Preferences for facial femininity/masculinity across culture and the sexual orientation spectrum

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Abstract

Judgments of attractiveness have many important social outcomes, highlighting the need to understand how people form these judgments. One aspect of appearance that impacts perceptions of attractiveness is facial femininity/masculinity (sexual dimorphism). However, extant research has focused primarily on White, Western, heterosexual participants' preferences for femininity/masculinity in White faces, limiting generalizability. Indeed, recent research indicates that these preferences vary by culture, and other work finds differences between gay/lesbian and heterosexual individuals. Aspects of identity such as culture and sexual orientation do not exist in isolation from one another, but rather intersect, leaving a critical gap in understanding. Our research therefore bridged across these hitherto separate areas of inquiry to provide a more comprehensive understanding of facial femininity/masculinity preferences. We tested how White British and East Asian Japanese individuals' culture and sexual orientation (including, crucially, bisexual individuals) predict their femininity/masculinity preferences for White and East Asian women's and men's faces, using two experimental tasks (forced-choice, interactive). Results show that individuals' culture and sexual orientation consistently interact to predict their preferences for femininity/masculinity in women's and men's faces, and we furthermore reveal bisexual individuals' preferences to differ from those of other sexual orientations. We also find differences between experimental tasks, with greater preferences for femininity emerging in the interactive task, compared to the forced-choice task. Altogether, our findings highlight the importance of considering intersecting identities, consequences of methods of measurement, and shortcomings of extant explanations for preferences for facial femininity/masculinity.

Key words: attractiveness, sexual dimorphism, culture, sexual orientation, face perception

Public Significance Statement

This research tested how people's culture (British, Japanese) and sexual orientation (bisexual, gay/lesbian, heterosexual), as well as faces' gender (women, men) and ethnicity (East Asian, White), predicted how much femininity or masculinity people found most attractive in faces. The results showed that multiple aspects of a person's identity (such as their culture and their sexual orientation) simultaneously influence what they find most attractive in others' faces – people of different cultures and sexual orientations showed different preferences. Our findings also provide the first evidence of what bisexual women and men find attractive in faces, as bisexual people are often excluded from research on attraction and relationships. Finally, we showed that how people are asked about their preferences matters: People show stronger preferences for femininity when they can manipulate how feminine versus masculine a face looks along a continuum than when they are asked to choose between a feminized and a masculinized face.

Preferences for facial femininity/masculinity

across culture and the sexual orientation spectrum

People form judgments of others' attractiveness rapidly and automatically (e.g., Ritchie et al., 2017; Willis & Todorov, 2006). These judgments have a range of significant downstream consequences, with attractive individuals benefiting from, for example, a broad halo effect (Dion et al., 1972) and more positive hiring and career outcomes than less attractive individuals (Hosoda et al., 2003). Perhaps most salient, attractiveness judgments inform decisions in the romantic and sexual domain (e.g., Perrett, 2010). Given these critical social consequences, it is crucial to understand what drives impressions of attractiveness.

Extant work demonstrates that one aspect of appearance that impacts perceptions of attractiveness is facial sexual dimorphism. Facial sexual dimorphism refers to the average differences in facial appearance between women and men, which arise due to the influence of sex-specific steroid hormone levels during puberty. A face that is more typical of women (compared to men) is considered more "facially feminine," whereas a face that is more typical of men (compared to women) is considered more "facially masculine." Facial sexual dimorphism usually is conceptualized as a single dimension, defined by the shape differences between the average female and the average male face shape (and is thus different from gender-identity related concepts of femininity and masculinity, as well as perceptual ratings of femininity and masculinity, see e.g., Holzleitner et al., 2014). Throughout this manuscript, we use "feminine/masculine" or "femininity/masculinity" to refer to sexually dimorphic shape of women's and men's faces. Research shows that, on average, men prefer feminine women's faces, whereas women's preferences for men's faces are less clear-cut (see, e.g., Little, 2014; Little et al., 2011). However, previous research has largely focused on

preferences (i.e., evaluations of attractiveness)[1] among White, Western, heterosexual individuals and primarily used White face stimuli (like much face perception research; Cook & Over, 2021), raising questions regarding the generalizability of these findings and leaving a substantial knowledge gap.

Indeed, research in non-Western cultures indicates that facial femininity/masculinity preferences vary across cultures. For example, extant work has shown a preference for more feminine faces among Japanese versus White British participants (e.g., Marcinkowska et al., 2014; Perrett et al., 1998; see also Nakamura & Watanabe, 2019). Other research shows substantial variation in facial femininity/masculinity preferences across cultures varying in their economic development (e.g., industrialization, urbanization; Scott et al., 2014) or ecological conditions (Marcinkowska et al., 2019). Furthermore, research shows preferences vary by sexual orientation and gender. For example, gay men prefer less feminine women's faces and more masculine men's faces compared to heterosexual men, and lesbian women prefer less feminine women's faces and less masculine men's faces compared to heterosexual women (Shiramizu et al., 2020, 2021). Additionally, lesbian women prefer less feminine women's faces compared to heterosexual men, and gay men prefer more masculine men's faces than heterosexual women do (Glassenberg et al., 2010). Specific degrees of sexual attraction (vs. self-identified sexual orientation category) also affect preferences: Self-identified heterosexual women's degrees of self-reported sexual attraction to women and men respectively negatively and positively predict their preferences for masculinity in men's faces (Batres et al., 2020). Although each of these findings valuably demonstrates variability in facial femininity/masculinity preferences, they leave understanding of these preferences incomplete.

[1] Throughout the manuscript, we use the term "preference" to denote the evaluation of a face as most attractive or more attractive than an alternative face, due to its degree of femininity or masculinity.

Research is therefore needed to unify these hitherto separate areas of inquiry, to expand their scope, and to ensure a more generalizable understanding of facial femininity/masculinity preferences. To date, no research has explored how sexual orientation and culture interact in predicting perceptions of facial attractiveness and thus whether cultural variations are consistent across sexual orientation and vice versa. Yet, this is crucial to understand, as identities (e.g., culture, sexual orientation, gender) do not exist independently from one another, but rather intersect (e.g., Hudson & Ghani, 2023; Parks et al., 2004). A further critical gap is the widespread exclusion of bisexual individuals from extant research. Although a growing body of research has examined non-heterosexual individuals' preferences for own-gender faces, it has largely not differentiated between gay/lesbian and bisexual individuals (Zhang, 2022; Zheng, 2019; Zheng & Zheng, 2015, 2016). Only two recent studies specifically compared bisexual and gay men's preferences for men's faces (Zheng, 2021; Zheng & Zhang, 2021), leaving understanding of bisexual individuals' preferences critically underexplored. Related to this is the question of whether sexual attraction to women and men (i.e., sexual orientation assessed continuously rather than categorically, as in Batres et al., 2020) may more clearly predict preferences for facial femininity/masculinity than sexual orientation categories (e.g., bisexual, gay/lesbian, heterosexual) do.

Finally, there are methodological limitations to existing research on femininity/masculinity preferences. Most research has used forced-choice designs, typically a two-alternative forced choice (2AFC) task to test preferences for feminized versus masculinized transforms of faces (e.g., Jones et al., 2018; Welling et al., 2007). However, presenting participants with a choice of two images means it is impossible to tell whether a face was chosen because it was perceived as *attractive* or simply the *less unattractive* of the pair – that is, it cannot distinguish between a preference for one face versus an aversion to the

other (e.g., Holzleitner & Perrett, 2017; Jones et al., 2013). In a 2AFC design, measured preferences depend on the context of the respective face identity. This might be especially critical since manipulations do not account for face identities' starting levels of femininity/masculinity. Recent research furthermore shows that face judgments from 2AFC designs do not necessarily generalize to other face judgment tasks (e.g., ratings of unmanipulated faces; Dong et al., 2023; Jones & Jaeger, 2019; Lee et al., 2021).

The Current Research

The current research aimed to address these substantial gaps in the literature and to improve on experimental paradigms and measures to gain a more comprehensive and generalizable understanding of facial femininity/masculinity preferences. To do so, we tested femininity/masculinity preferences in bisexual, gay/lesbian, and heterosexual women and men across two cultures, the UK and Japan, who all judged White and East Asian women's and men's faces—providing insight into how attractiveness judgments vary across multiple social group memberships. We chose to compare the UK and Japan, as these nations differ on a variety of cultural measures (e.g., Hofstede, 1984; Schwartz, 1999), as extant research has tested preferences among heterosexual participants in each of these countries (providing a point of comparison for our results), and as there is a broad lack of research about sexual minorities in Japan (where attitudes toward homosexuality are more negative than in the UK, e.g., Furnham & Saito, 2009).

We also used more comprehensive measures to investigate the effect of sexual orientation on face preferences. In addition to participants' self-identified sexual orientation category (bisexual, gay/lesbian, heterosexual), we analyzed a continuous measure of sexual orientation: self-reported attraction to women and men. Such a measure could reveal nuances in preferences within sexual orientation categories.

Finally, we tested femininity/masculinity preferences in faces using two different experimental tasks. First, we included a traditional 2AFC task, to directly compare our findings with extant research. We supplemented this with a second task, in which participants interactively manipulated faces' femininity/masculinity to optimize facial attractiveness, allowing for a more fine-grained analysis of preferences (e.g., Perrett et al., 1998).

In summary, the current work enabled a test of how perceivers' culture and sexual orientation (measured as a sexual orientation category and as sexual attraction to women and men) as well as faces' gender and ethnicity predict preferences for femininity/masculinity. This provides a more comprehensive understanding of both (a) the relationship between facial femininity/masculinity and attractiveness judgments and (b) how perceivers' and faces' intersecting identities predict a consequential social judgment.

Hypotheses

Although this research was largely exploratory, we did preregister several hypotheses (https://osf.io/7gmnf). First, we anticipated replicating cultural and face gender differences in femininity/masculinity preferences demonstrated in previous research. Specifically, we anticipated greater preferences for femininity among Japanese than British participants (H1) and greater preferences for femininity in women's than men's faces (H2). Furthermore, we expected that British participants would show a clear preference for femininity in women's faces (H3a) and no preference for masculinity (and possibly a slight preference for femininity) in men's faces (H3b; e.g., Glassenberg et al., 2010; Little, 2014). We anticipated that Japanese participants would show a clear preference for femininity in women's faces (H4a) and a preference for femininity in men's faces (H4b), replicating existing findings (e.g., Nakamura & Watanabe, 2019; Perrett et al., 1998).

We expected to replicate differences between heterosexual and gay/lesbian participants in extant research, at least among British participants: We anticipated that

compared to heterosexual men, gay men would show lower preferences for femininity in women's faces (H5a) and greater preferences for masculinity in men's faces (H5b; Shiramizu et al., 2020), and, compared to heterosexual women, lesbian women would show greater preferences for femininity in men's faces (H6a) and lower preferences for femininity in women's faces (H6b; Shiramizu et al., 2021).

Various key effects remained exploratory, and we thus present them as research questions[2]: As bisexual individuals' preferences are hitherto largely unexplored, we wondered whether any of gay/lesbian individuals' preferences (or specifically, *differences* between their preferences and those of heterosexual individuals) might generalize to bisexual individuals, or alternatively, whether any of heterosexual individuals' preferences might generalize to bisexual individuals (RQ1). We additionally tested whether sexual attraction to women and men might have similar predictive effects as sexual orientation category (RQ2). The possible interaction between culture and sexual attraction/orientation posed the question of whether effects of sexual attraction/orientation would generalize across culture (RQ3). Finally, we explored whether patterns of results generalized across face ethnicity (i.e., tested for interactions with face gender, participant culture, and participant sexual attraction/orientation; RQ4) and whether results from the often-used 2AFC task would generalize to the interactive preference task (RQ5).

Lastly, we planned to test whether participant age, own attractiveness, relationship status, or relationship quality moderated any results. For participant age, own attractiveness, and relationship status, we anticipated patterns among heterosexual women similar to those found in previous research—i.e., greater preferences for masculinity in men's faces among older women (H7a; DeBruine et al., 2006), women who consider themselves more attractive

[2] Note that for clarity we frame these here as research questions related to generalizability but presented them simply as exploratory analyses in our preregistration.

(H7b; e.g., Batres et al., 2020; Docherty et al., 2020; Holzleitner & Perrett, 2017; Kandrik & DeBruine, 2012; Little et al., 2001; Marcinkowska et al., 2021; but see Penton-Voak et al., 2003), and single women (H7c; e.g., Little et al., 2002; Sacco et al., 2012; but see Holzleitner & Perrett, 2017). Whether these patterns would extend beyond heterosexual women remained exploratory.

Method

Transparency and Openness

We preregistered this research (https://osf.io/7gmnf). All data, analysis code, and materials can be found on the Open Science Framework at https://osf.io/5kepz/.

Participants

We aimed to recruit 1,110 British and 1,110 Japanese participants (aged 18-40), a sample size that, along with our sample of stimuli, would be highly powered to detect small effects, including interactions, in the planned cross-classified multilevel model analyses (Judd et al., 2017; Westfall et al., 2014). We aimed for participants within each culture to be split by gender (women, men) and sexual orientation (bisexual, gay/lesbian, heterosexual) as evenly as possible (i.e., 185 participants per cell). Within each culture, we recruited only members of one ethnic group for clearer cross-cultural comparison (e.g., to reduce possible noise due to a more ethnically diverse sample in the UK vs. Japan) and specifically recruited only majority ethnic group members (White and East Asian, respectively) in each culture for practicality of participant recruitment. We recruited all participants online and received ethical approval from the University of the West of England, Bristol.

British Participants

We recruited British participants via Prolific Academic, using the platform's pre-screening filters to specifically recruit samples of each gender and sexual orientation category, also specifying British nationality and White ethnicity. A total of 1,018 participants

(M_{age} = 29.29 years, *SD* = 6.04 years) completed the study and passed data quality checks and exclusions (167 bisexual women; 165 bisexual men; 154 lesbian women; 162 gay men; 188 heterosexual women; 182 heterosexual men; see Figure S1 in Supplemental Materials for sexual attraction distributions by sexual orientation category and Data Exclusions section below for details on exclusions).

Japanese Participants

We recruited Japanese participants using the Japanese recruitment platforms Lancers. We successfully recruited the sample of heterosexual participants in this manner but had very low response rates for bisexual and gay/lesbian participants. We therefore turned to CloudResearch to recruit these groups. Data from 574 participants (M_{age} = 38.05 years, *SD* = 10.48 years; 90 bisexual women; 71 bisexual men; 20 lesbian women; 48 gay men; 171 heterosexual women; 174 heterosexual men; see Figure S1 for sexual attraction distributions by sexual orientation category) remained after data exclusions. This number was lower than planned due to the increased cost of participant recruitment through CloudResearch and the extremely low response rate from gay/lesbian participants but still provided sufficient power for the planned analyses (PANGEA power calculator; Westfall, 2016). Note also that by using mixed effect models, our analyses control for variability across participants.

Stimuli

Using publicly available face stimuli from the Chicago Face Database (Ma et al., 2015), we created feminized and masculinized versions of White and East Asian women's and men's faces.[3] We used 160 individual face identities (40 per gender and ethnicity; aged 18-40), a much larger and more diverse set of stimuli than that used in previous work (e.g., Shiramizu et al., 2020: 20 White women and 20 White men; Glassenberg et al., 2010: 5

[3] The Chicago Face Database defines ethnicity simply as "Asian", but we chose our face stimuli from a subsample of face identities who could reasonably be perceived as East Asian, as determined by the third author and checked by the first author.

White women and 5 White men). We selected a random sample of faces that matched our inclusion criteria for ethnicity, gender, and age, and ensured that these faces did not substantially differ in age or attractiveness by ethnicity within each gender, using the norming data available in the Chicago Face Database (code for stimulus set selection available on the OSF: https://osf.io/fdrq2/). Then, using established and widely used computer-graphic methods (Tiddeman et al., 2001), we objectively manipulated the femininity/masculinity of each face identity. Specifically, we first created one female and one male composite face (based on the total of 80 women and 80 men in the sample), and then calculated the linear differences in 2D shape between these female and male composites.

To create the stimuli for the 2AFC task, we respectively subtracted and added 50% of the average shape difference between women and men to each face identity to create feminized and masculinized versions of each face. To create the stimuli for the interactive task, we created an image sequence that ranged between more extreme feminized and masculinized endpoints of −100% to +100% (in steps of 5%) for each of the 160 face identities (similar to Holzleitner & Perrett, 2017). We delineated and processed images using the *R* package *WebmorphR* (DeBruine, 2022). Delineation templates and scripts used to create stimuli are available on the OSF (https://osf.io/fdrq2/). Resulting face stimuli are available on the Chicago Face Database resources page (https://www.chicagofaces.org/resources/).

Measures and Procedure

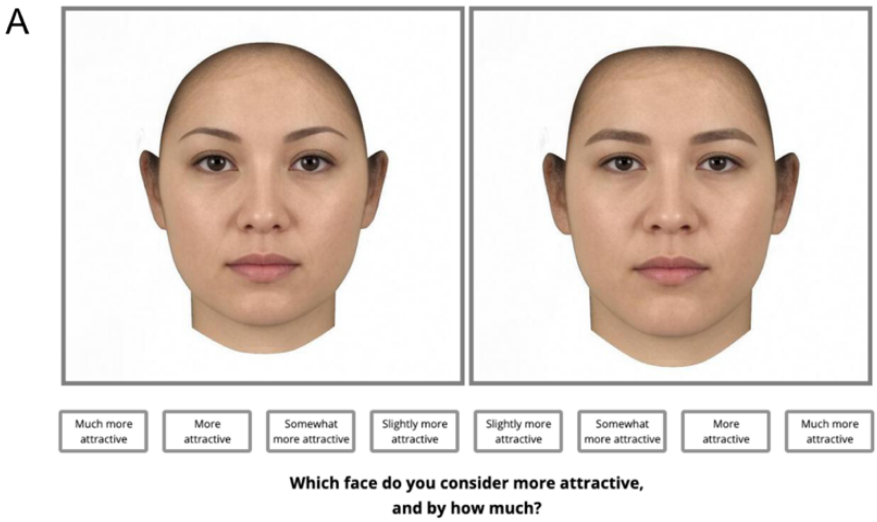
Following informed consent, each participant completed two femininity/masculinity preference tasks in a counterbalanced order using Pavlovia (https://pavlovia.org). In the 2AFC task, participants viewed a +50% feminized morph alongside a +50% masculinized morph of the same face identity and indicated which of the two they considered more attractive on a Likert-type scale from 1 ([*left face] much more attractive* to 8 ([*right face]*

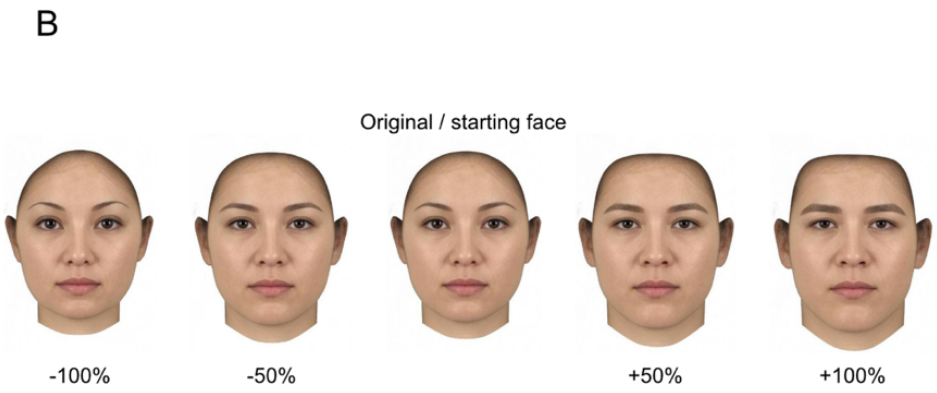
much more attractive; similar to Boothroyd et al., 2005; Shiramizu et al., 2020; see Figure 1A or https://osf.io/69e3v for a screen capture). The side of the screen on which the feminized versus masculinized versions of each face appeared was randomized on each trial.

In the interactive preference task, participants changed the femininity/masculinity of presented faces by moving their mouse over the face. Participants viewed the same face identities as in the 2AFC task, but for each face scrolled through the −100% to +100% image sequence and hit the spacebar when they found attractiveness to be highest (see Figure 1B or https://osf.io/52p7g for a screen capture). In both tasks, participants viewed all 160 face identities, which were blocked by gender and ethnicity, with the order of these blocks and the trials/face identities within them randomized.

Figure 1

Example Trials for the (A) 2AFC Task and (B) Interactive Preference Task





Note. Faces are composite images made for illustration purposes and do not depict any one individual. In the 2AFC task, participants were presented with a feminized and masculinized version of each face identity; in the interactive preference task, participants were presented with the unmanipulated face identity and increased or decreased facial femininity/masculinity by moving their mouse towards the left or right.

After completing both preference tasks, participants reported their age (free response), sexual orientation category (*bisexual, gay/lesbian, heterosexual/straight, other sexual orientation*), degree of sexual attraction to women, and, separately, to men (each from 1-*not at all* to 7-*very much*), gender (*woman, man, nonbinary, my preferred terms are not listed*), race/ethnicity (*East Asian, White/White British, other*), and nationality (*British, Japanese, other*). They also reported their relationship status (*single* or *in a relationship*), and how committed and happy they were in their relationship (each from 1-*not at all* to 7-*very*), similar to Batres et al. (2020). Participants then self-reported their face, body, and overall attractiveness (from 1-*extremely unattractive* to 10-*extremely attractive*, responding to questions on how attractive they think they are, how attractive they think female peers find them, and how attractive they think male peers find them; Perilloux et al., 2013).[4]

[4] Participants could select "prefer not to answer" or skip any question they did not wish to answer. If participants selected "other" as a response to any questions, they were asked to specify, if they were willing (i.e., they could skip this).

Finally, all participants answered a data quality check question (asking if they responded honestly or if they just tried to get through the study quickly) before debriefing; to encourage honest responses, participants were assured their responses would not affect their compensation. At debriefing, participants had the option to revoke their consent and remove their data. All instructions and questions appeared in English for the British participants and in Japanese for the Japanese participants. All materials, data, and analysis scripts can be found on the OSF (https://osf.io/5kepz/).

Data Exclusions

We excluded the data of participants who asked for their data to be removed after debriefing (n = 10) and whose responses suggested a lack of attention, i.e., participants who reported trying to get through the study quickly rather than responding honestly (n = 31), responded overly consistently on the 2AFC task (75% or more of responses the same in any block; n = 64), and responded overly quickly on the interactive preference task (average response time of 200 ms or less; n = 17). We also excluded participants who reported a gender other than *woman* or *man* (n = 39), a sexual orientation other than *bisexual, gay/lesbian*, or *heterosexual* (n = 43), and race/ethnicity and nationality other than White and British or East Asian and Japanese (n = 22).[5]

Analysis Plan

We used cross-classified multilevel modelling (MLM) in *R* 4.3.1 (R Core Team, 2023) using the packages *lme4* (version 1.1-33; Bates et al., 2015) and *lmerTest* (version 3.1-3; Kuznetsova et al., 2017). We included random intercepts for face identities and participants and random slopes for face gender, face ethnicity (each grouped by participant),

[5] We preregistered that we would exclude participants who reported demographic information at the end of the study that did not match their pre-screening demographics (e.g., on Prolific). Since we did not have pre-screening demographic information for all participants (e.g., those recruited on Lancers), we did not apply this exclusion criterion but instead excluded participants who reported demographic data at the end of the study that did not match our inclusion criteria. We also planned to exclude data from the interactive preference task based on a limited range of movement, but instead opted to base exclusions on response speed.

and participant culture (grouped by face identity).[6] We ran separate models for each participant gender (women, men),[7] for each of the two tasks (2AFC, interactive preference), and for each of the two measures of sexual orientation (sexual attraction, sexual orientation category), i.e., eight models in total.

Our outcome variables were preferences in the 2AFC task and preferences in the interactive preference task. For the 2AFC task, we centered original responses on the 1-8 scale so that negative values corresponded to a preference for feminized over masculinized faces, and positive values to a preference for masculinized over feminized faces (with higher numbers representing a stronger relative preference). We then scaled responses from −100 to +100 to make preferences comparable to those measured in the interactive preference task. For the interactive preference task, we converted the chosen frame in any given trial to the corresponding level of femininity/masculinity (the point in the −100% to +100% range), so that negative values again corresponded to a preference for feminized faces, and positive values to a preference for masculinized faces (with higher negative or positive numbers representing a preference for more femininity or masculinity, respectively).

In our primary preregistered analysis, the predictors were participant culture (British, Japanese), face ethnicity (East Asian, White), face gender (women, men), all of which we effect coded, and participant sexual orientation category (deviation coded with heterosexual as the reference category, as most is currently known about heterosexual individuals' preferences) or sexual attraction to women/men. Rather than treating attraction to women and attraction to men as separate predictors, we combined them into a single variable of relative

[6] Participant culture (Japan, UK) also encompasses participant ethnicity (East Asian, White). Including random slopes for participant sexual orientation led to model nonconvergence.

[7] Because extant work has established that women and men differ in their preferences for facial femininity/masculinity, our primary interest was to explore within-gender differences by participant sexual orientation/attraction and culture, and face gender and ethnicity. We therefore ran separate models for each participant gender (vs. including participant gender as a predictor) to reduce the complexity of our analyses.

sexual attraction by subtracting attraction to women from attraction to men and then grand mean centering this value (note that when we refer to "sexual attraction" henceforth, we mean *relative* sexual attraction; see Figure S2 for sample distribution of sexual attraction by sexual orientation category). We did so to avoid issues with multicollinearity, to ease interpretation of results, and because Batres et al. (2020) found the two to have opposing effects.[8]

In an unplanned exploratory analysis, we next assessed whether mean preferences differed for the two experimental tasks by examining simplified models in which the only predictor was the type of experimental task. As preregistered, we also tested participant age, self-rated attractiveness, relationship happiness and commitment (each grand mean centered), and relationship status (effect coded) as moderators of participants' preferences. In a final unplanned step, we also tested whether face identities' initial level of femininity/masculinity (i.e., prior to experimental manipulations) affected preferences for femininity or masculinity.

Results

We first report the results of our primary analysis, in which we tested participant culture, participant sexual attraction/orientation, face ethnicity, and face gender as predictors of women's and men's preferences in each of the two experimental tasks and for sexual attraction versus orientation. We focus on the highest-order effects that appeared consistently across models. We next report the results of the exploratory analyses, examining whether preferences differed by experimental task and whether participants' age, attractiveness, relationship status, relationship quality, and faces' initial level of femininity/masculinity moderated preferences. Table 1 broadly summarizes the results in terms of our hypotheses and research questions.

[8] In our sample, attraction to women and men were strongly negatively correlated, $r(1586) = -.72$, 95% CI[-.74, -.69], $p < .001$, though the strength of this correlation varied between participant cultures and sexual orientation categories (see Figure S3).

Table 1

Summary of Support for Hypotheses and Answers to Research Questions

Hypothesis/ Research Question	Result
H1-7	Supported (i.e., previous effects replicated).
RQ1	In the UK, bisexual and lesbian women's preferences similarly differed from heterosexual women's preferences. In Japan, bisexual and lesbian women's preferences for women's faces similarly differed from heterosexual women's preferences, whereas bisexual and lesbian women's preferences for men's faces showed opposing differences from heterosexual women's preferences. In the UK and Japan, bisexual and gay men's preferences for women's faces similarly differed from heterosexual men's preferences. Bisexual and heterosexual men showed similar preferences for men's faces.
RQ2	Sexual attraction had similar predictive effects as sexual orientation category but obscured nuances in bisexual individuals' preferences.
RQ3	Effects of sexual attraction/orientation largely generalized across culture (albeit with variations in magnitude), with the exception of patterns for bisexual women's preferences for men's faces.
RQ4	Patterns generalized across face ethnicity, but face ethnicity did moderate the main effect of face gender and, in the interactive preference task, of participant culture.
RQ5	There was a stronger preference for femininity in the interactive preference task compared to the 2AFC task.

Primary Analysis

The full results of each model appear in Tables S1-S4 in the Supplemental Materials. Table 2 provides a simplified summary of all effects.[9] Please note that each column represents a different model, and for models including sexual orientation category, there were two contrasts: bisexual vs. heterosexual and gay/lesbian vs. heterosexual.

In the following, we focus on the highest-order effect which emerged consistently across participant gender, experimental task type, and measure of participant sexual

[9] Results hold when controlling for participant age (which did differ by participant culture, as it was not possible to pre-screen Japanese participants by age; see Figure S4 in Supplemental Material for sample age distributions).

attraction/orientation (i.e., across the different models), indicating its robustness: an interaction of face gender × participant culture × participant sexual attraction/orientation (which addressed RQs 1, 2, and 3). This interaction qualified main effects of both participant culture (greater preferences for femininity among Japanese than British participants, supporting H1) and face gender (greater preferences for femininity in women's than men's faces, supporting H2; see Figure S5 in Supplemental Material), and two-way interactions between face gender and participant culture (supporting H3 and H4; see Figure S6) and between face gender and participant sexual attraction/orientation (supporting H5 and H6 and addressing RQs 1 and 2; see Figure S7). We then report effects involving face ethnicity (addressing RQ4), which were not qualified by the face gender × participant culture × participant sexual attraction/orientation interaction.

Table 2

Summary of Effects Across Participant Gender, Experimental Tasks, and Measures of Sexual Attraction/Orientation

	Female participants					Male participants				
	2AFC			Interactive Preference		2AFC			Interactive Preference	
	Sexual Attraction	Sexual Orientation		Sexual Attraction	Sexual Orientation	Sexual Attraction	Sexual Orientation		Sexual Attraction	Sexual Orientation
		bisexual vs hetero	lesbian vs hetero		bisexual vs hetero lesbian vs hetero		bisexual vs hetero	gay vs hetero		bisexual vs hetero gay vs hetero
Face gender *H2*	17.9	17.3		14.4	13.3	17.1	17.1		19.9	19.6
Face ethnicity	ns	ns		ns	ns	ns	ns		ns	ns
Participant culture *H1*	6.4	6.7		9.4	10.3	3.0	2.6		4.4	ns
Participant sexual attraction / orientation *RQ1, RQ2*	ns	ns	ns	ns	ns ns	1.1	4.8	10.1	1.7	6.6 16.3
Face gender × face ethnicity *RQ4*	4.7	4.5		ns	ns	3.5	3.5		7.3	7.5
Face gender × participant culture *H3, H4*	ns	3.4		8.9	12.3	3.5	3.6		3.6	4.3
Face ethnicity × participant culture *RQ4*	ns	ns		−3.6	−2.6	ns	ns		−3.7	−3.1
Face gender × participant sexual attraction /orientation *H5, H6, RQ1, RQ2*	1.1	−2.1	−11.9	2.2	−8.6 −23.4	0.2	−6.4	4.8	0.6	−11.8 7.4
Face ethnicity × participant sexual attraction /orientation *RQ1, RQ2, RQ4*	ns	ns	ns	ns	ns −1.9	0.2	ns	3.1	ns	1.2 ns
Participant culture × participant sexual attraction /orientation *RQ1, RQ2, RQ3*	0.7	ns	ns	ns	ns ns	−0.7	−9.3	ns	ns	ns ns

Face gender × face ethnicity × participant culture *RQ4*	−5.2		−4.9		ns		ns		ns		ns	
Face gender × face ethnicity × participant sexual attraction /orientation *RQ1, RQ2, RQ4*	ns	ns	ns	ns	ns	ns	−0.4	−3.7	−3.5	ns	ns	ns
Face gender × participant culture × participant sexual attraction /orientation *RQ1, RQ2, RQ3*	0.8	−2.6	−3.5	1.7	−10.0	−9.8	−1.1	ns	−13.9	−2.1	−3.4	−22.6
Face ethnicity × participant culture × participant sexual attraction /orientation *RQ1, RQ2, RQ3, RQ4*	−0.4	−2.0	ns	ns	−2.9	4.8	ns	2.7	ns	−0.4	3.3	ns
Face gender × face ethnicity × participant culture × participant sexual attraction /orientation *RQ1, RQ2, RQ3, RQ4*	1.1	−6.3	ns	ns	ns	ns	ns	ns	ns	ns	15.5	ns

Note. Each column represents a different model. Numbers are unstandardized regression coefficients; "ns" indicates non-significant effect. Preferences for facial femininity/masculinity (the dependent variable) ranged from –100 (greatest femininity preference) to +100 (greatest masculinity preference). For face gender, female faces were coded as −0.5 and male faces as +0.5; for face ethnicity, East Asian faces were coded as −0.5 and White faces as +0.5; for participant culture, Japan was coded as −0.5 and UK as +0.5. Participant sexual orientation was deviation-coded with "heterosexual" as the reference category, i.e., "heterosexual" was coded as −1/3 and "bisexual" and "gay/lesbian" as 2/3 in their respective contrasts (these contrasts are represented by the "bisexual vs hetero" and "gay/lesbian vs hetero" sub-columns). Participant sexual attraction was scored such that negative values indicated greater relative attraction to women and positive values greater relative attraction to men. Note that sexual attraction could range between −6 and 6 and hence was on a larger scale than the other predictors (leading to smaller coefficients). Superscripts refer to the specific hypotheses and research questions a given effect speaks to.

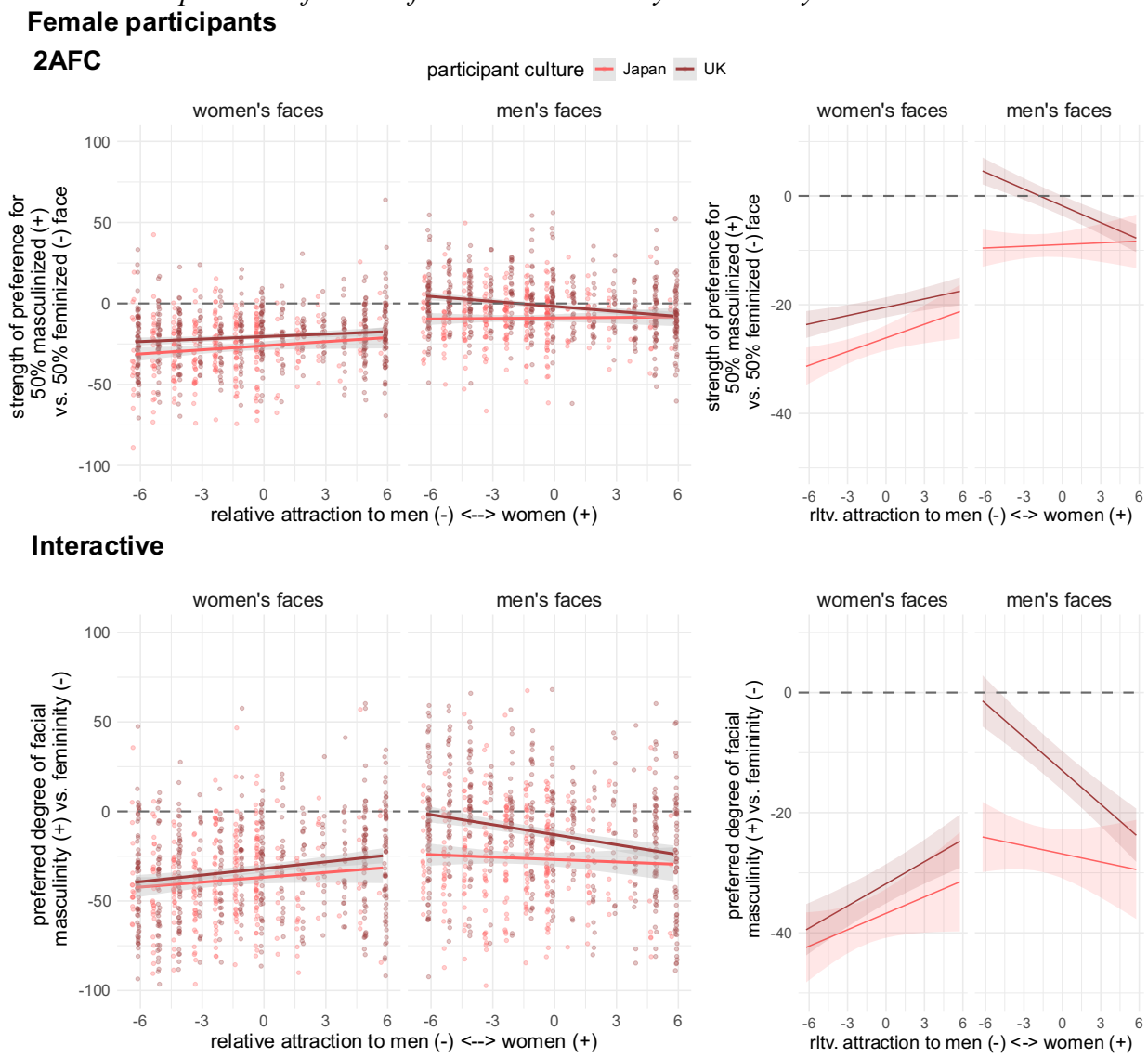
Interaction Effect of Face Gender × Participant Culture × Participant Sexual Attraction/Orientation

Female Participants. Greater relative attraction to women (versus men) predicted lower preferences for femininity in women's faces and greater preferences for femininity in men's faces, with this pattern stronger among British than Japanese women. Figure 2 presents participant-level data on the left and plots as predicted by the multilevel model (MLM) on the right (note that negative values on the *y*-axes represent preferences for femininity).

For sexual orientation category, the results for lesbian compared to heterosexual women mirrored those for sexual attraction (Figure 3). In contrast, preferences of bisexual compared to heterosexual women differed by participant culture. Compared to British heterosexual women, British bisexual women showed lower femininity preferences in women's faces and greater femininity preferences in men's faces. However, compared to Japanese heterosexual women, Japanese bisexual women showed lower preferences for femininity in *both* men's and women's faces.

Figure 2

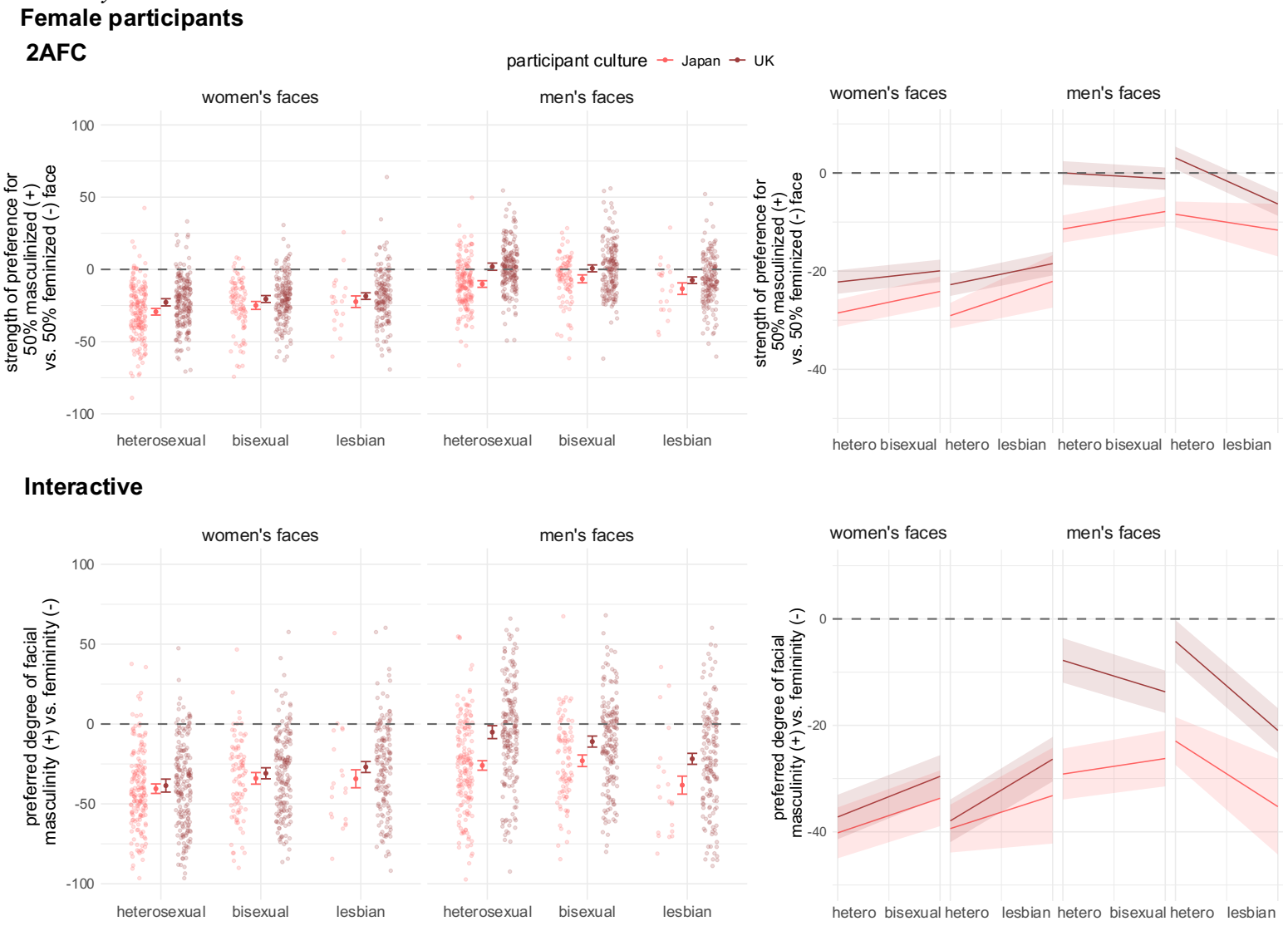
Face Gender, Participant Culture, and Participant Relative Sexual Attraction Predicting Female Participants' Preferences for Facial Femininity/Masculinity.



Note. Plots on the left show participant-level preferences (averaged across faces), with translucent points representing individual participants and grey shading representing 95% CIs. Plots on the right are as predicted by the MLMs, with shading representing 95% confidence intervals. Dashed line indicates no preference for femininity or masculinity. Note that the x-axes are flipped such that greater relative attraction to men is plotted as negative, in contrast to how this was coded in the analyses. Stronger relative attraction to women predicted lower preferences for femininity in women's faces and greater preferences for femininity in men's faces – and more so among British than Japanese women.

Figure 3

Face Gender, Participant Culture, and Participant Sexual Orientation Predicting Female Participants' Preferences for Facial Femininity/Masculinity



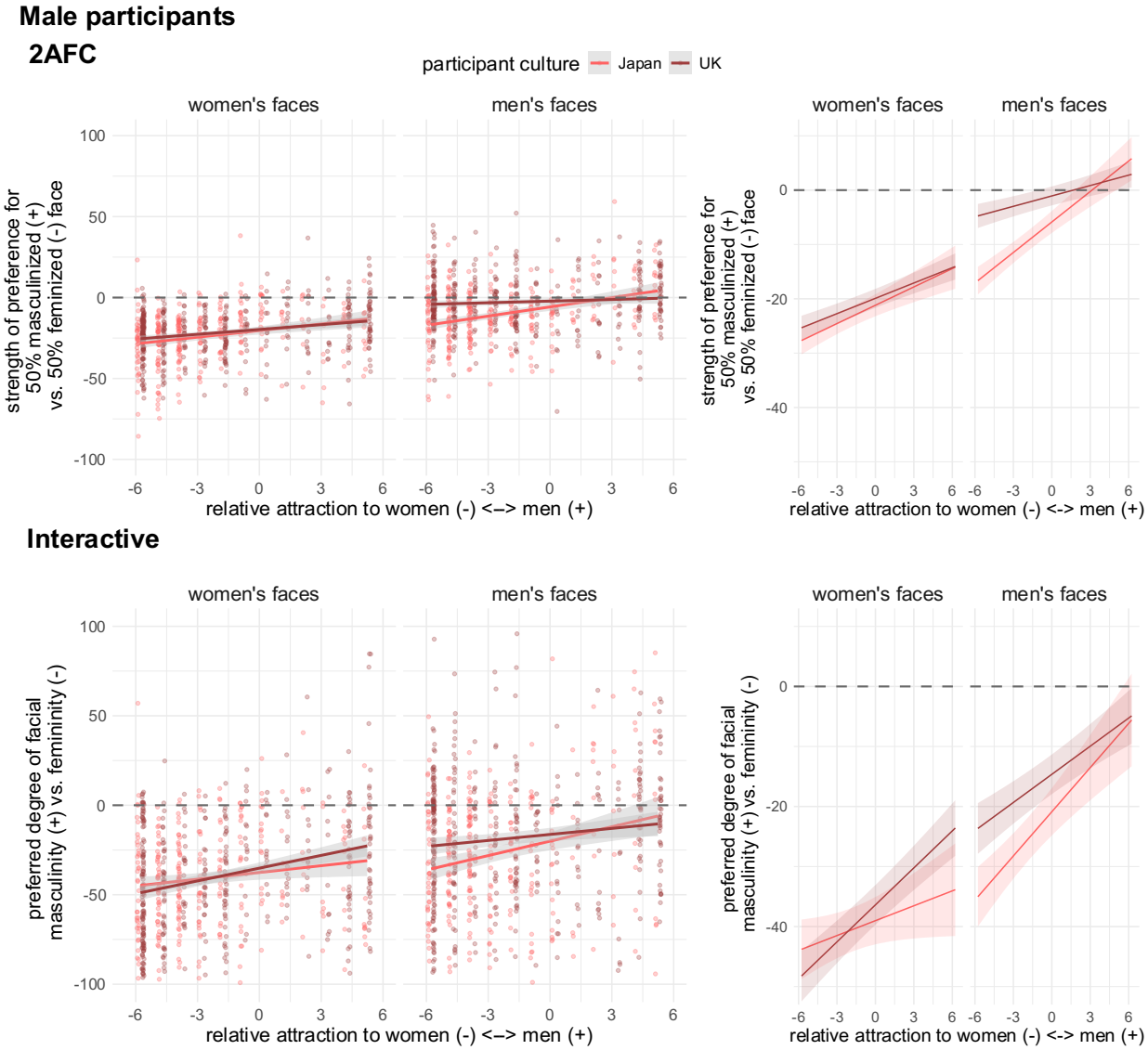
Note. Plots on the left show participant-level preferences (averaged across faces), with translucent points representing individual participants and points with error bars representing means and 95% CIs. Plots on the right are as predicted by the MLMs, with shading representing 95% confidence intervals. Dashed line indicates no preference for femininity or masculinity. Among British women, lesbian and bisexual women showed lower preferences for femininity in women's faces and greater preferences for femininity in men's faces, compared to heterosexual women. Among Japanese women, lesbian women showed lower preferences for femininity in women's faces and greater preferences for femininity in men's faces, and bisexual women showed lower preferences for femininity in women's and men's faces, compared to heterosexual women.

Male Participants. Higher relative attraction to men (versus women) predicted weaker preferences for femininity (Figure 4). For judgments of men's faces, this pattern was stronger among Japanese than British men, whereas for judgments of women's faces, this pattern was (in the interactive preference task) stronger among British than Japanese men.

This pattern was echoed in the differences between gay and heterosexual men's preferences (Figure 5). However, a different pattern emerged when comparing bisexual and heterosexual men's preferences. Compared to heterosexual men, bisexual men showed weaker preferences for femininity in women's faces but similar preferences for men's faces. Note that this was the case only for the interactive preference task, as the interaction was not significant for the 2AFC task (non-significance denoted by grayscale panels in Figure 5). See Figures S8 and S9 for a simplified summary of these interactions across both experimental tasks.

Figure 4

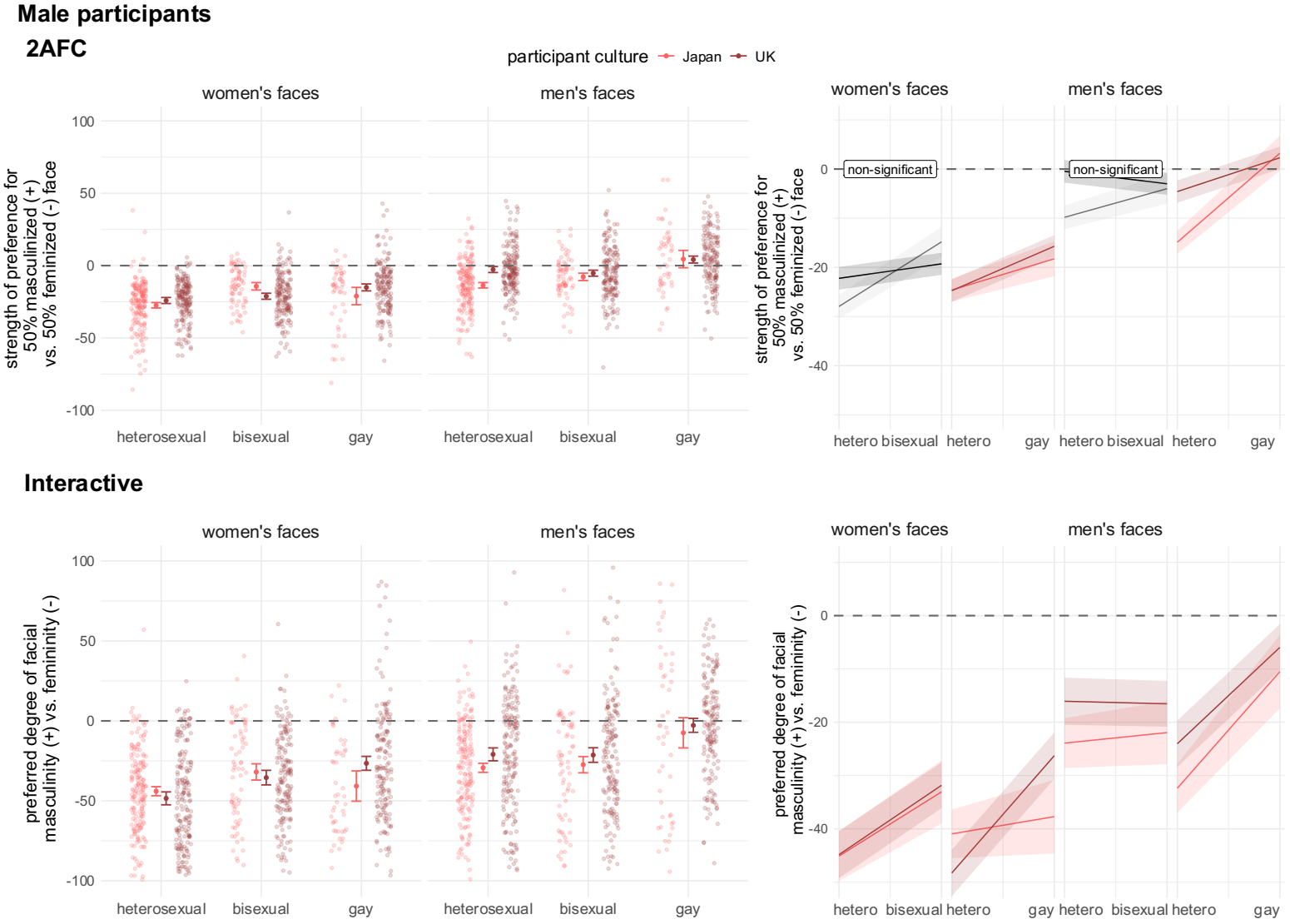
Face Gender, Participant Culture, and Participant Relative Sexual Attraction Predicting Male Participants' Preferences for Facial Femininity/Masculinity



Note Plots on the left show participant-level preferences (averaged across faces), with translucent points representing individual participants and grey shading representing 95% CIs. Plots on the right are as predicted by the MLMs, with shading representing 95% confidence intervals. Dashed line indicates no preference for femininity or masculinity. Stronger relative attraction to men predicted lower preferences for femininity, and the magnitude of this varied by culture differently for women's and men's faces.

Figure 5

Face Gender, Participant Culture, and Participant Sexual Orientation Predicting Male Participants' Preferences for Facial Femininity/Masculinity



Note. Plots on the left show participant-level preferences (averaged across faces), with translucent points representing individual participants and points with error bars representing means and 95% CIs. Plots on the right are as predicted by the MLMs, with shading representing 95% confidence intervals (greyscale plots represent non-significant effects). Dashed line indicates no preference for femininity or masculinity. Gay men showed lower preferences for femininity than heterosexual men. Bisexual men showed lower preferences for femininity in women's faces, compared to heterosexual men (in the interactive task).

Effects of Face Ethnicity

We observed two consistent interactions with face ethnicity (addressing RQ4) that were not qualified by the above interaction. The first was a face gender × face ethnicity interaction, which emerged in all but two models (female participants, interactive preference task, sexual attraction and sexual orientation). Breaking down this interaction revealed a greater preference for femininity in White than East Asian women's faces and in East Asian than White men's faces (see Figure S10).

Finally, there was a consistent interaction between face ethnicity and participant culture in the interactive preference task, but not the 2AFC task. Specifically, the cultural differences in preferences for femininity were amplified for judgments of East Asian, compared to White, faces. This appeared to be driven by British participants preferring less femininity in East Asian than White faces (see Figure S11).

Exploratory Analyses

Consistency Between Experimental Tasks

To address RQ5, we tested whether mean preferences significantly differed between the two experimental tasks in two ways: (1) by examining participants' *degree* of preference for femininity/masculinity (i.e., their preference from −100 to +100 on each task; reported below), which we present below, and (2) by recoding responses on both tasks to reflect a *binary* choice*,* i.e., whether participants chose a feminized or a masculinized face in each task (revealing a similar pattern of results, see Supplemental Material and exploratory analysis script 3a-*Task Comparison* on the OSF, https://osf.io/gr3cn).

Given the consistent interaction between face gender, participant culture, and participant sexual attraction/orientation in our primary analysis, we ran separate models by face gender, participant culture, and sexual orientation category for ease of interpretation. We adjusted the alpha level for 12 comparisons (3 sexual orientation groups × 2 cultures × 2 face

genders) using Bonferroni correction ($\alpha = .05/12 = .004$). We computed MLMs with the type of experimental task (effect-coded; 2AFC: −0.5, interactive preference: +0.5) as the sole predictor of the degree of preference. We modelled random intercepts for participants and face identities and random slopes for experimental task, grouped by both participant and face identity.

For nearly all models tested (20 of 24), the intercept was significant and negative, indicating an overall preference for femininity (see Table 3 for summary). Four models had non-significant intercepts (suggesting no significant preference for either femininity or masculinity): Judgments of men's faces by British heterosexual women, British bisexual women, British gay men, and Japanese gay men.

The effect of experimental task was also significant and negative for all but two models. This indicated a stronger preference for femininity in the interactive preference task compared to the 2AFC task. The two models in which there was no effect of experimental task were for Japanese lesbian women judging women's faces and Japanese gay men judging men's faces (Table 3; see also Table S5 for full model estimates).

Table 3

Summary of Models Testing Intercept and Effect of Experimental Task on Degree of Preference for Femininity/Masculinity

Model				Results	
Participant culture	Participant gender	Participant sexual orientation	Face gender	Intercept	Experimental task
Japan	Female	Heterosexual	Female	−34.92	−11.17
			Male	−18.03	−15.85
		Bisexual	Female	−29.48	−9.08
			Male	−14.79	−16.48
		Lesbian	Female	−28.31	ns
			Male	−25.80	−24.92
UK	Female	Heterosexual	Female	−30.67	−15.78

			Male	ns	−6.97
		Bisexual	Female	−25.68	−10.34
			Male	ns	−11.72
		Lesbian	Female	−22.71	−8.44
			Male	−14.65	−14.33
Japan	Male	Heterosexual	Female	−35.70	−16.54
			Male	−21.46	−15.74
		Bisexual	Female	−23.09	−17.61
			Male	−17.56	−19.60
		Gay	Female	−30.89	−19.66
			Male	ns	ns
UK	Male	Heterosexual	Female	−36.27	−24.32
			Male	−11.80	−18.23
		Bisexual	Female	−28.32	−14.31
			Male	−13.29	−16.14
		Gay	Female	−20.79	−11.45
			Male	ns	−6.97

Note. Reported values are unstandardized coefficients (full results including 95% CIs can be found in Table S5). For the intercept, a negative effect corresponds to a preference for femininity; for the experimental task predictor, a negative effect corresponds to a stronger preference for femininity in the interactive preference compared to the 2AFC task. "ns" denotes a nonsignificant effect.

Moderators of Facial Femininity/Masculinity Preferences

We tested the following moderators in separate models: participant age, participant attractiveness, participant relationship status, and initial level of stimulus shape femininity/masculinity.[10] Although not preregistered, given the consistent interaction between participant sexual attraction/orientation, face gender, and participant culture, we chose to run separate moderation models for each sexual orientation category and each face gender for ease of interpretation (Bonferroni correcting for six comparisons, $\alpha = .05/6 = .008$). We included participant culture and experimental task as predictors rather than running separate models for each culture or experimental task to enable comparisons across culture and tasks.

[10] We also tested a model with participant relationship quality (happiness and commitment), but both relationship happiness and commitment were very skewed, showing ceiling effects and limited range that suggested socially desirable responding (see Figure S13). Because of this and because commitment and happiness tended to have opposing effects, we hesitate to interpret the results of these models (but see exploratory analysis script 3a-*Relationship* on the OSF for model estimates and figures, https://osf.io/wpefv).

The predictors in each model were therefore experimental task, participant culture, face ethnicity, and the specified moderating variable(s), with random intercepts for participants and face identities and random slopes for participant culture (grouped by face identity) and the interaction between face ethnicity and experimental task (grouped by participant). Participant preferences (from −100 to +100) were the outcome variable.

Participant Age, Attractiveness, and Relationship Status. Here, we focus our reporting on the results for heterosexual women judging men's faces (for which these moderators have been tested previously) and the generalization of these patterns to other groups. Detailed reporting of moderation results can be found in the Supplemental Material and on the OSF.

Age. For heterosexual women in the UK, increasing age predicted preferences for lower levels of femininity (higher levels of masculinity) in men's faces (in line with H7a). This pattern did not generalize across participant culture, sexual orientation, or gender, nor face gender (see Supplemental Materials and exploratory analysis script 3b-*Age* on the OSF, https://osf.io/9ha6m).

Self-Rated Attractiveness. Among heterosexual women, higher self-perceived attractiveness predicted preferences for less femininity in men's faces (supporting H7b). This generalized across culture and to bisexual women. However, patterns otherwise varied across participant sexual orientation, gender, and culture, and face gender. Moreover, patterns for female peer-perceived and male peer-perceived attractiveness were mixed and often in opposition to one another or to self-perceived attractiveness (see Supplemental Material and exploratory analysis script 3c-*Attractiveness* on the OSF, https://osf.io/3u4xc).

Relationship Status. Finally, single heterosexual women showed somewhat weaker preferences for femininity in men's faces compared to women in a relationship (in line with H7c). This pattern held across both cultures and generalized to bisexual women. Preferences

otherwise differed by relationship status in varying ways across participant sexual orientation, gender, and culture, and face gender (see Supplemental Material and exploratory analysis script 3d-*Relationship Status* on the OSF, https://osf.io/su2dw).

Lastly, we also ran unplanned analyses to test whether type of task impacted the effect of these moderators and found moderation to be more pronounced in the interactive preference versus 2AFC tasks (see exploratory analysis script 3a-*Task Comparison,* https://osf.io/gr3cn).

Initial Level of Face Stimulus Femininity/Masculinity. We tested whether the initial level of stimulus images' femininity/masculinity affected participant preferences. We measured faces' shape femininity/masculinity using "vector scores", i.e., by calculating the linear differences between the average female and male face shapes in the sample and projecting individual faces onto this vector (e.g., Holzleitner et al., 2015; Holzleitner et al., 2019; see exploratory analysis script 3e-*Sexual dimorphism* on the OSF, https://osf.io/4m3uh). Values were scaled so that 0 reflected the average female face shape, and 1 the average male face shape (i.e., higher values indicated a higher level of face shape masculinity). A simple linear model predicting vector scores with face gender and face ethnicity confirmed that vector scores successfully discriminated women's and men's faces (main effect of face gender, $b = 1.00$, 95% CI [0.87, 1.13], $p < .001$). The model also showed that East Asian faces in our sample were more feminine in face shape than White faces (main effect of face ethnicity, $b = 0.34$, 95% CI [0.21, 0.48], $p < .001$). Neither the intercept nor the interaction between face gender and face ethnicity was significant (both $|bs| < 0.19$, both $ps >= .171$).

We then tested the same models as for all other moderator variables but included initial level of femininity/masculinity as the moderator. Across all models, we found a significant interaction between initial level of femininity/masculinity and experimental task,

such that the higher the initial level of masculinity, the stronger the preference for femininity and more so in the interactive preference compared to 2AFC task. For further details please see exploratory analysis script 3e-*Sexual dimorphism* on the OSF, https://osf.io/4m3uh.[11]

Discussion

Here, we tested how participants' culture (British, Japanese) and sexual attraction/orientation, in addition to faces' gender and ethnicity, predicted preferences for facial femininity/masculinity in two experimental tasks. Across these two tasks, the two measures of sexual attraction/orientation, and participant gender, we observed some consistent patterns of results. Most notable were the overall preference for femininity and the interaction between face gender, participant sexual attraction/orientation, and participant culture. This consistent interaction demonstrates that *intersections* in participant identities, rather than just single identities considered in isolation, importantly predict those participants' judgments of attractiveness (i.e., their preferences for facial femininity vs. masculinity). This adds to the growing literature on intersecting identities, demonstrating the importance of not only keeping intersecting *target* identities in mind (e.g., as with stereotyping; Hudson & Ghani, 2023) but also intersecting *perceiver* identities. Our results furthermore caution against generalizing patterns observed in one group to another group without empirical testing and highlight important methodological considerations that may bias results.

[11] We also conducted additional analyses at the level of faces (versus at the level of participants) and found a similar pattern of results which can be found in the same analysis script.

Crucially, our research is the first to reveal bisexual women's and men's preferences for facial femininity/masculinity, demonstrating these to be distinct from heterosexual individuals' preferences and to some extent also from gay/lesbian individuals' preferences. Among bisexual men, patterns were consistent across culture. Like gay men, bisexual men preferred less feminine women's faces compared to heterosexual men. Unlike gay men, bisexual men showed femininity/masculinity preferences for men's faces similar to heterosexual men's. This latter result is in line with extant findings showing Chinese gay men to prefer more masculinity in men's faces than Chinese bisexual men (Zheng, 2021; Zheng & Zhang, 2021). Among bisexual women, patterns differed by culture. British bisexual women showed stronger femininity preferences for men's faces and weaker femininity preferences for women's faces, compared to heterosexual women (similar to lesbian women, though differing somewhat in magnitude). Japanese bisexual women, in contrast, showed a weaker preference for femininity in both women's and men's faces than heterosexual women (with the pattern for men's faces contrasting with that observed among lesbians).

Our findings on bisexual individuals' preferences address a critical gap in the literature since they cannot be explained fully by the prominent idea that perception of (facial) attractiveness reflects a set of cognitions that evolved under sexual selection pressures (for reviews, see, e.g., Little et al., 2011; Thornhill et al., 1999). That is, an adaptation-for-mate-choice hypothesis would predict both heterosexual and bisexual (wo)men to show similar preferences for opposite-gender faces. Yet, we found bisexual individuals' preferences to consistently differ from those of heterosexual individuals. They also aligned only partially with the preferences of gay and lesbian individuals, which, too, are currently poorly understood. Our results highlight the importance of considering not only intersectional identities but also of conceptualizing sexual orientation beyond a heterosexual-versus-gay/lesbian dichotomy in understanding face preferences.

Our results also replicate a number of previous findings, but with a larger and more diverse sample of both face stimuli and participants. We found that Japanese participants preferred higher levels of femininity than British participants (in line with our hypotheses and existing work, e.g., Marcinkowska et al., 2014; Perrett et al., 1998), and particularly so when it came to the perception of men's faces. These cultural differences could be explained by several factors. For example, visual diet has been found to shape preferences (Leopold et al., 2001; Rhodes et al., 2003; Webster et al., 2004) and likely differed for our Japanese and White British participants. In our sample, we found East Asian faces to be more feminine in shape than White faces. If this difference generalizes beyond our sample, then Japanese individuals may have had greater exposure to more feminine faces and subsequent greater preferences for femininity than White British individuals (in line with research showing gendered associations with race/ethnicity; Johnson et al., 2012). Another explanation might lie in cultural differences in the value that is placed on (inferred) traits (e.g., the positive valuation of warmth in leaders in Japan vs. dominance in Western cultures, Rule et al., 2010), and how these traits and values are stereotypically linked to femininity or masculinity (e.g., Becker et al., 2007; Carrito et al., 2023; Hess et al., 2009).

In line with previous findings and our predictions, we found that Japanese participants preferred femininity in both women and men's faces, except for gay Japanese men, who showed no clear preference for either femininity or masculinity when judging men's faces. British participants, too, preferred femininity in women's faces; they also preferred femininity in men's faces, except for heterosexual women, bisexual women, and gay men, who showed no clear preference either way. These lower femininity preferences among gay (compared to heterosexual) men and British heterosexual (compared to lesbian) women are in line with previous findings (Glassenberg et al., 2010; Shiramizu et al., 2020; Shiramizu et al., 2021), although in contrast with Glassenberg et al. (2010) and Shiramizu et al. (2020), we did

not find a significant overall preference for masculinity in men's faces among gay men (or any other group).

Based on findings by Glassenberg and colleagues (2010) and Shiramizu and colleagues (2020), we predicted and found that gay men would prefer more masculine (less feminine) men's and women's faces than heterosexual men. This main effect was qualified by an interaction with participant culture and face gender: this pattern was stronger among Japanese than British men for judgments of men's faces (driven by Japanese heterosexual men's greater preference for femininity), but stronger among British than Japanese men for judgments of women's faces. We also replicated Glassenberg et al.'s (2010) and Shiramizu et al.'s (2021) findings comparing lesbian and heterosexual women's preferences. As predicted, we found that lesbian women showed a higher preference for femininity in men's faces, and a lower preference for femininity in women's faces than heterosexual women, and this pattern was stronger among British than Japanese women.

Importantly, our research also included faces of two ethnicities, in contrast to the bulk of existing work. We found that face ethnicity consistently interacted with face gender. This interaction both aligned and contrasted with extant findings. Stephen and colleagues (2018) found that people preferred greater femininity in White than Asian faces. In line with this, we found that participants preferred greater femininity in White compared to East Asian women's faces. This greater preference for femininity in White compared to East Asian women's faces might be explained by the differences we found in starting face shape femininity/masculinity of East Asian and White faces. That is, because in our sample East Asian women's faces were more feminine in face shape than White women's faces to begin with, participants may have feminized them less to optimize their attractiveness (in line with Stephen et al.'s, 2018, reasoning).

However, in contrast to Stephen et al. (2018), we found that participants preferred less femininity in White compared to East Asian men's faces. This difference in findings may possibly be explained by differences in stimulus samples or the method for manipulating facial femininity/masculinity. Stephen and colleagues calculated female and male averages separately for Asian and White faces, whereas we manipulated femininity/masculinity using composite faces averaged across face ethnicity. We found that in our sample, average face shape femininity/masculinity differed between East Asian and White faces, independent of face gender: East Asian faces scored higher on femininity (quantified as the average difference between the sample female and male composite faces) than White faces. If there was a similar difference in face shape femininity/masculinity in Stephen et al.'s (2018) Asian and White faces, their femininity/masculinity transforms would have differed in the extent of their femininity/masculinity from ours. However, why participants in our sample across both cultures preferred more feminine East Asian than White men's faces remains to be explained. Future research could explore whether exemplars of attractiveness in different ethnicities and cultures differ in their femininity/masculinity (e.g., East Asian boy band members vs. White Hollywood actors) and might help explain differences in preferences.

Moderators of Facial Femininity/Masculinity Preferences

Our exploration of moderators both replicated existing findings and highlighted the importance of not generalizing results across culture and sexual orientation. Regarding the effect of participant age, we replicated existing findings for British heterosexual women, with older age predicting lower femininity preferences for men's faces and greater femininity preferences for women's faces (e.g., Batres et al., 2020). Overall, findings did not generalize across the two participant cultures, participant genders, or different sexual orientation groups. It should be noted that Japanese participants in our sample had a greater age range and were substantially older than the British participants (M_{Japan}±SD = 38.0 ± 10.5 years, M_{UK}±SD =

29.3 ± 6.0 years), which may help explain the lack of generalization of age effects across culture.

For self-rated attractiveness, we found that across both cultures, heterosexual women who perceived themselves as more attractive preferred less femininity (more masculinity) in men's faces. This is in line with previous findings (e.g., Batres et al., 2020; Docherty et al., 2020; Holzleitner & Perrett, 2017; Little et al., 2001; Marcinkowska et al., 2021; but see Alharbi et al., 2021, for a null finding in an Arab sample) and here we found this pattern to also extend to bisexual women. Patterns for lesbian women and for men were variable, however, and self-rated perceptions of how attractive female or male peers found participants did not consistently predict their preferences.

Across both cultures, we also replicated previous findings on the effect of relationship status: heterosexual single women preferred somewhat less femininity in men's faces compared to women in a relationship (in line with Batres et al., 2020; Little et al. 2002; Sacco et al. 2012; but see Holzleitner & Perrett, 2017), and this was also true for bisexual women. However, effects varied for other sexual orientation and gender groups. In summary, each of the moderating variables we investigated warrants further testing in non-Western cultures and sexual minority groups.

Methodological Considerations

Sexual Orientation Category vs. Continuum

We included two measures of sexual orientation: In addition to recording participants' self-identified sexual orientation category (bisexual, gay/lesbian, heterosexual), we also collected continuous self-reported attraction to women and to men. We did so because previous evidence suggests that gynephilia (sexual attraction to women) and androphilia (sexual attraction to men) may be best conceptualized as two independent axes (Shirazi et al., 2021; Zietsch & Sidari, 2020), and because Batres et al. (2020) reported these measures to

independently explain preferences for facial femininity/masculinity among heterosexual women.

In our sample, sexual attraction to women and men were strongly negatively correlated. To avoid problems with multicollinearity and given both the large number of predictors and Batres et al.'s (2020) finding that attraction to women and attraction to men had opposite effects on preferences, we decided to combine sexual attraction to women and men into a single continuous measure of relative sexual attraction. Although we observed similar patterns of results when examining relative sexual attraction and sexual orientation categories, nuances appeared only when considering bisexual as a category rather than on the continuum of attraction to women versus men. This may be because in some groups (such as bisexual British women), attraction to women and men was not strongly correlated, and the single relative sexual attraction score we calculated may therefore have obscured these patterns. An exploratory examination of the relation between facial femininity/masculinity preferences and sexual attraction to each gender separately among bisexual participants did, however, show that each tended to have opposing effects (see Figure S14). This indicates that the relative sexual attraction score, although imperfect, was not a misleading measure. Future research could nonetheless consider ways to measure and model sexual attraction that could reveal further nuances.

2AFC vs. Interactive Preference Task

To our knowledge, ours is the first study to directly compare preferences in a 2AFC task to those in an interactive preference task. Historically, the first experimental studies on facial femininity/masculinity preferences used interactive preference tasks (such as Perrett et al., 1998), but these were soon more or less entirely replaced with 2AFC tasks. We found that first, other factors aside, participants expressed weaker preferences for femininity in the 2AFC task compared to the interactive preference task, particularly when judging men's

faces. We also found that the type of task interacted with face images' starting level of femininity/masculinity independent of face gender. Preferences for femininity were only higher in the interactive preference task compared to the 2AFC task when the initial level of masculinity was high (whereas they were similar across tasks when initial level of masculinity was low). This indicates that existing research using forced-choice designs may have underestimated preferences for facial femininity (and overestimated preferences for masculinity), and is in line with a recent finding that forced-choice tasks might overestimate the importance of masculinity in another social judgment: dominance (Dong et al., 2023).

Both the interactive preference and 2AFC tasks only provide limited insight into preferences. Preferences for facial femininity/masculinity follow a curvilinear pattern, but 2AFC and interactive preference tasks can only measure if different participant groups vary in their mean preferences. Holzleitner and Perrett (2017) showed that such differences in mean preferences can be driven by a mean shift in the overall level of preferences (such as variation in the extent to which women feel exclusively attracted to men). Other parameters, however, change women's tolerance towards low versus high levels of masculinity. This might be more consequential in a 2AFC than an interactive preference task—the observed higher preference for masculinized faces in the 2AFC task might be driven by a dislike of "overly" feminine men's faces (whereas findings from the interactive task show that overall, a slightly more feminine than original level is preferred in men's faces). Additionally, the strength—and in some cases, direction—of moderating effects consistently varied by experimental task, suggesting that the interactive preference task might be more sensitive to individual differences than a 2AFC task and highlighting the importance of *how* facial femininity/masculinity preferences are measured.[12]

[12] We note that systematic differences between the two tasks are unlikely to be an artefact of how responses were recorded (i.e., eight choices in the 2AFC task vs 40 choices in the interactive preference task). As we

Limitations and Future Directions

Our findings provide important insights into the interactive effects of perceivers' and faces' social identities or group memberships in predicting facial femininity/masculinity preferences. However, we compared only two cultures here and included participants and face stimuli corresponding to the majority ethnic group in each, leaving future research to test our research questions in a broader range of cultures and with more ethnically diverse participants and stimuli. Furthermore, although we crucially recruited bisexual individuals in this research, we did not include asexual individuals, an even more under-studied group whose mate preferences have only recently begun to be explored (Scheller et al., 2023). Future work should address this gap and could also recruit more gender-diverse participants, including nonbinary individuals.

Because of the challenges we faced recruiting LGB participants in Japan, our research also included a limited sample of Japanese gay and lesbian participants. We therefore hesitate to draw too strong of conclusions regarding Japanese gay/lesbian participants' preferences (especially when considering moderators), as further research with larger samples will be needed to confirm the patterns we observed. Future research will also have to consider other methods for participant recruitment in cultures that are less LGBTQ-friendly, such as through LGBTQ organizations and networks rather than broad online recruitment platforms.

It is also important to consider possible limitations from our stimuli. Although we used a larger and more diverse sample of stimuli than previous research, the particular variation of facial features and the exact differences in these features between women and men (and thus the shapes used to transform femininity and masculinity) are specific to the stimulus set. However, our analysis technique did account for this, as using MLMs enabled

report in the Supplemental Material, we also compared tasks by converting responses into binary choices of femininity preferred or masculinity preferred. Here, too, we found that for 22 out of 24 models there was a greater preference for femininity in the interactive compared to 2AFC task (or a greater preference for masculinity in the 2AFC compared to interactive task).

us to treat face identities as random factors, and the baseline differences in femininity/masculinity both by face gender and face ethnicity echoed those found in previous research.

From a methodological point of view, we manipulated sexual dimorphism, i.e., sex-typical face shape, in our study. It is important to note that preferences for sex-typical shape, although referred to as preferences for "femininity/masculinity" are not necessarily identical to preferences assessed by *asking* participants about their preferences for femininity/masculinity. Indeed, multiple studies have shown there to be only a weak correlation between quantitative measures of sexual dimorphism (facial femininity/masculinity) and perceptions of femininity/masculinity (see, e.g., Holzleitner et al., 2014, for a review; Komori et al., 2011). Although sexual dimorphism by definition is a single axis along a female/male binary, concepts of femininity and masculinity—and their effect on person perception and mate choice—likely are not (Hester et al., 2021). That is, any reasoning regarding the potentially adaptive origin of preferences for facial femininity/masculinity does have to carefully consider cultural differences (as well as societal changes) in connotations of femininity/masculinity, and we did not collect any data to this end.

Lastly, although facial femininity/masculinity has been repeatedly demonstrated to impact face preferences, experimentally manipulating individual attributes such as shape femininity/masculinity might lead to overestimates of their importance in social perception (e.g., Dong et al., 2023). Femininity/masculinity is only one amongst several established predictors of judgments of facial attractiveness (e.g., Holzleitner et al., 2019; Nakamura & Watanabe, 2019; Rhodes, 2006; Zhan et al., 2021). Having demonstrated the importance of considering multiple group memberships (e.g., participant culture and sexual orientation) in predicting attractiveness judgments here, future work can take more complex and resource-

intensive data-driven approaches to explore further nuances in how intersecting identities predict impressions of attractiveness. Future research could also extend our investigation from faces to bodies, exploring whether culture and sexual orientation similarly interact to predict attractiveness judgments from bodies. Extant research has tested body attractiveness cross-culturally (e.g., Swami et al., 2006; Swami & Tovée, 2005; Tovée et al., 2006) and explored the role of sexual orientation (e.g., Legenbauer et al., 2009; Lucas et al., 2011; Swami & Tovee, 2008; Swami & Tovée, 2006), but minimal research to date has examined both, and only for preferences for women's bodies (Varella Valentova et al., 2017).

Conclusion

This research represents the most comprehensive test of facial femininity/masculinity preferences to date. Testing these preferences across multiple group memberships represents an important step toward understanding the generalizability of previous findings regarding preferences for facial femininity/masculinity specifically and attractiveness perception more broadly. This work opens doors for future research exploring other aspects of attractiveness perception and testing different methods by highlighting the importance of considering intersections between sexual orientation and culture. Our results can thus inform and refine broader theories of attractiveness perception.

Constraints on Generality

Participants included women and men from two cultures and ethnicities (East Asian Japanese, White British) and three sexual orientation categories (bisexual, gay/lesbian, heterosexual). Face stimuli depicted East Asian and White women and men. We focused on these ethnicities and nationalities to be able to compare two different cultures and examine whether preferences differed for ethnic ingroup and outgroup members. We recruited

participants from three sexual orientation categories to be more inclusive of the sexual orientation spectrum than previous research.

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Preferences for facial femininity/masculinity across culture and the sexual orientation spectrum

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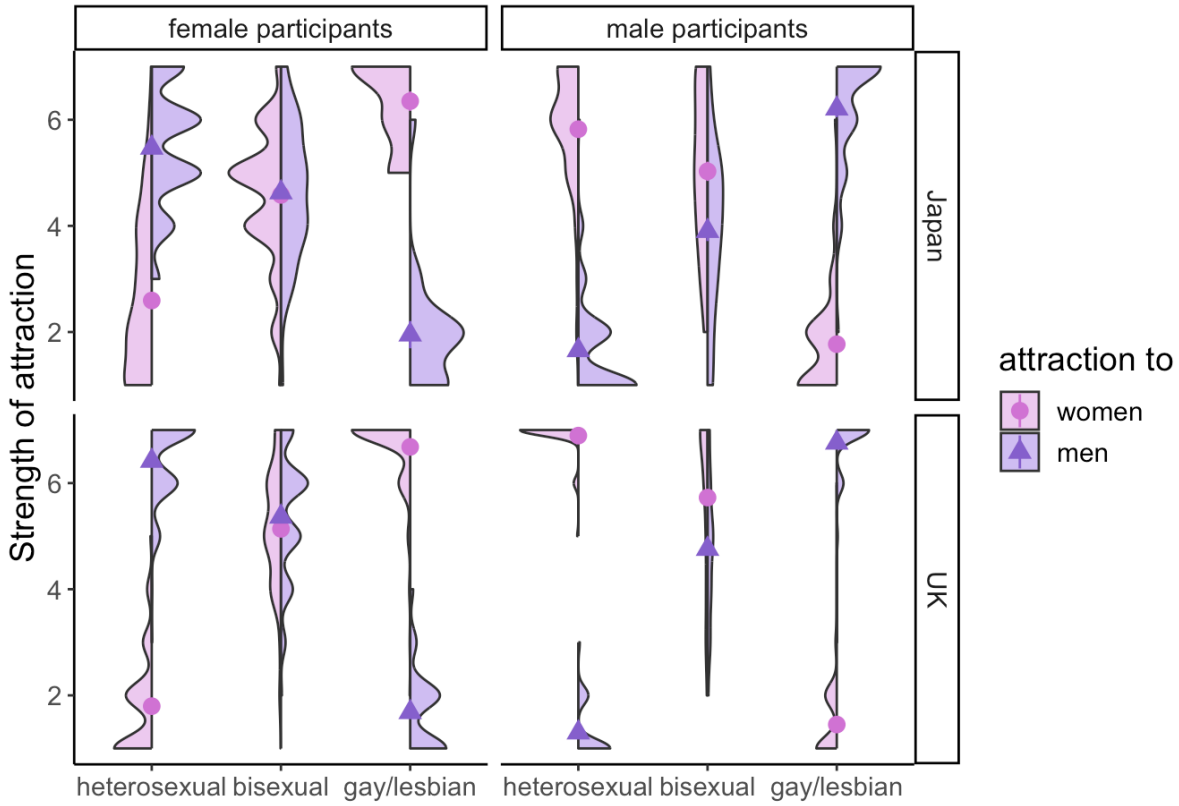
Supplemental Materials

Figure S1

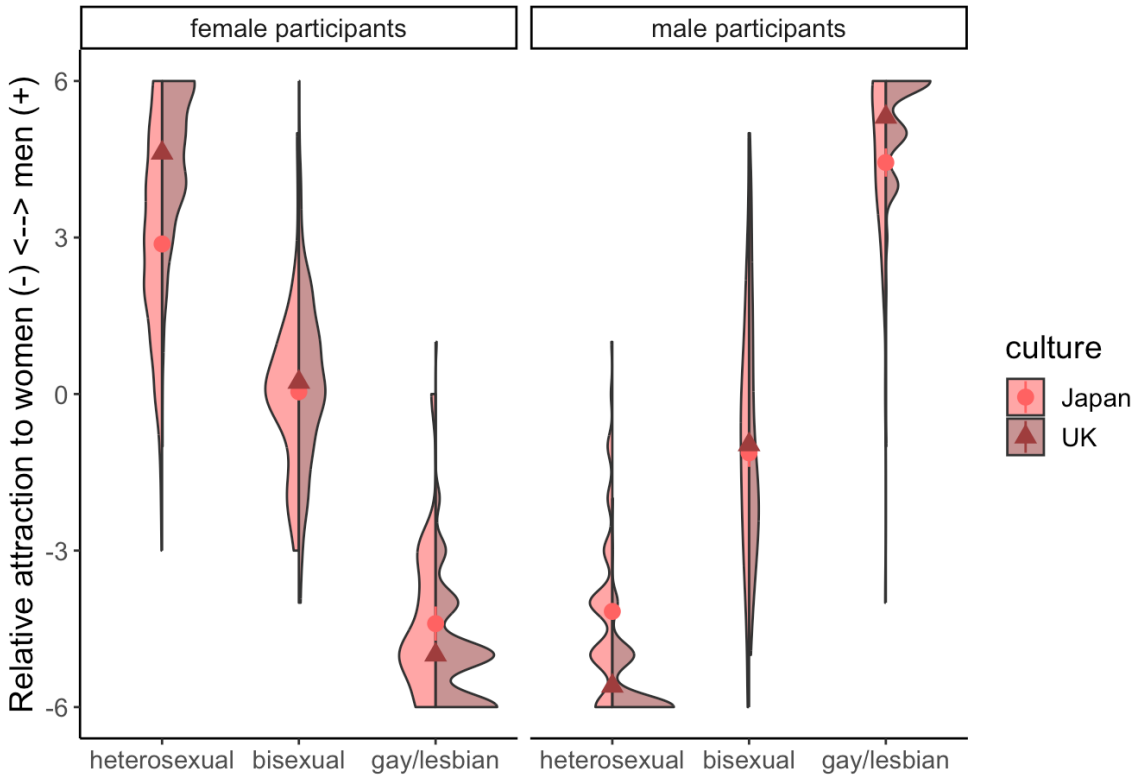
Distribution of Sexual Attraction by Participant Sexual Orientation Category, Culture, and Gender



Note. Circular and triangular points represent means

Figure S2

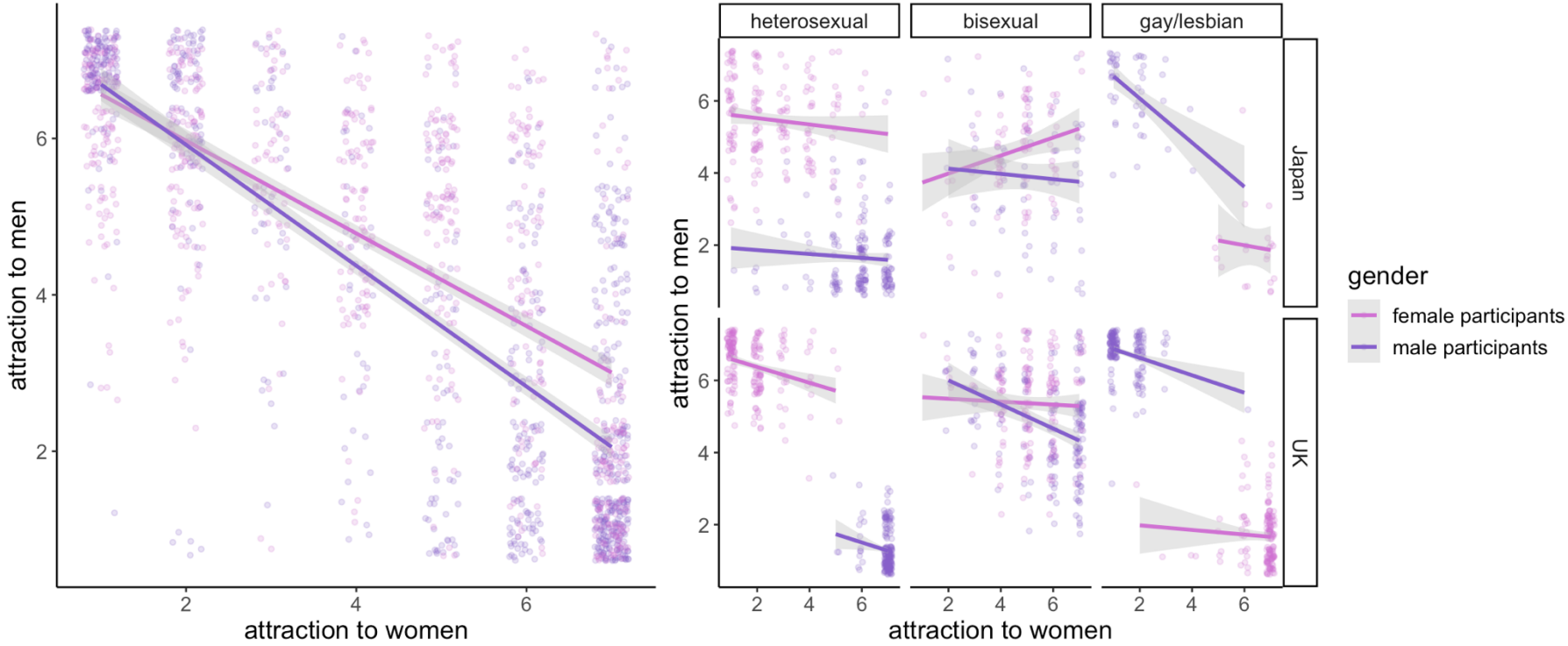
Distribution of Relative Sexual Attraction by Participant Sexual Orientation Category, Culture, and Gender



Note. Circular and triangular points represent means

Figure S3

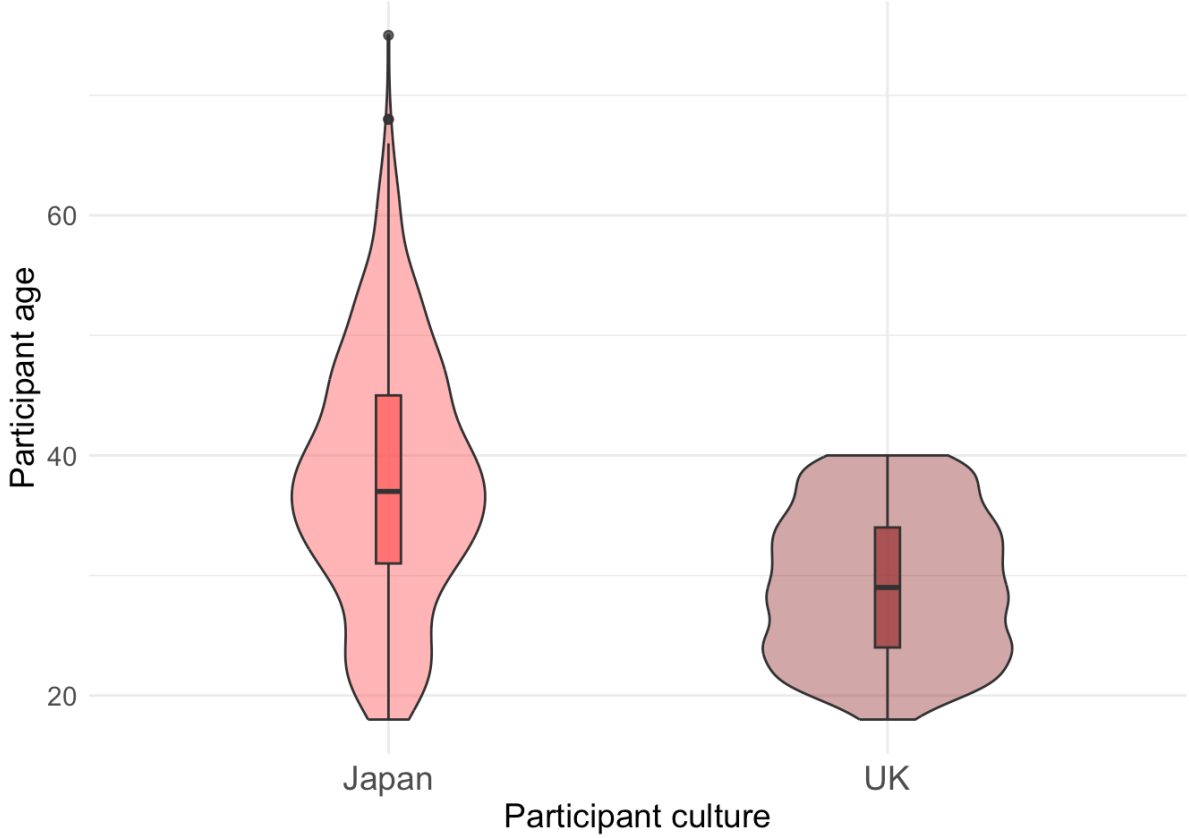
Relation Between Sexual Attraction to Women and to Men



Note. Left panel shows relation split by participant gender, right panel shows relation split by participant gender, sexual orientation, and culture.

Figure S4

Age Distributions by Participant Culture



Note. Boxplots display medians and quartiles. Black points represent outliers

Table S1

Model Estimates for 2AFC Task with Sexual Orientation Category as Predictor

Predictor	Female participants					Male participants				
	b	*SE*	*CI*	*t*	*p*	*b*	*SE*	*CI*	*t*	*p*
Intercept	-14.44	0.81	-16.02 – -12.86	-17.93	**<.001**	-11.97	0.67	-13.27 – -10.66	-17.98	**<.001**
Face gender	17.25	0.95	15.40 – 19.11	18.24	**<.001**	17.09	0.79	15.55 – 18.64	21.69	**<.001**
Face ethnicity	-0.09	0.95	-1.95 – 1.76	-0.10	.922	0.72	0.79	-0.83 – 2.26	0.91	.362
Participant culture	6.66	1.37	3.98 – 9.34	4.87	**<.001**	2.59	1.13	0.37 – 4.82	2.29	**.022**
Participant sexual orientation (bisexual v heterosexual)	2.26	1.15	0.01 – 4.52	1.97	**.049**	4.84	1.20	2.48 – 7.20	4.02	**<.001**
Participant sexual orientation (gay/lesbian v heterosexual)	-0.33	1.78	-3.82 – 3.15	-0.19	.851	10.10	1.33	7.50 – 12.71	7.60	**<.001**
Face gender × face ethnicity	4.52	2.00	0.60 – 8.44	2.26	**.024**	3.50	1.67	0.23 – 6.77	2.09	**.036**
Face gender × partic. culture	3.42	0.82	1.81 – 5.02	4.17	**<.001**	3.56	0.74	2.12 – 5.00	4.84	**<.001**
Face ethnicity × partic. culture	0.81	0.82	-0.79 – 2.42	0.99	.321	-1.21	0.74	-2.65 – 0.24	-1.64	.101
Face gender × partic. sexual orientation (bi v hetero)	-2.14	0.44	-2.99– -1.28	-4.88	**<.001**	-6.39	0.47	-7.32 – -5.47	-13.54	**<.001**
Face ethnicity × partic. sexual	-0.43	0.44	-1.28 – 0.43	-0.97	.331	0.83	0.47	-0.10 – 1.75	1.75	0.080

orientation (bi v hetero)										
Partic. culture × partic. sexual orientation (bi v hetero)	-3.42	2.30	-7.93 – 1.09	-1.49	.137	-9.27	2.41	-13.99 – -4.55	-3.85	**<.001**
Face gender × partic. sexual orientation (gay v hetero)	-11.93	0.68	-13.26 – -10.61	-17.62	**<.001**	4.80	0.52	3.78 – 5.82	9.21	**<.001**
Face ethnicity × partic. sexual orientation (gay v hetero)	0.37	0.68	-0.96 – 1.70	0.55	.585	3.09	0.52	2.07 – 4.11	5.93	**<.001**
Partic. culture × partic. sexual orientation (gay v hetero)	-4.41	3.56	-11.39 – 2.57	-1.24	.215	-4.28	2.66	-9.49 – 0.93	-1.61	.107
Face gender × face ethnicity × partic. culture	-4.90	2.08	-8.98 – -0.81	-2.35	**.019**	-0.64	1.83	-4.23 – 2.96	-0.35	.728
Face gender × face ethnicity × partic. sexual orientation (bi v hetero)	1.88	1.42	-0.90 – 4.66	1.33	.185	-3.73	1.53	-6.73 – -0.72	-2.43	**.015**
Face gender × partic. culture × partic. sexual orientation (bi v hetero)	-2.62	0.88	-4.34 – -0.90	-2.99	**.003**	1.83	0.94	-0.02 – 3.68	1.94	.052

Face ethnicity × partic. culture × partic. sexual orientation (bi v hetero)	-2.04	0.88	-3.76 – -0.32	-2.33	**.020**	2.73	0.94	0.88 – 4.59	2.90	**.004**
Face gender × face ethnicity × partic. sexual orientation (gay v hetero)	-0.96	2.19	-5.26 – 3.35	-0.44	.663	-3.51	1.69	-6.83 – -0.20	-2.08	**.038**
Face gender × partic. culture × partic. sexual orientation (gay v hetero)	-3.46	1.35	-6.11 – -0.80	-2.55	**.011**	-13.90	1.04	-15.95 – -11.86	-13.34	**<.001**
Face ethnicity × partic. culture × partic. sexual orientation (gay v hetero)	1.59	1.35	-1.06 – 4.25	1.18	.240	-1.97	1.04	-4.01 – 0.07	-1.89	.059
Face gender × face ethnicity × partic. culture × partic. sexual orientation (bi v hetero)	-6.25	2.84	-11.81 – -0.69	-2.20	**.028**	1.67	3.06	-4.33 – 7.68	0.55	.585
Face gender × face ethnicity × partic. culture × partic. sexual orientation (gay v hetero)	-6.69	4.39	-15.30 – 1.91	-1.52	.127	-0.61	3.38	-7.24 – 6.02	-0.18	.857

Note. Participant sexual orientation was deviation-coded with “heterosexual” as the reference category, i.e., “heterosexual” was coded as -1/3 and “bisexual” and “gay/lesbian” as 2/3 in their respective contrasts. For participant culture, Japan was coded as -0.5 and UK as +0.5; for face gender, female faces were coded as -0.5 and male faces as +0.5; and for face ethnicity, East Asian faces were coded as -0.5 and White faces as +0.5.

Table S2

Model Estimates for Interactive Preference Task with Sexual Orientation Category as Predictor

Predictor	Female participants					Male participants				
	b	*SE*	*CI*	*t*	*p*	*b*	*SE*	*CI*	*t*	*p*
Intercept	-27.51	1.43	-30.33 – -24.70	-19.18	**<.001**	-28.00	1.32	-30.59 – -25.42	-21.23	**<.001**
Face gender	13.32	1.82	9.74 – 16.89	7.30	**<.001**	19.62	1.55	16.57 – 22.66	12.63	**<.001**
Face ethnicity	-1.51	1.82	-5.09 – 2.07	-0.83	.408	-2.22	1.55	-5.26 – 0.83	-1.43	.154
Participant culture	10.31	2.26	5.88 – 14.73	4.56	**<.001**	4.22	2.17	-0.02 – 8.47	1.95	.051
Participant sexual orientation (bisexual v heterosexual)	2.79	1.94	-1.01 – 6.58	1.44	.150	6.63	2.36	2.00 – 11.26	2.81	**.005**
Participant sexual orientation (gay/lesbian v heterosexual)	-2.81	3.00	-8.68 – 3.06	-0.94	.348	16.30	2.61	11.19 – 21.41	6.25	**<.001**
Face gender × face ethnicity	7.59	3.85	0.05 – 15.12	1.97	**.049**	7.53	3.28	1.11 – 13.96	2.30	**.022**
Face gender × partic. culture	12.30	0.90	10.53 – 14.06	13.69	**<.001**	4.27	0.75	2.80 – 5.75	5.67	**<.001**
Face ethnicity × partic. culture	-2.59	0.90	-4.36 – -0.83	-2.89	**.004**	-3.10	0.75	-4.58 – -1.62	-4.12	**<.001**
Face gender × partic. sexual orientation (bi v hetero)	-8.56	0.53	-9.59 – -7.52	-16.23	**<.001**	-11.78	0.59	-12.93 – -10.63	-20.11	**<.001**
Face ethnicity × partic. sexual	0.10	0.53	-0.93 – 1.14	0.20	.843	1.20	0.59	0.05 – 2.35	2.05	**.041**

orientation (bi v hetero)										
Partic. culture × partic. sexual orientation (bi v hetero)	-3.84	3.87	-11.43 – 3.74	-0.99	.321	-0.74	4.73	-10.01 – 8.52	-0.16	.875
Face gender × partic. sexual orientation (gay v hetero)	-23.41	0.82	-25.01 – -21.81	-28.72	**<.001**	7.36	0.65	6.09 – 8.63	11.39	**<.001**
Face ethnicity × partic. sexual orientation (gay v hetero)	-1.94	0.82	-3.54 – -0.34	-2.38	**.017**	0.04	0.65	-1.23 – 1.30	0.06	.954
Partic. culture × partic. sexual orientation (gay v hetero)	0.49	5.99	-11.25 – 12.24	0.08	.934	7.49	5.22	-2.73 – 17.72	1.44	.151
Face gender × face ethnicity × partic. culture	-2.38	3.02	-8.30 – 3.53	-0.79	.430	-1.53	2.57	-6.57 – 3.51	-0.59	.552
Face gender × face ethnicity × partic. sexual orientation (bi v hetero)	-0.24	2.35	-4.85 – 4.37	-0.10	.920	0.44	2.58	-4.61 – 5.49	0.17	.864
Face gender × partic. culture × partic. sexual orientation (bi v hetero)	-9.96	1.05	-12.03 – -7.90	-9.45	**<.001**	-3.40	1.17	-5.70 – -1.11	-2.91	**.004**

Face ethnicity × partic. culture × partic. sexual orientation (bi v hetero)	-2.85	1.05	-4.91 – -0.78	-2.70	**.007**	3.30	1.17	1.00 – 5.59	2.81	**.005**
Face gender × face ethnicity × partic. sexual orientation (gay v hetero)	-3.11	3.64	-10.24 – 4.02	-0.86	.392	1.65	2.84	-3.92 – 7.23	0.58	.561
Face gender × partic. culture × partic. sexual orientation (gay v hetero)	-9.78	1.63	-12.97 – -6.58	-6.00	**<.001**	-22.57	1.29	-25.10 – -20.04	-17.46	**<.001**
Face ethnicity × partic. culture × partic. sexual orientation (gay v hetero)	4.79	1.63	1.60 – 7.99	2.94	**.003**	-0.38	1.29	-2.91 – 2.16	-0.29	.771
Face gender × face ethnicity × partic. culture × partic. sexual orientation (bi v hetero)	-1.67	4.70	-10.89 – 7.54	-0.36	.722	15.47	5.15	5.37 – 25.57	3.00	**.003**
Face gender × face ethnicity × partic. culture × partic. sexual orientation (gay v hetero)	-0.57	7.28	-14.83 – 13.69	-0.08	.937	2.30	5.69	-8.85 – 13.45	0.40	.686

Note. Participant sexual orientation was deviation-coded with “heterosexual” as the reference category, i.e., “heterosexual” was coded as -1/3 and “bisexual” and “gay/lesbian” as 2/3 in their respective contrasts. For participant culture, Japan was coded as -0.5 and UK as +0.5; for face gender, female faces were coded as -0.5 and male faces as +0.5; and for face ethnicity, East Asian faces were coded as -0.5 and White faces as +0.5.

Table S3

Model Estimates for 2AFC Task with Sexual Attraction as Predictor

Predictor	Female participants					Male participants				
	b	*SE*	*CI*	*t*	*p*	*b*	*SE*	*CI*	*t*	*p*
Intercept	-14.33	0.73	-15.77 – -12.90	-19.61	**<.001**	-12.01	0.66	-13.29 – -10.72	-18.32	**<.001**
Face gender	17.91	0.94	16.07 – 19.75	19.09	**<.001**	17.08	0.79	15.54 – 18.62	21.71	**<.001**
Face ethnicity	-0.23	0.94	-2.07 – 1.61	-0.25	.806	0.67	0.79	-0.88 – 2.21	0.85	.398
Participant culture	6.37	1.19	4.05 – 8.70	5.37	**<.001**	3.04	1.11	0.86 – 5.21	2.73	**.006**
Participant sexual attraction to men v women	-0.11	0.17	-0.43 – 0.22	-0.64	.523	1.14	0.13	0.89 – 1.39	9.02	**<.001**
Face gender × face ethnicity	4.65	1.96	0.81 – 8.48	2.38	**.018**	3.51	1.66	0.25 – 6.77	2.11	**.035**
Face gender × partic. culture	1.48	0.78	-0.04 – 3.01	1.91	.057	3.52	0.73	2.09 – 4.95	4.81	**<.001**
Face ethnicity × partic. culture	1.08	0.78	-0.44 – 2.61	1.39	.164	-1.06	0.73	-2.49 – 0.37	-1.45	.147
Face gender × partic. sexual attr. to men v women	1.14	0.06	1.01 – 1.26	18.00	**<.001**	0.22	0.05	0.12 – 0.32	4.44	**<.001**
Face ethnicity × partic. sexual attr. to men v women	0.10	0.06	-0.03 – 0.22	1.55	.122	0.23	0.05	0.14 – 0.33	4.68	**<.001**
Partic. culture × partic. sexual attr. to men v women	0.73	0.33	0.08 – 1.38	2.20	**.028**	-0.71	0.25	-1.21 – -0.21	-2.80	**.005**

Face gender × face ethnicity × partic. culture	-5.24	1.91	-8.98 – -1.50	-2.74	**.006**	-0.72	1.81	-4.27 – 2.84	-0.40	.693
Face gender × face ethnicity × partic. sexual attr. to men v women	-0.11	0.20	-0.51 – 0.29	-0.53	.595	-0.44	0.16	-0.76 – -0.12	-2.72	**.007**
Face gender × partic. culture × partic. sexual attr. to men v women	0.80	0.13	0.56 – 1.05	6.38	**<.001**	-1.05	0.10	-1.24 – -0.85	-10.49	**<.001**
Face ethnicity × partic. culture × partic. sexual attr. to men v women	-0.37	0.13	-0.61 – -0.12	-2.91	**.004**	-0.11	0.10	-0.30 – 0.09	-1.08	.280
Face gender × face ethnicity × partic. culture × partic. sexual attr. to men v women	1.06	0.41	0.26 – 1.87	2.59	**.010**	0.13	0.32	-0.50 – 0.77	0.41	.679

Note. Participant sexual attraction was scored such that negative values indicated greater attraction to women and positive values greater attraction to men. For participant culture, Japan was coded as -0.5 and UK as +0.5; for face gender, female faces were coded as -0.5 and male faces as +0.5; and for face ethnicity, East Asian faces were coded as -0.5 and White faces as +0.5.

Table S4

Model Estimates for Interactive Preference Task with Sexual Attraction as Predictor

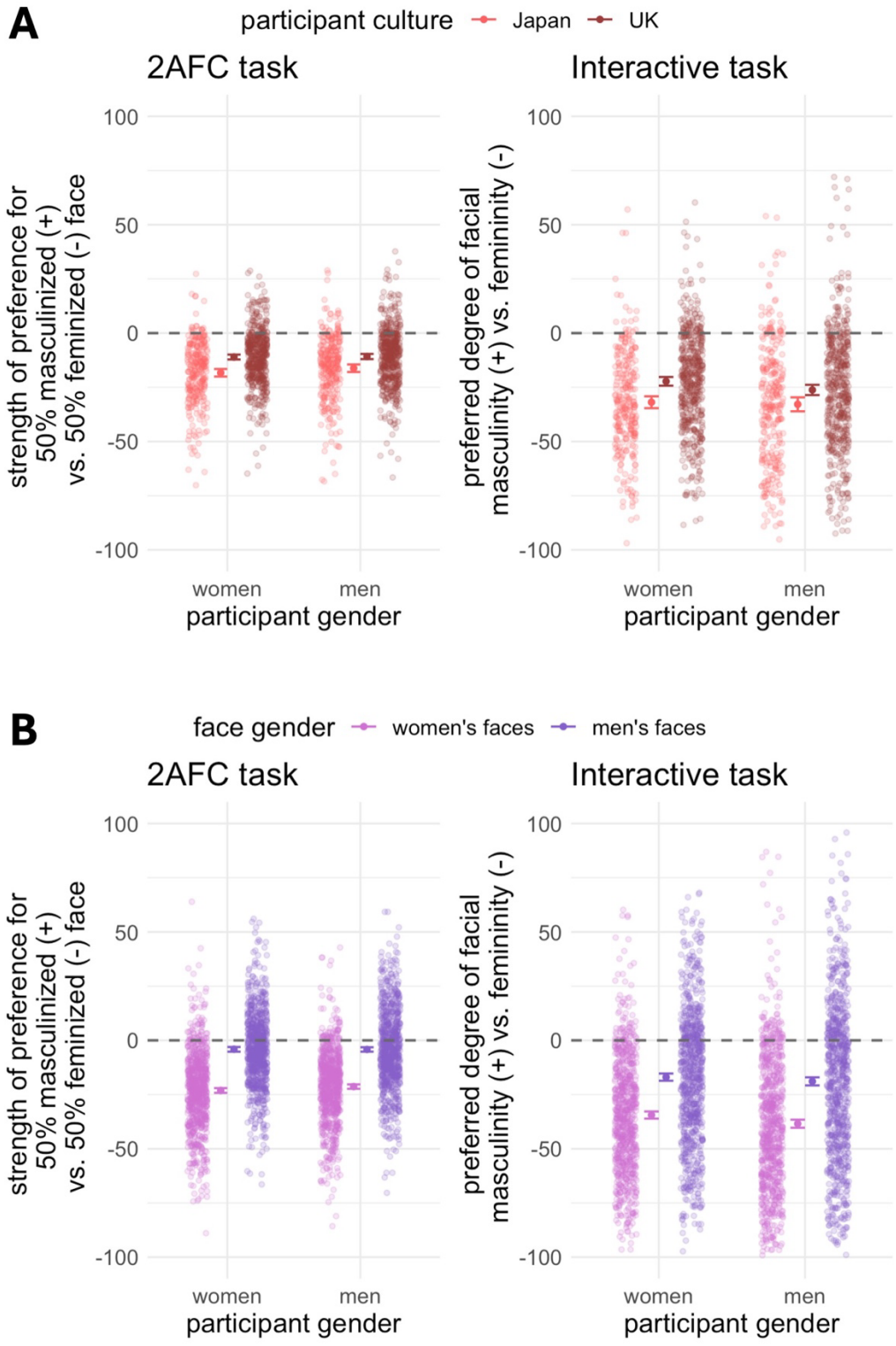
Predictor	Female participants					Male participants				
	b	*SE*	*CI*	*t*	*p*	*b*	*SE*	*CI*	*t*	*p*
Intercept	-27.12	1.31	-29.69 – -24.54	-20.67	**<.001**	-27.73	1.30	-30.27 – -25.19	-21.38	**<.001**
Face gender	14.37	1.82	10.80 – 17.94	7.90	**<.001**	19.94	1.55	16.90 – 22.99	12.84	**<.001**
Face ethnicity	-1.02	1.82	-4.59 – 2.55	-0.56	.575	-1.95	1.55	-5.00 – 1.09	-1.26	.208
Participant culture	9.38	1.94	5.59 – 13.18	4.84	**<.001**	4.43	2.11	0.30 – 8.57	2.10	**.036**
Participant sexual attraction to men v women	0.04	0.28	-0.50 – 0.59	0.16	.874	1.72	0.25	1.24 – 2.21	6.95	**<.001**
Face gender × face ethnicity	7.23	3.79	-0.19 – 14.64	1.91	.056	7.34	3.27	0.93 – 13.75	2.24	**.025**
Face gender × partic. culture	8.92	0.84	7.27 – 10.58	10.57	**<.001**	3.60	0.74	2.14 – 5.06	4.84	**<.001**
Face ethnicity × partic. culture	-3.56	0.84	-5.22 – -1.91	-4.22	**<.001**	-3.70	0.74	-5.16 – -2.24	-4.98	**<.001**
Face gender × partic. sexual attr. to men v women	2.23	0.08	2.08 – 2.37	29.26	**<.001**	0.57	0.06	0.45 – 0.69	9.15	**<.001**
Face ethnicity × partic. sexual attr. to men v women	0.03	0.08	-0.12 – 0.18	0.39	.698	0.11	0.06	-0.01 – 0.23	1.79	.073
Partic. culture × partic. sexual attr. to men v women	0.55	0.56	-0.54 – 1.64	0.98	.325	0.17	0.50	-0.80 – 1.14	0.34	.735

Face gender × face ethnicity × partic. culture	-1.57	2.68	-6.82 – 3.67	-0.59	.557	-1.19	2.54	-6.17 – 3.78	-0.47	.639
Face gender × face ethnicity × partic. sexual attr. to men v women	0.61	0.34	-0.06 – 1.27	1.80	.072	-0.16	0.27	-0.70 – 0.37	-0.59	.556
Face gender × partic. culture × partic. sexual attr. to men v women	1.73	0.15	1.43 – 2.03	11.38	**<.001**	-2.12	0.12	-2.36 – -1.87	-17.08	**<.001**
Face ethnicity × partic. culture × partic. sexual attr. to men v women	-0.12	0.15	-0.41 – 0.18	-0.76	.448	-0.40	0.12	-0.65 – -0.16	-3.25	**.001**
Face gender × face ethnicity × partic. culture × partic. sexual attr. to men v women	-0.76	0.68	-2.09 – 0.57	-1.13	.260	0.73	0.55	-0.34 – 1.80	1.34	.181

Note. Participant sexual attraction was scored such that negative values indicated greater attraction to women and positive values greater attraction to men. For participant culture, Japan was coded as -0.5 and UK as +0.5; for face gender, female faces were coded as -0.5 and male faces as +0.5; and for face ethnicity, East Asian faces were coded as -0.5 and White faces as +0.5.

Figure S5

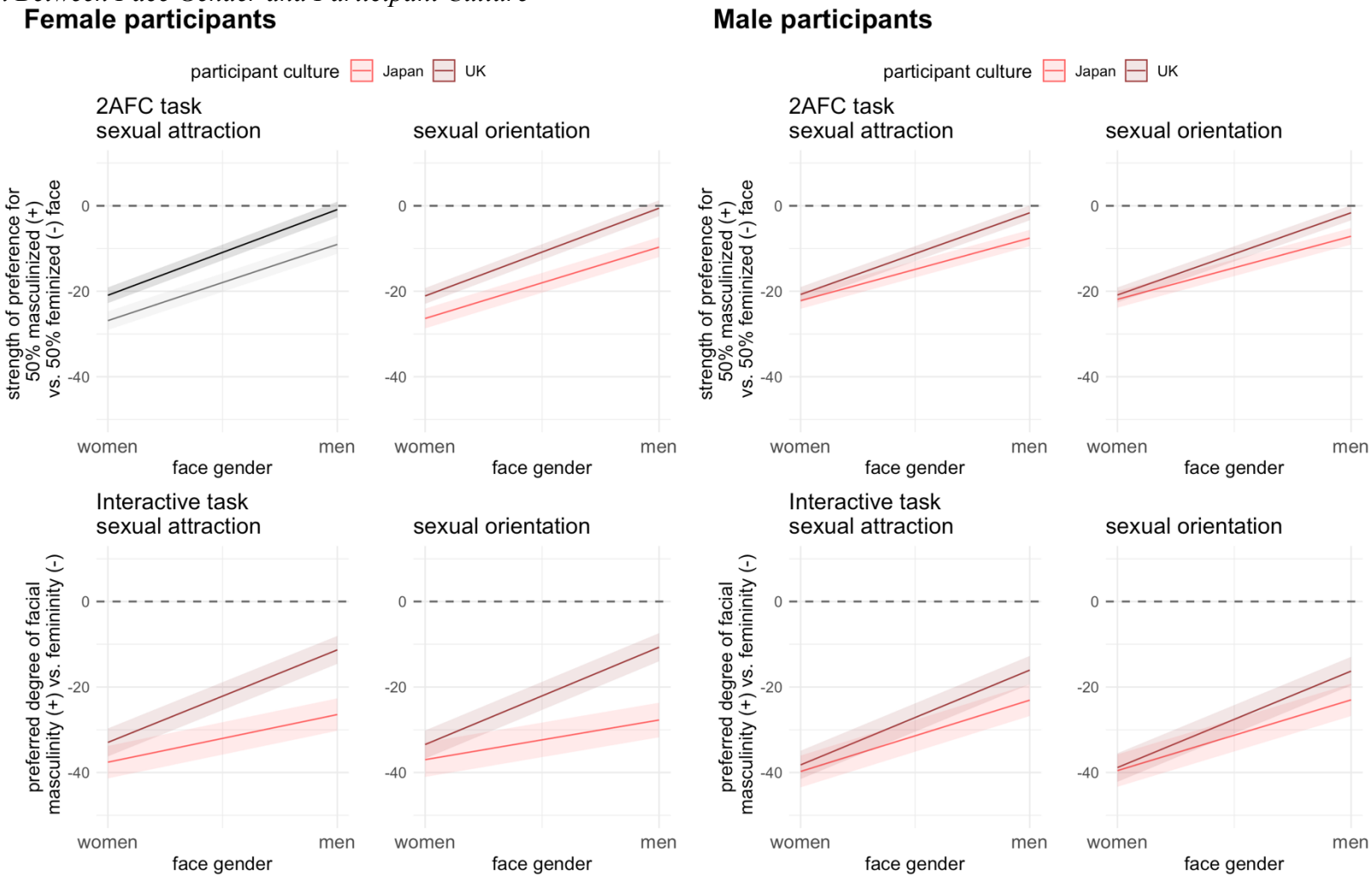
Main Effects of (A) Participant Culture and (B) Face Gender



Note. Plots show participant-level preferences. Translucent points represent individual participants (responses averaged across faces). Points with error bars represent means and 95% CIs. Horizontal dashed line at 0 indicates no preference for femininity or masculinity.

Figure S6

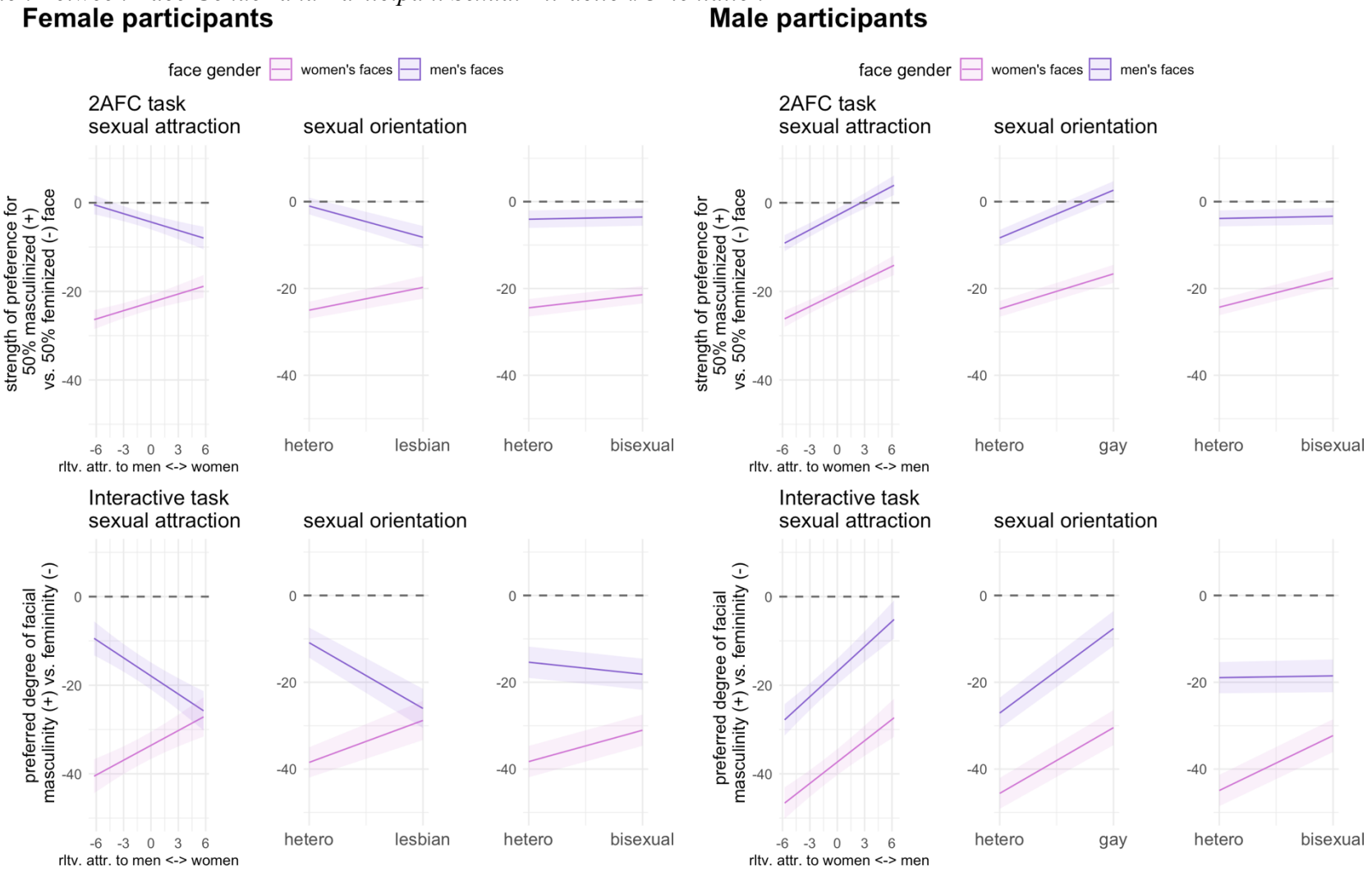
Interaction Between Face Gender and Participant Culture



Note. Face gender × participant culture interaction was not significant when predicting women's preferences in the 2AFC task using sexual attraction and therefore appears in greyscale. Horizontal dashed line at 0 indicates no preference for femininity or masculinity.

Figure S7

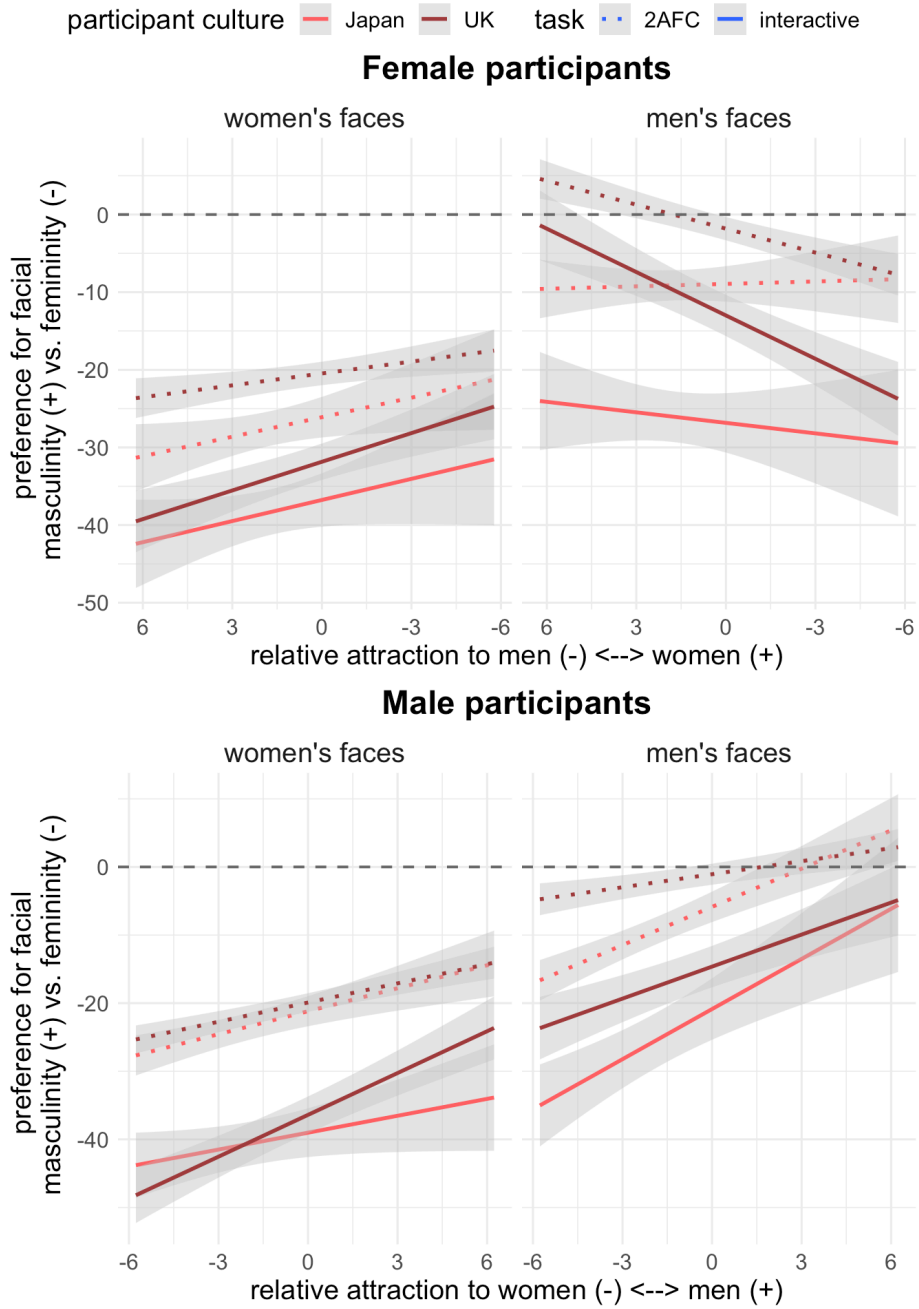
Interaction Between Face Gender and Participant Sexual Attraction/Orientation



Note. Horizontal dashed line at 0 indicates no preference for femininity or masculinity.

Figure S8

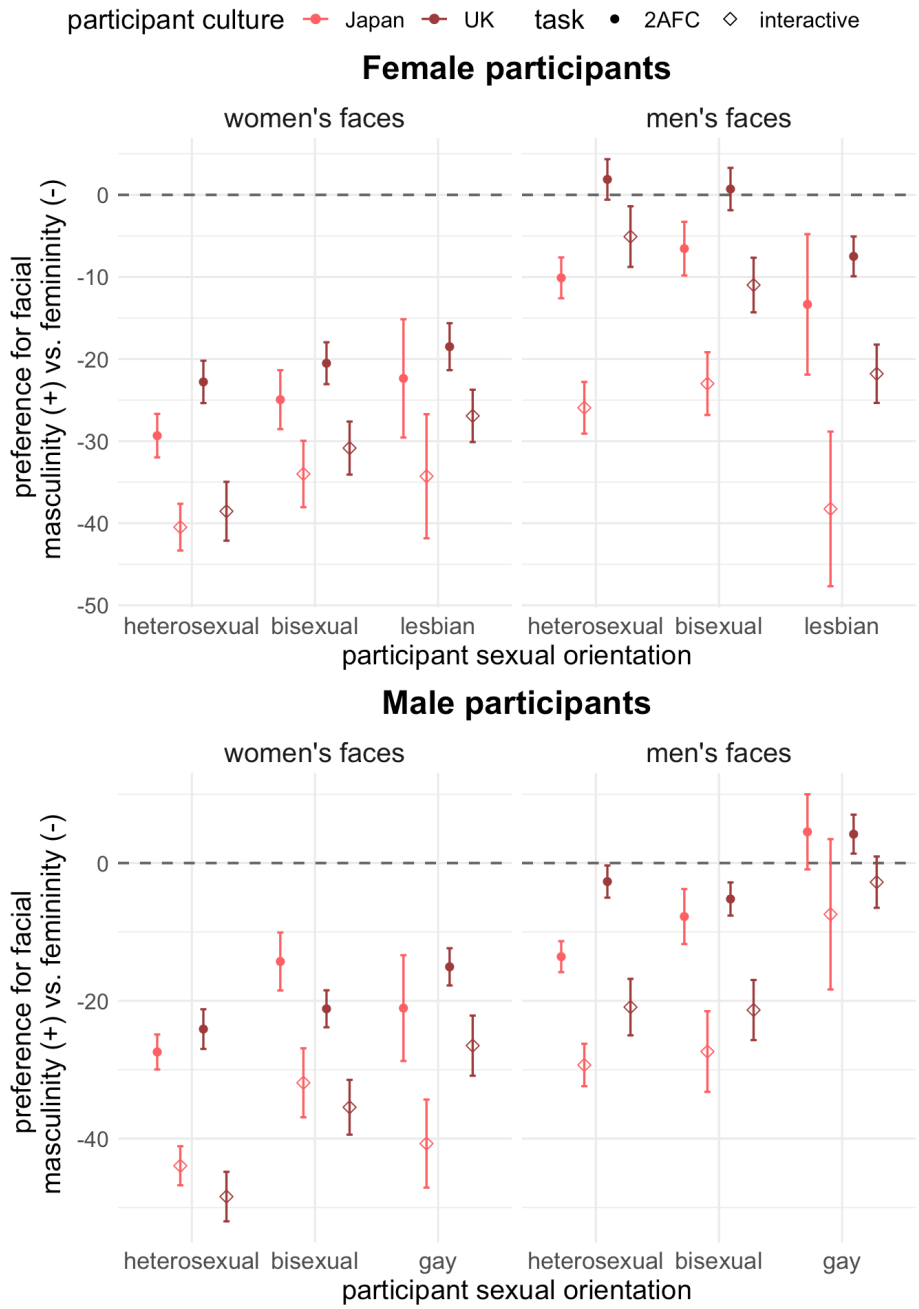
Summary of Interaction Between Face Gender, Participant Culture, and Participant Relative Sexual Attraction



Note. Plots show participant-level preferences (averaged across faces). Gray shading shows 95% CIs. Horizontal dashed line at 0 indicates no preference for femininity or masculinity.

Figure S9

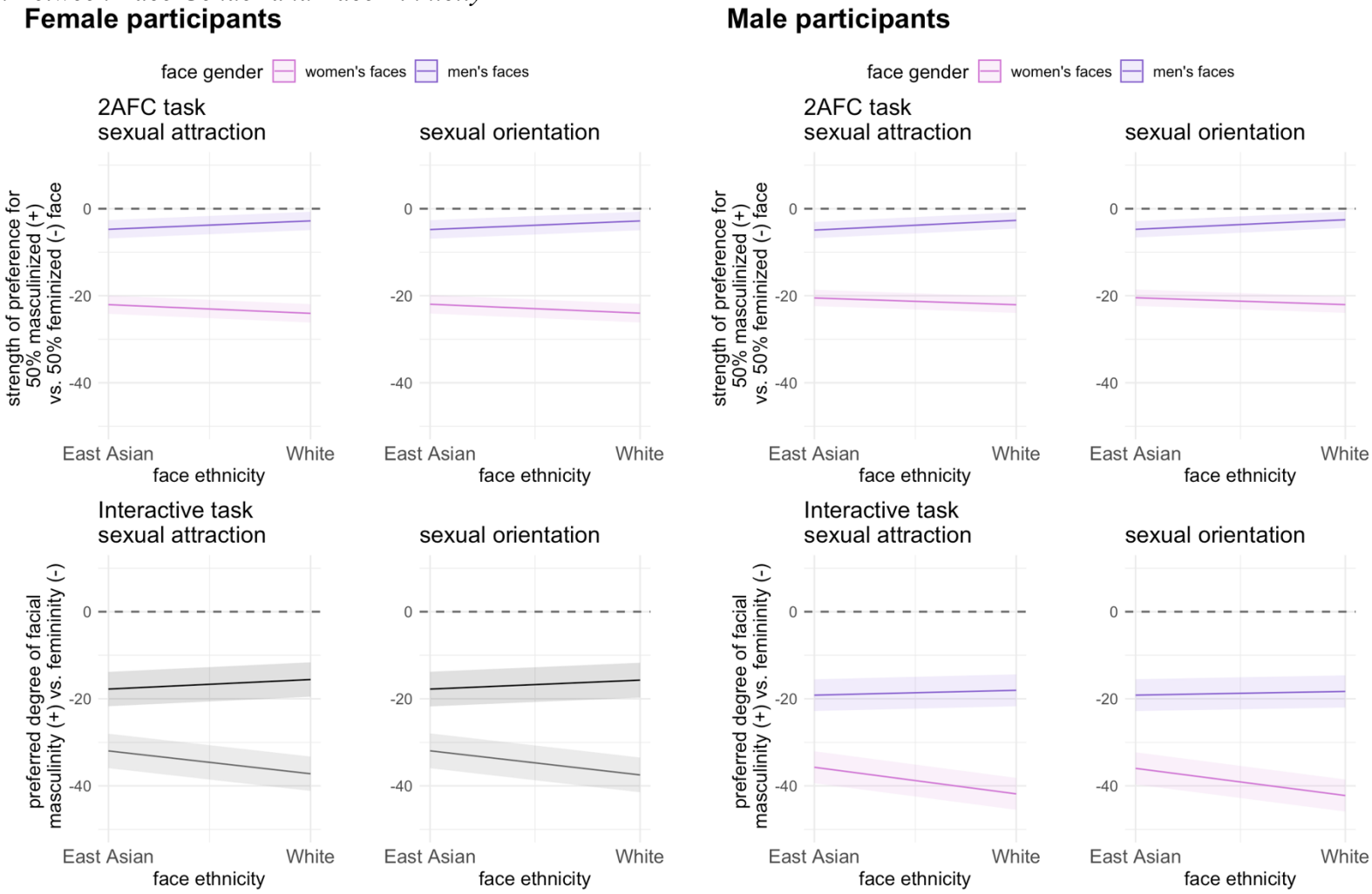
Summary of Interaction Between Face Gender, Participant Culture, and Participant Sexual Orientation



Note. Plots show participant-level preferences (averaged across faces). Points with error bars represent means and 95% CIs. Horizontal dashed line at 0 indicates no preference for femininity or masculinity.

Figure S10

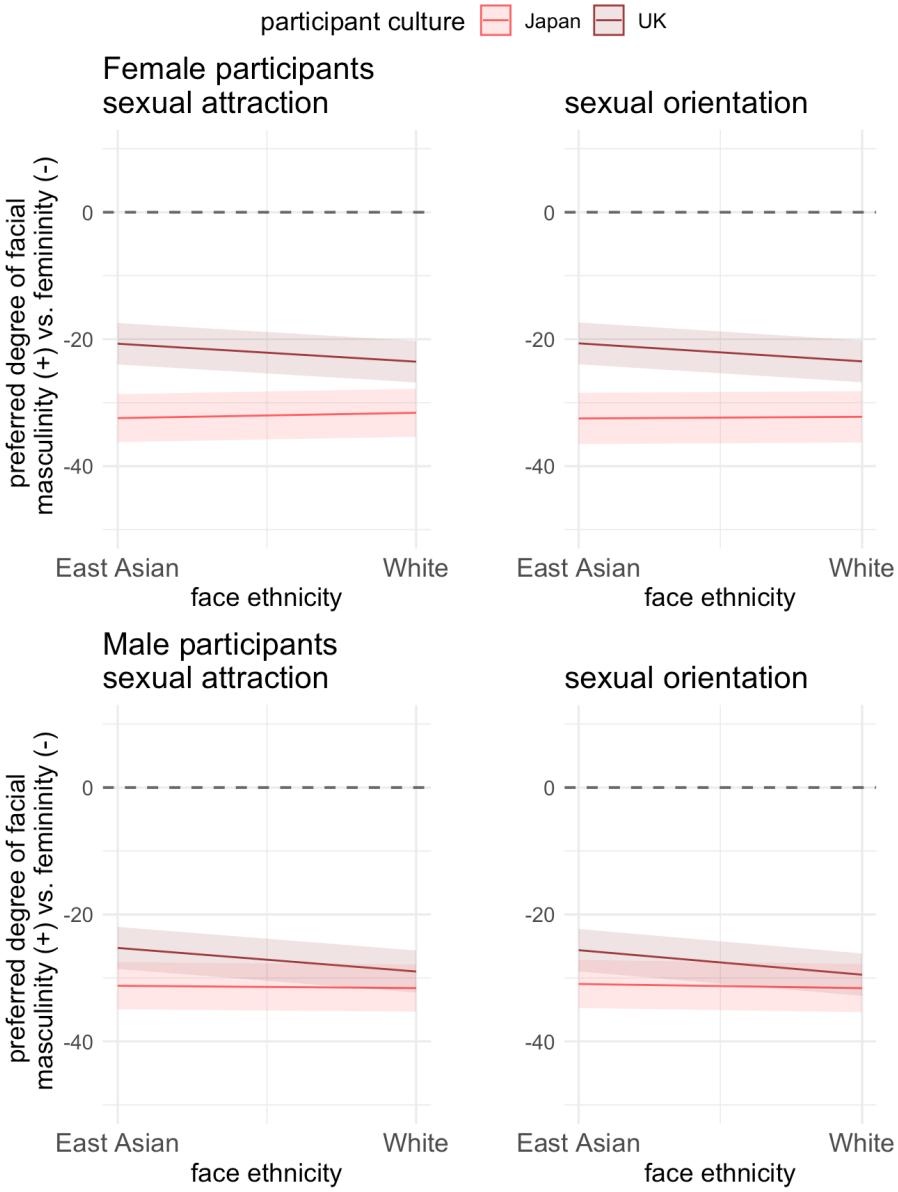
Interaction Between Face Gender and Face Ethnicity



Note. Face gender × face ethnicity interaction was not significant when predicting women's preferences in the interactive preference task and therefore appears in greyscale. Horizontal dashed line at 0 indicates no preference for femininity or masculinity.

Figure S11

Interaction Between Face Ethnicity and Participant Culture in the Interactive Preference Task



Note. Horizontal dashed line at 0 indicates no preference for femininity or masculinity.

Table S5

Model Estimates for Models Testing Intercept and Effect of Experimental Task on Degree of Preference for Femininity/Masculinity

Model				Model estimates					
Participant culture	Participant gender	Participant sexual orientation	Face gender	Predictor	*b*	*SE*	*95% CI*	*t*	*p*
Japan	Female	Heterosexual	Female	Intercept	-34.92	1.71	-38.27 – -31.56	-20.40	< .001
				Experimental task	-11.17	2.00	-15.09 – -7.25	-5.58	< .001
Japan	Female	Heterosexual	Male	Intercept	-18.03	1.81	-21.58 – -14.48	-9.96	< .001
				Experimental task	-15.85	2.12	-20.00 – -11.70	-7.48	< .001
Japan	Female	Bisexual	Female	Intercept	-29.48	2.04	-33.47 – -25.49	-14.48	< .001
				Experimental task	-9.08	2.92	-14.80 – -3.36	-3.11	.002
Japan	Female	Bisexual	Male	Intercept	-14.79	2.13	-18.97 – -10.61	-6.94	< .001
				Experimental task	-16.48	2.62	-21.61– -11.35	-6.30	< .001
Japan	Female	Lesbian	Female	Intercept	-28.31	5.25	-38.61 – -18.02	-5.39	< .001
				Experimental task	-11.91	5.75	-23.17 – -0.65	-2.07	.052
Japan	Female	Lesbian	Male	Intercept	-25.80	5.04	-35.69 – -15.92	-5.12	< .001

				Experimental task	-24.92	7.16	-38.96 – -10.89	-3.48	.002
UK	Female	Heterosexual	Female	Intercept	-30.67	1.58	-33.76 – -27.58	-19.45	< .001
				Experimental task	-15.78	2.00	-19.70 – -11.86	-7.89	< .001
UK	Female	Heterosexual	Male	Intercept	-1.60	1.89	-5.31 – 2.10	-0.85	.397
				Experimental task	-6.97	1.96	-10.81 – -3.13	-3.56	< .001
UK	Female	Bisexual	Female	Intercept	-25.68	1.72	-29.04 – -22.32	-14.97	< .001
				Experimental task	-10.34	1.93	-14.13 – -6.56	-5.36	< .001
UK	Female	Bisexual	Male	Intercept	-5.15	1.97	-9.01 – -1.29	-2.61	.010
				Experimental task	-11.72	1.97	-15.58 – -7.85	-5.94	< .001
UK	Female	Lesbian	Female	Intercept	-22.71	1.90	-26.43 – -19.00	-11.98	< .001
				Experimental task	-8.44	2.09	-12.54 – -4.34	-4.03	< .001
UK	Female	Lesbian	Male	Intercept	-14.65	2.10	-18.76 – -10.55	-6.99	< .001
				Experimental task	-14.33	2.13	-18.50 – -10.16	-6.74	< .001
Japan	Male	Heterosexual	Female	Intercept	-35.70	1.53	-38.69 – -32.70	-23.38	< .001
				Experimental task	-16.54	2.04	-20.54 – -12.55	-8.11	< .001

Japan	Male	Heterosexual	Male	Intercept	-21.46	1.76	-24.92 – -18.00	-12.16	< .001
				Experimental task	-15.74	2.09	-19.83 – -11.65	-7.54	< .001
Japan	Male	Bisexual	Female	Intercept	-23.09	2.36	-27.73 – -18.46	-9.77	< .001
				Experimental task	-17.61	3.28	-24.04 – -11.17	-5.37	< .001
Japan	Male	Bisexual	Male	Intercept	-17.56	2.91	-23.27 – -11.85	-6.03	< .001
				Experimental task	-19.60	3.70	-26.85 – -12.35	-5.30	< .001
Japan	Male	Gay	Female	Intercept	-30.89	3.32	-37.39 – -24.39	-9.31	< .001
				Experimental task	-19.66	3.84	-27.19 – -12.13	-5.12	< .001
Japan	Male	Gay	Male	Intercept	-1.46	5.09	-11.44 – 8.52	-0.29	.775
				Experimental task	-11.99	5.70	-23.15 – -0.82	-2.10	.041
UK	Male	Heterosexual	Female	Intercept	-36.27	1.50	-39.21 – -33.32	-24.11	< .001
				Experimental task	-24.32	2.25	-28.74 – -19.90	-10.79	< .001
UK	Male	Heterosexual	Male	Intercept	-11.80	1.94	-15.60 – -8.01	-6.10	< .001
				Experimental task	-18.23	2.30	-22.74 – -13.72	-7.92	< .001
UK	Male	Bisexual	Female	Intercept	-28.32	1.60	-31.45 – -25.19	-17.73	< .001

				Experimental task	-14.31	2.33	-18.88 – -9.75	-6.15	< .001
UK	Male	Bisexual	Male	Intercept	-13.29	2.19	-17.58 – -9.00	-6.07	< .001
				Experimental task	-16.14	2.39	-20.83 – -11.45	-6.75	< .001
UK	Male	Gay	Female	Intercept	-20.79	2.03	-24.76 – -16.82	-10.26	< .001
				Experimental task	-11.45	2.48	-16.31 – -6.59	-4.62	< .001
UK	Male	Gay	Male	Intercept	0.71	2.18	-3.57 – 4.99	0.33	.745
				Experimental task	-6.97	2.15	-11.18 – -2.76	-3.25	.001

Consistency Between Experimental Tasks

Preferences as Binary

Here, we recoded responses on both tasks to reflect a binary choice, i.e., whether participants chose a feminized or a masculinized face in each task, with 0 indicating feminized and 1 masculinized. Given that we observed a consistent interaction between face gender, participant culture, and participant sexual attraction/orientation in our primary analysis, we ran separate models by face gender, participant culture, and sexual orientation category for ease of interpretation. We adjusted the alpha level for 12 comparisons (3 sexual orientation groups, 2 cultures, 2 face genders) using Bonferroni correction ($\alpha = .05/12 = .004$).

We predicted choice (0 = feminized face, 1 = masculinized face) using binomial mixed effects models with type of task (2AFC = −0.5, interactive preference = +0.5) again as the sole predictor (see exploratory analysis script 3a-*Task Comparison* on the OSF for full model specifications, https://osf.io/gr3cn). Like the pattern observed for the degree of preferences, intercepts were significant and negative for all but four models, indicating an overall preference for feminized faces (see Table S6 for summary; see also Figure S12). The four models with non-significant intercepts were those for judgments of men's faces by British heterosexual women, British bisexual women, British gay men, and Japanese gay men (as for degree of preferences).

Type of task had no effect in any models testing judgments of women's faces (except for judgments by British heterosexual men). There was a significant effect of experimental task for most models testing judgments of men's faces (apart from Japanese lesbian women, Japanese heterosexual men, and both British and Japanese gay men). The significant effects were negative throughout, indicating a higher likelihood of a feminized face (or lower likelihood of a masculinized face) being chosen in the interactive preference task compared to the 2AFC task (see Table S7 for full model estimates).

Alignment Between Tasks and Impact of Task on Previously Reported Effects

Lastly, we also tested how much preferences in the two tasks aligned, and whether type of task affected some of the previously reported findings in the literature. Overall, preferences for the same stimulus identities in 2AFC vs interactive preference tasks were only weakly correlated, and previously found effects of moderators more pronounced in interactive preference vs 2AFC tasks. Please see exploratory analysis script 3a-*Task Comparison* on the OSF for full analyses and results, https://osf.io/gr3cn.

Table S6

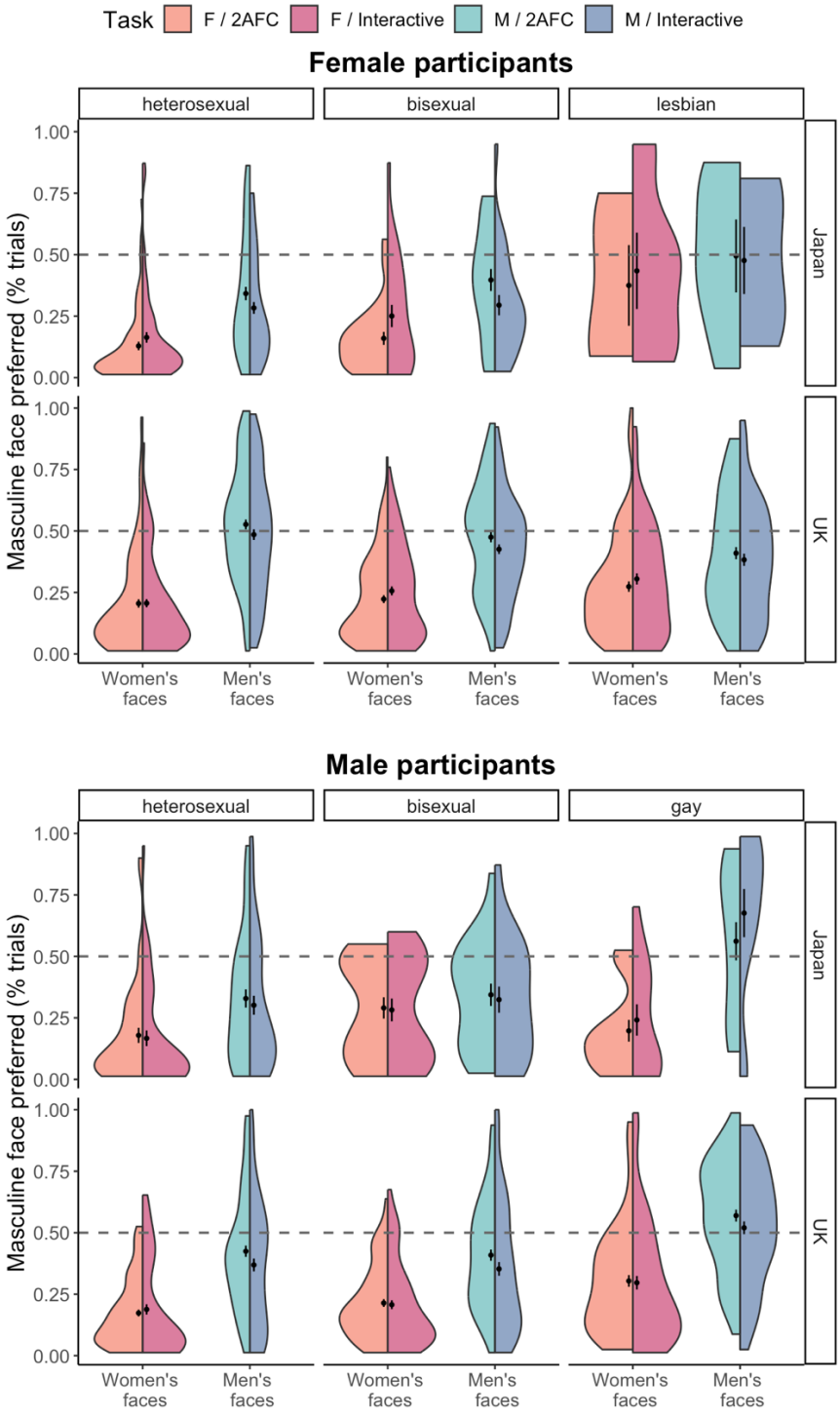
Summary of Models Testing Intercept and Effect of Experimental Task on Binary Preference for Masculinized vs. Feminized Face

Model				Results	
Participant culture	Participant gender	Participant sexual orientation	Face gender	Intercept	Experimental task
Japan	Female	Heterosexual	Female	−	ns
			Male	−	−
		Bisexual	Female	−	ns
			Male	−	−
		Lesbian	Female	−	ns
			Male	−	ns
UK	Female	Heterosexual	Female	−	ns
			Male	ns	−
		Bisexual	Female	−	ns
			Male	ns	−
		Lesbian	Female	−	ns
			Male	−	−
Japan	Male	Heterosexual	Female	−	ns
			Male	−	ns
		Bisexual	Female	−	ns
			Male	−	−
		Gay	Female	−	ns
			Male	ns	ns
UK	Male	Heterosexual	Female	−	−
			Male	−	−
		Bisexual	Female	−	ns
			Male	−	−
		Gay	Female	−	ns
			Male	ns	ns

Note. Full results including 95% CIs can be found in Table S7. "−" indicates significant negative effect. For the intercept, a negative effect corresponds to a preference for femininity; for the experimental task predictor, a negative effect corresponds to a stronger preference for femininity in the interactive preference compared to the 2AFC task. "ns" denotes a non-significant effect.

Figure S12

Comparing Binary Preferences Across the Two Experimental Tasks



Note. Responses on both 2AFC and interactive preference tasks were recoded into binary choices, with 1 indicating that a masculinized face and 0 indicating that a feminized face was chosen. Y-axis shows the proportion of trials in which a masculinized face was chosen. Red hues represent preferences for women's faces, blue hues represent preferences for men's faces; lighter hues represent 2AFC task, darker hues represent interactive preference task. Horizontal dashed line at 0.5 indicates equal proportion of choice of masculinized and feminized face.

Table S7

Model Estimates for Models Testing Intercept and Effect of Experimental Task on Binary Preference for Masculinized vs. Feminized Face

Model				Model estimates					
Participant culture	Participant gender	Participant sexual orientation	Face gender	Predictor	*Estimate*	*SE*	*95% CI*	*Z*	*p*
Japan	Female	Heterosexual	Female	Intercept	-2.60	0.14	-2.87 – -2.33	-18.83	< .001
				Experimental task	0.22	0.13	-0.03 – 0.47	1.69	.090
Japan	Female	Heterosexual	Male	Intercept	-1.15	0.13	-1.40 – -0.90	-9.04	< .001
				Experimental task	-0.49	0.11	-0.72 – -0.27	-4.39	< .001
Japan	Female	Bisexual	Female	Intercept	-1.81	0.14	-2.07 – -1.54	-13.32	< .001
				Experimental task	0.18	0.15	-0.11 – 0.46	1.23	.219
Japan	Female	Bisexual	Male	Intercept	-0.77	0.12	-1.01 – -0.53	-6.38	< .001
				Experimental task	-0.44	0.14	-0.71 – -0.18	-3.28	.001
Japan	Female	Lesbian	Female	Intercept	-1.92	0.36	-2.62 – -1.22	-5.38	< .001
				Experimental task	0.21	0.33	-0.44 – 0.86	0.62	.534
Japan	Female	Lesbian	Male	Intercept	-1.58	0.36	-2.29 – -0.87	-4.36	< .001
				Experimental task	-0.78	0.34	-1.44 – -0.12	-2.31	.021

UK	Female	Heterosexual	Female	Intercept	-1.98	0.11	-2.2 – -1.76	-17.52	< .001
				Experimental task	-0.01	0.10	-0.20 – 0.18	-0.13	.895
UK	Female	Heterosexual	Male	Intercept	-0.02	0.12	-0.25 – 0.20	-0.21	.837
				Experimental task	-0.27	0.09	-0.45 – -0.09	-2.97	.003
UK	Female	Bisexual	Female	Intercept	-1.54	0.11	-1.75 – -1.32	-13.98	< .001
				Experimental task	0.02	0.09	-0.16 – 0.20	0.25	.804
UK	Female	Bisexual	Male	Intercept	-0.25	0.11	-0.47 – -0.04	-2.32	.020
				Experimental task	-0.36	0.09	-0.54 – -0.19	-4.14	< .001
UK	Female	Lesbian	Female	Intercept	-1.35	0.13	-1.60 – -1.11	-10.81	< .001
				Experimental task	0.12	0.10	-0.07 – 0.32	1.24	.216
UK	Female	Lesbian	Male	Intercept	-0.86	0.13	-1.12 – -0.61	-6.64	< .001
				Experimental task	-0.30	0.09	-0.48 – -0.12	-3.24	.001
Japan	Male	Heterosexual	Female	Intercept	-2.78	0.13	-3.04 – -2.52	-21.06	< .001
				Experimental task	0.10	0.13	-0.16 – 0.36	0.75	.455
Japan	Male	Heterosexual	Male	Intercept	-1.39	0.13	-1.64 – -1.14	-10.76	< .001

				Experimental task	-0.34	0.12	-0.58 – -0.11	-2.83	.005
Japan	Male	Bisexual	Female	Intercept	-1.40	0.15	-1.70 – -1.10	-9.06	< .001
				Experimental task	-0.04	0.15	-0.33 – 0.25	-0.28	.780
Japan	Male	Bisexual	Male	Intercept	-1.03	0.18	-1.38 – -0.69	-5.88	< .001
				Experimental task	-0.63	0.18	-0.99 – -0.28	-3.53	< .001
Japan	Male	Gay	Female	Intercept	-2.15	0.24	-2.61 – -1.69	-9.11	< .001
				Experimental task	-0.66	0.25	-1.16 – -0.16	-2.59	.010
Japan	Male	Gay	Male	Intercept	-0.16	0.35	-0.84 – 0.51	-0.47	.636
				Experimental task	-0.74	0.31	-1.35 – -0.13	-2.36	.018
UK	Male	Heterosexual	Female	Intercept	-2.38	0.12	-2.61 – -2.14	-20.00	< .001
				Experimental task	-0.55	0.12	-0.79 – -0.32	-4.56	< .001
UK	Male	Heterosexual	Male	Intercept	-0.64	0.12	-0.88 – -0.40	-5.27	< .001
				Experimental task	-0.53	0.11	-0.74 – -0.32	-4.95	< .001
UK	Male	Bisexual	Female	Intercept	-1.57	0.10	-1.76 – -1.38	-16.28	< .001
				Experimental task	-0.10	0.11	-0.30 – 0.11	-0.89	.374

UK	Male	Bisexual	Male	Intercept	-0.69	0.12	-0.92 – -0.45	-5.65	< .001
				Experimental task	-0.50	0.11	-0.71 – -0.29	-4.70	< .001
UK	Male	Gay	Female	Intercept	-1.16	0.12	-1.40 – -0.92	-9.44	< .001
				Experimental task	-0.17	0.11	-0.38 – 0.05	-1.53	.126
UK	Male	Gay	Male	Intercept	0.03	0.12	-0.21 – 0.26	0.24	.811
				Experimental task	-0.23	0.09	-0.41 – -0.05	-2.54	.011

Moderation Results

We detail the highest-order interactions involving the moderator for each model below (see Table S8 for summary). Tables with full model estimates and figures illustrating each significant interaction are available on the OSF.

Table S8

Summary of Moderation Results

Model			Highest-order interaction(s) involving moderator(s)			
Participant gender	Participant sexual orientation	Face gender	Age	Attractiveness	Relationship status	Relationship quality
Female	Heterosexual	Female	age × culture × task	self × task female peers × culture × task male peers × culture × task	status × culture × task × face ethnicity	commit × culture × task happy × culture × task
Female	Heterosexual	Male	age × culture × task	self × culture × task male peers × culture × task	status × task status × culture × face ethnicity	commit × face ethnicity happy × task commit × culture × task happy × culture × face ethnicity
Female	Bisexual	Female	age × task	female peers × culture × task male peers × culture × task	status × culture × task	commit × culture × task commit × culture × face ethnicity happy × culture × task happy × culture × face ethnicity
Female	Bisexual	Male	age × task age × culture × face ethnicity	female peers × face ethnicity self × culture × task	status × culture × task	happy × task commit × culture × task commit × culture × face ethnicity

Female	Lesbian	Female	age × culture × task	male peers × task female peers × culture × task self × culture × task	status × culture × task	
Female	Lesbian	Male	age × task	male peers × culture × task self × culture × task	status × culture × task	
Male	Heterosexual	Female	age × culture × face ethnicity	female peers × culture × task male peers × culture × task self × culture × task × face ethnicity	status × culture × task status × culture × face ethnicity	happy × task commit × culture × face ethnicity happy × culture × face ethnicity
Male	Heterosexual	Male	age × culture × face ethnicity	self × task male peers × task male peers × face ethnicity female peers × culture × task female peers × culture × face ethnicity	status × culture × task status × culture × face ethnicity	commit × task commit × face ethnicity happy × culture × task happy × culture × face ethnicity
Male	Bisexual	Female	age × culture × task	self × task self × face ethnicity male peers × culture × task	status × task	happy × task happy × face ethnicity
Male	Bisexual	Male	age × culture × task	self × task female peers × task	status × culture × task	commit × task commit × culture × face ethnicity happy × culture × task happy × culture × face ethnicity

Male	Gay	Female	age × task	self × culture × task male peers × culture × task	status × culture × task	commit × culture × task happy × culture × task
Male	Gay	Male	age × culture × task	self × culture × task female peers × culture × face ethnicity male peers × culture × face ethnicity male peers × culture × task	status × culture × task	happy × task commit × culture × face ethnicity

Note. Culture = participant culture, task = experimental task, self = self-perceived attractiveness, female peers = female peer-perceived attractiveness, male peers = male peer-perceived attractiveness, status = relationship status, commit = relationship commitment, happy = relationship happiness. Moderation by age, attractiveness, relationship status, and relationship quality tested in separate models.

Participant Age

These models included participant age as a moderator. Full results can be found in the exploratory analysis script 3b-*Age* on the OSF, https://osf.io/9ha6m. Across all models but two (heterosexual men judging women's and men's faces), participant age either interacted with task, or with task and participant culture. All interactions including task were such that participant age emerged as a stronger predictor in the interactive compared to the 2AFC task (with participant age sometimes nonsignificant in the 2AFC task).

Overall, with increasing age, women showed greater femininity preferences. Exceptions to this were heterosexual women in the UK judging men's faces (in line with H7b), lesbian women in Japan judging women's faces, and lesbian women in both cultures judging men's faces; these groups preferred lower levels of femininity (higher levels of masculinity) the higher their age. However, this finding did not generalize across the two participant cultures and different sexual orientation groups (see Tables S8-9). For bisexual women judging men's faces, there was also a three-way interaction of participant age, participant culture, and face ethnicity, indicating that participant age had a slightly larger effect for ethnic in-group faces. Patterns for men also showed variations by culture and sexual orientation. With increasing age, bisexual Japanese men judging women's faces and gay Japanese men judging men's faces preferred lower femininity, whereas other groups preferred either higher femininity with increasing participant age (bisexual British men independent of face gender, gay British men judging men's faces), or participant age had no effect on preferences (bisexual Japanese men looking at men's faces, see Table S9).

Heterosexual men were the only group who showed no interaction between participant age and task (or task and participant culture). Instead, there was a three-way interaction of participant age, participant culture, and face ethnicity. Participant age had no effect on Japanese men's preferences for East Asian women's faces but had a positive effect on their preferences for White women's femininity. In contrast, participant age had a positive effect on White men's preferences for East Asian women's femininity, and a negative effect on their preferences for White women's femininity. When judging men's faces, participant age had no effect for ethnic in-group faces, but a positive effect on preferred femininity levels for ethnic out-group faces.

Table S9

Summary of Participant Age Effects by Participant Gender, Participant Culture, Sexual Orientation, and Face Gender

Participant gender	Participant sexual orientation	Face gender	Japan	UK
			With increasing age, preference for:	
Female	Heterosexual	Female	higher femininity	
		Male	higher femininity	lower femininity
	Bisexual	Female	higher femininity	
		Male	higher femininity	
	Lesbian	Female	lower femininity	higher femininity
		Male	lower femininity	
Male	Heterosexual	Female	*[effect of age qualified by face ethnicity]*	
		Male		
	Bisexual	Female	lower femininity	higher femininity
		Male	*[no effect]*	higher femininity

Gay	Female	higher femininity	
	Male	lower femininity	higher femininity

Note. Where cells are merged, participant age did not interact with participant culture (i.e., effects were independent of participant culture).

Participant Attractiveness

We averaged across participant self-rated face, body, and overall attractiveness scores separately for attractiveness as perceived by the self, female peers, and male peers, based on the results of a factor analysis (see Table S10 for factor loadings). These models thus included these three composite attractiveness scores as moderators. Full results can be found in the exploratory analysis script 3c-*Attractiveness* on the OSF, https://osf.io/3u4xc.

Table S10

Factor Loadings for Participant Self-Rated Attractiveness

	Female Peers Factor	Male Peers Factor	Self Factor
Female Peers: Face	**.88**	.00	.06
Female Peers: Body	**.85**	.08	-.01
Female Peers: Overall	**.99**	-.01	.01
Male Peers: Face	.03	**.87**	.04
Male Peers: Body	.01	**.90**	.00
Male Peers: Overall	.01	**.99**	.00
Self: Face	.03	-.02	**.85**
Self: Body	.00	.07	**.79**
Self: Overall	.01	-.01	**1.00**
Proportion Variance Explained	*.28*	*.28*	*.26*

Note. Exploratory factor analysis using promax rotation. Items with bolded loadings were averaged to create composite factor.

Participant attractiveness most consistently interacted with participant culture and experimental task, though whether self-perceived, female peer-perceived, and/or male peer-perceived attractiveness was a significant moderator varied across models. Overall, self-perceived and male peer-perceived attractiveness emerged as moderators more often than female peer-perceived attractiveness, for both female and male participants. Effects of attractiveness moreover varied by the source of perceived attractiveness (self, female peers, male peers) and by experimental task. Throughout, strength (and in some cases, direction) of patterns varied by experimental task.

Heterosexual women (across both cultures) who perceived themselves as more attractive preferred less femininity in men's faces (supporting H7c). Bisexual women also showed this pattern. Results for lesbian women were variable and, across sexual orientation, patterns for female peer-perceived and male peer-perceived attractiveness were mixed and often in opposition to one another or to self-perceived attractiveness.

Japanese heterosexual men who perceived themselves to be more attractive preferred more femininity in women's faces, but British heterosexual men with greater self-perceived attractiveness preferred less femininity in women's faces. Self-rated attractiveness predicted

lower femininity preferences for heterosexual men judging men's faces, and bisexual men and British gay men judging women's and men's faces. Preferences among Japanese gay men, however, varied by experimental task, and patterns for female peer-perceived and male peer-perceived attractiveness were again mixed and often in opposition to one another or to the patterns for self-perceived attractiveness.

Participant Relationship Status

These models included participant relationship status (single or in a relationship, effect-coded) as a moderator. Full model specifications and results can be found in the exploratory analysis script 3d-*Relationship Status* on the OSF, https://osf.io/su2dw).

Relationship status most consistently interacted with participant culture and experimental task. Single heterosexual and bisexual women in Japan and the UK preferred somewhat less femininity in men's faces compared to women in a relationship (in line with H7a). When judging women's faces, British and Japanese bisexual women and Japanese heterosexual women also showed weaker femininity preferences when single than when partnered, whereas patterns for British heterosexual women varied by both experimental task and face ethnicity. Relationship status had little if any effect on British lesbian women, but Japanese lesbian women showed increased preferences for femininity across face gender when single compared to when in a relationship. Throughout, strength (and in some cases, significance) of patterns varied by experimental task.

Among men, Japanese heterosexual men showed increased preferences for femininity in both women's and men's faces when single, whereas relationship status had little if any effect on preferences of British heterosexual men. Relationships status also did not appear to affect preferences of British bisexual men when judging men's faces, whereas bisexual Japanese men judging men's faces, and bisexual men across both cultures judging women's faces preferred lower femininity. Gay men judging men's faces preferred higher femininity, and for gay men judging women's faces there was a small effect of single men preferring somewhat lower femininity, but strength (and in some case significance) of effects varied again by task.

Participant Relationship Quality

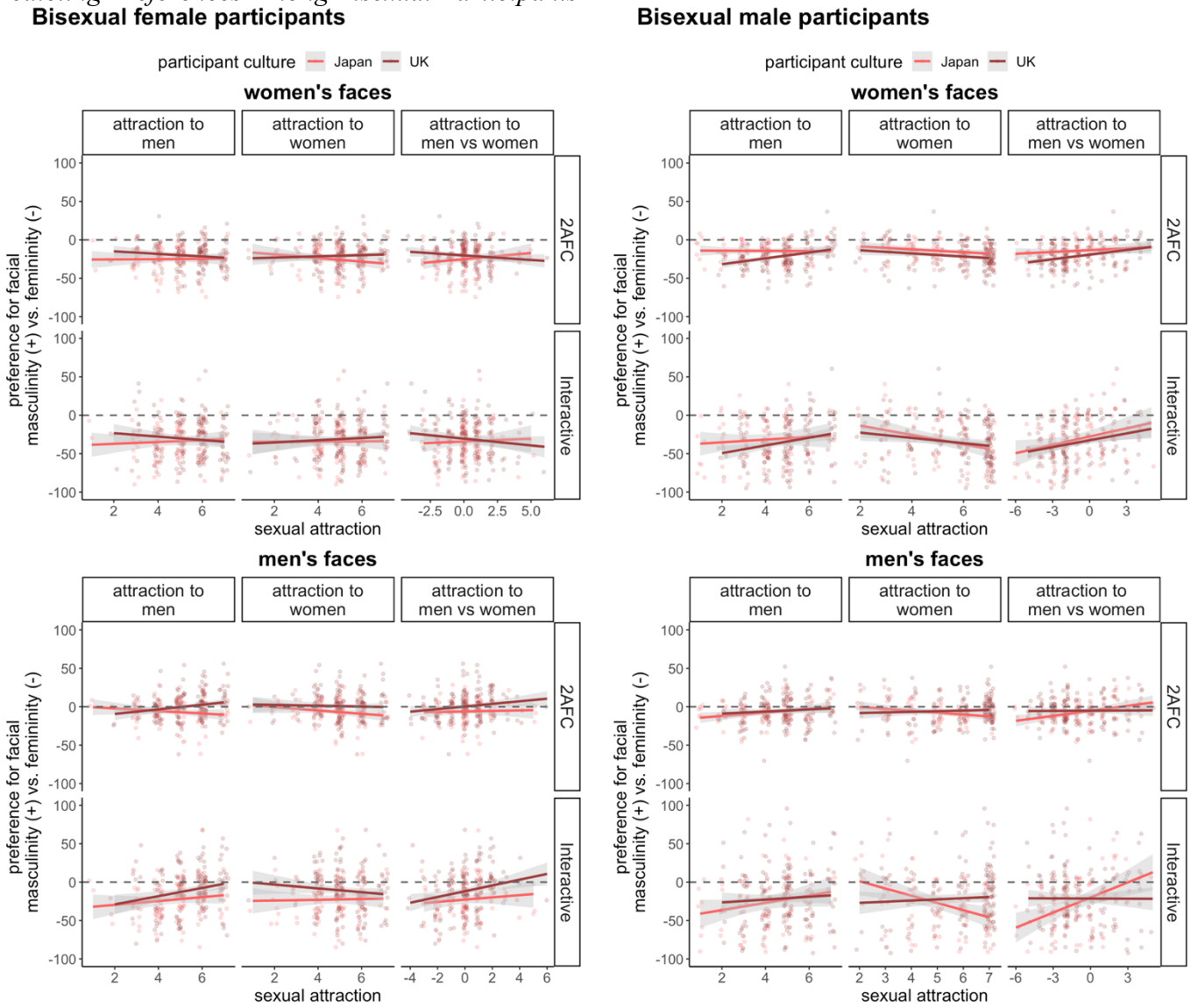
In these models, we included participant self-reported commitment to and happiness in their relationship as moderators. Full model specifications and results can be found in the exploratory analysis script 3d-*Relationship Status* on the OSF, https://osf.io/su2dw). Both relationship happiness and commitment were very skewed, showing ceiling effects and limited range that suggested socially desirable responding (see Figure S13). Overall, commitment and happiness tended to have opposing effects–e.g., greater relationship commitment predicting stronger femininity preference but greater relationship happiness predicting weaker femininity preference. We hesitate to interpret these effects, however, due to the limited range of responses.

Figure S13

Relationship Commitment and Happiness Distributions by Participant Culture

Figure S14

Sexual Attraction Predicting Preferences Among Bisexual Participants



Note. Horizontal dashed line at 0 indicates no preference for femininity or masculinity.