Mate Availability and Sexual Disgust

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Abstract

Objective: One of the factors that sexual disgust should be calibrated to is the size of the mating pool. Previous research provides evidence that low mate availability affects perceptions related to mate choice. However, methodological shortcomings leave the role of sexual disgust in facilitating mate selection unclear. We will examine whether perceptions of mate availability explain variance in levels of sexual disgust towards potential mates.

Methods: Participants (N = 1,000) will rate how sexually disgusting they find 60 potential mates that have previously been rated on attractiveness by a separate group of raters. We will measure participants' perceptions of mate availability in their local environment, self-perceived attractiveness and mate value, and relevant control variables (e.g., age, relationship status).

Results: We will use linear mixed effect models to examine (1) the association between sexual disgust towards potential mates and perceived mate availability; (2) the sex difference in sexual disgust; (3) the association between targets' attractiveness and raters' sexual disgust; and (4) whether perceived mate availability moderates the association between sexual disgust and targets' attractiveness.

Conclusions: This study will test perceptions of mate availability as an input into the calibration of sexual disgust. The results will clarify the magnitude of mate availability perceptions on mate choice.

Keywords: sexual disgust; mate availability; attractiveness; mating; evolution

Mate Availability and Sexual Disgust

Why and when do individuals experience sexual disgust? Evolutionary scientists have begun to develop an understanding of the functional role of sexual disgust. Sexual disgust is hypothesized to be an emotion that has been shaped by selection pressures that are partially distinct from other forms of disgust, such as pathogen disgust and moral disgust (Curtis et al., 2004; Crosby et al., 2020; Tybur, et al., 2009). A central assumption underlying this hypothesis is that by experiencing sexual disgust in specific sexual contexts, individuals are guided away from mating opportunities that would have, on average, led to lower reproductive fitness over the course of human evolution.

As with other emotions, sexual disgust is hypothesized to consist of a computational architecture wherein specific inputs trigger its activation (Al-Shawaf et al., 2016; Cosmides & Tooby, 2000; Nesse, 1990; Tybur et al., 2013). Once activated, sexual disgust should direct individuals away from potentially costly mating opportunities or sub-optimal mates, such as genetic relatives (Ackerman et al., 2007; Haidt et al., 2000) or mates with cues to communicable diseases (Ryan et al., 2012). Given the range of cues that are probabilistically associated with the presence of potential fitness costs in sexual domains (e.g., disease cues, investment cues), sexual disgust should be sensitive to multiple, predictable inputs including situational contexts and individual traits (Tybur et al., 2013).

One of the most salient environmental factors to which sexual disgust should be calibrated is the local mating pool (Lieberman & Patrick, 2018; Tybur et al., 2013). Though the adaptive problem of selecting a high-quality mate is incredibly important, the potential benefits of being highly selective become outweighed by the costs associated with not reproducing as the number of mating options dwindles (Daly & Wilson, 2001). Consequently, perceptions of

potential mates are hypothesized to be calibrated to the size of the mating pool. A relative dearth of available mates is predicted to raise the threshold for sexual disgust and motivate approach behavior to increase the odds of mating success. Conversely, the threshold for sexual disgust is expected to be lower in a more densely populated mating pool, increasing selectivity.

While mate availability perceptions should track the true mate availability in the local environment, the estimation may not be perfectly accurate. The inputs into mechanisms facilitating mate choice can only be mental estimations: there is no direct sensory stimulus that can adequately simulate the size and makeup of all the individuals in a local mating pool. Thus, if mate availability drives downstream behavioral changes through sexual disgust, disgust thresholds should be calibrated as a function of *perceived* mate availability more than any objective measure. For example, if an individual perceives that there are few available mates to select from and that these circumstances are unlikely to change, the expected sexual value of the mates that *are* available should be higher.

While the relationship between mate availability and sexual disgust has not been directly examined in the literature, there is empirical support for the impact of mate availability on a number of related constructs. Prior studies have attempted to experimentally manipulate perceptions of mate availability with text-based information and edited photos. For example, Griskevicius et al. (2012) presented photos of varying numbers of men and women and found that a male-biased sex ratio (i.e., a scarcity of women) resulted in an expectation for men to spend more money during courtship. Other researchers have fabricated newspaper articles about sex-ratio imbalances (Arnocky, et al., 2016; Arnocky et al., 2014; Hahn et al., 2014; Watkins et al., 2012). For example, Arnocky et al. (2016) presented participants with one of two conditions: one priming mate scarcity or another priming mate abundance. The study found that heterosexual

men, but not women, in the mate abundance condition had higher infidelity intentions and less restricted sociosexuality.

Despite these findings, there are reasons to be skeptical about the validity of manipulating mate availability perceptions within a lab setting. While it is possible that these evolutionarily-novel stimuli may serve as inputs into our evolved mate selection mechanisms, natural selection likely favored perception psychologies that make accurate and robust inferences about the relative number of available men and women in an individual's local ecology. There are possible costs to allowing novel, potentially unreliable information to sway perceptions of the mating pool: others might exploit this heuristic in favor of their own mating strategy, or an individual's mating strategy could be easily miscalibrated. A more ecologically valid way of assessing the potential influence of mate availability on sexual disgust may be to measure individuals' perceptions of mate availability in their own ecology to examine the influence of this internal regulatory variable on sexual disgust parameters.

In the current study, we aim to more directly measure internal estimations of mate availability to test the hypothesis that perceived mate availability will be positively associated with baseline levels of sexual disgust across potential mates (**H1)**. That is, people who perceive there to be low mate availability in their current environment will consider novel, potential mates as less sexually disgusting, on average, than people who perceive there to be high mate availability in their current environment. The influence of mate availability perceptions on disgust levels may be subtle, so we conservatively predict that this relationship will be small.

We will also test three additional peripheral hypotheses about sexual disgust. Because men tend to be less disgusted than women, on average (Al-Shawaf et al., 2018; Crosby et al., 2020; Tybur et al., 2009), we predict that men's baseline sexual disgust levels across potential

mates will be lower than women's baseline sexual disgust (**H2**). Based on previous research, we expect this sex difference to be fairly large (Al-Shawaf at al., 2018; Al-Shawaf et al., 2015; Crosby et al., 2020; Tybur et al., 2009).

Additionally, as a composite of many fitness-relevant cues, facial attractiveness is component of overall mate-value (Fisher et al., 2008; Little et al., 2011; Thornhill & Gangestad, 1999)—which is another input hypothesized to calibrate sexual disgust thresholds (Tybur et al., 2013). Thus, we hypothesize that sexual disgust will be negatively associated with potential mates' facial attractiveness such that more attractive mates will be considered less sexually disgusting **(H3)**. Given the relative importance of physical attractiveness in mating decisions (Buss, 1989), we expect this association to be large.

Finally, we will examine whether mate-availability estimations moderate the association between potential mates' facial attractiveness and an individual's sexual disgust. Specifically, we predict that sexual disgust should be more dependent on the physical attractiveness of potential mates for individuals that have an internal representation that there are many available mates in the environment than for individuals that perceive there to be few available mates in the environment (**H4**). More plainly stated, if an individual perceives there to be many mates to select from, the attractiveness of potential mates should be weighted *more* heavily, and individuals should be even *more* disgusted by less-attractive individuals. We expect this interaction effect to be small.

To test these hypotheses, we will ask a sample of raters to indicate their level of sexual disgust towards potential mates. Raters will also be asked to report perceptions of mate availability within their environment. The stimuli that we will present to raters as potential mates have been previously rated on attractiveness by raters from 11 world regions (Jones et al., 2018),

providing a somewhat objective estimation of each potential mate's attractiveness across environments. We will use these average ratings to examine how general facial attractiveness—which itself is a composite of various cues to fitness relevant information (Little et al., 2011; Thornhill & Gangestad, 1999)—relates to sexual disgust thresholds.

To more accurately test our hypotheses, we will control for several potentially confounding factors. First, perceptions of available mates and sexual disgust thresholds may both be influenced by an individual's self-perceived mate value and attractiveness. For example, more attractive, higher mate-value individuals tend to be more selective on average than less attractive, lower mate-value individuals (Arnocky, 2018; Buss & Shackelford, 2008; Yong & Li, 2012). As a result, attractive individuals may even perceive there to be fewer desirable mates to select from in their environment. Second, an individual's current relationship status may also confound perceptions of available mates and sexual disgust thresholds towards potential mates other than their relationship partner. Whether individuals are pursuing short- or long-term relationships may similarly alter mate-availability perceptions and disgust thresholds if, for instance, short-term oriented people perceive there to be more desirable mates around (Al-Shawaf et al., 2019; Crosby et al., 2020; Tybur et al., 2009). Because each of these factors may confound our measurement of participants' mate availability perceptions, we will control for these and other nuisance variables (e.g., rater age, ethnicity) in our analyses in order to more precisely assess the unique association between mate availability perceptions and sexual disgust thresholds. Finally, because the nuances of long-term and short-term mating contexts may complicate the hypothesized relationships between sexual disgust and mate availability perceptions (Buss & Schmitt, 1993), we will focus only on short-term mating decisions in our study.

Method

Participants

Participants (N = 1,000) will be recruited from Prolific, the psychology subject pool at our University, and snowball sampling through social media platforms (e.g., Facebook, Twitter, Reddit) to complete the study. Participants recruited through Prolific will be paid $1.00 to complete the survey as it takes no more than 15 minutes to complete. Prolific users must have a minimum approval rating of 80% to participate. Participants recruited through our University's psychology subject pool will be compensated with course credit, and participants recruited through social media platforms will not be compensated. We will have separate survey links for these three sources of recruitment. The survey itself will be identical across platforms. All surveys will be launched at the same time. Prior to data analysis, we will merge these three datasets. We have enough funds to recruit around 500 participants from Prolific and we aim to recruit the balance of our sample via snowball sampling and the department's subject pool. All study procedures have been IRB approved.

Our target sample size is based on power simulations we conducted (see Power Simulations code: https://osf.io/vcu9r/?view_only=3dd4467ac8584d6b9c561a5a039f774e). Given the importance of sexual disgust for mating decisions, it is likely that even a very small relationship between perceptions of available mates and disgust levels would be theoretically meaningful. We estimated that we need around 900 raters to achieve 90% power to detect our smallest hypothesized effect (i.e., the interaction between mate availability perceptions and attractiveness of potential mates) with our fixed number of stimuli (i.e., 120 faces). We are recruiting a larger number of participants upfront to ensure that we have an adequate sample size after excluding participants based on our exclusion criteria. We will recruit men and women

between the ages of 18 and 80. We expect that the majority of our participants will identify as white and heterosexual.

Materials

The complete Qualtrics survey depicting all questions asked, stimuli presented, and survey logic is available on the Open Science Framework (https://osf.io/vcu9r/?view_only=3dd4467ac8584d6b9c561a5a039f774e). The survey can be viewed using this preview link: https://utexas.qualtrics.com/jfe/form/SV_aVPoF0WfgKfYe7H.

Face stimuli. We will use 120 photos of men's (n = 60) and women's (n = 60) faces from the Chicago Face Database (Ma et al., 2015) that were used in Jones et al. (2018) as stimuli in our study. This stimuli set contains photographs of 30 White (15 male), 30 Asian (15 male), 30 black (15 male), and 30 Latin (15 male) faces. The average age of the stimuli subjects is 26.40 years (*SD* = 3.60). Each photo has already been rated on 13 social perception dimensions by raters across 11 world regions as part of Jones et al. (2018). We will be using the third-party attractiveness ratings aggregated across a random subset (*N* = 3,851) of raters from all 11 world regions in our analyses as a somewhat "objective" measure of targets' physical attractiveness across human environments (https://osf.io/ufnm6/).

Demographics. We will ask participants to report their age, ethnicity, sex assigned at birth, gender identity, sexual orientation, and gender they are most sexually attracted to (see https://osf.io/vcu9r/?view_only=3dd4467ac8584d6b9c561a5a039f774e for all study questionnaires).

Perception of available mates. We developed four carefully worded items to assess participants' perceptions of the size of the mating pool in their local environment without focusing on the number of people participants would or could actually mate with: (1) "There are

a lot of people of the gender that I am attracted to who are available to date casually in my area (regardless of their interest in me or my attraction to them)"; (2) "There are a lot of people of the gender that I am attracted to who are sexually available in my area (regardless of their interest in me or my attraction to them)"; (3) "There are more people in my area who are sexually available than who are sexually unavailable (regardless of their interest in me or my attraction to them)"; and (4) "There are **not** a lot of people of the gender that I am attracted to in my area who are sexually available (reverse coded)". Participants will indicate the degree to which they agree with each statement using a four-point scale (1 = strongly disagree; 2 = somewhat disagree; 3 = somewhat agree; 4 = strongly agree).

Sexual disgust. We will ask participants to report their level of sexual disgust towards each face by asking "How grossed out are you by the thought of having a short-term sexual encounter with this person (e.g., intercourse; hookup; one night stand)?" on a scale of 1 (not at all grossed out) to 5 (extremely grossed out). We opted to use the term "grossed out" instead of "sexually disgusted" because the latter may prime more of a moral response than the former; we want to curtail the potential effect that participants' moral views toward short-term sexual encounters might have on their disgust ratings.

Self-perceived mate value. Following Arnocky (2018), we will assess each individual's self-perceived mate value by asking participants to fill out a modified version of the Components of Mate Value Survey (CMVS; Fisher et al.,2008). This scale is based on an earlier scale (the Self-Perceived Mating Success Scale; Landolt et al., 1995) and assesses an individual's perception of how the opposite sex views them as a potential relationship partner. We altered the questions to be more applicable to non-heterosexual participants by changing the phrase "opposite sex" to "gender I prefer to date" throughout (e.g., "members of the gender I prefer to

date like me back.") the questionnaire. To lessen the burden on participants, our modified version contains only seven of the original 22 items. We removed items that were not directly related to participants' perceptions of others' interest in them as a mate (e.g., "I am popular"; "I want to have children in my lifetime") and items that could be tapping into perceived mate availability or a participants' mating self-esteem (e.g., "I often worry about not having a date"; "I would like members of the opposite sex to hit on me more than they do").

Self-perceived physical attractiveness. We will also ask participants to rate how attractive they perceive themselves to be by asking them the extent to which they agree (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree) with three statements about their physical attractiveness ("Compared with people my age, I have an attractive body"; "Compared with people my age, I have an attractive face"; "Compared with people my age, I am physically attractive").

Current relationship status and mating orientation. In this study, we will control for relationship status and mating orientation. Being in a relationship or being highly motivated towards short-term mating may influence disgust such that these individuals may be more or less disgusted, respectively. Previous research has shown that individuals oriented towards short-term mating are less disgusted (Al-Shawaf et al., 2019; Crosby et al., 2020; Tybur et al., 2009). It is important to control for these potential confounds, so that we do not artificially inflate the association between perceptions of mate availability and sexual disgust. We will ask participants to indicate if they are in a relationship with a dichotomous "yes" or "no" question. To assess participants' mating orientation, we will ask them to indicate how much they agree (1 = strongly disagree; 2 = somewhat disagree; 3 = somewhat agree; 4 = strongly agree) with two statements about the extent to which they are currently seeking a short-term, uncommitted relationship or a

long-term, committed relationship ("I am currently seeking short-term, uncommitted relationships (e.g., casual sex, one-night stands, brief affairs); "I am currently seeking a long-term, committed relationship (e.g., a committed romantic relationship or marriage)".

Attention and validity checks. At two points in the survey—once during the self-perceived attractiveness scale, and once during the self-perceived mate value scale—we will ask participants to select a specific rating scale option to ensure that they are paying attention. At the completion of the survey, we will also ask participants to indicate how carefully they paid attention, and how honest they were throughout the survey (using a continuous sliding scale ranging from 0-100%). Participants will be assured that their answers to these questions will not affect their compensation in any way, but that their answers will simply be used to conduct more accurate analyses. We will use forced responding to ensure that participants respond to all of the survey questions. If participants wish to stop responding for any reason, they will be able to exit the survey at any time. We will exclude participants from confirmatory analyses if they fail to correctly answer both attention check questions or if they report that they were not paying attention and responding honestly to at least 80% of the survey.

Procedure

Participants will be recruited through Prolific, our University's psychology subject pool, and snowball sampling through social media platforms (e.g., Facebook, Twitter, Reddit) to participate in an online study about emotions. If participants agree to take part in our study, they will be directed to fill out an online survey through the online survey-hosting software Qualtrics.

Participants will first grant informed consent and complete demographics questions. In order to assign participants to rate faces of the appropriate sex, participants will then indicate which gender they are most attracted to when it comes to selecting a sexual partner. Participants

who report preferring men will rate all 60 male faces, participants who report preferring women will rate all 60 female faces, and participants who report no preference will rate a random 60 faces of either sex. The faces will be presented in a random order for each participant.

Participants will be randomly assigned to one of two conditions: Condition A will require participants to first answer questions about their self-perceived mate availability and subsequently rate faces, and Condition B will require participants to first rate faces and subsequently fill out questions about their self-perceived mate availability. Doing this will allow us to explicitly test and control for potentially confounding demand characteristics and order effects. After completing 60 face ratings and the self-perceived mate availability questionnaire, participants will answer questions about their self-perceived mate value, attractiveness, control questions, and the attention and honesty questions. Participants will then be debriefed, thanked for participation, and provided with a link to be compensated if they are participating through Prolific. The survey takes no more than 15 minutes to complete on average.

Power Analysis

We conducted power simulations using R to determine how many participants we would need to collect, given that our stimuli sample size is fixed. We modified code provided by DeBruine and Barr (2019) to create power analysis functions for our specific needs. The simulated data sets cross raters with targets of the opposite sex and create an outcome variable (e.g., sexual disgust) based on both rater- and target-level continuous (e.g., target attractiveness) and categorical (rater sex) covariates, in addition to rater- and target-level random variance. We describe the details of the power analyses below and the full code and simulation results are available to view on the OSF (see Power Simulations code on OSF).

The random-effects structure was held constant for all simulations: we specified large amounts of variability in target- and rater-level random intercepts, a moderate amount of variability in rater-level slopes, a moderate correlation between rater-level random slopes and intercepts, and a large residual error. These random-effects guesstimates are based on random-effect estimates from similar studies the authors have conducted where raters rate targets on various dimensions.

We specified effect size estimates for each fixed-effect of interest representing the smallest effect that would be theoretically interesting for our four primary hypotheses: (H1) a small positive association (r = .1) between raters' self-perceived mate availability (SPMA) and average sexual disgust across raters; (H2) a moderate sex difference (d = 0.4) in raters' average sexual disgust across targets; (H3) a moderate negative association (r = .4) between targets' objective attractiveness and raters' disgust ratings; and (H4) a small interaction (r = .05) between raters' SPMA and targets' attractiveness, such that attractiveness has a slightly larger association at higher levels of SPMA than at lower levels of SPMA.

We estimated the power to detect each effect of interest across nine sample size conditions (100, 200, 300, 400, 500, 700, 800, and 900 raters). Each sample size condition tested the effects of interest across 1,000 simulated datasets. The results of the power analyses are shown in Figure 1. Unsurprisingly, the effect that requires the most raters to achieve 90% power is the small interaction between SPMA and targets' third-party rated attractiveness.

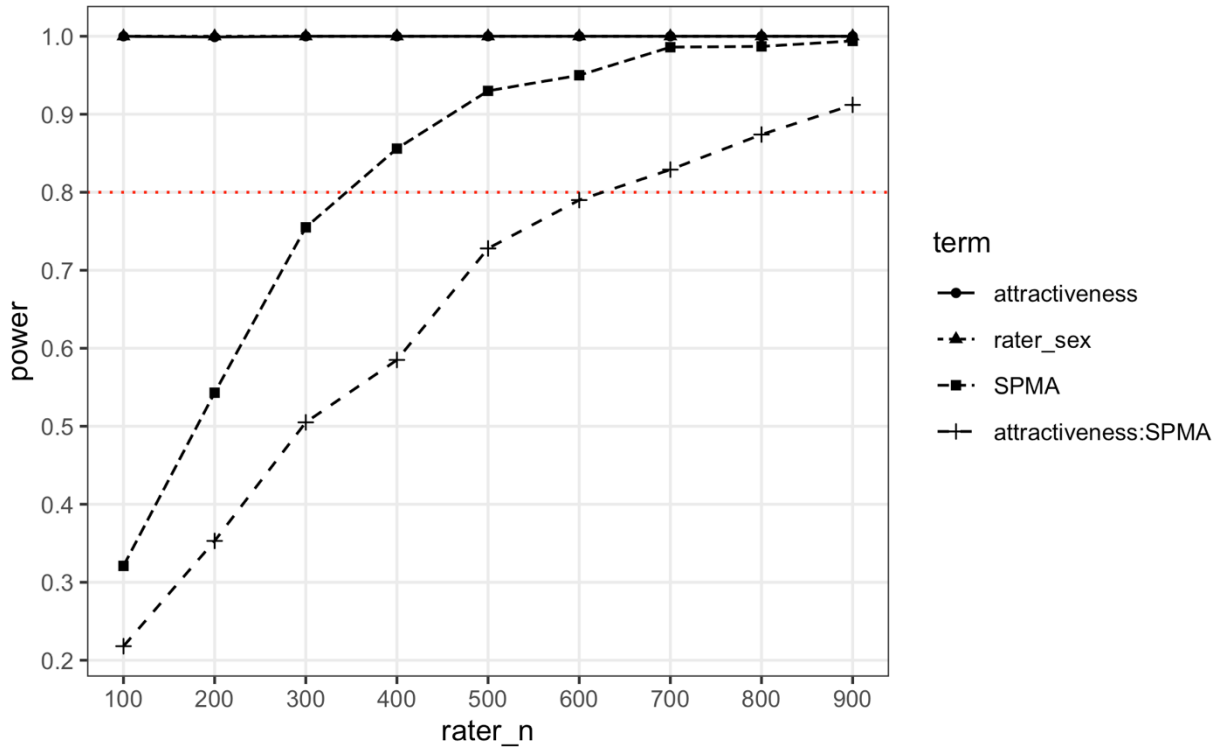

Figure 1. Plot of power curves, depicting the power to detect each effect of interest at various sample sizes, given the other constant parameters in the model. The power analyses indicate that we will need 90% power to detect the smallest of our hypothesized associations (i.e., the interaction between mate availability perceptions and target attractiveness) with 900 raters.

Proposed analyses

Validity checks

Before beginning data analysis, we will process the data and filter out all data that does not pass our exclusion criteria. To be included in our confirmatory analyses, participants must meet six criteria: (1) Pass each attention check in the self-perceived mate value and self-perceived attractiveness questionnaires; (2) Not be a careless responder, which we define as answering the same level of disgust to more than 10 targets in a row; (3) Indicate that they've answered honestly to at least 80% of the survey and that they paid attention to at least 80% of the survey; (4) Be either male or female and have a gender identity congruent with the sex they report being assigned at birth; (5) Report a heterosexual orientation and report a sexual preference for members of the opposite sex; and (6) be between the ages of 18 and 80.

Participants who do not meet all six criteria will be excluded from analyses (see Data Cleaning and Analysis Code on OSF).

Analyses

We will use linear mixed effect models (LMEMs) to test our hypotheses because of the nested structure of the data we will be collecting. Maximal random effects structures will be specified for all models, where participant intercepts and slopes as well as stimulus intercepts and slopes can vary where possible (Barr et al., 2013). Specifically, targets intercepts will be allowed to vary in all models, and rater intercepts and slopes will be allowed to vary in all models. We describe the confirmatory and exploratory models below and each are clearly specified in our analysis code (see Data Cleaning and Analysis Code).

Confirmatory. Sexual disgust levels of each participant towards the faces will be the outcome variable. We will regress these sexual disgust ratings on (1) effect-coded rater sex; (2) the scaled average third-party ratings of targets' attractiveness, (3) scaled raters' perceptions of mate-availability; (4) an interaction term between targets' attractiveness and raters' self-perception of mate availability; and (5) the control variables—scaled raters' self-perceived mate value and attractiveness, effect-coded relationship status, scaled continuous short-term mating orientation, scaled continuous long-term mating orientation, rater age, categorical rater ethnicity, and target ethnicity. If the interaction between target attractiveness and mate availability perceptions is not statistically significant ($p < .05$), we will remove this term from the model and

examine only the simple effects. We provide depictions of the hypothesized results based on simulated data in Figure 2.

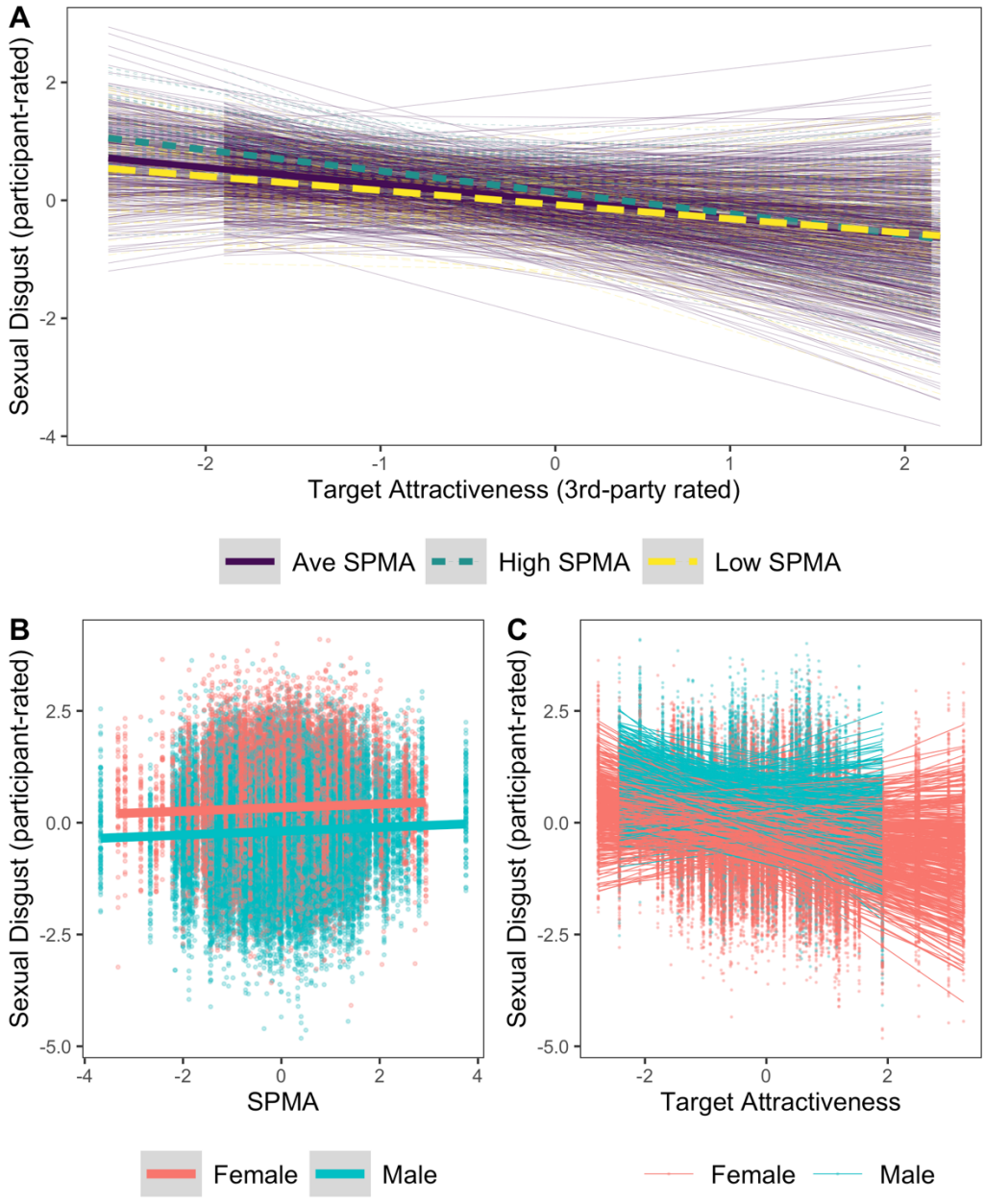

Figure 2. Simulated expected results based on hypothesized effect sizes and directions in a sample of 700 raters. Panel A depicts a small interaction between raters' self-perceptions of mate availability (SPMA) the association between targets' third-party rated attractiveness and raters' sexual disgust. Panel B depicts a small positive association between raters' SPMA and sexual disgust. Panel C depicts a moderate negative association between raters' sexual disgust and third-party ratings of targets' attractiveness, as well as the sex difference in disgust.

Exploratory. We will explore potential demand characteristics and order effects by including a three-way interaction between a dichotomous "rating condition" term (indicating whether the participant rates faces before or after rating SPMA), target attractiveness, and rater's self-perceived mate availability. If the three-way interaction is not significant ($p < .05$), we will examine the two-way interactions between the three variables. If there are no two-way interactions, we will remove all interaction terms and examine if there is a simple effect of rating condition on disgust ratings. These exploratory models will contain the same control variables as the confirmatory models (see Data Cleaning and Analysis code).

Anticipated timeline

We anticipate this study to take 3-6 months from launching the study to dissemination of results. If this proposal gets accepted, we anticipate taking up to two months to collect data, and up to two months to analyze the data and write up the results and discussion for publication.

COI Statement: The authors declare that they have no conflict of interest.

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