (2011) notes MC may stem from Laland's (2004) social learning theory of 'copy-when-uncertain' – so younger, less experienced women are more uncertain about how to make good choices, thus they engage in copying others' choices more readily. Rater age, therefore, could be a significant covariate when examining female MC and should be considered within female MC study designs.

## The Current Study

The current study aimed to clarify whether being presented alongside a woman (versus being presented alone) provides information on unobservable traits over observable traits using stimulus photographs free from relationship labels. It was hypothesised that trait-ratings will be higher for men presented alongside a woman than for men presented alone (H1). Additionally, being pictured alongside a woman (versus being pictured alone) will provide raters with more information about the men's unobservable than observable traits (H2).

## Method

### Participants

The participants were 736 non-homosexual women aged between 18 and 45 ( $M = 24.90$  years,  $SD = 6.59$  years) recruited by convenience sampling via social media and university advertisements. Selection criteria included being aged between 18 and 45, female, sexually attracted to men, and fluent in English. Participants could enter an optional gift card draw to win one of four AUD\$50 e-gift cards. Seventy-three percent of participants advised they were heterosexual, 22% bisexual, and 5% pansexual. Forty-five percent were in a dating relationship, 42% were single, 11% were married, with the remaining participants categorising their relationship status as 'other'. Although the prevalence of bisexuality may seem high in both Studies 1 and 2, it must be kept in mind that both

of these studies sampled only from non-homosexual women below the age of 65.

Again, inferential analyses indicated that women's ratings did not differ depending on whether they were single or not, or as a function of their sexual orientation. Additionally, 68 % of participants indicated that they were European, 13% Asian, 8% North American, with the remaining participants identifying as African, South American, Aboriginal/Torres Strait Islander, Pacific Islander, or 'other'.

## Materials and Procedure

The methodology employed in Study 2 was very similar to that used in Study 1, except that the photographs were now presented between subjects (so participants either saw the man alone or alongside a woman. Importantly however, in Study 2 women were not explicitly described as either former or current partners of the target man, but rather their relationship status was left as ambiguous. Participants were randomly allocated to either an Alone or Together condition. Replicates were used for each condition but were found to be comparable (per condition) and thus combined. The survey took approximately five minutes to complete.

Female participants (raters) rated men (targets) on a range of desirable observable and unobservable traits on a 7-point Likert scale in reference to a stimulus photograph of a man pictured alone, or together with a woman (model). The traits were chosen if they were identified as important to female mate choice ideally across multiple cultural contexts (e.g., see Boxer, Noonan, & Whelan, 2013; Chang et al., 2011; Furnham, 2009; Kamble et al., 2014; Li et al., 2002; Li et al. 2011; Souza et al., 2016). The 16 unobservable traits were: intelligence, trustworthy, good financial prospect, sociable, humorous, dependable, stable, has an exciting personality, caring, ambitious, understanding, industrious, considerate, kind, easygoing, wants to have children. The four observable traits were: in good health, good-looking, masculine, physically attractive. While there is potential overlap between some traits, there is also the potential for differing definitions or interpretations, so these have been included given the evidence in the literature.

Similar to Study 1 and other MC studies (e.g., Anderson & Surbey, 2014; Rodeheffer et al., 2016), photographic stimuli pre-rated on attractiveness by participants not involved in the main analysis were used (from the Chicago Face Database; Ma, Correll, & Wittenbrink, 2015). Two Caucasian men (photo WM-006, attractiveness rating  $A = 3.51$ , rated age 25.6; photo WM-033, attractiveness rating  $B = 3.85$ , rated age 26.6;) and one Caucasian female (photo WF-024, attractiveness rating = 4.76 out of 7, rated age 23.9) were chosen. The Alone condition comprised a photograph of a man pictured by

himself, while the Together condition comprised a photograph of the man merged side-by-side with the woman.

All procedures were approved by the Monash University Human Research Ethics Committee (Project ID 14540).

## Results

### Preliminary Testing

A preliminary linear regression was performed to identify whether age significantly predicted the Observable or Unobservable agreement ratings for Alone/Together groups combined. The regression showed that age did not significantly predict Unobservable trait agreement ratings,  $R^2 < .001$ ,  $\beta = .04$ ,  $t(734) = 1.01$ ,  $p = .31$ , however it did significantly predict Observable trait ratings,  $R^2 = .01$ ,  $\beta = .10$ ,  $t(734) = 2.74$ ,  $p = .006$ . As such, age was used as a covariate in the main analysis.

### Descriptive Statistics

Descriptive statistics for overall Observable/Unobservable trait ratings and each cell's agreement ratings (Alone/Observable, Alone/Unobservable, Together/Observable, Together/Unobservable) can be seen in Table 2. Means and standard deviations for all 20 traits' agreement ratings across their respective Alone/Together groups can be seen in Table 3.

### Inferential Statistics

A  $2 \times 2$  mixed-design ANCOVA was performed with a between-subjects variable of stimulus type (Alone or Together), a within-subjects variable of trait type (Observable or Unobservable), a covariate (age), and a dependent variable (agreement rating). After controlling for age, the ANCOVA revealed no effect of stimulus type on agreement rating,  $F(1, 733) < .001$ ,  $p = .97$ ,  $\eta_p^2 < .001$ . No effect was found for the effect of trait type on agreement rating,  $F(1,$

**Table 2** Means and (Standard Deviations) for Agreement Rating for Each Stimulus Group

Trait Type	Stimulus Group		
	Alone ( $n = 370$ )	Together ( $n = 366$ )	All Groups ( $N = 736$ )
Observable	4.09 (1.02)	4.09 (1.05)	4.09 (1.03)
Unobservable	3.93 (0.74)	3.93 (0.71)	3.93 (0.73)
Total	4.01 (0.79)	4.01 (0.79)	4.01 (0.79)

Note:  $n$  = number of participants

**Table 3** Means (M) and Standard Deviations (SD) for All 20 Trait Agreement Ratings by Alone/Together Grouping

<i>Unobservable Traits</i>	<i>Alone (M, SD)</i>	<i>Together (M, SD)</i>
Trustworthy	3.66 (1.10)	3.69 (1.02)
Humorous	3.61 (1.24)	3.76 (1.14)
Caring	3.86 (1.10)	3.87 (1.05)
Stable	3.96 (1.21)	3.94 (1.09)
Has an Exciting Personality	3.08 (1.17)	3.17 (1.19)
Good Financial Prospect	4.00 (1.09)	3.90 (1.08)
Ambitious	3.82 (1.14)	3.78 (1.13)
Dependable	4.05 (1.15)	4.10 (1.03)
Understanding	3.93 (1.16)	3.89 (1.06)
Industrious	3.94 (1.02)	3.97 (0.97)
Considerate	3.95 (1.16)	3.99 (1.00)
Kind	4.14 (1.13)	4.14 (1.10)
Easygoing	4.26 (1.28)	4.27 (1.24)
Sociable	4.15 (1.31)	4.12 (1.31)
Wants to have Children	4.06 (1.18)	4.01 (1.10)
Intelligent	4.40 (1.14)	4.27 (1.09)
<i>Observable Traits</i>	<i>Alone (M, SD)</i>	<i>Together (M, SD)</i>
Physically Attractive	3.72 (1.37)	3.71 (1.42)
In Good Health	4.68 (1.22)	4.76 (1.22)
Masculine	4.19 (1.41)	4.22 (1.35)
Good Looking	3.78 (1.40)	3.68 (1.43)

Note: All  $p$ 's > .05

733) = 1.16,  $p = .28$ ,  $\eta_p^2 < .001$ , nor for the interaction between trait type and stimulus type,  $F(1, 733) < .001$ ,  $p = .99$ ,  $\eta_p^2 < .001$ . However, there was a main effect of age,  $F(1, 733) = 5.09$ ,  $p = .02$ ,  $\eta_p^2 = .01$ , and a significant interaction between trait type and age,  $F(1, 733) = 6.32$ ,  $p = .01$ ,  $\eta_p^2 = .01$ . Thus, the older the rater, the higher their rating of observable traits. It should be noted that other variables (e.g. marital status, ethnic heritage etc.) were determined to be non-significant covariates (all  $p$ 's > .05).

A series of t-tests (two-tailed) comparing each trait across the Alone and Together conditions (with a Bonferroni correction) indicated that there were no differences between the conditions for any of the traits. A mixed ANOVA G\*Power analysis (Faul et al. 2007) with two between-subjects conditions suggested 494 participants would enable 80% power to detect a small effect,  $f^2 = .15$  (not guided by any relevant literature),  $p < .05$ .

## Discussion

The current study aimed to clarify the type of trait information (observable or unobservable) provided by female MC and to

uncover which (if any) specific unobservable traits MC provides information about. It was expected that female MC would provide more information about overall unobservable traits than observable traits (H1), and that individual unobservable traits would be particularly relevant to female MC compared to individual observable traits (H2), however, as the ANCOVA revealed neither a main nor interaction effect, neither hypothesis was supported. Age was revealed as a significant covariate as older participants rated targets as higher on their observable traits than younger participants.

## Conditions Required for Mate Copying

The non-significant results were unexpected given research suggesting female MC gives raters insight about the unobservable traits of the target (Little et al., 2008; Rodeheffer et al., 2016). Comparing the current study to Rodeheffer et al. (2016), it may be that their younger sample with a narrower age range made it more likely for them to find a significant MC effect because younger women rely on MC more than older women (the copy-when-uncertain effect; Laland, 2004). Further, the current study's sample size was considerably larger than Rodeheffer et al.'s study. This may have limited the generalisability of their significant findings, whereas the current study's findings may be representative of an overall non-significant effect in a broader population.

These findings, however, are similar to Uller and Johnson's (2003) findings of no effect of female MC on ratings of target socioeconomic status (a type of unobservable trait) or attractiveness (an observable trait). Uller and Johnson (2003) used in-person interactions between the rater and target, and is the only known MC study to do so. This design could be considered as a naturalistic MC study with strong external validity.

## Methodological Considerations

**Relative Model-Target Attractiveness** Similar to Study 1, while the current study's stimulus was a photo of a relatively more attractive model than the target, the relative difference between the target-model attractiveness may not have been large enough: the target men may have been too attractive, and/or the model female not attractive enough (see above for further discussion).

**Relationship labels.** The current study was designed to explore MC without using explicit relationship labels to increase the naturalism of the stimuli (e.g., in the real world, you are not necessarily aware of the explicit relationship between two people on the street). Given no MC effect was found, this could indicate explicit labelling of the target-model relationship is required for female MC to affect a rater's perception of target desirability. In neither Study 1 nor Study 2 were the target male and model female explicitly described as dating. Doing so would have potentially invoked attitudes relevant to

mate poaching (a separate construct), which we did not want to do. Studies finding significant female MC effects without explicit labels employed fundamentally different designs from the current study, such as using video stimuli (e.g., Bowers et al., 2012; Place et al., 2010), or using groups of four models surrounding the target rather than pairing one target with one model (Hill & Buss, 2008). Using a group of models rather than an individual model may shift the focus away from unobservable traits related to mate suitability in a one-on-one context (e.g., trustworthy, caring), and towards those more relevant to social group settings (e.g., has an exciting personality, humorous). This may affect the strength of female MC and the likelihood of finding a significant result per Hill and Buss (2008). Previous research reporting evidence of MC has typically used explicit relationship labels (Anderson & Surbey, 2014; Eva & Wood, 2006; Kalaitzaki, Tsouvelas, & Vakirtzis, 2018; Little et al., 2008; Rodeheffer et al., 2016; Waynforth, 2007; Winegard, Winegard, Reynolds, Geary, & Baumeister, 2017; Yorzinski & Platt, 2010). Future research may wish to directly quantify the effects of explicitly stating that a male-female pair has been (or is currently) in a relationship versus not doing so.

### Rater Age

Older participants agreed with statements about physical traits (e.g., physically attractive) to a higher degree than did the younger participants. This was unexpected, as younger participants generally rely on MC more when making romantic decisions. Accounting for the current finding is challenging given the lack of relevant empirical investigation, though the below concept may be a starting point for investigation.

**Short- and Long-Term Orientation** Rater age can be examined with reference to the short- or long-term orientation of the rater. Women with short-term oriented sexual strategies (e.g., ‘Sex without love is ok’) rely on MC less than those with long-term sexual strategies (e.g., ‘I have to be closely attached to someone before I could feel comfortable and fully enjoy having sex with him’; Waynforth, 2007). Waynforth (2007) suggested that this was because long-term oriented women viewing a mate are more interested in unobservable traits relating to good parenting skills, whereas short-term-oriented women prioritise the observable, physical attractiveness of a temporary mate. Potentially the current study’s older participants did not adopt a long-term orientation consistent with mate-seeking as they were more likely to already have a mate in their life. Instead, perhaps they adopted a short-term mindset and were more attuned to the targets’ physical attributes than the younger participants (who may not yet have long-term mates and perhaps less likely to focus on observable traits).

### Implications

The non-significant findings of the current study have implications regarding the theory of the requisite conditions conducive to female MC. The lack of relationship labels in the current study further clarifies that such labels likely increase an MC effect when static photographs of one-on-one target/model interactions are used as stimuli. This clarification will be useful for any future MC research design.

The findings inform future research regarding female MC and the specific traits it provides information about. While it has been theorised to provide information about unobservable traits (see the review by Vakirtzis, 2011), this has scarcely been empirically investigated. The findings imply MC may not consistently provide information about unobservable traits, questioning whether this theory holds under various conditions (e.g., without relationship labels, or for all ages).

### Directions for Future Research

Future research could investigate older participants rating targets higher on their observable traits in terms of short- and long-term orientation and sociosexual orientation (Penke & Asendorpf, 2008).

Future research could also investigate how targets are presented as possessing a particular trait: generally they are presented directly as adjectives within questions (per the current study; e.g., ‘is he trustworthy?’) or short descriptions (e.g., ‘he is trustworthy’; Chang et al., 2011; Rodeheffer et al., 2016; Vakirtzis & Roberts, 2010). Instead, participants could discover these traits indirectly by viewing scenarios. For example, a man is trusted to keep a secret by a best friend and does not give up the secret even when pressured by others. Such a scenario may convey trustworthiness more realistically than merely stating the adjective ‘trustworthy’. No known studies have used this indirect method of conveying target traits to examine female MC, so this is a potential avenue for future research.

### Conclusion

No firm conclusions can be drawn about the general or specific nature of the information provided by MC; instead, the findings contribute to a growing body of literature concerning the circumstances under which MC can be observed (e.g., with explicit relationship labels using photographic stimuli) and how age interacts with target ratings of observable traits (older participants rating targets higher than younger participants). Although MC has been repeatedly demonstrated in the past in a great number of empirical studies (among both humans and non-humans), there has been theoretical research suggesting that the phenomenon is nuanced and may only



occur under certain conditions (see Anderson & Surbey, 2018 for a discussion). Further, this study contributes to our growing understanding of female MC and prompts several new directions for research.

While we were attempting to replicate previous published work demonstrating MC in humans we failed to find an effect in either Study 1 or Study 2. There are many possible reasons for this inconsistency but it is possible that inconsistent findings are a function of inconsistent methodological protocols. Mate copying in humans would seem to be considerably nuanced phenomenon and one that is sensitive to methodological variation.

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### Compliance with Ethical Standards

**Conflicts of Interest** On behalf of all authors, the corresponding author states that there is no conflict of interest.

**Research Involving Human and Animal Rights** All procedures performed in studies involving human participants were in accordance with the ethical standards of Monash University Human Research Ethics Committee (Project ID 14540) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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