“It’s Not What it Looks Like!” Early Attention is Captured by Attractive Faces

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Abstract

**Objective:** Despite the notion of extra pair mating interests being controversial in Western societies, it may be that attending to attractive others is an adaptive and automatic process which informs and maintains plasticity in mating strategies. Previous research has examined this though later attentional processes in relation to potential mates. The current study examines this potential adaptive process further by using early attentional capture, which is beyond conscious control, to examine attentional bias towards attractive faces.

**Methods:** In addition to providing self-report measures relevant to extra-pair interests, participants completed two flicker tasks, each comprising a grid of faces of the gender participants indicated they were most attracted to. Half of the faces were rated as attractive and half as unattractive. In one task, an attractive face was substituted for another attractive face, and in the other an unattractive face was substituted for another unattractive face. Change detection latency differences for attractive vs unattractive faces was measured as an indication of attentional bias towards potential mates.

**Results:** Sociosexual desires predicted a quicker response time to attractive faces relative to unattractive faces. Relationship status, sex of the participant, sociosexual attitudes, sociosexual behaviours, and self-reported sexual and romantic interests outside of the primary relationship did not predict response time on the flicker tasks.

**Conclusions:** The results suggest early attentional processes are adaptively biased towards potential mates in a given environment, calibrating and maintaining plasticity in mating strategies. However, this does not necessarily indicate an inclination towards infidelity.

1. Introduction

In Western societies where monogamy is the dominant mating strategy, the concept of extra-pair interests is controversial because it is conflated with, or seen as a precursor to, infidelity. Here, we argue that extra-pair interests should not be considered synonymous with infidelity, or as an antecedent to infidelity, but that attending to potential mates in the environment is an adaptive process and thus an innate part of human psychology. To achieve this, we adopt an evolutionary perspective to examine whether early attentional resources are captured by attractive faces of the sex individuals self-report as being predominantly attracted to, and whether this is associated with sociosexuality, or self-reported sexual or romantic interests in someone other than a primary partner.

There is much variation in human sexuality and mating strategies cross culturally and across our evolutionary history (Gray, 2013). However, converging lines of evidence indicate that long-term pair bonding with mild polygyny was likely the dominant mating strategy for ancestral humans (Baker & Bellis, 1995; Buss & Schmitt, 1993; Gallup et al., 2003; Symons, 1979). This evidence includes sexual dimorphism in size, testis size relative to body size, neuroendocrine mechanisms, and cross-cultural matrilineal data (Gray, 2013). Indeed, this appears to still be the case worldwide whereby monogamy is
the most common mating system cross culturally even in areas where polygyny is accepted. In these areas, polygyny is in the minority despite being possible, therefore monogamy remains the most dominant mating system (Schacht & Kramer, 2019).

Such evidence converges and is consistent with a framework of evolutionary theories relevant to mating strategies and behaviours, including Parental Investment Theory (Trivers, 1972), Life History Theory (Figueredo et al., 2006), and Costly Signalling Theory (Bliege Bird, et al., 2001). Cumulatively, this suite of complimentary theories suggests that men are more inclined to follow a faster life history strategy than women, characterised by greater engagement in mating effort at the expense of parenting effort. This manifests as a greater motivation to compete in various culturally and contextually sensitive ways in order to gain access to resources and mating opportunities, which is ultimately due to their comparatively unconstrained reproductive biology. A surface level analysis of these theories would therefore suggest that men are less inclined to follow monogamous mating strategies, preferring instead to follow consensually or non-consensually polygynous matings.

Previous research outlines three adaptations which give the illusion that men are more motivated by short term matings than women (Schmitt, et al., 2001). These three adaptations are: 1) men generally have a greater desire for short-term matings than women, 2) men generally prefer a greater quantity of sexual partners than women do, and 3) men are generally quicker to consent to sex than women are. However, despite the plethora of evidence in support of these strategies, the nuances of the theoretical framework and relevant cultural context has not been extensively acknowledged. Closer analysis of the theoretical framework suggests monogamy is an adaptive mating strategy for more than a minority of men (e.g. Klug, 2018; Schacht & Bell, 2016). Non monogamy is only achievable for a minority of men, consistent with the greater male variability hypothesis (Archer & Mehdikhani, 2003). In other words, the variability of men's mate value means that only a minority of men would have a high enough mate value (i.e. high in attractiveness and status) to be able to secure multiple mating opportunities (consistent with a fast mating strategy) before the drop in mate value requires a compromised approach to mating (consistent with a slower mating strategy).

This surface level analysis of mating strategies based on ultimate explanations also extends into misconceptions that women's mating strategies are solely long term orientated (Schmitt, et al., 2001). There is a robust evidence base for plasticity in women's mating strategies as well, particularly in terms of how women's mating preferences differ depending on short- and long-term scenarios (Owens, et al., 2020). Specifically, women are likely to be more attracted to physical and behavioural indicators of mating effort in short term contexts, but this is seen as less preferable in long term mating contexts, where more cooperative behaviours are preferred such as behavioural indicators of parenting effort. However, further to this, it has been suggested in The Mate Switching Hypothesis (Buss, et al., 2017) that both men and women will continuously unconsciously appraise their environment in order to calibrate their mating strategies. This theory suggests that because both our environment and ourselves are constantly changing, it is adaptive for us to continuously calibrate such internal and external indicators which may affect out reproductive behaviours. These changes would include both the presence and/or
availability of relevant mates and mating resources, and our own mate value as we age. Not only will appraising relevant factors allow the calibration of our mating strategies, it may also afford us the opportunity to engage in mate switching, which is a necessary component of serial monogamy.

Monogamy, or serial monogamy, is normative in Western societies, and previous research has established that monogamy has an adaptive basis for both men and women (e.g., Klug, 2018). Threats to a monogamous relationship remain a primary concern in contemporary society with actual and perceived infidelity being the main cause of relationship dissolution and spousal abuse worldwide (Lee & O’Sullivan, 2018). This could suggest some form of proclivity of an existing sensitivity to attend to potential other partners, irrespective of relationship status. In other words, if people are paying attention to potential mates in the environment, then it would follow that we would have evolved some form of mechanism to remain sensitive to these cues in order to avoid our partner leaving us. Thus, we argue here that both men and women will be attentive to potential mates in their environment because it was adaptive to continually monitor and appraise aspects of the environment relevant to reproductive success because it informs plasticity in adaptive mating strategies (Buss et al., 2017). Furthermore, we suggest that this will occur irrespective of relationship satisfaction, indicated by reported extra pair interests, because it is adaptive for our early automatic attentional processes to be captured by potential mates. This does not mean that in attending to a potential mate it will result in infidelity; humans have evolved higher order cognitive processes, such as executive control, which allow us to inhibit impulses to pursue additional mates in order to protect the primary relationship (Pronk, et al., 2011).

Previous research suggests subjective relationship satisfaction is an internal regulatory variable that tracks and calibrates relevant internal (e.g. our own mate value) and external factors (e.g. potential mates in the environment) with our relationship behaviours (Buss et al., 2017; Conroy-Beam, et al., 2015). Thus, how satisfied we feel in our current relationship is crucial to how much attention we allocate to potential mates in the environment, and this is also informed by a myriad of other factors which is why continuous appraisal and calibration is necessary. Research suggests people will be more attentive to potential mates if they are less satisfied in their current relationship (Maner, et al., 2009) and that disengaging attention from potential mates faster predicted lower chances of engaging in infidelity (McNulty, et al., 2018). However, previous research has tended to rely on attentional tasks that are not necessarily only under automatic control. For example, Maner et al., (2009) aimed to examine early attentional processes involved in relationship maintenance when faced with desirable relationship alternatives in response to prior research that focussed solely on higher order cognitive mechanisms. However, this research used priming procedures to activate mental representations associated with mating to examine the impact of this on early attentional processes. The validity of priming of social factors have since been questioned following many failed replication attempts (Biswas-Diener & Diener, 2016). It would therefore be helpful to use alternative methods to examine how early attentional processes are allocated in response to the presence of attractive others in the environment.

One way to address this would be to examine extra-pair mating interests within the concept of attentional biases. Attentional bias is an adaptive phenomenon wherein certain categories of stimuli capture and
hold attention at the cost of other items in a visual field. Crucially, this attentional capture is based upon the items’ top-down qualities, usually via a previously learned association, rather than their bottom-up saliency (Field & Cox, 2008; MacLeod, et al., 1986), and crucially, it does not rely on priming. Individuals with issues such as anxiety (Mogg & Bradley, 2005; Rinck, et al., 2003), eating disorders (Smeets, et al., 2008), depression (Gotlib, et al., 2004), chronic pain (Schoth, et al., 2012), specific phobias (Constantine, et al., 2001) and addiction (Jones, et al, 2006; Yaxley & Zwaan, 2005) all appear to preferentially process items relating to their concerns. Furthermore, more recent research has highlighted that attentional bias is a cognitive phenomenon and exists outside of psychopathological populations (Knight, et al., 2016). Examining whether early attention is captured by attractive faces in an attentional bias task would therefore allow us to examine whether potential mates in the environment automatically capture our early attentional processes in a methodologically sound way.

Another important factor to consider in relationship behaviours and mating strategies is the role of sociosexuality. Sociosexuality is considered to be an individual differences variable concerned with propensity for uncommitted sexual relations (Penke & Asendorpf, 2008), whereby an unrestricted orientation indicates greater endorsement of uncommitted sexual encounters versus a restricted orientation. Sociosexuality is considered on three inter-related dimensions; 1) past sociosexual behaviours, 2) attitudes towards sociosexuality, and 3) the desire for sociosexual encounters. The nature of sociosexuality means it is a good candidate for highlighting those at risk of engaging in infidelity. People with less restricted sociosexuality are more likely to engage in infidelity (Rodrigues, et al., 2017), but this is specific to past sociosexual behaviours predicting future infidelity (McNulty et al., 2018; Shaw, et al., 2013). Consistent with the theoretical framework outlined here, previous research suggests men have a more unrestricted sociosexuality than women (Schmitt, 2005). Though men are often implicated as being motivated by non monogamy and by a greater quantity of sexual relations, this, as discussed, fails to acknowledge the nuance of the theoretical framework as applied to both men's and women’s mating strategies, including such issues as attitudes towards extra-pair matings and how they may influence subsequent behaviours. Previous research has highlighted the importance of prior sociosexual behaviours in predicting future infidelity, but this only considers one third of the construct of sociosexuality. Furthermore, the sociosexuality index is a self-report measure, and therefore relies on higher order cognitive processes rather than automatic attentional allocation. Although it could be argued that the sociosexuality index represents a latent trait relevant to sociosexuality, the index still relies upon higher cognitive processes to complete it and therefore is potentially subject to bias in responding, which behavioural measures bypass. Therefore, parts of sociosexuality may be an important indicator in identifying someone at risk of engaging in infidelity, but this should not be related to the automatic allocation of attention to potential mates in the environment.

The current research will examine these factors, suggesting that both men and women will be more attentive to potential mates in the environment, and that this will be independent of relationship status, self-reported interests in extra pair mates, and sociosexuality. Early attentional capture to potential mates in the environment likely drove behaviour in the ancestral environment, however would not be deterministic to subsequent behaviours in the modern age. Therefore an attentional bias towards
attractive faces is likely a vestigial automatic cognition. This is because attention to potential mates is an unconscious, adaptive manifestation of our continual appraisal of adaptively relevant stimuli within the environment and how it informs our own adaptive mating behaviours. To date, attentional bias for potential mates in an environment has not been examined beyond using questionable priming techniques. The current study will therefore examine this using a flicker task. A flicker task involves two almost identical images being presented sequentially back and forth to participants, interspersed by a mask, to induce change blindness. The time taken for participants to detect the change between the two pictures is recorded as a measure of attentional capture. In light of the research presented here, we expect that people will respond quicker to attractive faces of the sex they report being primarily attracted to than to unattractive faces, and that this will be independent of sex, relationship status, reported interests in extra pair mates and sociosexuality.

2. Materials And Methods

2.1 Participants

Participants (N = 85) were recruited from data collection website Prolific.co. This allowed us to pre-screen the eligibility of participants whilst reimbursing them a nominal fee for their participation. We specified that participants needed a comfortable grasp of the English language, normal or corrected-to-normal vision, and no difficulties in face perception. The study was advertised as investigating ‘factors that influence human face perception’. The majority of participants indicated being from the United Kingdom (n = 31), being Caucasian (n = 70), being male (n = 50) and being in a relationship (n = 53). The age of the sample ranged from 18-43 years (M = 24.67, SD = 5.43).

2.2 Materials

2.2.1 Flicker Task

We created four flicker tasks in Psychopy (Peirce et al., 2019) and hosted this in Pavlovia, which is an online program used to create and administer experiments. Each flicker task comprised a 6x3 grid of images which were obtained from the FACES database (https://faces.mpdl.mpg.de/imeji/; Ebner, et al., 2010) and had already been rated for attractiveness. We selected 10 images rated over, and 10 images rated below the median in attractiveness, of male and female images. Each 6x3 grid was organised mirroring the organisation of Jones et al. (2006). It should be noted that while Jones et al. (2006) did counterbalance the organisation of items in their flicker tasks bilaterally (so the stimuli of interest were presented on both the left- and right-hand side of the screen), their results showed that this did not affect responses at all (no main effect of stimulus orientation or any interaction involving this factor). As such, in the current study nine faces above the median attractiveness rating were organised on the left of the grid, and the nine below the median attractiveness rating were organised on the right of the grid. In the attractive condition, one of the attractive faces was swapped for the tenth attractive face, whereas in the unattractive condition one of the unattractive faces was swapped out for the tenth unattractive face; an example of the original and changed stimuli can be seen in Figure 1. The grids of faces were presented to
participants for 250ms with a mask presented in between of 80ms. In all conditions, the mask was a completely blank screen. The time taken to identify which face had been changed was taken as a measure of the allocation of attention. In line with previous research using flicker tasks to examine attentional biases, participants were only given one single flicker task for attractive faces and one single flicker task for unattractive faces. Although, as Jones et al., (2006) state, this practice only generates a single data point for each condition per participant, which is statistically less powerful, it does overcome the likelihood of participants developing search strategies, which compromises the process of measuring attentional bias and has been a self-reported issue in previous research.

2.2.2 Sociosexuality

Participants were asked to complete the revised sociosexual orientation inventory (SOI-R; Penke & Asendorpf, 2008). This is a nine-item measure which assesses an individual’s sociosexuality across three domains: sociosexual behaviours (three items: 1-3); sociosexual attitudes (three items; 4-6, item six is reverse scored), and sociosexual desires (three items; 7-9). Sociosexual behaviours measures past behaviours and each of the three items are measured on a nine-point Likert scale. Sociosexual attitudes measures an individual’s attitudes towards engaging in casual sex regardless of their past behaviours or their desire to engage in them themselves on a nine-point Likert scale. Sociosexual desires measures an individual’s desire to engage in uncommitted sexual relations regardless of their past behaviours or of their attitudes around this, which may be impacted by social or cultural norms. Again, this subscale is rated on a nine-point Likert scale. Potential scores on each subscale ranged from 3-27, where higher scores indicate greater endorsement of the subscale. Subscale scores can also be totalled to provide a global sociosexual orientation score.

2.2.3 Extra-Pair Interests

Participants were asked two additional questions: ‘Do you have any sexual interests other than your partner?’ and ‘Do you have any romantic interests in anyone other than your partner?’. Both of these items were scored on a five-point Likert scale (1 = never to 5 = all the time). Previous research indicates asking such questions outright in this manner is surprisingly effective (e.g., McIntyre, et al., 2006; Shaw. et al., 2013) therefore we opted for this over any longer questionnaires around potential infidelities.

2.2.4 Further Information

The study was bookended using Qualtrics (Version February 2021, Provo, UT), an online questionnaire and survey hosting site, therefore the participant information sheet, consent form, demographic questions and questionnaires were presented here. Demographic information collected included participant age, sex, gender, nationality and details of any children, which were collected using open-text responses so participants could respond in a way that was most appropriate for them. They were asked if they were currently in any kind of relationship, whether this was casual or long-term, monogamous or not, using a yes/no response format. Finally, participants were asked to indicate whether they were attracted
predominantly to men, or predominantly to women so they could participate in the flicker task which contained images of the sex they were most attracted to.

2.3 Design

The three subscales of the SOI-R were used as predictor variables, and the two standalone items were used as another two predictor variables. The outcome variable was calculated as correct response time to the attractive face minus the correct response time to the unattractive face (in milliseconds). Therefore, a score of zero indicated no difference in the time taken to identify and respond to attractive and unattractive faces, positive scores indicated a faster response time to unattractive faces and a negative score indicated a faster response time to attractive faces. Ethics was granted by the Institutional Research Ethics Group.

2.4 Procedure

Participants were recruited from Prolific.co, being invited to participate in a study on factors that influence face perception in humans. On accepting the invitation to participate, they read the full information sheet, and provided consent to proceed with the study. Participants then provided demographic information including which gender (male or female) they were predominantly attracted to. Participants were then directed to the flicker tasks showing the matrices of faces of the gender they indicated being predominantly attracted to. Each participant completed two flicker tasks; one with attractive face change and one with the unattractive face change. Once this was completed, participants were returned to Qualtrics to complete the SOI-R and the two standalone questions. Finally, participants were debriefed and asked if they consented to the use of their data for the true intention. The study took less than ten minutes to complete.

3. Results

The current study examined whether early attentional processes are captured by attractive faces of the sex we are most attracted to in the environment, regardless of sociosexuality, relationship status, or extra pair interests. The data from 27 participants was removed because they did not identify the correct face that changed in both flicker tasks, and a further three were removed as they were poorly predicted by the final model (over 3 standardised residuals) therefore 55 datasets remained in the analysis. A multiple regression analysis using the Enter method was conducted using the subscales of the SOI-R as predictor variables, alongside self-reported romantic interests in another person, self-reported sexual interests in another person, sex of the participant and relationship status. The outcome variable was the time taken to correctly identify a change in a grid of attractive faces relative to a change in unattractive faces in a pair of flicker tasks. Table 1 shows the zero order correlations between predictor variables.

Table 1. Zero order correlations ($r$) between predictor variables.
The assumptions of multiple regression analysis were met for the final model; there was no evidence of multicollinearity; the correlation between the predictor variables ranged between $r = .18-.64$; values of VIF were below the cut-off point of 10, ranging between 1.12-2.68, and values of Tolerance were above the minimum value of 0.2 ranging between 0.37-0.89. Furthermore, the collinearity diagnostics indicated there were eight eigenvectors underlying the dataset, further supporting the absence of multicollinearity. The value of Durbin-Watson was 1.93, indicating the assumption of independence of errors was met. The assumption of homoscedasticity was also met.

Only sociosexual desire ($t = -2.97, p = .005$) was a significant predictor of the time taken to identify the change in the attractive faces relative to the time taken to identify the change in unattractive faces. Sociosexual behaviours ($t = -0.46, p = .647$), sociosexual attitudes ($t = -0.76, p = .453$), relationship status ($t = -0.77, p = .445$), sex ($t = -0.15, p = .879$), romantic interests in another ($t = 1.58, p = .121$), and sexual interests in another ($t = 0.59, p = .552$) did not significantly predict the time taken to identify the attractive face change relative to the unattractive face change. Overall, the model was significant, $F(7, 47) = 2.71, p = .019$, and explained 28.7 per cent of the variance in the data. The coefficients are shown in Table 1.

Table 1: Coefficients obtained from stepwise multiple regression analysis for reaction time in flicker tasks.
### 4. Discussion

The aim of the current study was to examine whether attention is captured by potential mates in the environment regardless of sex, relationship status, sociosexuality and extra pair interests. We predicted that early attentional processes would be biased towards potential mates in the environment, and this would be irrespective of these variables, the suggestion being that it would be adaptive for early attentional processes to be biased towards potential mates in order to inform and continuously update our mating strategies. The current study found some support for this suggestion. While sex, relationship status, sociosexual attitudes, sociosexual behaviours, and self-reported sexual and romantic interests outside of the primary relationship did not predict early attentional capture, sociosexual desires did predict a quicker response to attractive faces.

Considering our non-significant findings, these were not only predicted but are also consistent with Buss et al.'s, (2017) research on the Mate Switching Hypothesis. However, while the Mate Switching Hypothesis was argued to apply to both men and women, in actuality it was only discussed with reference to women, the logic being that men can always potentially increase their reproductive success by engaging in mating effort. Men are often implicated as being more motivated by non-monogamy and by more short term mating opportunities (Schmitt et al., 2001). However, our research demonstrates that attention to attractive faces in the environment is similar for both men and women, regardless of their relationship status or their self-reported sexual or romantic interests beyond the primary relationship. It should be noted that this does not necessarily mean that there is no relationship between attention to attractive potential mates and sexual or romantic interests beyond the primary relationship, just that this does not relate to the self-reported measures of extra pair interests. As discussed, there are issues with using self-report measures to examine extra pair interests because of the highly sensitive nature and potential ramifications of this. Overall, our study supports the suggestion that automatic attention to potential
mates in the environment is an adaptive, reflexive mechanism which informs our mating strategy rather than dictates it.

Further support for the suggestion that our automatic motivations do not necessarily translate into associated behaviours comes from the exclusion of sociosexual behaviours in our findings. Previous research has shown that past sociosexual behaviours predict future engagement in infidelity (McNulty et al., 2018; Shaw et al., 2013). However, in our study sociosexual behaviours did not predict reaction time in the flicker tasks, therefore past sociosexual behaviours did not predict early attention towards potential mates in the environment. This therefore suggests a disconnect between attention towards potential mates and the likelihood of engaging in infidelity, though this specific link was not explicitly examined here. Likewise, sociosexual attitudes did not predict response time in the flicker task – which makes sense given attitudes are more conscious and both societally informed and enforced rather than innate and automatic. Thus, examination of the separate domains of sociosexuality has provided a more nuanced understanding of the role of attention to attractive others and how this relates to infidelity. Specifically, our research suggests that past sociosexual behaviours and specific interests in sex outside of the primary relationship do not predict innate attention towards potential mates, despite previous research suggesting that past sociosexual behaviours do predict engagement in infidelity. Our research therefore suggests that, consistent with suggestions by Buss et al., (2017), we adaptively appraise the environment for potential mates and this both informs and adaptively calibrates our mating strategy, but this does not necessarily mean that it will result in infidelity.

While the discussed findings so far were expected, our finding that sociosexual desire predicted response time in the flicker task was less expected. Here, we found that participants with higher levels of sociosexual desire were quicker in identifying the attractive face change. On the surface, this may seem contradictory to our earlier argument that appraising the environment is reflexive and thus not under conscious control. However, our finding is consistent with literature from the cognitive domain regarding mechanisms that affect attentional capture. One widely accepted model surrounds attentional settings, which are top-down controlled states that allow for the prioritisation of certain stimuli based on certain features (Folk et al., 1992; Leber & Egeth, 2006). Despite some debate on how visual stimuli are selected for further processing (Belopolsky & Theeuwes, 2010; Theeuwes, 1992), this model states that humans can activate one of two distinct attentional sets. Singleton Detection Mode is our default and includes characteristics such as having a large attentional window and attentional capture being driven by bottom-up physical saliency (Bacon & Egeth, 1994; Kawahara, 2010). Feature Search Mode on the other hand relies on a defining target characteristic and is centred on reducing interference from salient objects that do not share the defining feature (Leber & Egeth, 2006). While the activation of feature search mode is generally under conscious control (i.e., when searching for a set of car keys, a feature search mode for small metal objects may be activated), it can also be unconsciously and involuntarily activated by long-term memory representations (Carlisle et al., 2011) and contextual cuing (Cosman & Vecera, 2013; Knight et al., 2016). In the context of the current study, our findings suggest that activation of a feature search mode for potential mates can be both involuntarily activated as part of an evolutionary system to ensure...
reproductive success of the species, and voluntarily activated as a result of interest in uncommitted sexual encounters, i.e. sociosexual desire.

It may be that people with higher levels of interest in uncommitted sexual relations are more biased towards potential mates than those with lower levels of sociosexual desire. It is not possible in the current study to examine cause and effect in terms of sociosexual desire and performance on the flicker task. Specifically, we cannot determine whether people with higher levels of sociosexual desire are more likely have their early attentional processes captured by potential mates, or whether those who are more attentive to potential mates are so because of their higher levels of sociosexual desire. However, it is understandable that people with a greater desire for uncommitted sex are more attentive to attractive faces in their environment. In other words, just because early attention can be reflexively captured by potential mates, this merely informs behaviour but does not necessarily dictate it. Future research needs to further explore the link between sociosexual desire and the propensity to engage in infidelity. Though previous research has established sociosexual behaviours predicts infidelity (McNulty et al., 2018; Shaw et al., 2013), these studies did not measure sociosexual desires – they only used an individual item from the sociosexual behaviours subscale. It may therefore be the case that, although sociosexual desires predicts attention to attractive faces, this is not related to sociosexual behaviours (as indicated in the present study) and, in conjunction with previous research, this would suggest this does not then lead onto engagement in infidelity. However, this requires formal longitudinal testing.

The current research provides a novel approach to understanding attentional processes which inform mating strategies and supports the suggestion by Buss et al., (2017) that we appraise the environment, continuously calibrating mating strategies with regard to updated and adaptively relevant information. This research is the first to demonstrate that this occurs in the early stages of attentional processing, prior to conscious awareness, and furthermore that this occurs in both men and women. Thus, it is suggested here that we do this unconsciously in order to maintain plasticity in adaptive mating strategies. When considered in conjunction with previous research, this suggests that attention towards potential mates does not necessarily lead to infidelity, though this needs to be formally tested.

A further consideration surrounds the nuances of relationship status. The current study did not ask participants about the nature of their relationship, if they indicated being in one. However, research suggests that interests in extra pair mates may be heightened for some people who are in a relationship, supported by elevated levels of testosterone. For example, research has shown that in partnered men, testosterone levels remain as high as those of single men if their relationship is still considered new, i.e. less than 12 (Farrelly, et al., 2015) or if they self-report being interested in pursuing additional mates (McIntyre et al., 2006). Research also implicates elevated testosterone levels in supporting mating behaviour among polyamorous and polygynous people in order to support mating effort (e.g. Alvergne, et al., 2009; van Anders, et al., 2007). Therefore, feeling satisfied in one's relationship may be an indicator as to whether or not individuals would still be interested in pursuing additional mates or not, however relationship satisfaction is multifaceted and comprises more variables than those relating to only sex and emotionality (Joel et al., 2020). The two stand alone questions used in our research i.e., having
sexual interests outside of the primary relationship and having romantic interests outside of the primary relationship were used as potential indicators of someone having extra pair interests. These questions may indicate extra pair interests but these two questions alone are not sufficient to gauge relationship satisfaction. Relationship satisfaction is typically assessed subjectively across various measures, including sexual frequency and emotional intimacy, which allows for the inclusion of a variety of sexual and mating orientations, including asexuality and demisexuality, rather than being based on normative assumptions. Future research should further explore the various factors comprising relationship satisfaction and how they relate to early attention capture of attractive faces, and how this may relate to or inform our understanding of infidelity or mate switching.

Another novel aspect of this research is that we allowed participants to indicate the sex of the person they are primarily attracted to, rather than focussing on either heterosexual or homosexual mating preferences. It should be noted that we did not specifically analyse and compare across groups due to lack of statistical power, however our findings are suggestive of attentional processes being the same across different demographics. Nevertheless, this is further support for the adaptive nature of the mechanism of interest here; early, automatic attentional processes are biased towards faces of the sex we are most attracted to, and this is the same across people who reported being cisgender or not, regardless of sexual orientation. However, future research may wish to examine this more clearly in specific populations.

Despite the relevance of the findings outlined here, there are a number of disadvantages which should be considered. Firstly, the stimuli used were taken from a freely available online repository and had already been rated for attractiveness. However, it would be beneficial for participants to have also rated the attractiveness of the faces used in the flicker tasks in order to confirm the attractiveness ratings were also applicable to the current sample. Another disadvantage is that we only asked participants to indicate their sexual and romantic interests outside of the primary relationship on a five point Likert scale. Previous research has used binary response categories (e.g., McIntyre et al., 2006), therefore a five-point Likert scale response may be considered an improvement, however it would be helpful to measure these interests on a more nuanced scale, particularly in multiple linear regression analyses. Nevertheless, the data met the assumptions of multiple regression analysis, and successfully differentiated participants. As discussed, though more comprehensive relationship satisfaction measures exist, this was not the primary concern here, and previous research has indicated that asking directly about sexual or romantic interests outside of the primary relationship is sufficient for studying extra pair interests. Finally, the low statistical power of the study should be addressed. This was, in part, due to 27 data points requiring exclusion from analysis, leaving a final sample size of 55. There are a variety of reasons this could be the case. Firstly, the study was delivered online, meaning that the programme used to deliver the flicker task had to first require participants to indicate when they detected a change and then indicate via mouse click where they detected the change. It is entirely possible that erroneous mouse-clicks led to some data sets being removed from analysis where participants did indeed detect a change – an issue that is rectified in in-person testing. Secondly, some participants’ reaction times were removed from the analysis as outliers. It is possible that running multiple flicker tasks and averaging reaction times for each participant across
tasks would remedy this, however this does invite the issue noted by Jones et al., (2006) of participants adopting search strategies. Thus, on the balance, running one flicker task for each condition per participant – while less statistically powerful – is a more accurate measurement of the automatic allocation of attentional resources.

To summarise, we used a flicker task paradigm to examine whether early, automatic attentional processes are captured by attractive faces of the sex we are most attracted to, and what factors predict this. Our results are consistent with Buss et al’s., (2017) Mate Switching Hypothesis, suggesting that we are more attentive to potential mates in the environment regardless of sex, relationship status and largely regardless of sociosexuality, thus suggesting that this is an innate, adaptive process. Only sociosexual desire predicted response time in the flicker tasks. This may be because people with more sociosexual desires may have heightened attention towards potential mates in the environment.

Declarations

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Consent to participate: participants indicated fully informed consent prior to participation.

Material availability: materials and data are available via the OSF.

Consent for publication: the authors provide consent.

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References


**Figures**
Figure 1

An example of (a) original and (b) changed stimuli used in one flicker task.