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## **Having options alters the attractiveness of familiar versus novel faces: Sex differences and similarities**

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### **Data availability statement:**

Data and codebook are available via the Open Science Framework (<https://osf.io/xs74r/files/>)

## **Having options alters the attractiveness of familiar versus novel faces: Sex differences and similarities**

### **Abstract:**

Although online dating allows us to access a wider pool of romantic partners, choice could induce an 'assessment mindset', orienting us toward 'optimal' or alternative partners and undermining our willingness to commit or remain committed to someone. Contextual changes in judgements of facial attractiveness can shed light on this issue. We directly test this proposal by activating a context where participants imagine choosing between items in picture slideshows (dates or equally attractive desserts), observing its effects on attraction to i) faces on second viewing and ii) novel versus familiar identities. Single women, relative to single men, were less attracted to the same face on second viewing (Experiments 2 and 4), with this sex difference only observed after imagining not 'matching' with any romantic dates in our slideshow (i.e., *low* choice, Experiment 4). No equivalent sex differences were observed in the absence of experimental choice slideshows (Experiment 3), and these effects (Experiment 2) were not moderated by slideshow content (romantic dates or desserts) or choice set size (five versus fifteen items). Following slideshows, novel faces were more attractive than familiar faces (Experiment 1), with this effect stronger in men than in women (Experiment 2), and stronger across both sexes after imagining 'matching' with desired romantic dates (i.e., *high* choice, Experiment 4). Our findings suggest that familiarity does not necessarily 'breed liking' when we have the autonomy to choose, revealing lower-order socio-cognitive mechanisms that could underpin online interactions, such as when browsing profiles and deciding how to allocate effort to different users.

**Keywords:**

Face perception, Choice, Online dating, Profile browsing, Familiarity

## **Introduction**

### ***Social judgements of faces and their consequences***

Social judgements of others can have real-world consequences (reviewed in Todorov et al., 2015), including when we select a romantic partner (reviewed in Little et al., 2011; Rhodes, 2006). Valence and attractiveness are key dimensions on which we evaluate faces (Oosterhof & Todorov, 2008; Sutherland et al., 2013; Vernon et al., 2014), and attractive faces are motivating to engage with at the neural and behavioural level (reviewed in Hahn & Perrett, 2014). Moreover, attractiveness judgements of faces are made rapidly (Willis & Todorov, 2006), even when these judgements are irrelevant to the task at hand (Ritchie et al., 2017). Complementing classic studies in social psychology which proposed that ‘familiarity breeds liking’ (Zajonc, 1968; see Bornstein, 1989 and Montoya et al., 2017 for meta-analytic reviews), familiarity (e.g., Batres et al., 2017; Peskin & Newell, 2004; Rhodes et al., 2001; Sofer et al., 2015) and typicality/representativeness of a population average (e.g., Grammer & Thornhill, 1994; Langlois & Roggmann, 1990; Lie et al., 2008; Rhodes & Tremewan, 1996; Rhodes et al., 1999) underpins attractiveness judgements of faces, at least in part. Similarity in interests, values, age, and education also motivates repeated contact on online dating sites more generally (reviewed in Finkel et al., 2012). The current paper focusses on the dimension of familiarity versus novelty and its role in attractiveness judgements in the context of online dating.

### ***Assessment mindsets induced via online dating platforms***

While the above evidence points to the importance of familiarity in face and person perception, a large number of people (see, e.g., Wilson et al., 2012 for discussion) spend a reasonable proportion of their leisure time interacting with others in an online

environment (see US Bureau of Labor Statistics, 2019 for recent data), which affords users access to a wide range of unfamiliar/novel social partners, and often involves the use of profile pictures where an individual displays their face and/or body. Profile browsing is a critical aspect of online dating. Dating profiles may be conceptualized as a 'sales pitch' where people make their initial choices in a joint evaluation mode, learning about and evaluating a large number of potential partners quickly, and contacting them in a low-cost manner in the absence of a social context, which may shape approach-avoidance behaviour differently, compared to our behaviour when indicating initial romantic interest in-person (see Finkel et al., 2012 for discussion). Finkel and his colleagues (2012) theorized that as searchable or visible traits are more salient online than attributes normally gleaned via experience during in-person courtship (e.g., humour or conversation quality), online dating may foster a relatively superficial 'assessment mindset' where we critically evaluate potential dates in comparison to (many) available alternatives, which may, in turn, orient dating app users toward an 'optimal' partner beyond their first 'mutual match' (see, e.g., Miller & Todd, 1998 for related discussion).

### ***Assessment mindsets and the role of choice in dating***

An assessment mindset may motivate behaviour at various stages of the online dating process, including when we browse through profiles, choose whether to respond to a high level of interest/contact from multiple users, when 'screening' partners during an early date, and deciding whether to signal 'commitment' to a current romantic prospect (a second date or beyond), explore alternate prospects (i.e., to remain 'active' within the platform), or disengage from online dating entirely (see Finkel et al., 2012). For example, although feelings of choice and autonomy are important for health and

wellbeing (e.g., Deci & Ryan, 2012), large choice sets promote frugal choice strategies when dating, based on superficial (Lenton & Francescioni, 2010) and/or minimal cues (see Finkel et al., 2012 for discussion), and reduce the likelihood of female speed-daters saying yes to a date (Fisman et al., 2006). These findings complement work on choice set size and general consumer decision making, where a larger choice set size decreases our motivation to buy (Iyengar & Lepper, 2000) and lowers our satisfaction with our eventual decision ('The Choice Overload Hypothesis', e.g., D'Angelo & Toma, 2017; see Scheibehenne et al., 2010 for variance in the effect across studies). This effect has also been observed in face-to-face 'speed dating', where people meet many potential partners across a series of short interactions. Greater choice (more opposite-sex partners to choose from) and greater variance in speed dater traits (e.g., age, height, occupation, and education levels of potential partners) were related to fewer romantic proposals made across speed dating events (Lenton & Francesconi, 2011). As directly observable characteristics are particularly salient in an online environment, access to many potential partners on an online dating platform may foster an assessment mindset which undermines our willingness to commit or remain committed to a romantic partner at different stages of the dating process.

***The current experiments: Online dating platforms and contextual changes in attractiveness judgements***

Experimental activation of an 'assessment mindset' and its corresponding effects on attractiveness judgements of familiar and novel faces enables us to test Finkel and colleagues' proposal directly, as attractiveness is an important dimension of face perception, and our motivation to engage with faces (Hahn & Perrett, 2014). Thus, contextual changes in our attraction to a given individual (e.g., in light of exposure to

others) enables us to examine whether ‘familiarity breeds liking’ (Zajonc, 1968; see Bornstein, 1989 and Montoya et al., 2017 for meta-analytic reviews) in an online environment. This can shed light on the lower-order perceptual mechanisms (attractiveness judgements) involved at different stages of the dating process, such as when we evaluate multiple profiles quickly, and the attractiveness of others may be strengthened or attenuated in light of the presentation of many novel alternate partners. In biology, the presence of novel mates’ orients (predominantly) males of different species toward alternate mates (e.g., Devigili et al., 2015; Jordan & Brooks, 2010; Koene & Ter Maat, 2007; see also Pizzari et al., 2003), and may facilitate sexual arousal in men (Koukounas & Over, 2000; ‘The Coolidge Effect’, Dewsbury, 1981; Wilson et al., 1963). This theoretical perspective has been applied to examine preferences for familiar versus novel faces. Little and colleagues (2014) demonstrated a ‘Coolidge-like’ effect in humans, where familiar versus novel faces were more attractive to women than men, on average (Little et al., 2014). When using an online dating app, as the same profile can be encountered multiple times (e.g., when deciding whether to ‘commit’ or remain committed to that option in light of alternatives), familiarity is an important dimension of research on dating and choice. The current set of experiments adapts Little et al.’s (2014) paradigm, examining the attractiveness of both familiar faces and novel face identities. Specifically, we examine whether the ability to choose between items, activated by pictorial slideshows with an accompanying context, directly reduces attractiveness ratings of i) familiar faces (i.e., from one’s original attraction, *sensu* Little et al., 2014) and ii) familiar faces *relative to* unfamiliar/novel faces.

Our first experiment examined two pre-registered hypotheses (<https://osf.io/xs74r/files/>). As online dating sites may foster an assessment mindset

which undermines our willingness to commit to a partner because choice is greater (Finkel et al., 2012), we examine whether activating the context of using an online dating site (i.e., thinking about accepting or rejecting people presented in pictorial slideshows) reduces the attractiveness of familiar preferred-sex faces compared to our control condition (Hypothesis #1). This design enables us to directly test Finkel and colleagues' proposal that choice undermines commitment, if imagining having options has a direct (negative) effect on our attraction to familiar faces, which would be particularly relevant to the stage at which someone searches for and dates potential partners via this platform (i.e., before committing to an 'optimal' choice). We also examine whether this predicted effect is weaker or absent in females compared to males, given the general focus on male sociosexual orientation and reproductive fitness in studies of the 'Coolidge effect' (e.g., Little et al., 2014; Jordan & Brooks, 2010, Hypothesis #2).

## **Experiment 1**

### **Methods**

#### ***Participants***

Our first online experiment (188 heterosexual individuals, 93 of whom were male,  $M_{\text{age}} = 24.69$  years,  $SD = 8.52$  years) was run via Qualtrics, with procedures for recruitment, informed consent and testing approved by our local Ethics Committee and hypotheses, methods, and exclusion/inclusion criteria pre-registered initially via the Open Science Framework (<https://osf.io/xs74r/files/>). A convenience sample was recruited on and off campus by the first author via word of mouth, flyers, social media, and our research participation scheme, with participants either granted course credit or entered into a draw for a £15 Amazon voucher. We registered an initial data

collection-stopping rule of 54 heterosexual individuals per experimental factor (i.e., 216 participants), based on 90% power to detect a moderate effect (i.e.,  $r > .30$ ) when comparing two independent groups (Lakens & Evers, 2014). However, in this initial experiment, applying exclusion criteria, including response times exceeding 15 minutes ( $N = 10$ ), meant that cells met 80% power to detect a moderate effect ( $N \geq 41$  per cell) except for males allocated to the control condition ( $N = 39$ ).

### ***Face stimuli (familiar/test faces and novel/distractor faces)***

Face stimuli and accompanying attractiveness ratings were taken from a publicly available image set (Face Research Lab London Set; DeBruine & Jones, 2017 <https://doi.org/10.6084/m9.figshare.5047666.v3>) and consisted of full colour images (1350x1350 pixels) of Caucasian individuals taken under standardized conditions with direct gaze, neutral expression, identical t-shirt, and no adornments. In order to select a subset of images for use in our experiments, we analysed DeBruine and Jones' (2017) attractiveness ratings data from nine-hundred fifty heterosexual females' ( $M_{\text{age}} = 22.40$  years,  $SD = 4.57$  years) and five-hundred fifteen heterosexual males' ( $M_{\text{age}} = 23.92$  years,  $SD = 4.66$  years) judgments of preferred-sex faces, who rated attractiveness on a 1 (much less attractive than average) to 7 (much more attractive than average) Likert scale. Based on their data, we selected a subset of faces from around the mid-point in attractiveness. Following a procedure adapted from Little et al. (2014), participants in our first experiment rated a set of 10 test faces (5 male, 5 female) on two occasions (i.e., 'familiar faces'), and also rated an additional 10 distractor faces (5 male, 5 female) on the second occasion (i.e., 'novel faces'). The male test set ( $M_{\text{age}} = 23.20$  years,  $SD = 3.63$  years;  $M_{\text{attractiveness}} = 3.41$ ,  $SD = 0.43$ ), male distractor set ( $M_{\text{age}} = 25.00$  years,  $SD = 4.36$  years;  $M_{\text{attractiveness}} = 3.48$ ,  $SD =$

0.36), female test set ( $M_{\text{age}} = 24.20$  years,  $SD = 3.70$  years;  $M_{\text{attractiveness}} = 3.43$ ,  $SD = 0.22$ ), and female distractor set ( $M_{\text{age}} = 26.00$  years,  $SD = 4.30$  years;  $M_{\text{attractiveness}} = 3.49$ ,  $SD = 0.20$ ) were matched in attractiveness as rated by this large independent sample (DeBruine and Jones, 2017) of heterosexual Caucasian judges aged between 18 and 35 (all  $t < .48$ , all  $p > .64$ ). Participants rated both same-sex and opposite-sex faces to examine the boundaries of our predicted effects of choice on face preferences (i.e., whether effects were specific to romantic attraction or applicable to social attraction more generally). Such designs are common in research examining whether social attributions of faces are context-specific (see, e.g., Little et al., 2011 for a review).

***Experimental slideshow images: Pilot-test ratings of images of potential dating partners and desserts***

In order to pilot test our choice set slideshow images, we recruited independent samples of thirty-one heterosexual males ( $M_{\text{age}} = 32.87$  years,  $SD = 7.29$  years) and sixty-four heterosexual females ( $M_{\text{age}} = 35.67$  years,  $SD = 9.91$  years) to rate hypothetical dating images of thirty-two females ( $M_{\text{age}} = 25.75$  years,  $SD = 3.8$  years) and forty-one males ( $M_{\text{age}} = 27.12$  years,  $SD = 4.7$  years) respectively. Raters were recruited via Prolific academic and reimbursed the equivalent of £5 per hour.

In order to collate dating images, we recruited volunteers to donate an image of themselves which they would use on their online dating profile, which could be (if they wished) a full-body photograph, provided nobody else was in the picture. The donors of these unstandardized ‘ambient’ photographs were different identities to the standardized face stimuli used before and after our picture slideshows. Note that while ‘ambient’ photographs were used to give an authentic context to our experimental

design (browsing through profile pictures) and converge with models explaining the dimensions underpinning social inferences of faces from standardized photographs (Sutherland et al., 2013; Vernon et al., 2014), we measured responses to standardized face photographs presented before and after these slideshows in order to examine changes in attractiveness judgements of the same identity in the absence of potential artefacts which could reduce the internal validity of our findings (e.g., differences in eye gaze, head tilt, expression, makeup).

A further independent sample (31 females, 33 males;  $M_{age} = 33.58$  years,  $SD = 11.24$  years) were recruited via Prolific academic to rate sixty images of various desserts extracted from Pixabay.com, presented on surveymonkey. Desserts were selected and pilot tested as control stimuli in order to present equally attractive exemplars from the same category which people could think about selecting (or not) while viewing a pictorial slideshow (i.e., variation in images within a given category that also activates an assessment mindset). In all pilot tests of slideshow images (dating images and desserts), images were presented on surveymonkey in the centre of the screen in a randomized order (500 x 600 pixels, with a resolution of 72 pixels per inch). On each trial, using the scale from the International Affective Picture System (Lang et al., 1997), participants were asked how each image made them feel on a 1 to 9 scale on the valence, arousal and dominance dimensions: “happy” (=1) versus “unhappy” (=9), “excited” (=1) versus “calm” (=9), and “controlled” (=1) versus “in-control” (=9). Participants were also asked how attractive each person/dessert was on a 1 (not attractive) to 7 (very attractive) scale. We used this data to create a slideshow of 15 male dating images ( $M_{age} = 26.73$  years,  $SD = 3.37$  years), 15 female dating images ( $M_{age} = 26.33$  years,  $SD = 4.01$  years), and 15 desserts (control stimuli). Critically, each of the three sets were matched in attractiveness (all absolute  $t < 0.69$ ,

all  $p > .49$ , see Table 1 for descriptive statistics). Thus, any differences observed between slideshow conditions can be attributed to the content of the slideshows rather than their attractiveness (i.e., social versus non-social stimuli that are equally attractive).

<INSERT TABLE 1 AROUND HERE>

### ***Experimental procedure***

The experiment consisted of three phases: a pre-slideshow attractiveness-rating task, a pictorial slideshow used to activate a choice context, and a post-slideshow attractiveness-rating task. In the pre-slideshow attractiveness rating task, participants were asked to rate the attractiveness of five female faces and five male faces presented sequentially in the centre of the screen in a randomized order, using the scale 'much less attractive' (=1), 'less attractive' (=2), 'slightly less attractive' than average (=3), 'of average attractiveness' (=4), 'slightly more' (=5), 'more' (=6), 'much more attractive' than average (=7). In the slideshow phase of our experiment, participants were randomly allocated either to our experimental condition (browse through a slideshow of online dating profiles) or our control condition (browse through a slideshow of desserts). Each slideshow consisted of fifteen images from our pilot study presented sequentially in the centre of the screen in a randomized order for four seconds each. For the dating slideshows, participants were allocated to view preferred-sex faces only (i.e., the sex they were attracted to), based on their self-reported sexual orientation. Before the slideshow, participants were informed that they were about to view a slideshow of online dating profiles/slideshow of desserts. We asked them to imagine that they are browsing through this website/these desserts,

thinking about whether they would accept or reject each individual as a dating partner/choose each option to take home with them. They were asked to think for a few moments about this scenario and then imagine themselves in this scenario as they work their way through the images of potential dates/desserts. Immediately following this, in the post-slideshow attractiveness rating task, participants were then shown the 10 familiar/test faces, as seen in the pre-slideshow phase of the experiment, and, to avoid guessing the nature of the study, 10 novel/distractor faces (*sensu* Little et al., 2014). All faces in the attractiveness-rating task were taken from the same image set (see Face Stimuli section) and were presented and rated in an identical manner to the pre-slideshow phase of the experiment.

### ***Data processing and analytical strategy***

Following Little et al. (2014), we calculated each participant's change in preference for familiar faces (i.e., from baseline), by averaging their attractiveness ratings of test faces. Averages were calculated separately for ratings of the five male faces and the five female faces and were also calculated separately for the pre-slideshow phase of the experiment and the post-slideshow phase of the experiment (i.e., four separate average values). In order to test our pre-registered hypotheses, each participant's change in preference was then calculated by subtracting their pre-slideshow score from their post-slideshow score. High scores (i.e., greater than zero) indicate a stronger preference for familiarity in faces. Conversely, low scores (i.e., below zero) indicate a stronger preference for novelty in faces.

In this experiment, we ran three models. A mixed design ANOVA on the dependent variable *change in preference for familiar/test faces*, with the within subjects factor *sex of face* (male faces, female faces), and the between subjects

factors *experimental slideshow condition* (view images of potential dates, view images of potential desserts) and *participant sex* (male, female). Then, further analyses were run on the dependent variable *attractiveness of familiar/test faces* with the same model, but treating *experimental phase* (pre-slideshow, post-slideshow) as a within subjects factor. A third model re-ran this ANOVA with the within subjects factor *face set* (familiar/test face set, novel/distractor face set) in place of the factor *experimental phase*.

## Results

### ***Change in preference for familiar/test faces (i.e., from baseline)***

The first model revealed no significant effects or higher-order interactions (all  $F < 2.46$  all  $p > .11$ , all  $\eta_p^2 < .014$ ).

### ***Examining preferences familiar/test faces before and after slideshows***

The second model revealed a main effect of *sex of face* ( $F(1,184) = 12.53$ ;  $p = .001$ ,  $\eta_p^2 = .06$ ) which was qualified by an interaction with *participant sex* ( $F(1,184) = 4.60$ ;  $p = .033$ ,  $\eta_p^2 = .024$ ). This interaction reflected that while men rated opposite-sex faces ( $M = 3.87$ ,  $SEM = .09$ ) as more attractive than same-sex faces ( $M = 3.54$ ,  $SEM = .10$ ,  $t(92) = 3.64$ ;  $p < .001$ ), women did not rate same-sex faces ( $M = 3.62$ ,  $SEM = .08$ ) differently to opposite-sex faces ( $M = 3.51$ ,  $SEM = .08$ ,  $t(94) = 1.67$ ;  $p = .10$ ). A main effect of *experimental phase* was also observed ( $F(1,184) = 14.57$ ;  $p < .001$ ,  $\eta_p^2 = .07$ ). No other effects or interactions were significant (all  $F < 2.46$  all  $p > .11$ ).

Paired t-tests to interpret the main effect of *experimental phase* revealed that familiar faces were less attractive after our slideshow manipulation ( $M = 3.63$ ,  $SEM =$

.06, BCa 95%CI[3.53,3.75]) than before our slideshow manipulation ( $M = 3.72$ ,  $SEM = .06$  BCa 95%CI[3.61,3.83], absolute  $t(187) = 3.75$ ;  $p < .001$ ,  $r = .14$ ).

### ***Attractiveness of familiar versus novel identities following the choice slideshow***

Rerunning the ANOVA with the within subjects factor *face set* in place of the factor *experimental phase* revealed the same pattern of results as above, with the exception that a main effect of the former factor (face set) was observed in place of the latter (experimental phase) which was no longer part of the model. Paired t-tests to interpret the main effect of *face set* revealed that, after our choice slideshows, participants were more attracted to the novel face set ( $M = 3.73$ ,  $SEM = .05$ , BCa 95%CI[3.63,3.84]) than they were to the familiar face set ( $M = 3.63$ ,  $SEM = .06$  BCa 95%CI[3.53,3.75]; absolute  $t(187) = 3.31$ ;  $p < .01$ ,  $r = .12$ ).

## **Experiment 2**

Our first experiment did not support our pre-registered hypotheses, although familiar faces, in general, appeared to be less attractive after our choice set slideshows than they were before our choice set slideshows (in the absence of any change from a participant's baseline attraction). Familiar faces were also less attractive relative to our novel face image set following the slideshows, even though these two image sets were balanced in attractiveness. The purpose of our second experiment was twofold. First, to examine whether our pattern of results replicated in a larger independent sample of single individuals only, or if this strategy generated results consistent with our original predictions, given that a subtle manipulation related to a dating context would be more salient to single people, and as differences in partnership status may add noise to our model, as it moderates responses to familiarity and/or attractiveness in faces (e.g.,

Karremans et al., 2011; Little et al., 2014). Furthermore, as previously discussed, because choice set size may be important in motivating frugal search strategies (reviewed in Finkel et al., 2012), in addition to activating an assessment mindset in the same way as our first experiment, we also manipulated choice set size more directly by presenting participants with either the same or fewer items (romantic dates or desserts) within slideshows of the same time span.

## **Methods**

### ***Participants***

Four hundred thirty-nine heterosexual individuals (231 of whom were male,  $M_{\text{age}} = 26.38$  years,  $SD = 4.84$  years) were recruited via Prolific Academic (see, e.g., Peer et al., 2017), and reimbursed the equivalent of £5 per hour, with duplicate responses from the same IP address not analysed. An outlier labelling rule was used to exclude participants with long response times (Hoaglin et al., 1986;  $N = 4$ ). Two participants informed us of reporting the wrong sexual orientation and were thus excluded given that the experiment allocated them to a choice context slideshow of their preferred-sex. All cell sizes exceeded 80% power to detect a moderate effect ( $N_{\text{Smallest cell}} = 47$ ) and 90% power when testing pre-registered hypotheses (i.e., that did not take our two new choice set size conditions into account).

### ***Procedure***

The second experiment was identical to the first experiment except that, during the slideshow phase of the experiment, participants were randomly allocated to one of four slideshow conditions ( $N = 104$  dating images-high choice;  $N = 112$  dating images-low choice,  $N = 123$  dessert images-high choice;  $N = 99$  dessert images-low choice).

The high choice slideshows were identical to the initial experiment (15 images). In the low choice slideshows, participants viewed a fixed subset of 5 images from the high choice slideshows in a randomized order during the same 1-minute timespan. The low choice slideshows were matched in mean rated attractiveness to the high choice slideshows (Female slideshow<sub>High</sub> = 3.88, *SD* = .54; Female slideshow<sub>Low</sub> = 3.91, *SD* = .10; Male slideshow<sub>High</sub> = 3.79, *SD* = .50; Male slideshow<sub>Low</sub> = 3.84, *SD* = .19; Dessert Slideshow<sub>High</sub> = 3.75, *SD* = .52; Dessert slideshow<sub>Low</sub> = 3.79, *SD* = .15).

### ***Data processing and analytical strategy***

The second experiment followed an identical analytical strategy to the first experiment, except that *choice condition* (more choice, less choice) was included in our models as an additional between subjects factor. Analyses with the within subjects factor *experimental phase* (pre-slideshow, post-slideshow) were not run here, as this prior analysis was run to establish whether attractiveness ratings differed between the two experimental phases. This motivated the current experiment, where we examine pre-registered predictions in terms of within-subjects changes in attractiveness ratings, on a larger sample of single individuals.

## **Results**

### ***Change in preference for familiar/test faces (i.e., from baseline)***

A main effect of *sex of face* ( $F(1,424) = 4.43$ ;  $p = .036$ ,  $\eta_p^2 = .010$ ) and a main effect of *participant sex* ( $F(1,424) = 5.52$ ;  $p = .019$ ,  $\eta_p^2 = .013$ ) was observed, with no other significant effects or higher order interactions (all  $F < 2.18$ , all  $p > .14$ ). The main effect of *participant sex* reflected that women's attractiveness ratings of familiar faces

decreased from baseline relative to men's attractiveness ratings of familiar faces (absolute  $t(430) = 2.35$ ;  $p = .019$ , see Figure 1a).

***Attractiveness of familiar versus novel identities following the choice slideshow***

We observed a main effect of *sex of face* ( $F(1,424) = 8.79$ ;  $p = .003$ ,  $\eta_p^2 = .02$ ) and a main effect of *face set* ( $F(1,424) = 54.82$ ;  $p < .001$ ,  $\eta_p^2 = .11$ ) that was qualified by an interaction with *participant sex* ( $F(1,424) = 6.15$ ;  $p = .014$ ,  $\eta_p^2 = .014$ ). An interaction between *experimental slideshow condition* and *participant sex* was also observed ( $F(1,424) = 8.33$ ;  $p = .004$ ,  $\eta_p^2 = .019$ ). No other effects or interactions were significant (all  $F < 3.61$  all  $p > .058$ ). The interaction between *face set* and *participant sex* reflected stronger attraction to novel versus familiar faces among male participants ( $M_{\text{Novel}} = 4.02$ , BCa 95%CI[3.88,4.14],  $M_{\text{Familiar}} = 3.82$ , BCa 95%CI[3.71,3.92]; absolute  $t(227) = 7.64$ ;  $p < .001$ ,  $r = .25$ ) than among female participants ( $M_{\text{Novel}} = 3.97$ , BCa 95%CI[3.86,4.07],  $M_{\text{Familiar}} = 3.87$ , BCa 95%CI[3.77,3.97]; absolute  $t(203) = 3.41$ ;  $p = .001$ ,  $r = .12$ , see Figure 1b).

To interpret our higher order interaction between *experimental slideshow condition* and *participant sex*, a final ANOVA was run on the dependent variable *attractiveness of faces after slideshow* (collapsed across face set), separately for male and female participants, with the between subjects factor *experimental slideshow condition*. This analysis revealed that, for men, attractiveness ratings of faces were greater after browsing through dating images ( $M = 4.04$ , BCa 95%CI[3.89,4.18]) than after browsing through dessert images ( $M = 3.78$ , BCa 95%CI[3.63,3.94],  $F(1,226) = 3.76$ ;  $p = .012$ ,  $\eta_p^2 = .027$ ). However, for women, attractiveness ratings of faces tended to be greater after browsing through dessert images ( $M = 4.00$ , BCa 95%CI[3.86,4.14])

than after browsing through dating images ( $M = 3.83$ , BCa 95%CI[3.67,3.99],  $F(1,202) = 2.78$ ;  $p = .097$ ,  $\eta_p^2 = .014$ ), although this difference was not significant.

<INSERT FIGURE 1 AROUND HERE>

### **Experiment 3**

Our second experiment, on single individuals only, revealed a sex difference in preferences for familiar faces following activation of an assessment mindset. Attractiveness ratings of faces on second viewing influenced women's behaviour differently to men's following picture slideshows designed to encourage participants to think about accepting versus rejecting different items. Although this effect was observed across both slideshow conditions (romantic dates and desserts), decision-making can be influenced in much lower stakes choice tasks than selecting a romantic partner (see Scheibehenne et al., 2010), so a null effect of experimental slideshow condition might be deemed consistent with the generality of this effect on the behaviour under study (i.e., profile browsing, having different options, and its hypothesised effects on attractiveness judgements of faces). However, as familiarity generally enhances attractiveness (e.g., Batres et al., 2017; Peskin & Newell, 2004; Rhodes et al., 2001; Sofer et al., 2015), a third experiment was run where we examined familiarity/novelty preferences in the absence of picture slideshows with a choice context, in order that we could make stronger inferences about the effects observed in our first and second experiments in the presence of a general choice context (i.e., effects that were not qualified by the type of slideshow viewed).

### **Methods**

## **Participants**

One hundred thirty heterosexual individuals (64 of whom were male,  $M_{\text{age}} = 23.78$  years,  $SD = 3.68$  years) took part in our third online experiment run via the same recruitment platform. No outlier labelling rule was used here, as potential outliers ( $N = 5$ ) could be an artefact of the time spent during the one-minute break phase of this experiment. Sample size was determined in a manner consistent with our previous experiments, but the overall sample size was smaller as there were fewer between subjects' factors (i.e., with the exception of participant sex).

## **Procedure, data processing and analytical strategy**

The third experiment was identical to our previous experiments, except that, in place of the slideshow phase of the experiment, participants were simply asked to take up to a one-minute break ( $M_{\text{Duration}} = 24$  seconds) before an automatic timer directed them to the second attractiveness rating task. The variable duration of the delay across participants is not a cause for concern as familiarity effects are observed at longer and shorter delays (reviewed in Montoya et al., 2017) and in self-paced tasks involving responses to faces (e.g., Little et al., 2014). We follow the same analytical strategy as in our initial experiment, except that, in its absence, there were no between subjects factors related to slideshows included in our models.

## **Results**

### ***Change in preference for familiar/test faces (i.e., from baseline)***

We observed a main effect of *sex of face* ( $F(1,128) = 9.78$ ;  $p = .002$ ,  $\eta_p^2 = .071$ ), where familiarity was more attractive when judging women's faces ( $M = .08$ , BCa 95%CI[.02,.14]) than when judging men's faces ( $M = -.05$ , BCa 95%CI[-.12,.003],

absolute  $t(129) = 3.12$ ;  $p = .002$ ). No other effects or interactions were observed (both  $F < .54$ , both  $p > .46$ ).

### ***Attractiveness of familiar versus novel identities***

We observed a main effect of *face set* ( $F(1,128) = 13.06$ ;  $p < .001$ ,  $\eta_p^2 = .09$ ) which was qualified by an interaction with *participant sex* ( $F(1,128) = 7.06$ ;  $p = .009$ ,  $\eta_p^2 = .05$ ). No other effects or interactions were observed (all  $F < 2.92$ , all  $p > .09$ ). The interaction between *face set* and *participant sex* reflected that men were more attracted to novel versus familiar identities ( $M_{\text{Novel}} = 3.98$ , BCa 95%CI[3.82,4.14],  $M_{\text{Familiar}} = 3.75$ , BCa 95%CI[3.57,3.90]; absolute  $t(63) = 4.15$ ;  $p < .001$ ,  $r = .25$ ), but women did not differ in their preference for novel versus familiar identities ( $M_{\text{Novel}} = 3.77$ , BCa 95%CI[3.59,3.92],  $M_{\text{Familiar}} = 3.73$ , BCa 95%CI[3.57,3.88]; absolute  $t(65) = .73$ ;  $p = .47$ ).

### ***Rerunning analyses on single individuals***

Analysing data only from individuals not in a romantic relationship (48.5% of sample) generated the same pattern of results, except that, in contrast to our second experiment, no interaction between *face set* and *participant sex* was observed ( $F(1,61) = 1.42$ ;  $p = .24$ ). An interaction between *face set* and *sex of face* was observed ( $F(1,61) = 4.50$ ;  $p = .038$ ), where the sample were more attracted to novel male faces than familiar male faces ( $M_{\text{Novel}} = 4.08$ , BCa 95%CI[3.84,4.30],  $M_{\text{Familiar}} = 3.78$ , BCa 95%CI[3.53,3.99]; absolute  $t(62) = 3.58$ ;  $p = .001$ ,  $r = .22$ ), but did not differ in their preference for novel versus familiar female faces ( $M_{\text{Novel}} = 4.00$ , BCa 95%CI[3.82,4.19],  $M_{\text{Familiar}} = 3.92$ , BCa 95%CI[3.72,4.11]; absolute  $t(62) = 1.23$ ;  $p = .22$ ).

## **Experiment 4**

The results of our third experiment suggest that, in the absence of activating a general choice context (accepting or rejecting romantic dates or desserts), no sex differences in single men versus single women's preference for familiar versus novel faces are observed. The purpose of our final experiment was as follows. First, we examined whether the sex difference observed in Experiment 2 was replicated when our two face image sets were counterbalanced across participants either to be used as familiar/test faces or novel/distractor faces. Replicating the effect in this instance would enable us to make a stronger inference that our findings generalize across different faces, even though the two image sets were balanced in rated attractiveness in Experiments 1-3. Second, as our findings reported thus far are observed across both dating and dessert slideshows, we manipulate choice more directly in this instance by focussing on dating slideshows only, but providing an additional context where participants imagine that those whom they are romantically interested in have either reciprocated or not reciprocated their romantic interest (i.e., 'matched'). Thus, although the effects of 'Choice overload' may be observed regardless of what category of item the person is choosing from (see Scheibehenne et al., 2010 for discussion), this adaptation to our experimental design enables us to directly examine whether a greater or lesser proportion of romantic options moderate attractiveness judgements of familiar versus novel faces, such that greater romantic options orient the user toward novelty versus familiarity.

## **Methods**

### ***Participants***

An independent sample of three-hundred fifty-two single heterosexual individuals (181 males, 171 females.  $M_{\text{age}} = 22.05$  years,  $SD = 3.43$  years) took part in the experiment, with recruitment of participants aged 18-30 inclusive conducted via Prolific Academic. Participants were reimbursed the equivalent of £5 per hour, with duplicate responses from the same device not permitted, and the same strategy used to determine sample size. For transparency, as the same outlier labelling rule used in experiment 2 excluded a large proportion of the sample ( $N = 76$ ), results are reported here before and after outlier exclusion.

### ***Procedure***

Our final experiment consisted of an identical pre-slideshow attractiveness rating phase and identical post-slideshow attractiveness rating phase as used in experiment 2, with the exception that the presentation of face sets was counterbalanced across participants such that half judged one of our two face image sets as the familiar/test image set, with the other face image set acting as the novel/distractor set, and vice versa for the other half of participants. In the slideshow phase of our final experiment, participants viewed the same 15 individuals of their preferred-sex in a randomized order, as used in Experiment 1 and the high choice condition within Experiment 2 (i.e., we did not manipulate choice set size in light of the prior null effect). Participants proceeded through the slideshow with the same dating instructions as used previously, however they were provided with an additional context immediately after viewing the slideshow. Here, participants were randomly allocated to one of two slideshows where their romantic interest was either reciprocated ( $N = 174$ ) or not reciprocated ( $N = 178$ ). Specifically, we informed them:

“You have just spent time thinking about these people as potential dating partners on an online dating website, and whether or not you would accept or reject them. Of those individuals whom you would be romantically interested in, imagine that **ALL/NONE** of them have reciprocated their interest in you (i.e., you have **matched/not ‘matched’** with any of them). Please spend a few moments thinking about how you would feel in this scenario, and proceed to complete the questionnaire on the next page to describe how you would feel in this scenario.”

Participants were then directed to complete the 20-item Positive and Negative Affect Schedule (Watson et al., 1988), by way of a manipulation/engagement check. They were told that the scale consists of a number of words that describe different feelings and emotions, and that they should read each item and mark the appropriate answer (1 = ‘very slightly or not at all’ to 5 = ‘extremely’ scale) according to how they would feel in the online dating scenario described on the previous page. We subtracted the average response to the negatively worded items from the average response to the positively worded items, and confirm that the experimental manipulation directly reduced positive affect in the direction intended (Interest reciprocated  $M = .69$ ,  $SEM = .06$ , Interest not reciprocated  $M = -.27$ ,  $SEM = .08$ ,  $t(306.69) = 9.55$ ;  $p < .001$ ,  $r = .48$ ). Participants then rated familiar/test and novel/distractor faces in the same manner as before (i.e., post-slideshow attractiveness rating phase), and were debriefed and could exit the experiment.

### ***Data processing and analytical strategy***

Data were coded and analysed in an identical manner to Experiments 1 and 2, except that in this instance the between subjects factor *experimental slideshow condition*

consisted of the two levels: interest reciprocated from potential dates, interest not reciprocated from potential dates.

## Results

### ***Change in preference for familiar/test faces (i.e., from baseline)***

No significant effects or interactions were observed (all  $F < 2.72$ , all  $p > .10$ ). Applying the same outlier labelling rule as used previously for long response times (76 cases excluded) revealed an interaction between *participant sex* and *experimental slideshow condition* ( $F(1,272) = 3.90$ ;  $p = .049$ ,  $n_p^2 = .014$ ). Of note, in light of the significant effect of *participant sex* observed in Experiment 2, the equivalent main effect of participant sex observed here would be significant in a one tailed test ( $F(1,272) = 3.01$ ;  $p = .084$ ,  $n_p^2 = .01$ ). No other effects or interactions were significant in the model (all  $F < 1.74$ , all  $p > .18$ ).

Interpreting the significant two-way interaction revealed that while the one-tailed effect of participant sex was in the same direction to that of Experiment 2 (i.e., men were more attracted to familiar faces on second viewing ( $M = .06$ , BCa 95%CI[.01,.10]) than were women ( $M = -.01$ , BCa 95%CI[-.07,.04]), this was qualified by *experimental slideshow condition* such that there was no difference in responses between male ( $M = .03$ , BCa 95%CI[-.03,.10]) and female participants ( $M = .04$ , BCa 95%CI[-.05,.13]) when dating interest was reciprocated (absolute  $t(134) = .17$ ;  $p = .87$ ), however men were more attracted to familiar faces on second viewing ( $M = .09$ , BCa 95%CI[.02,.16]) than women were ( $M = -.05$ , BCa 95%CI[-.12,.01]), when dating interest was not reciprocated (absolute  $t(138) = 2.60$ ;  $p = .01$ ,  $r = .22$ , Figure 2a).

### ***Attractiveness of familiar versus novel identities following the choice slideshow***

Analyses revealed an interaction between *sex of face* and *participant sex* ( $F(1,348) = 4.13$ ;  $p = .043$ ,  $\eta_p^2 = .012$ ), which was qualified by a higher-order three way interaction with *face set* ( $F(1,348) = 4.13$ ;  $p = .043$ ,  $\eta_p^2 = .012$ ). A two-way interaction between *face set* and *experimental slideshow condition* was also observed ( $F(1,348) = 4.32$ ;  $p = .039$ ,  $\eta_p^2 = .012$ ), with no other significant effects or interactions in the model (all  $F < 1.77$ , all  $p > .18$ ).

The only finding within the model that was robust to outlier exclusion was the two-way interaction between *face set* and *experimental slideshow condition* ( $F(1,272) = 6.66$ ;  $p = .010$ ,  $\eta_p^2 = .024$ ) with all other effects and interactions in the model not significant (all  $F < 2.93$ , all  $p > .08$ ). This two-way interaction revealed that participants were more attracted to novel ( $M = 3.80$ , BCa 95%CI[3.66,3.94]) versus familiar faces ( $M = 3.70$ , BCa 95%CI[3.57,3.82]) after their dating interest had been reciprocated (i.e., relatively greater choice, absolute  $t(135) = 2.38$ ;  $p = .019$ ,  $r = .10$ ), but there was no difference in their preference for novel ( $M = 3.80$ , BCa 95%CI[3.67,3.91]) versus familiar faces ( $M = 3.84$ , BCa 95%CI[3.73,3.95]) after their dating interest was not reciprocated (i.e., less choice, absolute  $t(139) = 1.31$ ;  $p = .19$ , Figure 2b).

<INSERT FIGURE 2 AROUND HERE>

## **Discussion**

### ***Summary of findings***

Contrary to our pre-registered predictions, our first experiment did not reveal a decrease from baseline in attractiveness ratings of opposite-sex faces on second viewing, after activating a choice context via pictorial slideshows. Further exploratory analyses suggested that familiar faces were less attractive after our slideshow

manipulation than they were before our slideshow manipulation, demonstrating an effect of when the faces were rated versus a predicted baseline change in individual preferences for faces. Moreover, participants were more oriented toward novel versus familiar faces after our slideshows, even though these two image sets were matched in attractiveness. Our second experiment, on a larger sample of single individuals revealed that unpartnered women, relative to unpartnered men, were less attracted to familiar faces following our slideshow manipulation, with no effect of choice set size (fifteen versus five items to accept or reject) or the content of the slideshow they had just viewed (potential dates versus potential desserts) on face preferences. Moreover, when comparing responses to the two equally attractive face image sets, both men and women were more attracted to the novel versus familiar face image set, with this effect twice as strong in men ( $r = .25$ ) than in women ( $r = .12$ ). Men, in contrast to women, also rated the same post-slideshow face images as more attractive after browsing through dating versus dessert slideshows, suggesting that a dating context motivates men's attraction to faces more generally.

In the absence of a pictorial slideshow designed to activate an assessment mindset (Experiment 3), no sex differences in unpartnered participants' face preferences were observed, which suggests that the experimental context activated generated sex differences in attractiveness perception among unpartnered people, even if it was observed regardless of the type of image they viewed (romantic dates or desserts), or the sex of face they rated before and after our slideshows. Finally, an additional manipulation where participants imagined 'matching' with all (greater choice) or none (less choice) of their desired romantic dates revealed a sex difference in responses to faces following outlier exclusion (Experiment 4). In a one-tailed test, men were more attracted to familiar faces on second viewing than were women, which

was a pattern of results consistent with Experiment 2. However, this sex difference was qualified by the experimental slideshow condition they were allocated to, such that it was present and in the same direction when dating interest had not been reciprocated (less choice, or no romantic ‘matches’), but no sex difference in responses to faces were observed when dating interest had been reciprocated (more choice or success in ‘matching’). Indeed, in this latter scenario, both men and women were more attracted to our novel versus familiar face image set, suggesting that ‘success’ on an online dating site both induces positive affect, as indexed via our manipulation check, but orients dating app users toward novel versus familiar people, consistent with early theorizing (Finkel et al., 2012).

### ***Theoretical implications***

Our findings provide a direct experimental test of some of Finkel and colleagues’ early theorizing on the costs and benefits of online dating sites (Finkel et al., 2012). Namely, how a larger pool of potential dates on an online site can induce an assessment mindset and undermine commitment at different stages of the dating process, such as when browsing profiles or when deciding to ‘commit’ to a second date, as users are oriented toward an ‘optimal’ romantic partner in light of many available alternatives. This can be evidenced by contextual changes in our attraction to the same faces on a second occasion (see Little et al., 2014), and our attraction to familiar faces *relative to* novel faces after experimentally activating a choice context, as facial attractiveness is a critical dimension of face perception and social interaction (reviewed in Little et al., 2011; Sutherland et al., 2013), attractiveness judgements are made in a mandatory fashion (Ritchie et al., 2017), and are important in shaping our motivation to approach or avoid specific people (reviewed in Hahn & Perrett, 2014). Specifically, our research

reveals sex differences in attractiveness judgements that are not moderated by choice set size *per se* when inducing an assessment mindset while browsing through profile pictures (Experiment 2) but are explained by choice set size following *responses* from dating app users, where low choice (i.e., zero 'matches') orients men versus women toward familiarity when rating the attractiveness of faces on second viewing (Experiment 4). Stronger preferences among single women than single men for novelty versus familiarity across these two experiments complements speed dating research on choice sets and women's willingness to say yes to a romantic date (Fisman et al., 2006), where women were less likely to accept a romantic date if they had more romantic options. Researchers could extend our experimental paradigm to examine the extent to which other individual or contextual factors moderate the effects observed here, such as self-rated attractiveness, target attractiveness (e.g., attractive versus average faces), and how social norms may shape dating decisions, such as potential pressures to make dating decisions that vary at different stages of the lifespan.

In general, our findings develop prior work on choice and dating behaviour, which did not control for a participant's baseline attraction when examining similar topics (D'Angelo & Toma, 2017), which was an important control in the current set of experiments, in order to establish whether attractiveness perceptions change in light of contextual information (the online dating environment and the ability to accept or reject people in brief slideshows), independent of the general desirability/attractiveness of the standardized face image. We also develop this literature by distinguishing between the potential effects of an online environment on changes in our attraction to familiar people, and how we evaluate familiar partners relative to novel social partners. Our results showed that novel faces are more

attractive than familiar faces when controlling for attractiveness differences between two image sets (Experiment 1), with this effect stronger in men than women (Experiment 2), and stronger across both sexes following 'success' when matching with others (Experiment 4). Findings from this set of analyses advance the literature on the positive relationship between familiarity and attractiveness (e.g., Batres et al., 2017; Peskin & Newell, 2004; Rhodes et al., 2001; Sofer et al., 2015), by suggesting that user experiences with technology could moderate person perception in light of the presence of alternate social partners within online social networks. Indeed, that greater choice via romantic matching was related to weaker preferences for familiar faces (Experiment 4) directly suggests that online experiences of positive valence may have potentially negative effects on how we commit or remain attracted to familiar people. While some of our findings from these analyses suggest sex-specific and cross-sex effects that may be 'Coolidge-like' in their nature (Little et al., 2014), further work would be required to examine effects of technology on relationship functioning beyond online settings given that, for example, we found no evidence that these contexts moderated men's attractiveness ratings of the same person on second viewing, in the direction predicted. Our design has advantages in establishing the precise nature of 'Coolidge-like' effects in humans moving forward, as it distinguishes between the attractiveness of the same person over time versus the attractiveness of that person relative to others within the population.

### ***Limitations and practical applications***

There are limitations to our research. First, contrary to our pre-registered hypotheses, we did not observe a change in attractiveness judgements that was specific to familiar opposite-sex faces, and the effects observed generalized across both pictures

slideshows where participants could choose between items/people. Although we did not predict this, our findings support Finkel and colleagues' (2012) theorizing, but suggest a general mechanism involved in person perception where the autonomy to choose between items, in and of itself, moderates face/person perception. It is worth noting, however, that our final experiment partly addressed this issue by subtly moderating information provided solely within a dating context (matching or not matching with desired romantic partners), which altered both affect and face perception in ways that were consistent with Finkel and colleagues' theorizing (2012), albeit across both sexes of face evaluated. Thus, further work on assessment mindsets, preferences, and the allocation of online effort to social partners more generally will likely prove fruitful.

Further research could examine relationships between initial social judgements and actual (online or face-to-face) dating behaviours, to elucidate the stage in the user experience to which our research is most directly relevant. As we activated a context relevant to the user experience of online dating for only a brief period, however, and noticed an effect on face preferences, it may well be that effects of real-world interaction and prolonged profile browsing on attractiveness judgements are more substantial, and have a greater effect on subsequent decisions, if such impressions are formed in an involuntary manner (Ritchie et al., 2017) and physical attractiveness motivates further contact in an online dating setting (Finkel et al., 2012). Indeed, our observation of sex differences in attractiveness judgements after activating a choice context raises further questions on how men and women may diverge in their user experience when using online dating apps, if real-world data on the number of contacts initiated versus responses received suggests that women are relatively selective while men 'cast their net out wide', all else equal (see Finkel et al., 2012 for discussion).

Although the purpose of our research was to examine the lower-order socio-cognitive processes involved in online dating interactions, longitudinal research on this topic could build upon our work by examining objective indicators of commitment or effort within a dating context, such as the number of dates or length of courtship, when a relationship moves from online to offline and/or when individuals make decisions pertinent to different stages of a relationship (e.g., the escalation of intimacy, commitment, and marriage). Further research in this area also has general practical application if it provides an evidence base for programmers to add empirically supported algorithms or filters to limit the 'mating pool' to active and single participants, or those genuinely engaged in finding a romantic partner for a given type of romantic relationship, for example.

In our final experiment, it could be argued that matching at levels other than zero percent or 100% success would have greater external validity. Nonetheless, our design objectively manipulated choice, as participants either imagined having romantic options or no romantic options. Indeed, this design was the optimal way to run an experiment comparable to our previous experiments, while controlling for differences between participants in the number of pictured individuals in the slideshows whom they were attracted to. Setting one's popularity or 'matching success' to a given level (e.g., 50%) may have induced noise when participants responded to our task. It is also worth noting that for a given period of time spent online, specific individuals may be very unlikely to receive replies let alone mutual romantic interest (see Bruch & Newman, 2018), so our design has some relevance to real-world behaviour on online dating platforms. Indeed, lack of matching success is one of the primary motives for deleting a dating app (LeFebvre, 2018).

Future work could test our findings via an approach that emphasises external versus internal validity, such as via simulated dating platforms or ‘high stakes’ where there is the option to date a mutual match. It is worth noting however that high external validity can also induce noise or confounds that make interpretation of effects difficult. For example, participants may integrate appearance cues with other profile details, attend to distractors within the simulation or have certain preconceptions of specific dating sites. Our experimental design had high internal validity with the controls we employed, and was ecologically valid insofar as participants had to make relatively quick attractiveness judgements of faces in an online setting, which had an effect on emotion according to the manipulation check within our final experiment.

Finally, while some popular dating platforms have a ‘swipe mechanism’ akin to accepting or rejecting individuals in a one-shot manner (e.g., Tinder, Bumble, Hinge), other platforms do not have this mechanism and instead have a manual browsing feature where users are not directly prompted to make a choice. As our participants were given instructions to imagine accepting or rejecting different individuals/items during slideshows, our findings are potentially applicable across different platforms. Our findings perhaps best speak to the process of inducing an assessment mindset and its effects on attractiveness evaluations during profile browsing when users are considering their options, albeit the decision to commit or remain committed to someone is ultimately resolved when said user no longer has a need to use the dating service. Indeed, being in an exclusive relationship or lack of success in matching are the two primary reasons for deleting a dating app (LeFebvre, 2018). As mentioned previously, our findings suggest a general effect of choice and inducing an assessment mindset on attractiveness judgements of faces when thinking about accepting or rejecting people/items based on physical/surface characteristics alone. This points to

the utility of our paradigm for further research into the internet and social perception more generally, and choice and speed dating (e.g., Lenton & Francescioni, 2011), albeit we found no evidence in our data that choice set size per se influenced attractiveness judgements of faces. We exercise some caution in claiming that our findings will directly generalize to speed dating research, given that dynamic cues presented within these interactions may strengthen or attenuate the effects observed here (e.g., expansive body posture; see Vacharkulksemsuk et al., 2016).

Our pre-registered hypotheses were specific to attractiveness judgements of preferred-sex faces, and were motivated by theory proposing that a wider pool of possible dating partners induces an assessment mindset that orients users toward novel versus familiar partners at various stages of the online dating process (Finkel et al., 2012). However, our research observed a general effect of inducing an assessment mindset (preferred-sex romantic partners and equally attractive dessert items) on social perceptions of both preferred- and non-preferred sex faces. This was observed among individuals not currently in a romantic relationship, where dating motives would be stronger, and even when we provided an additional authentic dating context in our final experiment, by asking participants to think about 'matching' with all versus none of the individuals they previously viewed and were attracted to. Thus, our findings have implications for online dating interactions, and may be particularly relevant to the stage of browsing profile pictures, while the findings of our final experiment corroborated earlier theory (Finkel et al., 2012). However, the nature of our effects suggest that an assessment mindset has implications for online social interaction more generally which should be explored in other contexts too (e.g., allocating effort to familiar versus novel friends).

Of note, observing these effects from brief presentations of picture slideshows, with an accompanying context to imagine, suggests that our effects may well be more substantial in the real world, if individuals use the platform for longer intervals and/or if profile images are accompanied by other cues that evince rewarding online interactions (e.g., emoticons, speedier replies or offers of social contact from novel social partners). Our experiments were suited to examine attractiveness preferences of romantic partners in online environments, given earlier theorizing on the extent to which these environments place a relative emphasis on assessment based on easy-to-verify physical characteristics compared to face-to-face interaction (e.g., in static profile pictures), even though social perceptions of faces would play an important role in both contexts (see, e.g., Hahn & Perrett, 2014; Little et al., 2011; Rhodes, 2006; Todorov et al., 2015 for reviews). The effects we observed in our current set of experiments may well be stronger on platforms that emphasise physical judgements or platforms that may be more popular for short- versus longer-term relationships (e.g., Tinder versus Match, see, e.g., Silva et al., 2018 for discussion). While these effects may also may be accentuated prior to an individual making use of a matching algorithm, because they are exposed to a wider range of profile pictures before completing questionnaires to filter users based on similarity, it is possible that engaging with algorithms fosters self-determination in and of itself (see Tong et al., 2016 for discussion). This may parallel the current manipulation, where individuals think about accepting versus rejecting people/items, and where choice set size did not alter social judgements in Experiment 2. Finally, while our paradigm examines attractiveness perceptions of familiar faces after our manipulation (i.e., previously encountered versus new faces), it would of course be fruitful to also manipulate the extent to which additional traits in a profile picture or text-based biography are common

versus rare compared to the average within a choice set, given the different information presented across different platforms, and current knowledge on desirable traits in dating profiles (e.g., related to a healthy lifestyle, engagement with outdoors, and creativity; Lee et al., 2019). Ultimately, these and related questions could be addressed if dating companies subject their algorithms, and data on user behaviours, to empirical scrutiny (see Finkel et al., 2012 for discussion).

## **Conclusions**

In sum, our experiments suggest that choice alters social and romantic attraction to others, which may be relevant in the design of, and experience with, online dating sites. People are more attracted to novel faces than they are attracted to familiar faces when romantic interest is reciprocated. We found no evidence that men are less attracted to the same person after activating an experimental choice context, while women tend to be less attracted to the same person after activating an experimental choice context. Differences in attractiveness judgements moderated by technology may nudge people toward or away from certain decisions or underpin romantic outcomes when using online platforms to find a romantic partner.

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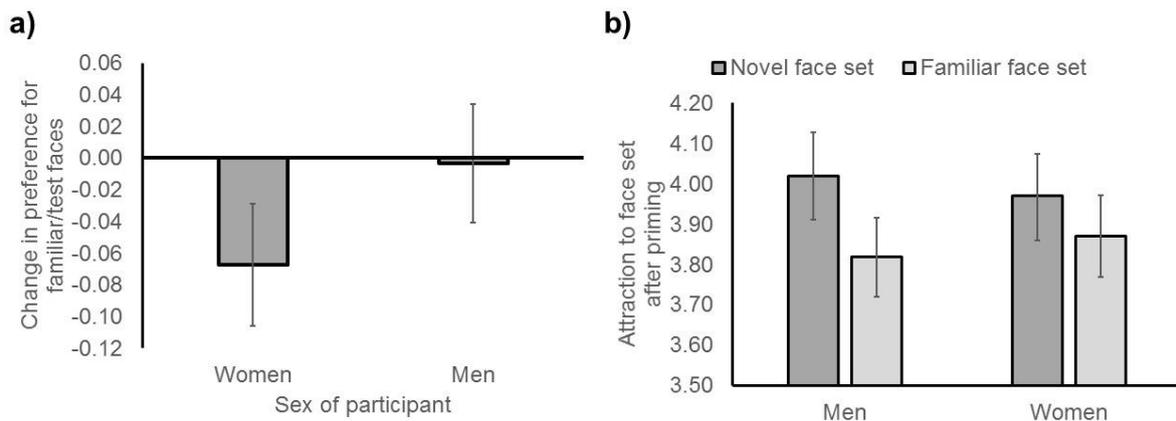
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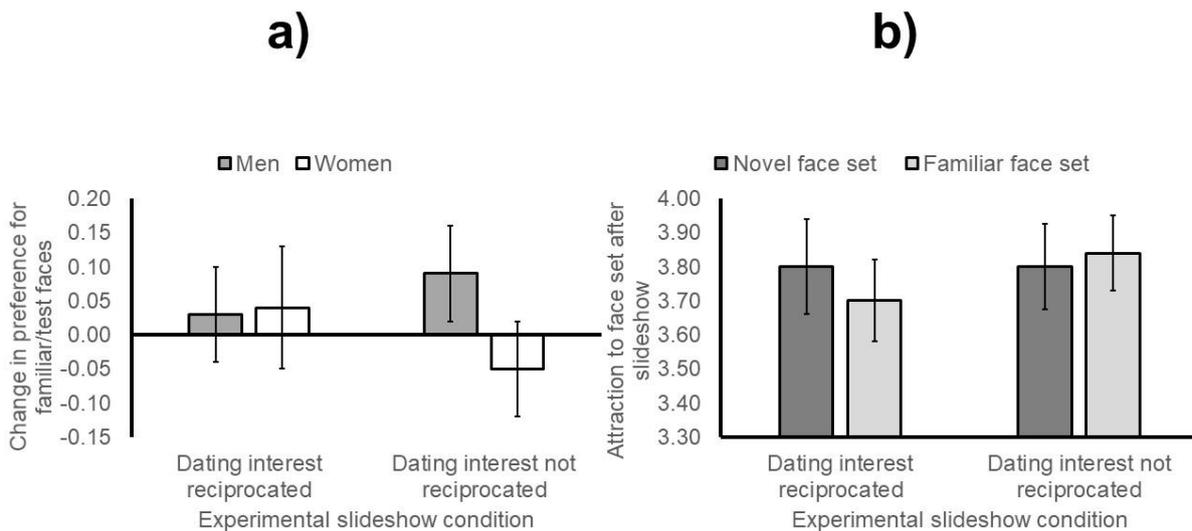
## Tables and figures

**Table 1.** Pilot ratings of slideshow stimuli (SD in parentheses)

	Attractiveness	Valence	Arousal	Dominance
Male dating images	3.79 (.50)	4.15 (.39)	4.82 (.37)	5.21 (.20)
Female dating images	3.88 (.54)	4.56 (.25)	4.97 (.38)	5.07 (.21)
Control images (desserts)	3.75 (.52)	4.87 (.34)	5.12 (.31)	5.44 (.23)



**Figure 1.** Panel a. Women's but not men's preference for familiar faces decreases from baseline. Panel b. A stronger effect of activating a choice context on single men's attraction to novel versus familiar faces ( $r = .25$ ) than single women's attraction to novel versus familiar faces ( $r = .12$ ). Error bars show 95%CI.



**Figure 2.** Less choice (dating interest not reciprocated) moderates the sex difference reported in Experiment 2, where men are more attracted to familiarity than are women (attractiveness ratings of faces on second viewing, panel a). Greater choice (dating

interest reciprocated) orients dating app users toward novelty versus familiarity (preference for novel versus familiar face image set following slideshow, panel b).