

Original Article

Mating strategy flexibility in the laboratory: Preferences for long- and short-term mating change in response to evolutionarily relevant variables



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ABSTRACT

One of the great challenges for evolutionary psychology has been to explain within-sex individual variation in mating behaviour. Several lines of evidence suggest that some of this variation stems from an adaptation for facultatively increasing or decreasing long- and short-term mating inclinations in response to circumstances. It remains unclear, however, how rapidly such changes can occur, and what stimuli might initiate them. This paper presents three experiments that investigate mating strategy change following exposure to the evolutionarily-relevant stimuli of parental care, resource-abundance, and danger. In each experiment, participants indicated their preferred relationship type (long-term, short-term, or none) for each of fifty other-sex individuals, both before and after priming. Relative to a control group, relationship preferences changed in all three experiments, in directions generally consistent with evolutionary psychological predictions. Moreover, short- and long-term relationship preferences were found to shift independently, such that a change in long-term preference was not accompanied by an opposite change in short-term, or vice versa. Together, these experiments represent the first direct test of the claim that brief interventions can shift the relative strength of people's preferences for long-term and short-term relationships.

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1. Introduction

Humans exhibit a great diversity of sexual behaviour. Some people only mate within a pair-bond, while others prefer casual sex with partners to whom they have little emotional attachment. Worldwide, monogamy is the most common mating arrangement. However, the number of strictly monogamous cultures is fairly small. Of the 1231 cultures included in the *Ethnographic Atlas* (Gray, 1998; Murdock, 1967), only 15.1% ($n = 186$) practice monogamy exclusively while 84.6% ($n = 1041$) allow a man to have more than one wife. There is even a small number of societies ($n = 4$) where a woman is able to have more than one husband.

What underlies this variation in human mating behaviour? In some species, including many arthropods, mating strategies are strongly linked to specific sets of alleles (Shuster, 2010; Shuster & Wade, 2003), and thus are generally fixed from conception. In other species, including some toads, individuals “choose” a mating strategy early in life in response to variables such as body size (Leary, Fox, Shepard, & Garcia, 2005; Moczek & Nijhout, 2002; Simpson, Sword, & Lo, 2011). In mammals, at least some plasticity in mating behaviour seems to be

retained throughout the lifespan (Eberle & Kappeler, 2004; Koprowski, 1993; Schradin, König, & Pillay, 2010). The focus of the present research is to investigate the extent to which humans exhibit such plasticity.

1.1. Human mating strategies

According to many evolutionary psychologists, individual differences in mating behaviour can be explained in part by the differential implementation of mating strategies – sets of psychological adaptations which have evolved to help individuals negotiate the many tasks involved in successful mating. Two main theories have applied the mating strategy perspective to humans. The first is Sexual Strategies Theory (SST; Buss & Schmitt, 1993); the second is Strategic Pluralism Theory (SPT; Gangestad & Simpson, 2000). In their article introducing SST, Buss and Schmitt identified two main modes of mating in our species: long-term and short-term. Individuals pursuing a long-term strategy tend to mate with one partner at a time within a committed relationship, while those who pursue a short-term strategy are less interested in sexual exclusivity or commitment. According to SST, both strategies could sometimes boost fitness in the ancestral environment, and both were associated with their own adaptive problems (e.g., detecting commitment in a potential long-term partner). A key component of the theory is the idea that humans may adaptively shift their mating strategies, depending on the circumstances.

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Seven years later, Gangestad and Simpson expanded on the idea that human mating strategies are deployed conditionally using models from behavioral ecology. According to their SPT, the costs and benefits of a long- vs. short-term mating strategy vary from person to person depending on circumstances, and the strategy a given individual pursues will change accordingly.

For example, *ceteris paribus*, a man in a society with many available sexual partners (and thus low intrasexual competition), might find himself able to establish low-commitment relationships with several women. However, in a society with few available sexual partners (and thus high intrasexual competition), the same man might find himself unable to establish any low-commitment relationships at all. Thus, there lies a switch-point at which the fitness benefits of pursuing one partner for a long-term relationship is more beneficial than pursuing multiple partners for casual relationships. It is at this point that we would expect men to switch from pursuing a short-term mating strategy to a long-term one. This example focuses on a single variable, namely partner availability. According to SPT, many variables jointly determine which strategy a given individual adopts. These include the individual's attractiveness, social standing, and mating opportunities.

1.2. Periods of plasticity

Together, SST and SPT provide a framework which explains *what* mating strategies are, *why* they evolved, and *how* they might be activated. At the same time, though, the theories say relatively little about *which* circumstances may cause a strategy shift and *when* this might happen. There are several possibilities. One is that humans have a critical period for mating strategy selection, perhaps during adolescence, in which they develop a permanent strategy preference in response to environmental input. A second possibility is that shifts in strategy remain possible throughout the lifespan, but occur only in response to substantial life events (e.g., a marked change in social status). A third and final possibility is that men and women respond rapidly to new mating-relevant information in their environment, shifting the relative strength of their long- and short-term mating inclinations within relatively brief windows of time. The importance of this question has been highlighted by the researchers behind SST and SPT. According to Buss (2002), for instance:

Further research is needed on the context-sensitive nature of human mating strategies. Precisely which circumstances might cause a person to shift from a long-term mating strategy to a short-term mating strategy and vice-versa? Which circumstances might trigger an extramarital affair, or conversely, cause someone to forgo an alluring sexual opportunity? (p. 57).

Similarly, Gangestad and Simpson (2000) note that 'Conditional strategies are a central topic in behavioral ecology... However, the possible role of conditional strategies in human mating has received relatively little attention' (p. 578). Seventeen years later, there is still comparatively little research addressing this question.

To be fair, a number of studies address the question indirectly. This includes both correlational and experimental research. Correlational research suggests that men and women's mating strategies are calibrated to their personal attributes. Lukaszewski, Larson, Gildersleeve, Roney, and Haselton (2014), for example, found that short-term mating behaviours positively correlate with physical strength in men and attractiveness in both sexes. Unfortunately, such studies do not tell us whether men and women recalibrate their strategies in response to changes in their circumstances.

Experimental research, in contrast, indicates that partner preferences can be manipulated within the laboratory. Little and colleagues, for instance, showed that preferences for facial symmetry and masculinity can be modulated by cues of intra-sexual competition and pathogen presence (Little, Cohen, Jones, & Belsky, 2007; Little, DeBruine, & Jones, 2011; Little, DeBruine, & Jones, 2013), although see Li et al. (2014). Similarly, Welling et al. (2007) showed that increases in women's

circulating testosterone heighten their preference for facial masculinity. Finally, some studies suggest that behavioral traits plausibly linked with different mating strategies can be manipulated. Wilson and Daly (2004), for example, found that men become more impulsive following exposure to images of attractive women, while women become more impulsive following exposure to cues of wealth. What these experiments have in common is that they focus on a single attribute associated with either short- or long-term mating (e.g., specific partner preferences or characteristics such as impulsivity), rather than directly measuring changes to a person's strategy orientation. It thus remains uncertain whether these effects are limited to the specific variable of interest, or represent a more general shift in mating strategy.

To address this research gap, we developed a task to measure people's inclination towards short- and long-term mating. We then ran a series of experiments in which the task was completed twice, once to get a baseline reading, and a second time after a priming intervention/manipulation. We ran three experiments in total, each one priming a different context thought to have affected the success of long- and short-term mating in ancestral humans. These contexts were parental care, resource-abundance, and danger.

2. Experiment 1: parental care

Human beings have evolved large brains but a narrow pelvic girdle (necessary for bipedal locomotion). This has had a large impact on childbirth. Compared to other primates, our offspring are born in a markedly underdeveloped state, so that they can fit through their mother's pelvis (Wittman & Wall, 2007). As a result, human neonates are fully dependent on the care and attention of older humans for several years. One of the reasons humans evolved to form durable pair-bonds was to provide a context for biparental care of dependent young (Geary, 2000; Stewart-Williams & Thomas, 2013). As such, we might expect humans to react when primed with cues related to parental care by increasing their likelihood of pursuing a long-term mating strategy.

A number of findings are consistent with this expectation. For example, several longitudinal studies have shown that the onset of parenthood leads to a decrease in circulating testosterone (T; Alvergne, Faurie, & Raymond, 2009; Gray, Jeffrey-Yang, & Pope, 2006). Similarly, experimental research suggests that interacting with infants, or being exposed to infant cues (e.g., the smells and sounds of a newborn), can lead to decreased circulating T in men (Storey, Noseworthy, Delahunty, Halfyard, & McKay, 2011; Storey, Walsh, Quinton, & Wynne-Edwards, 2000). T is positively associated with a host of behaviours themselves linked to short-term mating, including mate seeking, aggression, interest in uncommitted sex, and risk taking (Book, Starzyk, & Quinsey, 2001; Peters, Simmons, & Rhodes, 2008; Puts et al., 2015; Stanton, Liening, & Schultheiss, 2011). Although the precise nature of this association is not fully understood, the results suggest that becoming a parent may cause individuals to lean more strongly towards a long-term mating strategy and away from a short-term one.

Might we expect to see a difference between the sexes in their response to parental care priming? Although men provide more parental care than most male mammals, there is still a sex difference in the typical levels of parental care (Trivers, 1972). As such, the level of responsiveness to the presence of infants is likely to have had a greater impact on the reproductive success of ancestral women than men, and so we might expect the effect of priming parental care to be more pronounced in women.

Experiment 1 examined the effect of a parental care prime on short- and long-term mating inclinations. The prime took the form of short videos featuring men and women caring for infants. Our first hypothesis (H1) was that, following exposure to the prime, participants would choose more individuals for long-term relationships. The second hypothesis (H2) was that participants would choose fewer individuals for short-term relationships. The third and final hypothesis (H3) was that there would be a sex difference in this domain, with the prime affecting women more than men.

2.1. Method

2.1.1. Participants

One-hundred and fifty heterosexual volunteers participated in the experiment for either payment or course credit. There were equal numbers of male and female participants and the average age was 20.69 ($SD = 1.63$). The sample was predominately White ($n = 143$; 95.3%), and around two-thirds were in a committed relationship ($n = 92$; 61.3%). Two of the participants had one child each; the rest were childless. The average sociosexuality score, measured using the SOI-R (Penke & Asendorpf, 2008), was 38.37 ($SD = 12.51$) for men and 28.16 ($SD = 10.58$) for women. Sociosexuality measures an individual's willingness to engage in uncommitted sex. Usually there is a large average difference between the sexes with men typically scoring higher. This was the case with our sample, $t(148) = 5.400$, $p < 0.01$, $d = 0.88$.

2.1.2. Apparatus

2.1.2.1. The relationship choice task (SMA). The SMA task (inspired by the UK television program *Snog, Marry, Avoid*; see Appendix) is a measure of participants' disposition towards long- and short-term mating. It was created specifically for the present experiments. The task consists of a computer program which presents participants with a slideshow of 50 photographs of the other sex. These are presented in a random order, and the program asks the participant to decide which of three relationship types they would prefer to have with each person. The options are "short-term fling", "long-term thing", or "nothing at all." Only one relationship type can be chosen per person.

The SMA has two main advantages over other measures of mating strategies. First, the other measures are almost exclusively questionnaires, such as the SOI/SOI-R and the Mini-K (Figueredo et al., 2006; Penke & Asendorpf, 2008; Simpson & Gangestad, 1991). For a number of reasons, these are unsuitable for detecting change in behaviour within a single experimental session. For example, some SOI/SOI-R items ask about past behaviour and thus would not be expected to change. Furthermore, the small number of items makes it easy for participants to recall their previous answers. Second, existing measures generally focus on an individual's proclivity for short-term mating but not long-term mating. The SOI-R, for example, has items such as 'I can imagine myself being comfortable and enjoying "casual" sex with different partners.' The fact, however, that someone has a strong desire for short-term mates does not necessarily imply they have a weak desire for long-term mates, or vice versa. At least in principle, short- and long-term mating desires are orthogonal. For that reason, the SMA measures short- and long-term inclinations independently. Pilot research suggests that the SMA is both a valid measure and sensitive to changes in mating inclinations over short timescales (see Appendix).

2.1.2.2. SMA models. Fifty male models were selected from an initial sample of 169 photographs gathered from the open-access website hotornot.com. Ten male and ten female judges, aged 18 to 30, rated the models' attractiveness on a scale from one ('not at all attractive') to ten ('very attractive'). Fifty images were taken from the middle of the attractiveness distribution. The average attractiveness of this subset was 4.07 ($SD = 0.23$). The process was repeated to provide 50 female models, using the same judges and an initial sample of 175 photographs. The average attractiveness of this subset was 4.09 ($SD = 0.38$).

2.1.2.3. Experimental stimuli. The stimuli for the study consisted of two videos: a parental video for the experimental condition and a neutral video for the control condition. The parental video contained three clips chosen for their potential to prime parental care. Two of the clips were tutorials featuring male and female paediatricians giving advice on how to soothe and bathe babies. Both presenters referred to viewers in the second person and encouraged them to be gentle and cautious

with their baby (e.g., 'keep a firm hand on your baby at all times'). Many of the scenes in the tutorials showed men and women caring for new-born infants. The third clip was a montage of babies laughing while playing with, or being tickled by, caregivers. In total, the video lasted 6 min and 2 s.

The neutral video consisted of three shorter clips chosen to match the parental videos in terms of length and style, but without parental content. Two clips were tutorials: one about slicing pineapples and the other about growing orchards. As in the parental video, the tutorials featured both male and female presenters, referred to the viewer in the second person, and included cautions (e.g., 'if the roots don't get air they will die, so they need really good drainage'). The final clip was a montage of individuals failing at various tasks in the style of a funny clip show segment. This included a woman being thrown from a bucking bronco, and a man failing to release a ball in time while bowling, causing him to fall into the lane. In total, the video lasted 6 min and 12 s.

2.1.3. Design

The experiment utilized a $2 \times 2 \times 2$ mixed-model design with the within-subjects variable of relationship-type (long-term vs. short-term), and the between-subjects variables of video-type (parental vs. neutral) and sex. The dependent variables were the number of models chosen during the SMA task. Participants were assigned randomly to a video-type condition.

2.1.4. Procedure

Participants were recruited for a study on the topic of social perception and relationship choices. On arrival, they read an information sheet and signed a consent form. The format of the SMA task (described as a 'relationship choice task') was then explained. Participants were left to complete the task in private. The experimenter returned only to give further instructions and set up the tasks.

Before commencing the experiment, participants were asked to imagine that they were single and open to starting a new relationship, and also to imagine that each of the suitors presented in the study was known to them and their circle of friends. They were then given definitions for both short- and long-term relationships. Specifically, they were told that long-term relationships are 'marked by love and commitment and are long in duration (months or years),' whereas short-term relationships are 'brief affairs, one-night stands, or temporary liaisons (days or weeks).' Participants were presented with the same 50 models both before and after the experimental manipulation.

Having completed the SMA, participants were given a set of headphones to wear and shown either the neutral or parental video. After that, they completed the SMA a second time, ostensibly to make sure the experimenters had a complete and accurate idea of the participant's relationship preferences. They were also told that 'you may have seen some of the individuals that you have rated previously, but this is normal.' This was intended to ensure that participants would not interrupt the experiment should they recognise individuals from the first performance of the SMA. Finally, participants were thanked and given a full verbal and written debrief.

2.2. Results

Participants who viewed the neutral video selected a median of 3 models ($IQR = 10$) for a long-term relationship and 9 models ($IQR = 13$) for a short-term relationship on the SMA task. In contrast, participants who viewed the parental video chose a median of 7 ($IQR = 11$) and 10 ($IQR = 11$) models, respectively.

As both short-term (ST) and long-term (LT) scores from the SMA task were highly skewed, we normalized them using a cubed-root transformation. The ST and LT scores from the second performance of the task were analysed using a repeated measures ANCOVA to test for the within-subjects effect of relationship-type (ST vs. LT) and the

between-subjects effect of video-type (parental vs. neutral) and sex. Baseline ST and LT scores were entered into this analysis as covariates.

The analysis revealed a three-way interaction between relationship-type, video-type, and sex which approached significance, $F(1,144) = 3.549$, $p = 0.06$, $\eta^2_p = 0.02$. As this interaction was in line with our a priori predictions (H3), we decided to further investigate it by conducting a separate analysis for both LT and ST choices.

For the LT choices, there was a statistically significant main effect of video-type, $F(1,144) = 6.609$, $p = 0.01$, $\eta^2_p = 0.04$. Participants who viewed the parental video selected more LT relationships than those who watched the neutral video. There was no main effect of sex, $F(1,144) = 1.692$, $p = 0.20$. Finally, there was a sex by video-type interaction which approached significance, $F(1,144) = 3.391$, $p = 0.07$, $\eta^2_p = 0.02$. Again, because we expected to find a sex difference as part of H3, we decided to break down this interaction in order to more fully explore the data. This revealed that the main effect of video-type was significant for women, $F(1,71) = 9.868$, $p < 0.01$, $\eta^2_p = 0.12$, but not for men, $F(1,71) = 0.218$, $p = 0.64$ (see Fig. 1). Specifically, women exposed to the parental video made more LT selections, whereas men did not.

For the ST choices, there was no main effect of video-type, $F(1,144) = 0.002$, $p = 0.96$, or sex, $F(1,144) = 1.376$, $p = 0.24$. Nor was there an interaction between sex and video-type, $F(1,144) = 1.223$, $p = 0.27$ (see Fig. 1).

2.3. Discussion

Compared to a control group, participants who viewed the parental videos showed greater long-term relationship interest, selecting more models as potential long-term suitors during the SMA task, consistent with H1. Contrary to H2, however, this was not accompanied by a reduction in short-term interest following exposure to the slideshow. When the sexes were examined separately, the effect of the parental video on long-term choices appeared only among women, consistent with H3.

Taken at face value, the results imply that priming parental care impacted women's mating strategies but not men's. However, there are several other possibilities to consider. First, the cues used here may not have been relevant enough to men to elicit a parental response. Washing, playing, and soothing infants are indicators of direct parental

care. While men do engage in this type of care, generally this is to a much lesser extent than women. This is especially so in traditional societies, which may give us insight as to how our ancestors lived. For example, Hadza fathers, who are seen as high providers of direct parental care, hold their younger offspring (<4 years) around 6.1% of the time. Yet, this is roughly the same amount as maternal grandmothers (6.7%) and pales in comparison to the 71.5% of the time in which mothers do the holding (Marlowe, 2005). Thus, the cues use here may have been more representative of typical maternal care than paternal care.

Second, previous research has shown that the effect of parental cues on men can be mediated by other variables. In Storey et al. (2000), for example, listening to babies crying caused a drop in circulating T, but only among men who reported feeling concerned about the cries. Those who were not concerned actually showed an increase in T. As such, an additional measure of engagement could reveal a sub-set of men for which priming effectively changes behaviour. Another potential mediating variable is parental status. In this experiment, all men in the sample were non-fathers. As such, we do not know if fathers would have responded to the priming differently. It is plausible that parental cues could be more relevant to fathers than non-fathers, though we would still need to explain why the women in our sample (who were almost all non-mothers) were affected.

Despite finding that the LT choices of women increased following the parental care prime, there was no evidence of an accompanying reduction in ST choices. If short- and long-term mating strategies opposed one another, the activation of one would be accompanied by the deactivation of the other. This was not the case in this experiment or any of the others reported in this paper. We continue to present all of our a priori hypotheses as they were original conceived, and save further discussion of this finding until the *General Discussion*.

3. Experiment 2: resource-abundance

One of the hypothesized benefits of pair-bonded mating in ancestral humans was that it allowed for the efficient acquisition of resources for highly dependent offspring. Compared to a single parent, those cooperating within a pair-bond would have been able to divide responsibilities and each specialise in a subset of tasks (Geary, 2000; Quinlan, 2008; Winking, Kaplan, Gurven, & Rucas, 2007). Furthermore, a pair-bond allows for one partner to compensate for the other when they find it harder to provide for the family. Among the Hadza, for instance, fathers switch from providing just under half the calories for their family to almost 70% when mothers are preoccupied with children less than a year old (Marlowe, 2003).

Yet the benefits of biparental investment would likely have depended on local resource availability. That is, the benefits of biparental investment in a resource-abundant environment would have been smaller than those in a resource-poor one, as children in the former might have had a good chance of surviving and thriving even if they had only one investing parent (and that parent's kin). Under such conditions, ancestral women may have become more open to short-term mating as the benefits of doing so began to outweigh those of pursuing a long-term strategy. Short-term mating would have provided women with the opportunity to secure good genes, obtain resources from casual partners, and entice wealthy, high status men into long-term relationships (Greiling & Buss, 2000; Thornhill & Gangestad, 1993). A similar argument applies to ancestral men. During periods of high resource availability, the reduced benefits of biparental care may have led some men to prioritise increasing the number of children they had. For some, this would have meant increasing their mating effort by pursuing short-term relationships. As a result of these ancient selection pressures, modern men and women may be sensitive to cues of high resource availability, causing them to act as if resources are plentiful and moving towards a short-term mating strategy.

Wealth, by most definitions, is an evolutionarily recent indicator of resource availability, appearing only after the development of agriculture

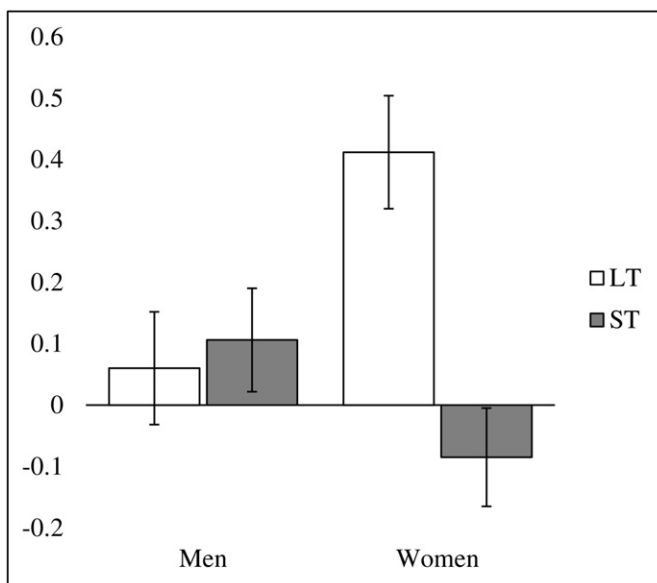


Fig. 1. The effect of parental cues on the number of long-term and short-term relationship choices made during the SMA task. The bars represent difference scores between the parental and neutral conditions. The error bars show the SEM for the parental group.

in the Neolithic era (Mazoyer & Roudart, 2006). Nonetheless, some studies indicate that priming resource-abundance using modern cues of wealth might trigger a mating strategy shift in women towards the short-term. Little et al. (2013), for instance, found that exposing women to wealth cues, including expensive food, watches, and cars, produced an increase in their average preference for facial masculinity. Similarly, Wilson and Daly (2004) found that exposure to images of fast cars caused women to become more impulsive on a delayed discounting task. Thus, while resource-abundance has potential implications for the success of mating strategies in both sexes, existing research suggests that this effect may be more pronounced among women.

In Experiment 2, participants were shown a slideshow of wealth cues designed to prime resource-abundance. Our first hypothesis (H1) was that, following exposure to the prime, participants would choose more individuals for short-term relationships. The second (H2) was that participants would choose fewer individuals for long-term relationships. Finally, the third hypothesis (H3) was that there would be a sex difference in this domain, with the prime affecting women more than men.

3.1. Method

3.1.1. Participants

One-hundred and fifty-one heterosexual volunteers participated in the experiment for either payment or course credit. Seventy-five were men (49.7%); 76 were women (50.3%). The average age was 20.93 ($SD = 1.72$). The sample was primarily White ($n = 141$; 93.4%), and more than half ($n = 84$; 55.6%) were in a committed relationship (including marriage). The average SOI-R score was 43.47 ($SD = 12.82$) for men and 29.76 ($SD = 11.23$) for women, $t(144) = 6.880$, $p < 0.01$, $d = 1.15$. Most participants came from a middle socio-economic background ($n = 103$; 68.2%), with the next most common backgrounds being lower-middle ($n = 24$; 15.9%) and upper-middle ($n = 21$; 13.9%).

3.1.2. Apparatus

3.1.2.1. SMA models. As with Experiment 1, pictures of men and women were gathered and rated for attractiveness by a mixed-sex group of 20 judges. For the male images, 169 pictures were gathered and ranked by attractiveness. Fifty were then chosen from the middle of the distribution. The average attractiveness of this subset was 4.68 ($SD = 1.5$). For the female images, 50 pictures were chosen in the same way from a sample of 202. The average attractiveness of this subset was 4.68 ($SD = 1.47$).

3.1.2.2. Experimental stimuli. The stimuli for this study consisted of two slideshows: one with neutral images and one with images containing wealth cues. A set of 166 public-domain images of luxury items and a set of 174 images of everyday household items were sourced online. These were then combined and randomised. The same judges that rated the SMA models also rated each image for its wealth content by answering the question ‘How wealthy would you feel if you owned the item in the picture?’ using a scale from one (‘not at all’) to ten (‘very much so’).

The 75 images with the highest scores were used in the wealth slideshow. These fell into four broad categories: (1) money/gold (10% of the images); (2) jewellery/watches (12%); (3) expensive cars/vehicles (25%); and (4) mansions/luxury apartments (53%). The average score for the images was 9.00 ($SD = 1.43$). The 75 images with the lowest scores were used in the neutral slideshow. These images also fell into four broad categories: (1) small pets (5% of the images); (2) potted plants (21%); (3) everyday groceries (24%); and (4) household objects (50%). The average score was 1.87 ($SD = 0.99$). Each slideshow was 3 min and 45 s long and presented the images in a random order for three seconds each.

3.1.3. Procedure and design

The procedure for Experiment 2 was identical to that of Experiment 1. The design was also the same, but the independent variable of video-type was now ‘slideshow-type’ and was now split into ‘neutral’ and ‘wealth.’

3.2. Results

Participants who viewed the neutral slideshow then selected a median of 1 model ($IQR = 5$) for a long-term relationship on the SMA task and 9.5 models ($IQR = 10$) for a short-term relationship. In contrast, participants who viewed the wealth slideshow chose a median of 2 models ($IQR = 7$) and 11 models ($IQR = 10$), respectively.

ANCOVA analysis on the transformed means revealed a significant two-way interaction between relationship-type and slideshow-type, $F(1,145) = 4.284$, $p = 0.04$, $\eta^2_p = 0.03$. To further explore this interaction, we analysed the effect of slideshow-type on LT and ST choices separately. For the LT choices, there was no significant main effect of slideshow-type, $F(1,147) = 1.278$, $p = 0.26$. However, there was a significant main effect of slideshow-type for the ST choices, $F(1,147) = 5.812$, $p = 0.02$, $\eta^2_p = 0.04$. Participants who viewed the wealth slideshow typically selected more ST relationships than those who watched the neutral slideshow (see Fig. 2).

3.3. Discussion

Compared to a control group, participants who were primed with resource-abundance tended to show elevated short-term relationship interest, selecting more models as potential short-term suitors during the SMA task, consistent with H1. The effect was notably weaker than that of the parental care prime ($\eta^2_p = 0.04$ compared to 0.12). Contrary to H2, there was no reduction in long-term interest and, contrary to H3, there were no differences between the sexes.

As mentioned, the rationale for our hypotheses was that wealth cues would prime resource-abundance, thus causing a relative shift in focus from mating within a resource maximising pair-bond towards attracting short-term mates. This type of shift would have been beneficial to ancestral women for several reasons. It may, for example, have allowed them to secure good genes from high quality partners, obtain resources from casual partners, or entice desirable men into pair-bonds (Greiling & Buss, 2000; Thornhill & Gangestad, 1993). For

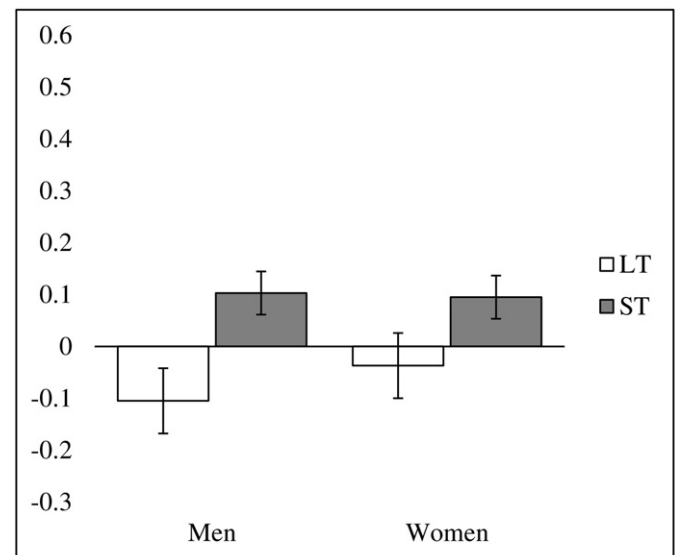


Fig. 2. The effect of wealth cues on the number of long-term and short-term relationship choices made during the SMA task. The bars represent difference scores between the wealth and neutral conditions. The error bars show the SEM for the wealth group.

ancestral men, short-term mating would have provided them with an opportunity to directly enhance their fitness by producing a greater number of children. These children may have been more likely to survive and thrive without biparental care within a resource-rich environment.

Contrary to expectations, priming resource-abundance had no more effect on women than men. The idea that they would was based on the results of previous research suggesting that exposure to wealth cues can cause women to become more impulsive in their decision making and develop a greater preference for facial masculinity in their partners – traits associated with short-term mating (Little et al., 2013; Wilson & Daly, 2004). However, this literature includes studies which test female-only samples. In Little et al. (2013), for example, the effect of wealth cues was tested using a sample of 171 women, but no men. Had these studies tested both sexes, then wealth cues may have been found to affect both men and women. Alternatively, as the effect of priming in this experiment was so small ($\eta^2_p = 0.04$), it is possible that resource-abundance primes affect the sexes differently and that larger sample sizes are required to reveal this.

4. Experiment 3: physical danger

In the ancestral environment, women and their dependant offspring would often have been vulnerable to predators (Hart & Sussman, 2009; Prokop & Fancovicova, 2010) and other human groups (Navarrete et al., 2009). In such circumstances, establishing a pair-bond with a man willing to protect his mate and her offspring would likely have enhanced women's fitness. At the same time, ancestral men would have increased their fitness by protecting their offspring and mates from such threats.

The protection benefits afforded by pair-bonded mating would have varied with the harshness of the environment. In relatively safe environments, women and their offspring would have had a reasonable chance of surviving and thriving with just the support of their kin alone, and thus the protection of a partner would have been less beneficial for males and females alike. Under these circumstances, following a short-term strategy would have allowed men to pursue mating with other women in order to produce more offspring, and women to pursue relationships with high quality men in order to secure, among other things, good genes for future offspring (Greiling & Buss, 2000; Thornhill & Gangestad, 1993).

In sum, we believe ancestral humans may have evolved to favour long-term mating more strongly during times of relatively high danger, and short-term mating in times of safety. Thus, we might expect modern humans, when primed with danger, to up-regulate their inclination towards long-term mating. Consistent with this idea, a large-scale cross-cultural study revealed that promiscuous sexual behaviours and attitudes are less common in cultures where life expectancy is low and infant mortality high (Schmitt, 2005).

If there is a tendency for humans to recalibrate their mating strategies in response to danger cues, then we might expect it to manifest somewhat differently in men vs. women. In modern humans, we find sex differences in average levels of fear towards ancestral dangers such as spiders and snakes, threatening humans, and aggressive nonhuman mammals (Prokop & Fancovicova, 2010; Rakison, 2009; Smith & Torstensson, 1997), and these differences appear to transcend culture (Davey et al., 1998). At the extremes, phobias of these stimuli are also more common in women than men (Fredrikson, Annas, Fischer, & Wik, 1996). As such, we might expect that threat priming would have a greater impact on women's mating behaviour than men's.

In Experiment 3, participants were exposed to a slideshow of danger cues designed to prime physical danger or threat. Our first hypothesis (H1) was that, following exposure to the prime, participants completing the SMA task would choose more individuals for a long-term relationship. The second (H2) was that participants would choose fewer individuals for a short-term relationship. The third and final hypothesis

(H3) was that there would be a sex difference, with the prime affecting women more than men.

4.1. Method

4.1.1. Participants

One-hundred and thirteen heterosexual volunteers participated in the experiment for either payment or course credit. Fifty-seven of the participants were female (50.4%) and 56 were male (49.6%). The average age was 20.85 ($SD = 1.26$). The sample was primarily White ($n = 108$; 95.6%), and more than half ($n = 57$; 50.4%) were either single or in an uncommitted relationship. The average SOI-R score was 41.38 ($SD = 13.87$) for men and 32.25 ($SD = 8.97$) for women, $t(110) = 4.155$, $p < 0.01$, $d = 0.79$. Participants were asked to rate (on a nine point Likert scale) how frightening they found snakes, spiders, aggressive animals, and people rioting, so that we could control for pre-existing fear of these stimuli. For all categories, the average score was higher for women than men ($ds = 0.72$ – 1.06 , $ps < 0.01$).

4.1.2. Apparatus

4.1.2.1. SMA models. Two samples of pictures were assembled in the same way as the previous experiments. For the images of men, 50 pictures were chosen from a sample of 173; these had an average attractiveness of 4.5 ($SD = 1.32$). For the images of women, 50 pictures were chosen from a sample of 184; these also had an average attractiveness of 4.5 ($SD = 1.63$). The photos were rated by a mixed-sex group of 15 judges.

4.1.2.2. Experimental stimuli. The stimuli for this study consisted of two slideshows: one with neutral images for the control group and one with images containing danger cues for the experimental group. A set of 166 threatening images and a set of 150 non-threatening images were sourced online from the public domain. These were then combined and randomised. The same judges who rated the SMA models rated each image for its threat content by answering the question 'How threatening do you find the content of the picture?' on a scale from one ('not at all') to ten ('very much so')

The 75 images with the highest threat scores were used in the danger slideshow. These fell into four broad categories: (1) snakes (10.7%); (2) people rioting (22.7%); (3) spiders (24%); and (4) other aggressive animals (42.7%). The average score for the images was 6.98 ($SD = 2.06$). The 75 images with the lowest scores were used in the neutral slideshow. These images also fell into three categories: (1) non-aggressive animals (4%); (2) landscapes (8%); and (3) household objects (88%). The average threat score was 1.15 ($SD = 0.43$) for these images.

4.1.3. Procedure and design

The procedure for Experiment 3 was the same as the previous experiments, except that the study advertisement and the consent form stipulated that participants 'must be comfortable viewing images of spiders and snakes.' The design of the study was also the same, but the independent variable of slideshow-type was now split into "neutral" and "danger."

4.2. Results

Participants who viewed the neutral slideshow then selected a median of 1 model ($IQR = 5$) for a long-term relationship and 11 models ($IQR = 11$) for a short-term relationship on the SMA task. In contrast, participants who viewed the danger slideshow chose a median of 4 ($IQR = 9$) and 17 ($IQR = 17.25$) models, respectively.

An ANCOVA revealed a significant effect of slideshow-type, $F(1,107) = 14.369$, $p < 0.01$, $\eta^2_p = 0.12$. Participants who viewed the danger slideshow typically selected more relationships – short-term and long-term – than those who watched the neutral slideshow

(see Fig. 3). There was a marginally significant interaction between slideshow-type and sex, $F(1,107) = 3.207$, $p = 0.08$, $\eta^2_p = 0.03$. There was no main effect of relationship type, nor any interactions between relationship-type and the other variables.

Because we expected to find a sex difference in responsiveness to the danger prime (H3), we examined the effect of slideshow-type on relationship choices for each sex separately. For women, there was a significant main effect of slideshow-type, $F(1,53) = 11.622$, $p < 0.01$, $\eta^2_p = 0.18$. For men, however, the effect was only marginally significant, $F(1,52) = 3.269$, $p = 0.08$, $\eta^2_p = 0.06$. Thus, the increase in the number of relationships selected following exposure to danger cues was driven primarily by women (see Fig. 3).

4.3. Discussion

Compared to a control group, participants who were primed with danger increased the number of individuals they chose as relationship partners, irrespective of relationship type. This effect was stronger among women ($\eta^2_p = 0.18$) than men ($\eta^2_p = 0.06$), consistent with H1. As with the other experiments, no evidence was found in support of H2 – that is, there was no decrease in the number of short-term relationships chosen (indeed, the number increased). Finally, danger stimuli had a greater impact on women than men, consistent with H3.

How can we explain an increase in short-term as well as long-term relationship interest following danger priming? One possibility is that priming danger caused participants to seek social support in a very general way. As the SMA task only allowed them to choose sexual relationships of one sort or another, this became the only channel in which the participants could seek such support. Though this is certainly plausible, we favour an alternative interpretation, namely that, rather than all the participants increasing in both ST and LT interest, some increased in LT interest but not ST, while others did the reverse.

To test our alternative interpretation, we examined the raw difference scores (scores after cues minus scores before) for ST and LT choices among those primed with danger in the experiment. LT difference scores were not correlated with ST difference scores, $r_s(54) = 0.14$, $p = 0.30$. Indeed, for the majority of these participants (67%; $n = 22$), ST and LT differences were discordant – an increase in one category was unaccompanied by an increase in the other. Thus, we suspect that the danger cues may have caused LT preference to increase for some participants, and ST preference to increase for others.

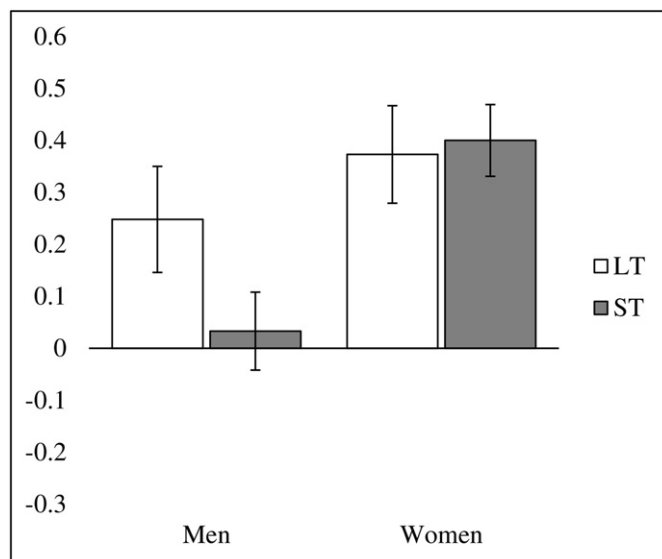


Fig. 3. The effect of danger cues on the number of long-term and short-term relationship choices made during the SMA task. The bars represent difference scores between the danger and neutral conditions. The error bars show the SEM for the danger group.

If this is right, then we are left to explain why some individuals chose to favour one relationship type over another. One possibility is that participants already had a pre-existing preference for this type of relationship, and so simply increased their number of selections within this domain. However, it may also have something to do with the fact that both short- and long-term mating strategies can afford protective benefits. In terms of long-term mating, a pair-bonded partnership would have given both sexes access to a wider social network of friends and kin able to provide protection against a range of threats (Hart & Sussman, 2009; Navarrete et al., 2009; Prokop & Fancovicova, 2010). However, short-term mating may have also provided women with an alternative way of gaining the protection of men (Greiling & Buss, 2000; Smuts, 1992). Among modern humans, this is reflected in the fact that women report that protection-related traits, such as muscularity, are important to them in both short-term sexual partners (Frederick & Haselton, 2007; Giebel, Weierstall, Schauer, & Elbert, 2013) and male friends (Bleske & Buss, 2000; Bleske-Rechek & Buss, 2001).

If both short- and long-term mating typically afforded protective benefits for women, whereas only long-term mating had that effect for men, we might expect women to increase their mate selections for both relationship types following danger priming, rather than just long-term. Certainly, when examining at the results separately for each sex this appears to be the case (see Fig. 3), although note that this wasn't reflected in our three-way ANCOVA.

5. General discussion

Overall, we found moderate support for our hypotheses. As predicted, the parental care primes in Experiment 1 caused an increase in long-term relationship interest, and the resource-abundance primes in Experiment 2 increased short-term relationship interest. In Experiment 3, danger primes increased long-term mating interest, which was also in line with our predictions, though we also found an unexpected increase in short-term mating interest. We also hypothesized, in every experiment, that increased interest in one relationship type would be accompanied by reduced interest in the other, yet this was falsified in every case. Finally, we predicted specific sex differences in each of the experiments, but found such differences only in Experiments 1 and 3.

As far as we are aware, these experiments constitute the first explicit demonstration that exposure to evolutionarily relevant stimuli can shift an individual's disposition towards long- or short-term mating. Other studies have shown that similar stimuli can shift people's preferences for attributes such as facial masculinity (e.g. Little et al., 2011; Little et al., 2013; Welling et al., 2007); they have not, however, directly shown that such stimuli can shift mating strategies per se. Our findings support the view that humans have an evolved mechanism for calibrating their mating behaviour depending on input from a range of sources in their environment. Here, we were able to trigger this mechanism, using some basic primes to produce some modest effects on relationship choices.

5.1. Strategy activation

Theories in behavioral ecology suggest that, while an organism may be capable of following different mating strategies, only one is used at a time, with individuals switching between them (Gross, 1991, 1996; Shuster, 2010). Indeed, because mating strategies in animal studies are measured behaviourally, they appear to be implemented in a binary fashion with one being activated while others are suppressed.

Our results suggest, however, that mating strategy implementation is not so simple, at least in humans. For example, rather than selecting one relationship type exclusively, 66.4% ($n = 275$) of our participants chose a mixture of relationship types when they completed the SMA task for the first time (baseline). This implies that both types of strategy may be active simultaneously in some individuals. Moreover, we found that an increase in long-term mating interest was not accompanied by a

decrease in short-term interest, or vice versa. Taken together, these findings have important implications regarding the nature of conditional human mating strategies. The idea that the activation of one strategy necessarily entails the suppression of the other appears to be false. Instead, both can be activated independently, with the overall behavioral outcome being due to differences in relative activation, and opportunity.

5.2. Primes and mating strategy change

The three experiments described here used priming to explore the influence of evolutionarily relevant stimuli on relationship choices. The use of primes in behavioral research brings its own set of challenges. Specifically, it is sometimes hard to discern exactly what concept a prime is activating in participants. This, in turn, makes it difficult to understand how these concepts impact behaviour. For example, in Experiment 1, we exposed participants to videos of infants being cared for. We anticipated that this would activate the concept of parental care in our participants. This would then cause them to favour a long-term mating strategy as this would have maximised fitness among those caring for infants in the ancestral environment. However, we do not know for certain whether the stimuli primed parental care, or whether it primed a similar concept (such as the presence of young children) which happened to yield a similar effect on the participant's behaviour.

One could also argue that it is uncertain what concepts were primed in Experiment 2. Here, we used wealth cues to prime resource-abundance in participants. We think this caused them to favour a short-term mating strategy as this would have provided the best way for our ancestors to maximise fitness in resource-rich environments. However, it may have also been the case that the women in our sample paired the wealth stimuli with the men presented in the SMA task, thus priming the concept of “wealthy and high status men.” This prime may have produced a similar result but for a different reason. Specifically, women may have shifted focus to short-term mating as, historically, this may have enabled them to entice wealthy and high status men into a committed relationship (Greiling & Buss, 2000). One problem with this explanation is that it implies that men should have paired the wealth stimuli with the women in the SMA task, thus priming “wealthy and high status women.” It is not quite clear how a short-term mating strategy would have allowed ancestral men to entice such women into a committed relationship, thus we are reluctant to accept this interpretation. Another possibility is that, given that status, wealth, and resources were more tied to the mating success of ancestral men, women are more likely to pair wealth cues and pictures of men together, while men are more likely to associate wealth images with their own access to resources. Subsequent research should focus on exploring these possibilities and establishing whether the sexes differ in how they approach and interpret wealth cues.

Another issue with the use of primes is that it is often hard to distinguish whether a behavioral change is due to a concept being activated, or due to secondary effects caused by the stimuli presented. For example, in Experiment 3, we used threatening stimuli to prime a dangerous environment, which we think led participants to favour mating strategies that historically maximised fitness under such conditions. However, it might be argued that the results were not due to priming at all, but a different effect caused by the stimuli, such as general arousal. There is some research suggesting that arousal effects can be misinterpreted as romantic interest (Dutton & Aron, 1974; Meston & Frohlich, 2003), in which case this may also explain why there was a general increase in desire for both short-term and long-term relationships.

To address these challenges, the SMA should be used in conjunction with a variety of intervention types. Less ambiguous primes could increase our confidence about what concept is being activated. In the case of parental stimuli, for example, participants could be asked to sooth a crying doll (Storey et al., 2000), while being told to imagine that it is their child. Similarly, visualisation tasks, which ask participants to imagine themselves in a given scenario (e.g., being personally

threatened), could be used. Moving away from primes, another idea would be to take advantage of naturally occurring events which cause variation in resource availability. For example, in the UK, students often take out a loan to cover their studies and living expenses which are then paid to them across the year in three installments. This process produces natural short-term variation in wealth among those who do not plan their finances well. Such variation could provide the opportunity to see if short-term changes in wealth affect relationship preferences. One common challenge with these types of interventions is that they may produce demand characteristics (see below).

5.3. Limitations

A potential criticism of the SMA task is that changes in the number of relationships chosen do not reflect a change in preference for that relationship type but rather a change in the threshold of partner acceptability. One might argue, for instance, that in Experiment 3, participants primed with danger cues lowered their standards for an acceptable partner, rather than increasing their interest in mating. Although this could theoretically explain the effects found in that experiment, it struggles to explain the others. The argument would imply that, in Experiment 1, women primed with parental care lowered their standards for a long-term partner and that, in Experiment 2, both sexes lowered their standards for a short-term partner when primed with resource-abundance. Although the latter is possible, the former implies that, after viewing parental stimuli, women decided that previously undesirable models were now attractive enough to warrant a long-term committed relationship. One could argue that a partner threshold effect does exist, but its effects are only apparent when priming effects are weak. However, even if this were the case, the “threshold change” argument is unable to account for why the reduction in partner standards would be restricted to one relationship type in most cases, rather than affecting both equally.

A more serious limitation concerns the homogeneity of the samples used in the experiments. The participants were almost exclusively White, childless, and in their early 20s. While the inclusion of covariates such as SES, SOI-R, self-perceived attractiveness, and relationship status had no impact on the results, additional research should be conducted with a more varied sample. These may prove the effects to be generalizable, but equally may reveal nuanced interactions with demographic characteristics relevant to mating success.

Finally, as with most studies using explicit cues or stimuli to affect behaviour, there are always concerns that demand characteristics may account for the findings. In Experiment 2, for example, wealth cues may have caused participants to act as if their environment was resource-abundant, but equally participants may have simply selected more short-term partners as this is what they felt they were expected to do. While these experiments would have benefitted from a measure of demand characteristics, we note that during the debrief process, none of the participants we asked were able to successfully guess any of the study hypotheses.

5.4. Mating strategy plasticity – the future

The plasticity of human mating strategies is likely a fruitful area for further research both inside and outside the laboratory. Examples of other evolutionarily relevant variables which could be the focus of such research include biased sex-ratios (Durante, Griskevicius, Simpson, Cantu, & Tybur, 2012; Pollet & Nettle, 2008), perceived social status (von Rueden, Gurven, & Kaplan, 2011), or victory in competition (Oyegbile & Marler, 2005; Welling, Persola, Wheatley, Cárdenas, & Puts, 2013). Changes in circulating levels of hormones, such as testosterone and cortisol, may also influence relationship preferences (Thomas, Crewther, Stewart-Williams, & Kilduff, *In submission*). Outside the laboratory, the effects of these stimuli could also be observed in real-world settings, such as speed dating events (Asendorpf, Penke, & Back, 2011). In these events, men and women have a series of brief conversations or

“mini-dates” with several partners and then indicate who they wish to see again. Contact details are then exchanged among pairs of individuals who mutually select each other. Our research suggests that exposure to evolutionarily relevant cues before such an event might change mate-selection behaviour. For example, women primed with danger cues prior to speed dating may then choose a greater number of potential suitors. Such experiments would provide invaluable results irrespective of their outcome; a concrete change in real world mating behaviour would confirm that mating strategies are subject to change over brief periods in a meaningful way, while a lack of change would highlight a discrepancy between the small-to-medium effects of interventions found in tightly controlled experimental contexts, and the capacity for such interventions to influence real-world mating behaviour.

The SMA task could be modified to enable us to answer important questions not addressed in our studies to date. One such modification would allow participants to pick a second relationship preference. This would enable us to differentiate between those who would be willing to pursue both types of relationship with a given model, and those who are interested in long- or short-term mating exclusively. Some participants may also opt for a short-term relationship as a way of securing a long-term relationship in the future. Another option would be to expand the options to include platonic “friendship” or relationships of a “medium” duration. The former would allow us to address the “social support” explanation mentioned in the discussion of Experiment 3 (Section 4.3). The latter would help clarify whether long- and short-term mating strategies lie on a continuum, or whether they are discreet entities activated independently of one another.

Another modification involves manipulating the attractiveness of the models used. In these experiments we used models of an average attractiveness; however, using group of models more diverse in attractiveness could produce different results. For example, following the priming with wealth cues, if participants prioritised indicators of good genes in potential partners, then this effect may be amplified if the models are high in physical attractiveness.

5.5. Conclusion

Earlier animal research, and a number of human studies, raise the possibility that humans have an evolved capacity to calibrate their mating inclinations to changes in circumstances. The experiments in this paper provide support for this idea by demonstrating that (1) humans can change their preferences for long- and short-term relationships within a short space of time, and (2) these changes can be initiated by priming participants with evolutionarily relevant stimuli. The results also provide insight into the nature of mating strategy activation in humans. While some of the results raise questions which will form the basis of future research, we have now begun to address the need within evolutionary psychology for experiments which directly test the flexibility of mating strategies in humans.

5.6. Data availability

The data associated with this research are available at <https://osf.io/nz37v/>.

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Declaration of interest

Conflicts of interest: none.

Appendix A. Appendix: The SMA task and pilot work

In order to assess changes to long- and short-term mating inclination within the same experimental session, we created a measure we call the SMA task. We wanted this task to do two main things. First, we wanted it to measure our participants' inclination towards long- and short-term mating separately, acknowledging the view that these are distinct mating motives, rather than two ends of a single motivational spectrum (Buss & Schmitt, 1993; Gangestad & Simpson, 2000). Second, we wanted it to be sensitive to change within a brief window of time (i.e., after administering primes in our experiments). In this appendix, we introduce the task in more detail and report data from a pilot study which was used to validate the task.

A.1. The ‘Snog Marry Avoid?’ task

In 2008, the BBC launched a television program called ‘*Snog Marry Avoid?*’ In the show, individuals with unconventional fashion styles are invited to take part in a “make-under.” To prove to these individuals that their current appearance is not as attractive as they believe it to be, one of the hosts of the show plays the participant a video. The video contains public reactions to a photo of the participant. The public are asked a simple question: ‘Would you snog, marry, or avoid this person?’ Generally, before the make-under, ‘avoid’ is the most common response. Following their make-under, a second reel is shown where most members of the public would generally ‘snog’ or ‘marry’ the candidate – who then promises to re-evaluate their fashion choices. It was this show which inspired the novel task for measuring mating strategies used in this paper. Our thinking was that, in asking the question ‘Snog, marry, or avoid?’ the real question is: ‘Is this individual worth pursuing as a short- or long-term partner, or should they be avoided entirely?’

Using the program as inspiration, we developed the *Snog Marry Avoid?* (SMA) task. The task involves participants viewing 50 opposite sex models in a random order. One-by-one the participant chooses which type of relationship they would prefer to have with each model: (a) a short-term fling; (b) a long-term thing; or (c) not interested. They are allowed only one choice per model. The task yields three numbers: the number of long-term choices made (LT), the number of short-term choices made (ST), and the number of models not chosen for either type of relationship (NI). The first two figures are taken as an indication of the participant's disposition towards long- and short-term mating strategies respectively.

The SMA task begins with several instruction pages. These explain the task format, define the different relationships participants can choose, and encourage participants to respond as if they were in a particular social context. The context is as follows:

For the purpose of this study we would like you to imagine that you are single and open to starting a new relationship with someone. As you view each person imagine you have met them once or twice through friends. Your friends have made it clear to you that the person finds you attractive.

This instruction was included in an effort to control for the potentially confounding variables of relationship status and reluctance to engage in relations with an unknown individual.

The SMA task is somewhat similar to a task used by Landolt, Lalumière, and Quinsey (1995). However, instead of forcing participants to choose between long-term and short-term relationships for each model, the SMA task gives an opt-out option of ‘not interested.’ Thus, any ST or LT selections made are more likely to be due to a genuine choice on behalf of the participant, rather than them being forced to choose an option.

A.2. Pilot study

In order to test the SMA's ability to detect changes in choices within the same experimental session, we conducted a pilot experiment

demonstrating a contrast effect. A contrast effect occurs when the normal perception of a stimulus (e.g., a model's attractiveness) is strengthened or weakened following exposure to other stimuli which are lesser or greater in value (e.g., more attractive models). The effect has been found across a number of sub-disciplines including visual (Gibson, 1933; Suzuki & Cavanagh, 1998) and behavioral science (Bower, 1961). In the specific case of relationship research, showing images of unattractive and attractive same-sex individuals can increase or decrease participant self-esteem respectively (Thornton & Moore, 1993).

In this experiment, participants completed the SMA task twice. Between the performances, we exposed them to a different set of models who were either more attractive or less attractive than those shown in the task. We hypothesized that, after being shown more attractive models, participants would find the models in the SMA task less desirable and thus choose fewer of them during the second performance (H1). Similarly, exposure to less attractive models would cause participants to find the models in the task more desirable and thus choose a more of them during the second performance (H2).

A.3. Method

A.3.1. Participants

74 participants (40 men and 34 women) were recruited from Swansea University to participate in the pilot study. All the participants were heterosexual. The average age of the participants was 20.74 ($SD = 2.07$) and they were all childless. The average SOI-R for men was 46.67 ($SD = 10.35$) and 27.24 ($SD = 10.94$) for women, $t(72) = 7.83$, $p < 0.01$, $d = 1.85$.

A.3.2. Stimuli

Pictures of men and women were gathered for use in the experiment. These were taken from a website where users uploaded photographs of themselves to be rated by members of the public for attractiveness (hotornot.com). All of the images came from users who were over 18. To qualify for inclusion in the stimuli set, the pictures had to: (a) be unedited (e.g., no enhancement or gray-scale effects); (b) contain no indicators of country of origin (e.g., plug sockets on a wall, country flags, license plates); (c) show the model's face clear of objects (e.g., sunglasses, costumes); and (d) not be overly revealing (e.g., bikinis or topless images).

The study required three sets of models to be created for each sex. The first set contained models of average attractiveness which were presented as part of the SMA task. The second and third sets contained models who were more attractive and less attractive than average, respectively. These two sets were used to generate a contrast effect in the experiment.

For the female models, a total of 194 images were taken from the website. Each picture was rated by at least 250 website users. The average attractiveness of the images was 8.36 ($SD = 1.23$) out of 10. From the original pool of images, the 30 with the highest rating were used to create an "attractive" set, the 30 with the lowest rating were used to create an "unattractive" set, and a random sample of 50 images from the middle of the distribution were used in the SMA task. The average attractiveness rating for the images in each set (derived from hotornot.com) was 9.73 ($SD = 0.13$), 6.28 ($SD = 0.74$), and 8.57 ($SD = 0.46$), respectively.

The same process was used to create three sets of male models. The original pool of models had 188 images and an average attractiveness rating of 8.92 ($SD = 0.62$). The average attractiveness rating for the images in each set was 9.72 ($SD = 0.14$) for the attractive set, 7.99 ($SD = 0.30$) for the unattractive set, and 8.99 ($SD = 0.23$) for the set from the middle of the distribution.

A.3.3. Attractiveness bias task

Participants were exposed to the more attractive or less unattractive set of models between two performances of the SMA task. To keep the

participants engaged with these new models, they were asked to rate each model for their attractiveness on a scale of 1 ('not at all attractive') to 10 ('very attractive'). Models were presented in a random order for each participant.

A.4. Results

A.4.1. SMA data

The most commonly selected relationship was 'Not interested' ($Mdn = 31$), followed by 'Short-term fling' ($Mdn = 11$), and then 'Long-term thing' ($Mdn = 4.5$). The typical participant, irrespective of sex, was relatively selective, but also chose a mixture of short- and long-term relationships. Eight participants (11%) selected long-term relationships exclusively, and only two participants (3%) selected short-term relationships exclusively.

The values for the SMA task were skewed and a cubed-root transformation was applied to normalise them. Between-subjects t -tests revealed a significant difference between men and women in the frequency of short-term relationship choice, $t(72) = 3.914$, $p < 0.01$, $d = 0.44$, but not long-term relationship choice, $t(72) = -0.336$, $p = 0.74$.

As a secondary analysis, we conducted Pearson's correlations between the number of ST and LT selections during the first performance of the SMA task and variables from the demographic questionnaire. As expected, there was a strong correlation between SOI-R and ST selection, $r(69) = 0.490$, $p < 0.01$, indicating that individuals high in sociosexual orientation (SO) tended to pick more ST relationships. However, there appeared to be no relationship between SOI-R and LT selection, $r(69) = -0.07$, $p = 0.55$.

A.4.2. The influence of more or less attractive individuals

The set of attractive models were rated on average as 5.81 ($SD = 1.01$) out of 10 for attractiveness, while the unattractive models were rated as 2.70 ($SD = 0.90$). This difference was statistically significant, $t(76) = 14.25$, $p < 0.01$, $d = 3.25$.

Paired t -tests were used to assess if exposure to the attractive models caused selections on the SMA task to decrease. This was indeed the case for both LT selections, $t(37) = -3.467$, $p < 0.01$, $d = 0.56$, and ST selections, $t(37) = -2.702$, $p = 0.01$, $d = 0.44$. Similarly, exposure to the unattractive models caused selections on the SMA task to increase both for LT selections, $t(35) = 2.690$, $p < 0.05$, $d = 0.46$, and ST selections, $t(35) = 2.016$, $p = 0.05$, $d = 0.34$ (see Fig. 1).

A.5. Discussion

In this pilot experiment we aimed to demonstrate that the SMA task was sensitive to changes in relationship preferences after a brief intervention. A simple contrast effect (Thornton & Maurice, 1997; Thornton & Moore, 1993) was chosen to establish this whereby the

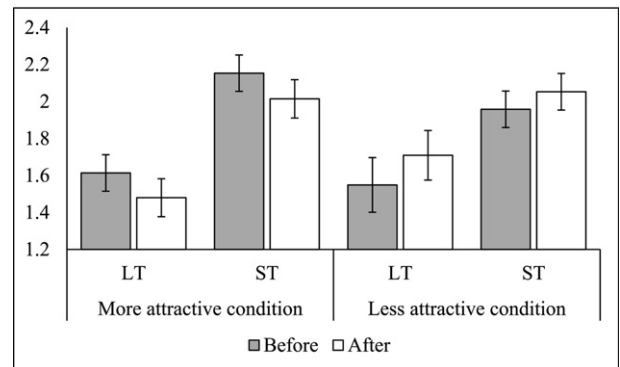


Fig. 1. Long-term (LT) and short-term (ST) relationship choices made during the SMA task before and after exposure to either more attractive or less attractive models. The error bars represent SEM.

SMA was completed twice with a set more attractive or less attractive models shown in between measurements.

Both hypotheses were supported. Following the presentation of attractive individuals, the willingness of the participants to engage in ST and LT relationships with the original models dropped (H1). When less attractive individuals were used, the reverse pattern was found: The number of ST and LT selections increased (H2). These results indicate that individuals can “change their mind” in a brief period of time after being exposed to appropriate stimuli.

A.5.1. The validity of the SMA

Four main points of interest emerged from the pilot study which suggested that the SMA task was appropriate for use in our mating strategy calibration experiments. First, the SMA was able to detect the well-established contrast effect within a brief experimental session. This demonstration of within-session sensitivity gives us some confidence that the measure is capable of detecting changes to short- or long-term relationship preference following exposure to evolutionarily relevant stimuli, if such changes occur.

Second, when completing the task, participants showed openness to all three types of relationship. For example, 86% of participants ($n = 67$) showed a preference for a mixture of both long- and short-term relationships during their first exposure to the SMA task. This means that the task is able to record behaviour in keeping with the view that humans implement a variety of mating strategies conditionally (Gangestad & Simpson, 2000).

Third, the frequency of choices made within each relationship category makes sense in light of what is known about human mating. Overall, participants of both sexes were selective about their mates, choosing ‘Not interested’ for most of the models. The second-most selected relationship was short-term, and there was a sex difference here with men selecting more models than women. Long-term relationships were chosen the most sparingly, reserved for a small handful of desirable individuals. There was no difference in LT choice between men and women which makes sense given that both sexes are similarly choosy about long-term mates. Most individuals were not considered to be a viable dating partner, and even among those who were, only a small number were chosen for a long-term relationship. Such results should be unsurprising given that pair-bonding is the most common reproductive arrangement found in our species (Stewart-Williams & Thomas, 2013).

Finally, the relationship choices from the SMA task correlated with other variables in logical ways. Specifically, ST choices correlated strongly with the SOI-R while LT choices did not. This makes sense given that the SOI-R is a measure of short-term, but not long-term, mating behaviours, desires and attitudes. In addition, the established sex difference in short-term mating desire was evident in the fact that ST choices correlated with sex, while LT choices did not. Together, these findings support the view that the SMA task is both a sensitive and valid measurement in mating strategy calibration experiments.

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