Current Psychology (2025) 44:180–193
https://doi.org/10.1007/s12144-024-07139-2

Sociosexuality is associated with disease avoidance tendencies and can decrease during a real-life disease threat

Barış Sevi[1] · **Natalie J. Shook**[2]

Accepted: 7 December 2024 / Published online: 18 December 2024

Abstract
Engaging in uncommitted sexual relationships increases the risk of pathogen transmission through close contact with novel partners. As such, greater disease avoidance tendencies may be associated with lower sociosexuality. Across three studies, we examined this proposition. In Studies 1a and 1b, we cross-sectionally assessed the associations between individual differences in disease avoidance (i.e., germ aversion, perceived infectability) and sociosexuality dimensions (i.e., behavior, attitude, desire). Greater germ aversion was significantly associated with more restricted sociosexuality across all three dimensions and replicated in both samples. Perceived infectibility was associated with more unrestricted sociosexual attitude and desire, but only in Study 1a. In Study 2, we tested whether sociosexuality levels changed with the COVID-19 pandemic. Participants reported more restricted sociosexuality levels during the COVID-19 pandemic compared to pre-pandemic levels, where a decrease was especially seen in sociosexual desire. Further, this decrease in sociosexual desire was predicted by pre-pandemic germ aversion levels. Overall, the findings indicate that disease avoidance tendencies (i.e., germ aversion) and real-life disease threat are associated with lower tendency to engage in uncommitted sexual relationships. Further research is needed to understand the causal relation of these two constructs, which may help in developing interventions and campaigns to support better sexual health.

Keywords Disease avoidance · Sociosexuality · Behavioral immune system · Germ aversion · Individual differences · COVID-19

Introduction

Engaging in sexual acts is one of the most primal human desires. However, sexual behavior involves the risk of pathogen exposure, especially in uncommitted sexual relationships. Avoidance of infectious diseases is vital for human survival, yet missing possible mating opportunities due to avoiding contamination reduces opportunity for reproduction and the benefits of sexual behavior. These two basic drives present a conundrum. Across three studies we sought to understand how disease avoidance processes are associated with the tendency to engage in uncommitted sexual relationships. Our aims were (1) to examine the extent to which individual differences in disease avoidance were associated with tendency to engage in uncommitted sexual relationships and (2) assess how the tendency to engage in uncommitted sexual relationships changes in the context of a real-life disease threat (Coronavirus Disease 2019; COVID-19).

Sociosexuality

Sociosexuality is an individual difference that reflects one's tendency toward engaging in uncommitted sexual relationships (Simpson & Gangestad, 1991). Individuals vary along a continuum from restricted to unrestricted sociosexuality (Penke & Asendorpf, 2008). Higher levels of sociosexuality (a.k.a. unrestricted sociosexual orientation) indicate more eagerness to have casual sex, more comfort in engaging in sexual activity without commitment, and more sexual partners. Lower levels of sociosexuality (a.k.a. restricted sociosexual orientation) indicate less eagerness to engage in casual sex, more likelihood to experience higher levels of

✉ Barış Sevi
sevib@mef.edu.tr

[1] MEF University, Istanbul, Turkey

[2] University of Connecticut, Storrs, CT, USA

commitment and emotional closeness in relationships, and fewer sexual partners.

Sociosexuality has been associated with several individual difference factors. For example, greater unrestricted sociosexuality is associated with greater self-perceived mate value (Arnocky et al., 2021), more avoidant attachment style (Chen, 2017; Jones & Curtis, 2017), and greater narcissism, psychopathy, and Machiavellianism (Jonason et al., 2009). Although generally reliable, sociosexuality varies in response to environmental or contextual changes (Arnocky et al., 2016; Gettler et al., 2019; Marcinkowska et al., 2021). In an environment with high accessibility to mates, people are less restricted in their sociosexuality, whereas in an environment with low accessibility to mates, people are more restricted in their sociosexuality (Arnocky et al., 2016). Further, in an environment where sharing of resources and investment is needed, people are more restrictive in their sociosexuality (Conroy-Beam et al., 2015). The changes in sociosexuality imply plurality in mating tactics, which can be adaptive in different contexts (Gangestad & Simpson, 2000).

Initially, sociosexuality was studied as a unidimensional tendency (Simpson & Gangestad, 1991), yet it was seen that it can be further studied with a dimensional structure to achieve nuanced findings (Penke & Asendorpf, 2008). There are three dimensions of sociosexuality: behavior, attitudes, and desire (Penke & Asendorpf, 2008). Sociosexual behavior is an individual's frequency of engaging in certain sexual activities, such as the number of sexual partners. Sociosexual attitude is a disposition characterized by wishes and moral feelings toward sex without emotional closeness. Sociosexual desire is the motivational state characterized by sexual fantasies and arousal. These dimensions are related, and a global score can be constructed by combining the scores in these dimensions (Penke & Asendorpf, 2008). However, utilizing dimensions helps in understanding components from which the global sociosexuality emerges and helps to identify the underlying psychological mechanisms, as the dimensions can be differentially associated with other factors (Nascimento et al., 2018; Penke & Asendorpf, 2008). For example, sociosexual attitudes is the only dimension that is significantly associated with women's reported attraction to symmetrized male faces (Quist et al., 2012), whereas sociosexual desire is the only dimension that is significantly associated with lower happiness and higher depression levels (Mafra et al., 2021). Using the dimensional approach helps in showing detailed findings, as well as flagging associations that may have been missed when using only a unidimensional measure.

The behavioral immune system

Humans have dealt with infectious diseases throughout their history (Curtis, 2007). Consequently, humans are equipped with evolutionary mechanisms to help them survive despite these threats. In particular, a set of psychological mechanisms, coined the "Behavioral Immune System" (BIS), evolved and functioned to facilitate the avoidance of pathogens and infectious diseases (Schaller & Duncan, 2007). The BIS is comprised of different affective, cognitive, and behavioral processes that help in detecting and responding to potential sources of contamination (Schaller & Park, 2011; Schaller, 2016). Sensory cues that signal a potential disease threat (e.g., foul smell) trigger the BIS, evoking affective and cognitive processes (e.g., disgust sensitivity, germ aversion). In the end, these processes lead to prophylactic behaviors (e.g., avoidance). Through early detection and avoiding potential contaminants, the likelihood of exposure to pathogens and risk of infection is reduced.

There are trait level differences in BIS sensitivity with individuals being more or less sensitive to and avoidant of pathogen sources (Schaller et al., 2007; Schaller & Park, 2011). Among the methods to measure individual differences in the BIS, Disgust Sensitivity and Perceived Vulnerability to Disease (PVD) are the most common methods to operationalize BIS sensitivity (Tybur et al., 2014). The current project utilized PVD (Duncan et al., 2009), which includes the subscales of *Germ Aversion* (i.e., dislike of situations involving pathogen transmission risk) and *Perceived Infectability* (i.e., perceived susceptibility towards infectious disease).

Sociosexuality and the behavioral immune system

All people are carriers of pathogens and pose a potential risk of contamination. Engaging in close and intimate relations with others can easily allow for pathogen transmission, and the risks of contamination increase when engaging in uncommitted sexual acts with novel or multiple partners. People with an unrestricted sociosexuality would be expected to have more exposure to these risks. Accordingly, the BIS and sociosexuality may be associated.

A few studies have examined the connection between the BIS and sociosexuality. One study found that greater BIS sensitivity (i.e., germ aversion, perceived infectability) was associated with more restricted sociosexuality (Duncan et al., 2009), but other studies did not replicate the correlation between perceived infectability and sociosexuality (Mogilski et al., 2020; Prokosch et al., 2021). At an environmental level, in geographic areas that suffered higher levels of infectious disease, people reported more restricted sociosexuality (Schaller & Murray, 2008). With the COVID-19

pandemic the salience and relevance of the BIS increased as well as it's connection to sociosexuality. In relation to this increased relevance one study showed that when an acute disease salience was primed via a description of the COVID-19 outbreak participants reported lower levels of sociosexuality compared to participants in control groups (Moran et al., 2021). Another study focused on sexual disgust the co-opted domain of disgust for unwanted sexual acts and reported an increase in sexual disgust levels with higher perceived risk of infection (Hlay et al., 2021). Thus, the evidence on the relation between sociosexuality and the BIS shows support for a connection, but it is scarce and, in some cases, inconsistent.

Further, no research to date has examined the sociosexuality dimensions association to the BIS. The dimensions of sociosexuality are distinct, and examining the dimensions separately can help to elucidate exactly how sociosexuality is associated with other variables. For example, sociosexual desire, but not sociosexual attitude or behavior, is correlated with emotional well-being, whereas sociosexual behavior, but not sociosexual desire or attitude, is correlated with psychological well-being (Blasco-Belled et al., 2022). Similarly, more sociosexual behavior is associated with greater satisfaction with one's sexual life, whereas more sociosexual desire is associated with more dissatisfaction with one's sexual life, and sociosexual attitudes is not significantly associated with sexual life satisfaction (Barrada et al., 2018). Taking a dimensional approach is important for identifying intervention targets and developing potentially more effective interventions.

In the context of disease avoidance, BIS indices may be differentially associated with each sociosexual dimension. The contamination risk each sociosexuality dimensions brings can be different for example the desire and attitude dimensions are on an abstract, thought level they do not include an immediate transmission risk for pathogens, while the behavior dimension does include the transmission risk of pathogens through the human contact. Therefore, differences in the significance and effect sizes of the associations between BIS indices and sociosexual dimensions may be observed. Identifying these differences would help in understanding how disease avoidance tendencies are associated with the sexual inclinations of the individual.

Current studies

To understand how the BIS is associated with sociosexuality, we conducted three studies. In Study 1a and 1b, the cross-sectional relation was examined between individual differences in sociosexuality and BIS sensitivity indicators germ aversion and perceived infectability. In Study 2, a longitudinal study was conducted to determine whether sociosexuality changed during an environmental disease threat (COVID-19 pandemic) and whether pre-pandemic germ aversion and perceived infectability levels predicted change in sociosexuality. In all studies, sociosexuality was examined with a focus on the three dimensions of sociosexuality (i.e., behavior, attitude, and desire). The aim was to provide a detailed examination of BIS sensitivity and sociosexuality, and explore possible differences according to sociosexuality dimensions. All hypotheses and data analysis plans were preregistered and data are available at https://osf.io/9havc/?view_only=4291c6776c5143e3a00e18bfaccfc07c.

Study 1a and 1b

The goal of these studies was to determine the extent to which BIS sensitivity (i.e., germ aversion, perceived infectability) was associated with the three dimensions of sociosexuality (i.e., behavior, attitude, and desire). It was expected that higher levels of germ aversion and perceived infectability would be associated with more restricted sociosexuality across all three dimensions. However, the strength of the association germ aversion and perceived infectability has with sociosexuality may differ by dimension, so we explored possible differences between the dimensions. We first tested bivariate correlations between germ aversion, perceived infectability, and sociosexuality scores (global and dimensions), then examined the unique associations germ aversion and perceived infectability with the sociosexuality dimensions using multivariate multiple regression models. In Study 1a, we first tested out hypotheses in an undergraduate U.S. sample. In Study 1b, we used a more diverse, U.S. national sample for replication.

Method

Study 1a participants & procedure

This study involved secondary data analysis of two unrelated studies. Data were collected from undergraduate students from a research university in the mid-Atlantic region of the U.S. between November 2018 and February 2019 ($n = 438$) and between October 2019 and December 2019 ($n = 458$). The original aim of the first study was to examine the associations between the BIS and the physiological immune system. The original aim of the second study was to examine relations between different personality traits, attitudes, and emotions. Participants were recruited through the Department of Psychology's participant pool. The studies were approved by the university institutional review board (IRB; Protocol numbers 1311139985 and 1711852730).

After agreeing to an online consent form, participants completed an online survey administered via Qualtrics. Questionnaires were presented in a random order, except for the demographic questions which appeared at the end of the survey. After the study was finished, participants were compensated with course credit.

Among the data several exclusions were made. First, cases that completed less than 99% of the study were excluded ($n = 84$). Second, participants who completed the study more than once were identified (i.e., duplicate SONA ID entries). Their first response was used, and the duplicate responses were excluded ($n = 28$). Third, the data were checked for missingness in the primary variables (i.e., BIS sensitivity, sociosexuality). Participants who answered less than half of the questions in the Perceived Vulnerability to Disease Questionnaire (answering less than 8) or the Revised Sociosexual Orientation Inventory (answering less than 5) were excluded ($n = 8$)[1]. Finally, outlier participants who had scores that were three standard deviations above or below the mean on the primary variables were excluded ($n = 7$)[2]. The final sample used for analyses consisted of 769 participants (M age = 19.61 years, SD age = 1.69, Range: 18–35; 620 Women; 85.2% White; See Table S1 for detailed demographic distribution).

Study 1b participants & procedure

Participants were recruited through Amazon's Mechanical Turk (MTurk) during November 2019. Eligibility criteria included residing in the United States and having a hit rate (proportion of completed tasks) of 95% or greater. The initial dataset consisted of 903 cases, but Amazon MTurk faced concerns regarding low quality and/or automated responses at the time of data collection (Bai, 2018; Dreyfuss, 2018). To reach better data quality, a conservative exclusion criterion was used. First, cases that completed less than 99% of the study, had multiple responses from the same IP address, or had multiple responses from the same coordinates were excluded ($n = 303$). Second, open-ended responses were examined for any gibberish/nonsensical responses that potentially indicated bots, and 116 cases were excluded[3]. Third, the data were checked for missingness (answering less than 50% of the items) in the primary variables (i.e., BIS sensitivity, sociosexuality). Missingness was not present and none of the cases were excluded. Finally, outlier participants who had scores that were three standard deviations above or below the mean on the primary variables were excluded ($n = 3$)[4]. The final sample used for analyses consisted of 481 participants (M age = 37.78 years, SD age = 11.18, Range: 20–72; 274 Women; 74.8% White; See Table S2 for detailed demographics).

Participants completed an online survey administered through Qualtrics. After providing online consent, participants were presented with several questionnaires in a randomized order, except for the demographic questions which appeared at the end of the survey. Participants received $1 for their time. The study was approved by the university IRB (Protocol number 1311139985).

Materials

Demographic information Participants were asked for their age, gender, race/ethnicity, sexuality, income, and religiosity.

Revised sociosexual orientation inventory (SOI-R; Penke & Asendorpf, 2008) The 9-item inventory consists of three subscales (behavior, attitude, and desire), with 3-items each. For the behavior subscale, participants report on their sexual behavior (e.g., "With how many different partners have you had sex within the past 12 months?"). Response options are a 9-point ordinal list of numbers from "0" to "20 or more". For the attitude subscale, participants indicate agreement with statements (e.g., "I can imagine myself being comfortable and enjoying "casual" sex with different partners.") on a 9-point scale of "strongly disagree" to "strongly agree". For the desire subscale, participants indicate the frequency with which they engage in different situations (e.g., "In everyday life, how often do you have spontaneous fantasies about having sex with someone you have just met?") on a 9-point scale from "never" to "at least once a day". Sum scores for each subscale and a total sum score for global sociosexual orientation were computed. Higher scores indicate a higher tendency toward unrestricted sociosexuality, whereas lower scores suggested a more restricted orientation.

Perceived vulnerability to disease questionnaire (PVD; Duncan et al., 2009) The 15-item questionnaire consists of

[1] The participants with missing responses reported higher sociosexual behavior ($M = 15.00$, $SD = 4.00$) compared to the participants without missing responses ($M = 7.85$, $SD = 5.08$), $t(775) = 2.44$, $p < .05$. None of the other variables differed, $ps > 0.05$.

[2] The pattern of results for the primary analyses did not differ when the outliers were included.

[3] When compared to not excluded cases, cases that were excluded due to responses from same IP, responses from same location, and gibberish open-ended reported significantly ($ps < 0.05$) different levels in all measures of interest except Germ Aversion (see Table S3).

[4] When outliers were included in the analyses, there were some changes in the results. The significant correlation between Germ Aversion and Sociosexual Behavior became non-significant ($p > .05$). In Step 2 of the regression models predicting dating app use motivation for short-term mating in woman, the association of Perceived Infectability became significant ($p < .05$), and in the model for man, the R^2 change in Step 1 became significant ($p < .05$).

Table 1 Bivariate correlations and descriptive statistics for study 1a variables

	1	2	3	4	5	6
1. Perceived Infectability	-					
2. Germ Aversion	0.17**	-				
3. Global Sociosexuality	0.04	−0.20**	-			
4. Sociosexual Behavior	0.06	−0.10**	0.72**	-		
5. Sociosexual Attitude	0.08*	−0.20**	0.87**	0.52**		
6. Sociosexual Desire	−0.04	−0.15**	0.73**	0.27**	0.43**	-
Cronbach's α	0.91	0.72	0.85	0.86	0.83	0.88
M	3.66	4.12	31.46	7.69	14.70	9.12
SD	1.33	1.01	14.02	4.82	7.21	5.85
Skewness	0.20	0.17	0.36	1.14	−0.02	0.84
Range	1–7	1.50–7	9–71	3–23	3–27	3–27

Note. *$p < .05$, **$p < .01$

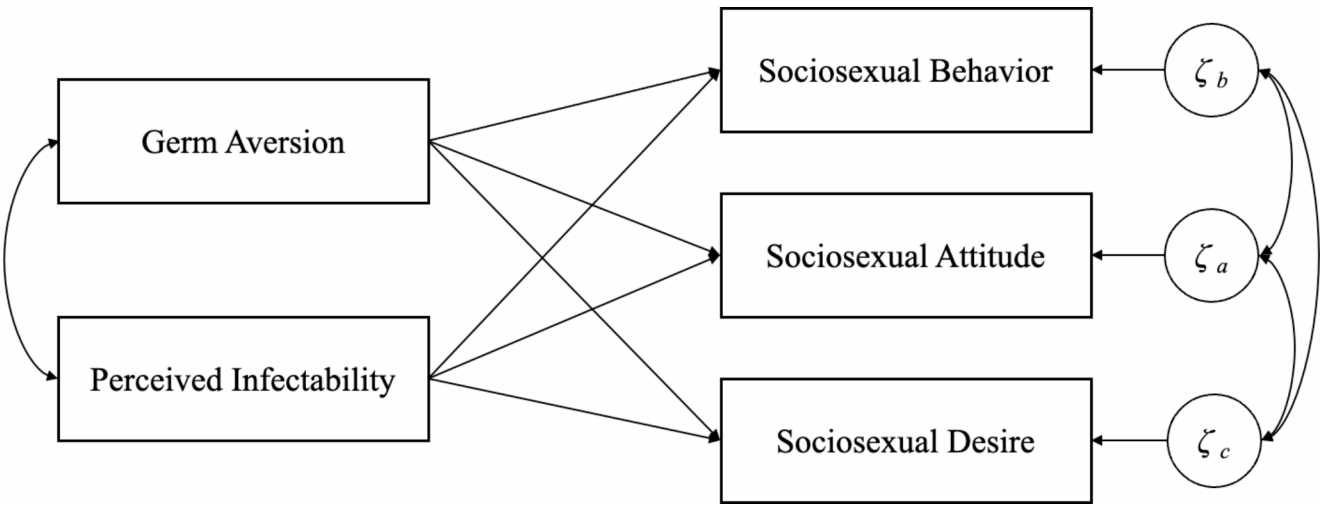

Fig. 1 The conceptual SEM model used for the multivariate multiple regression analysis

two subscales: germ aversion (e.g., "It really bothers me when people sneeze without covering their mouths") and perceived infectability (e.g., "I am more likely than the people around me to catch an infectious disease"). For each item, participants indicated their agreement with the given statements on a 7-point scale of "strongly disagree" to "strongly agree". For each subscale a composite variable was created by computing the average score across the items. Higher scores reflect greater germ aversion or perceived infectability.

Study 1a results

Descriptive statistics and bivariate correlations for germ aversion, perceived infectability, and sociosexuality (i.e., global sociosexuality score and the behavior, attitude, and desire subscales of sociosexuality) indices are presented in Table 1[5]. Germ aversion showed consistent significant negative relations with the global sociosexuality score and each dimension of sociosexuality. That is, higher germ aversion was associated with more restricted sociosexual behavior, attitude, and desire, with small effect sizes. Higher perceived infectability was only significantly related to more unrestricted sociosexual attitude, with a small effect size.

To examine the unique associations germ aversion and perceived infectability have with sociosexuality dimensions, a Multivariate Multiple Regression was run using SEM (see Fig. 1 for the conceptual model). Observed variables were used in the model and all scores were standardized before running the analyses. The analysis was conducted using the R package "lavaan" (Rosseel, 2012). Germ aversion and perceived infectability were entered as predictor variables. The three dimensions of sociosexuality were entered as outcome variables.

[5] Exploration of gender differences in BIS sensitivity and sociosexuality and bivariate correlations by gender are presented in supplemental materials (see Tables S4 and S5).

Participants with higher germ aversion reported significantly ($p < .01$) more restricted sociosexuality in all dimensions of sociosexuality: behavior ($\beta = -0.12$), attitude ($\beta = -0.22$) and desire ($\beta = -0.15$)[6]. When the effect sizes for the associations between germ aversion and the sociosexuality dimensions were compared, a significant difference was only seen between the effect sizes for the associations with the attitude dimension and the behavior dimension ($p < .05$; Soper, 2022), where a stronger association was seen with the attitude dimension. Participants with higher perceived infectability reported significantly ($p < .05$) more unrestricted sociosexuality in the dimensions of behavior ($\beta = 0.08$) and attitude ($\beta = 0.12$). A significant difference between the effect sizes of these associations was not present ($p > .05$). A significant association between perceived infectability and sociosexual desire was not present ($p > .05$).

Study 1b results

Bivariate correlations were estimated between germ aversion, perceived infectability, and sociosexuality (i.e., global sociosexuality score and the behavior, attitude, and desire subscales of sociosexuality; see Table 2)[7]. Higher germ aversion consistently significantly correlated with more restricted sociosexuality across all indices (global and the three dimensions), with small effect sizes. Higher perceived infectability was not significantly related to any of the sociosexuality variables.

To examine the unique associations between both germ aversion and perceived infectability with sociosexuality dimensions, a Multivariate Multiple Regression using SEM was run with the procedure outlined in Study 1a[8]. Participants with higher germ aversion reported significantly ($p < .05$) more restricted sociosexuality in all dimensions of sociosexuality: behavior ($\beta = -0.10$), attitude ($\beta = -0.23$) and desire ($\beta = -0.19$). When the effect sizes of the associations between germ aversion and the sociosexuality dimensions were compared, a significant difference was only seen between the associations with the attitude dimension and the behavior dimension ($p < .05$; Soper, 2022), where a stronger association was seen with the attitude dimension. Perceived infectability was not significantly associated with any of the sociosexuality dimensions ($p > .05$).

Discussion

Study 1a and 1b provided some evidence of an association between the BIS and sociosexuality. The multivariate multiple regression allowed us to control for the common factors of germ aversion and perceived infectability to analyze their unique associations with the three sociosexuality dimensions in the same model. According to the analysis, the hypothesized negative association between a more sensitive BIS and unrestricted sociosexuality was supported by the association of germ aversion in both studies, but not supported with the associations of perceived infectability. Individuals who had more discomfort towards situations with pathogen contamination risk (germ aversion) consistently reported more restricted sociosexual behaviors, attitudes, and desires. In the associations of perceived infectability a consistent association was not present with sociosexuality. Although individuals with more perceived infectability reported more unrestricted sociosexual behaviors and

Table 2 Bivariate correlations and descriptive statistics for Study 1b variables

	1.	2.	3.	4.	5.	6.
1. Perceived Infectability	-					
2. Germ Aversion	0.35**	-				
3. Global Sociosexuality	−0.02	−0.19**	-			
4. Sociosexual Behavior	−0.01	−0.09*	0.76**	-		
5. Sociosexual Attitude	−0.05	−0.21**	0.86**	0.51**	-	
6. Sociosexual Desire	0.02	−0.16**	0.83**	0.46**	0.53**	-
Cronbach's α	0.87	0.76	0.87	0.77	0.78	0.93
M	3.35	4.19	34.15	8.88	14.80	10.45
SD	1.28	1.11	15.86	5.15	7.27	6.90
Skewness	0.29	−0.05	0.33	0.92	−0.02	0.63
Range	1–7	1–7	9–75	3–24	3–27	3–27

Note. *$p < .05$, **$p < .01$.

[6] A second model was run to explore possible gender moderation of the associations between the BIS sensitivity measures and the sociosexuality dimensions. A gender moderation was not present ($p > .05$).

[7] Exploration of gender differences in BIS sensitivity and sociosexuality and bivariate correlations were according to gender are presented in supplemental materials (see Tables S6 and S7).

[8] A second model was run to explore possible gender moderation of the associations between the BIS sensitivity measures and the sociosexuality dimensions. A gender moderation was not present ($p > .05$).

attitudes in Study 1a, these findings did not replicate in Study 1b.

Germ aversion and perceived infectability differed in their associations with sociosexuality, which is contrary to previous findings (Duncan et al., 2009). Yet, discrepant findings between germ aversion and perceived infectability have been reported with other behaviors (e.g., engaging in proactive health behaviors; Makhanova & Shepherd, 2020). This discrepancy brings out the question for if perceived infectability serves the function of helping us avoid diseases affectively or behaviorally. Considerably, perceived infectability may be serving unalike roles than germ aversion that may be missed in the contemporary research questions studied under the topic of the BIS. Future research may focus on this difference between the measures of BIS sensitivity and the unique roles they play in the BIS. In addition, a reason for the discrepancies with perceived infectability maybe due to it not actually being a measure of the BIS. Some have questioned this possibility (e.g., Shook et al., 2020), with the consideration that perceived infectability may be a reflection of health history and biological susceptibility to infection (Hill et al., 2016). Although germ aversion and perceived infectability are traditionally considered as measures of BIS sensitivity (Tybur et al., 2014), the two measures are conceptually distinct, only modestly correlated, and differentially associated with some behaviors (Duncan et al., 2009; Makhanova et al., 2019; Makhanova & Shepherd, 2020). Perceived infectability may not be associated with factors as expected by BIS theory, due to the possibility that perceived infectability is not a measure of the BIS. Comprehensive studies that focus on the measurement of the BIS are needed for answering this question and would benefit the methods and theory of the BIS.

The dimensions specific approach allowed us to examine differences in the strength of associations between sociosexuality dimensions and germ aversion. Sociosexual behavior showed the weakest associations and sociosexual attitude showed the strongest associations. This difference may be due to couple reasons, the attitude behavior discrepancy or that behaviors are not always in one's control. Attitudes and behavior are not always consistent, including health related decisions (He et al., 2014). Further, according to the theory of planned behavior (Ajzen, 1991), attitudes are an antecedent to behavior. Therefore, the connection of germ aversion and sociosexual behavior may be mediated by sociosexual attitudes. Consequently, the link between BIS sensitivity and sociosexual behavior may be weaker than the link with sociosexual attitudes. As for another reason, not all behavior are in control of one's control, especially dyadic behaviors like sex. Even if someone has favorable attitudes and desire for sociosexuality, if they can't find partners, they won't be able to have high levels of sociosexual behavior. Therefore, the link disease avoidance has with sociosexuality dimension where the individual has control could have been stronger than a dimension with partial control. We should also note another possible reason, which may be due the limited variance in our data for the behavior dimension. The behavior subscale of SOI-R can range from 3 to 27, but the maximum sociosexual behavior scores reported in our study is 24 (the maximum scores are 27 in other dimensions). Therefore, our data may had limited variability for sociosexual behavior and resulting in weaker connections.

Findings from Studies 1a and 1b suggest a link between germ aversion and sociosexuality. However, both studies were cross-sectional and correlational. Thus, any claims regarding causality or direction of the relations cannot be estimated. Experimental and longitudinal designs should be used to examine how change in the BIS can influence sociosexuality.

Study 2

The aim of Study 2 was to determine whether sociosexuality changed during a real-life disease threat (COVID-19 pandemic) and to test whether germ aversion and perceived infectability predicted change in sociosexuality. Participants reported their germ aversion, perceived infectability, and sociosexuality levels before and during the COVID-19 pandemic. Using paired-samples t-tests, we tested our hypothesis that more restricted sociosexuality levels would be reported during the COVID-19 pandemic compared to pre-pandemic. With multiple regression models, we tested our expectation that higher BIS sensitivity (i.e., germ aversion and perceived infectability) levels before the pandemic would predict a greater decrease in unrestricted sociosexuality during the pandemic.

Method

Participants

Through the participant-sourcing platform CloudResearch, Study 1b participants were recontacted and invited to complete a follow-up study in April 2020 (after COVID-19 was declared a pandemic). A total of 218 participants (41% response rate) completed the study. Several participants were excluded from data analyses. First, cases that did not provide MTurk ID and completed less than 99% of the study were excluded ($n = 15$). Second, one participant completed the survey twice and both responses were excluded. Third, the data were checked for missingness in the primary variables (i.e., BIS sensitivity, sociosexuality). Participants who answered less than half of the questions in the scales PVD

(answering less than 8) or the SOI-R (answering less than 5) were excluded ($n = 2$)[9]. Finally, outlier participants who had scores that were three standard deviations above or below the mean on the primary variables were excluded ($n = 3$)[10]. The final sample used for analyses consisted of 196 participants (124 woman; *M* age = 38.71, *SD* age = 11.02, range 21–70 years; 78.6% White).

Procedure & materials

Participants provided online consent and then completed a survey via Qualtrics, including the PVD and SOI-R measures described in Studies 1a and 1b. Questionnaires were presented in a randomized order, except for health information (e.g., vaccination status) and demographic questions which were presented at the end of the survey. For their time, participants were compensated with $5. The measures used in Studies 1a and 1b were also used in this study. The study was approved by the university IRB (Protocol number X20-0048).

Results

Descriptive statistics, Cronbach's alphas, and bivariate correlations for study variables are presented in Table 3. To assess the relation germ aversion and perceived infectability has with sociosexuality before and during the pandemic, bivariate correlations were estimated between germ aversion, perceived infectability, and sociosexuality (i.e., global score and the behavior, attitude, and desire subscales). Correlations were run between all measures that were collected before the pandemic and during the pandemic[11]. The correlations of the same measures before and during the pandemic (e.g., pre-pandemic germ aversion and post pandemic germ aversion) were all positively correlated with strong effect sizes.

The pre-pandemic level of perceived infectability was negatively related to pre-pandemic sociosexual attitudes with a small effect size. More perceived infectability was related to more positive attitudes towards restricted

Table 3 Bivariate correlations and descriptive statistics for study 2 variables before and during the COVID-19 pandemic

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Pre-Pandemic Perceived Infectability	-											
2. Pre-Pandemic Germ Aversion	0.34**	-										
3. Pre-Pandemic Global Sociosexuality	−0.13	−0.14*	-									
4. Pre-Pandemic Sociosexual Behavior	−0.12	−0.09	0.72**	-								
5. Pre-Pandemic Sociosexual Attitude	−0.14*	−0.18*	0.89**	0.55**	-							
6. Pre-Pandemic Sociosexual Desire	−0.06	−0.07	0.82**	0.37**	−0.56**	-						
7. During Pandemic Perceived Infectability	0.72**	0.19**	−0.06	−0.08	−0.02	−0.07	-					
8. During Pandemic Germ Aversion	0.24**	0.72**	−0.20**	−0.09	−0.21**	−0.18*	0.12	-				
9. During Pandemic Global Sociosexuality	−0.07	−0.17*	0.84**	0.60**	0.77**	0.67**	−0.03	−0.20**	-			
10. During Pandemic Sociosexual Behavior	−0.10	−0.13	0.61**	0.79**	0.49**	0.33**	−0.08	−0.10	0.70**	-		
11. During Pandemic Sociosexual Attitude	−0.02	−0.14	0.73**	0.46**	0.78**	0.50**	0.04	−0.16*	0.90**	0.51**	-	
12. During Pandemic Sociosexual Desire	−0.08	−0.15*	0.70**	0.31**	0.55**	0.79**	−0.06	−0.21**	0.80**	0.34**	0.57**	-
Cronbach's α	0.91	0.79	0.86	0.70	0.76	0.94	0.93	0.82	0.87	0.71	0.85	0.92
M	3.29	4.29	32.04	8.01	14.45	9.57	3.13	4.79	30.15	7.64	14.01	8.51
SD	1.31	1.14	15.34	4.58	7.41	6.65	1.39	1.20	14.76	4.48	7.64	5.90
Skewness	0.39	−0.18	0.38	0.96	0.01	0.92	0.57	−0.18	0.46	1.05	0.06	1.12
Range	1–7	1–7	9–68	3–20	3–20	3–27	1–7	1.75–7	9–66	3–20	3–27	3–27

Note. *$p < .05$, **$p < .01$.

[9] The participants with missing responses ($M = 6.00$, $SD = 1.41$) reported higher sociosexual attitudes during the pandemic compared to the participants without missing responses ($M = 14.12$, $SD = 7.70$); $t(1.683) = -7.13$, $p < .05$. None of the other variables differed, $ps > 0.05$.

[10] When outliers were included in the analyses, there were some changes in the results. Significant ($p < .05$) correlations emerged for pre-pandemic germ aversion where negative relations were seen with during pandemic sociosexual behavior ($r = .15$) and during pandemic sociosexual attitudes ($r = .15$). The significant interaction between time and gender on level of global sexuality became non-significant ($p > .05$).

[11] Bivariate correlations according to gender are presented in supplemental materials (see Table S8).

sociosexuality. For germ aversion, significant relations were seen with sociosexuality scores in pre-pandemic and during pandemic measures, with small effect sizes. Before the pandemic, higher germ aversion was correlated with more restricted global sociosexuality levels and sociosexual attitude with small effect sizes. During the pandemic, higher germ aversion was correlated with more restricted global sociosexuality levels, sociosexual attitude, and sociosexual desire.

To assess changes in levels of sociosexuality, separate paired-samples t-tests were run for each sociosexuality score (i.e., global sociosexuality and the behavior, attitude, and desire dimensions)[12]. Compared to before the pandemic, during the pandemic participants reported significantly lower scores in global sociosexuality ($t(195) = 3.11$, $p < .01$, $d = 0.22$, $M_{\text{pre–pandemic}} = 32.04$, $M_{\text{during pandemic}} = 30.15$) and the desire dimension ($t(195) = 3.59$, $p < .01$, $d = 0.26$, $M_{\text{pre–pandemic}} = 9.57$, $M_{\text{during pandemic}} = 8.51$). Significant differences were not present for attitude and behavior dimensions of sociosexuality ($p > .05$).

To examine the role of germ aversion and perceived infectability on the possible change in the sociosexuality levels, hierarchical regressions were run (see Table 4). Four hierarchical regression analyses were run for each sociosexuality score (global and three dimensions). During pandemic sociosexuality scores were used as the outcome variable. In the first step of the regression models, pre-pandemic germ aversion and perceived infectability were entered as predictors, and the pre-pandemic sociosexuality score of interest was entered as a control variable (e.g., pre-pandemic sociosexuality attitudes was entered as a control variable when during pandemic sociosexuality attitudes was the outcome variable). In the second step, to control for the possible influence of demographic differences, age and gender were entered as control variables. The scores were standardized for the analyses. Multicollinearity was checked and found not to be a problem (all VIF < 5, Tolerance > 0.20)[13].

Neither pre-pandemic perceived infectability nor pre-pandemic germ aversion was a significant predictor of during pandemic levels of global sociosexuality or sociosexual behavior. Pre-pandemic perceived infectability significantly predicted during pandemic sociosexual attitudes with a small effect size; however, this association was no longer significant after controlling for gender and age. Pre-pandemic germ aversion significantly predicted during pandemic sociosexual desire with a small effect size, and this association remained even after controlling for gender and age.

Discussion

Study 2 aimed to examine how an ongoing real-life disease threat, COVID-19 pandemic, may influence sociosexuality. When the mean level differences in sociosexuality variables before and during the pandemic were examined, participants reported more restricted global sociosexuality during the pandemic. Although all three dimensions showed a decreasing trend, only sociosexual desire significantly changed. These findings presented partial support for the hypothesis that sociosexuality levels would show a change towards a more restricted sociosexuality level during the pandemic.

Pre-pandemic levels of germ aversion predicted the decrease in sociosexual desire during the pandemic. This finding between germ aversion and sociosexual desire provided partial support for the hypothesis that higher levels of BIS sensitivity would predict a lower level of sociosexuality during the pandemic. This finding showed that individuals with a more sensitive germ aversion adjusted their sociosexual desire to a greater extent in the presence of an ongoing disease threat, while controlling for age, gender, and the pre-pandemic sociosexual desire level. This finding support the proposed association the BIS has with change in sociosexuality during the pandemic, yet weaknesses of the finding should be acknowledged. Our pre-registered hypotheses did not include differences in findings according to the prediction's germ aversion and perceived infectability may have with the sociosexuality scores. Among the eight models that we tested, a significant prediction only occurred for germ aversion predicting sociosexual desire, which presents an inferential weakness. Further, we'd like to underline that although a longitudinal design presents predictive evidence it is not experimental, so causal claims cannot be made.

Sociosexual desire was the only dimension with significant change and the dimension that had its change predicted by germ aversion. Although a decreasing trend was present for sociosexual attitudes and behavior, this trend was not significant, which may be due to the limited amount of time passed in the pandemic before data collection. A month of living during a pandemic may not have been enough to create a significant change in sociosexual attitudes and behavior. Also, sociosexual attitudes are influenced by an individual's moral values and traditions (Penke & Asendorpf, 2008) and it can be hard to create change in a construct that is associated with an individual's cultural values. The attitudes towards sociosexuality could have shown difference if it was known that the pandemic would persist much longer and substantially change how people live. If

[12] This analysis is not in the pre-registered analysis plan. The planned analysis mixed ANOVA that also includes gender moderation is given in the supplemental materials (Table S9). Due to gender moderation not being a focus of this manuscript we opted to report paired-samples t-test in main text.

[13] Step 3 with gender interactions is presented in supplemental materials (Table S10).

Table 4 Study 2 hierarchical regression analyses predicting during pandemic levels of sociosexuality

		During pandemic global sociosexuality			During pandemic sociosexual behavior			During pandemic sociosexual attitude			During pandemic sociosexual desire		
		B	*SE*	ΔR^2	*B*	*SE*	ΔR^2	*B*	*SE*	ΔR^2	*B*	*SE*	ΔR^2
Step 1	Pre-Pandemic Perceived Infectability	0.07	0.04	0.72**	0.02	0.05	0.63**	0.10*	0.05	0.62**	0.01	0.05	0.63**
	Pre-Pandemic Germ aversion	−0.08	0.04		−0.07	0.05		−0.03	0.05		−0.10*	0.05	
	Pre-Pandemic Sociosexuality Score	0.84**	0.04		0.79**	0.04		0.79**	0.05		0.78**	0.04	
Step 2	Pre-Pandemic Perceived Infectability	0.06	0.04	0.00	0.02	0.05	0.00	0.09	0.05	0.00	−0.01	0.05	0.01
	Pre-Pandemic Germ aversion	−0.08	0.04		−0.06	0.05		−0.03	0.05		−0.10*	0.05	
	Pre-Pandemic Sociosexuality Score	0.83**	0.05		0.79**	0.05		0.76**	0.05		0.74**	0.05	
	Gender	−0.01	0.05		0.04	0.05		0.00	0.05		0.03	0.05	
	Age	−0.06	0.04		0.03	0.05		−0.08	0.05		−0.10*	0.05	

Note. The pre-pandemic sociosexuality score is the pre-pandemic sociosexuality score that correspond to the during pandemic sociosexuality score that is used as the dependent variable.
*$p < .05$, **$p < .01$

data were collected in the following phases of the pandemic with more information on COVID-19 and the reality of the pandemic lasting longer, the attitudes towards sociosexuality may have changed.

Sociosexual behavior is the dimension where the risk of pathogen transmission would be the highest, yet a significant change in sociosexual behavior was not present. The items in the SOI-R subscale may explain the non-significant findings. During pandemic levels for sociosexuality was collected a month after the COVID-19 pandemic started. However, the SOI-R items either do not have a time focus or focus on the last year. This does not allow for assessing behavior change in a short amount of time (e.g., a month) and presents a measurement limitation. Due to this limitation a possible change in sociosexual behavior during the pandemic may not have been properly assessed. In future studies it would be beneficial to modify the SOI-R behavior subscale items to indicate time intervals with the respect to the research questions.

General discussion

The current set of studies examined the extent to which the BIS is associated with sociosexuality. The aim was to better understand how disease avoidance processes are associated with the tendency towards engagement in uncommitted sexual relationships. Overall, this set of studies showed support for a connection between the BIS and sociosexuality. That is, as people reported more unrestricted sociosexuality, they also reported lower BIS sensitivity as assessed by germ aversion. Further, Study 2 showed that sociosexuality levels decrease in the presence of a real-life disease threat and this decrease was predicted by germ aversion.

The consistent relations shown in these studies between the dimensions of sociosexuality and germ aversion suggest that individual differences in the BIS and sociosexuality are related with nuance. Previous evidence on this relation was reported within the development of the PVD, demonstrating that higher germ aversion and higher perceived infectability were related to more restricted sociosexuality (Duncan et al., 2009). The negative association between germ aversion and unrestricted sociosexuality was replicated in Studies 1a and 1b, and extended by showing that this relation was present in all three dimensions of sociosexuality. Further, consistent with the BIS theory germ aversion predicted the decrease of sociosexual desire during a real-life disease threat. However, for perceived infectability the previously found negative associations with sociosexuality was not replicated in the current studies. Other studies similarly found a negative relation between germ aversion and sociosexuality, but not a significant relation with perceived infectability (Mogilski et

al., 2020; Prokosch et al., 2021). Further, perceived infectability was also a significant predictor of change for sociosexual attitudes during the pandemic, yet the significance did not persist when controlling for demographics and direction of the effect was not consistent with BIS theory.

The differences in the findings with germ aversion and perceived infectability brings support for the argument regarding whether perceived infectability is a measure of the BIS (e.g., Shook et al., 2020). The BIS theory (Schaller, 2006) is relatively new and in the early phase of development. More questions and discussions are needed to achieve an understanding of its constructs and the best ways to measure them. If perceived infectability is not a measure of BIS, this may be the reason for the inconsistent findings with sociosexuality. Other than perceived infectability, not being a measure of the BIS, another possible explanation may be the associations of germ aversion and sociosexuality being specific to the used measures. Understanding this distinction would help in improving BIS theory by clarifying the nature of its constructs and how they may be differently related with other variables. This project utilized the PVD to operationalize BIS sensitivity, yet other ways to operationalize BIS sensitivity are present. Future replication attempts and use of other ways to measure BIS sensitivity, like disgust sensitivity (Tybur et al., 2014), can help in showing if there is a consistent association between the BIS and sociosexuality, or if this finding is specific to germ aversion a subscale of PVD. Inclusion of disgust in the models can enable in understanding how the affective mechanisms of the BIS, disgust, may play a role on sociosexuality in interaction with germ aversion or while controlling for each other. These examinations would allow modeling how distinct pieces of the BIS work together in their association with sociosexuality.

Other than the link of individual differences, another aim of this study was to assess how the tendency to engage in uncommitted sexual relationships changes in the context of a real-life disease threat. A previous study showed that in geographic areas that experienced higher levels of infectious disease, people reported more restricted sociosexuality levels (Schaller & Murray, 2008). Although the current set of studies did not use any methods to examine this relation between geographic disease prevalence and sociosexuality, Study 2 examined the change in sociosexuality during a real-life disease threat. Results showed that during the COVID-19 pandemic people reported more restricted levels of sociosexuality. This finding provides support for the BIS theory by showing that in the presence of an ongoing disease threat individuals do restrict their inclinations that pose a higher risk of contamination.

The findings gathered from the connections of individual differences and changes during the COVID-19 provide steps in explaining how two primal desires, engaging in sexual acts and ensuring survival by avoiding diseases, are connected. Our findings show that the motivation to avoid diseases is associated with a more restricted inclination to engage in uncommitted sex and this inclination gets more restricted when presented with a real-life disease threat. In this project we were able to test one leg of the connection by showing disease avoidance may inhibit sociosexuality. Future research that focuses on the other leg and examine how sociosexuality may influence disease avoidance would help in providing a more comprehensive picture of how disease avoidance and sociosexuality are associated.

Limitations

All of the studies were conducted online, and most samples were recruited through Amazon MTurk or CloudResearch that is affiliated with Amazon MTurk. Recruitment via Amazon MTurk is highly used (Rouse, 2020), yet it does have limitations (see Aguinis et al., 2021, for review). The use of Amazon MTurk and convenience sampling may involve self-selection bias. The choice to participate in studies through Amazon MTurk is related with an individual's personal and demographic characteristics (e.g., employment, monetary incentives), which may influence the results and question the external validity of the findings (Aguinis et al., 2021). The participants recruited from Amazon MTurk can be inattentive and threaten construct validity (Aguinis et al., 2021; Fleischer et al., 2015). In all studies, there were several exclusion criteria used (e.g., duplicate IP's, open ended questions) to avoid low quality responses. Yet, the possible inattentiveness of participants may have influenced the results. We also acknowledge the high number of excluded participants in Study 1b where close to half of the initial participation from Amazon MTurk was excluded. This was due to the conservative exclusion protocol we used to reach better data quality; our point was that although number of exclusions may seem high, the inclusion of these cases could have led to misleading findings. Amazon MTurk faced concerns regarding automated responses during time of data collection (Bai, 2018; Dreyfuss, 2018) and our protocol indicated that the excluded responses were indeed automated or low-quality responses (e.g., multiple responses from same IP). We aimed to be transparent and explicit about this limitation we experienced so it can be reported and other researchers can be aware of this possible limitation in use of crowdsourcing platforms.

Another limitation is that all studies had participants located in the US. This may have created a mono-cultural bias. Both the BIS and sociosexuality are phenomena that are seen across cultures (Oaten et al., 2009; Schmitt, 2005a). However, pathogen prevalence in a geographic area is

associated with sociosexuality (Schaller & Murray, 2008). Furthermore, pathogen prevalence can influence the culture of an area (Murray & Schaller, 2010). For example, lower pathogen prevalence has been associated with a more individualistic culture (Fincher et al., 2008), a cultural system that is more prevalent in American samples (Oyserman et al., 2002). Accordingly, the US based samples may have been more individualistic and the cultural generalizability of the findings can be limited. Cultural inheritance shapes human behavior (Henrich, 2015) and culture may have an influence on the link between the BIS and sociosexuality. Use of different samples from multiple cultures, especially cultures with different pathogen prevalence rates can be helpful in testing the generalizability of the findings.

All studies utilized self-report measures to study BIS sensitivity and sociosexual orientation. This raises concerns for response bias or social desirability and common method variance. Future research that incorporates behavioral measurements can help addressing these concerns.

Future directions

Future research should consider possible demographic moderators on the link between the BIS and sociosexuality. The current set of studies explored gender as a possible moderator in this link and our results did not support gender as a moderator (see Supplemental Material for findings). Yet there are other possible moderators that may be in interaction. For some of the discrepancies between the findings of Study 1a and Study 1b, differences in the age distribution of the samples was a possible explanation. BIS sensitivity can show differences in relation to age and gender (Díaz et al., 2020), and sexual experiences that increase with age can lead to an increase in sociosexual behavior. Accordingly, age may be a possible factor that interacts with the BIS and sociosexuality that can be examined in future studies. Another possible moderating factor may be relationship status. Although a consistent difference is not seen present, sociosexuality can show differences according to relationship status (Schmitt, 2005b) and these differences can sometimes be more salient depending on gender (Penke & Asendorpf, 2008). Further, for people who are in committed relationships the disease transmission risks associated with novel partners would be presumably low. Accordingly, the relationship status can be a possible moderating factor in the link of the BIS and sociosexuality. Future research should explore the possible demographic moderators to have a comprehensive understanding of how and for whom the BIS and sociosexuality may show possibly stronger connections.

The applied value for the link of the BIS and sociosexuality can have should be considered. This connection may have implications for promoting better physical health, specifically against the transmission of sexually transmitted diseases. Novel and high number of sexual partners increase the risk of the transmission of sexually transmitted diseases (STD). This risk especially remains high when protection (e.g., condom) is not used during sex. Previous evidence shows that more unrestricted sociosexuality is associated with engagement with riskier sexual behavior (e.g., one-night stand with a partner you do not know well; Hall, 2012; Hall & Pichon, 2014) and sexual intercourse without using protection (Seal & Agostinelli, 1994), which can increase the spread of STDs. In the process of developing intervention programs to reduce the influence of sociosexuality on risk of STDs, the BIS can be a malleable tool. Previous evidence shows that an activated BIS can promote intentions for condom use (Tybur et al., 2011). Accordingly, use of messages and visuals that target activation of the BIS may help in promotion of restricted sociosexuality and condom use. The incorporation of the BIS may help in achieving stronger intervention designs to decrease the spread of STDs. Future studies are needed to be able to examine how the BIS theory can be valuable to promote better health.

Conclusion

The current research helps broaden our understanding of the link between the BIS and sociosexuality. First, a consistent association between the individual differences are seen with the germ aversion and sociosexuality levels. Second, the findings present that individuals' inclinations for engagement in uncommitted sexual relationships decreased during a real-life disease threat, the COVID-19 pandemic, and germ aversion predicted the change in sociosexual desire. These findings show that disease avoidance is associated with sociosexuality. However, it should be noted that this association is nuanced and additional research is necessary to test the robustness of it.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12144-024-07139-2.

Funding No funding was received to assist with the preparation of this manuscript.

Data availability This research was conducted as part of the dissertation work of the first author. The data and syntax of this research are available at the OSF page of the dissertation at https://osf.io/9havc/?view_only=4291c6776c5143e3a00e18bfaccfc07c.

Declarations

Ethical approval Institutional ethics approvals were obtained for all reported studies and the studies complied with the Helsinki Declaration. Study 1a and 1b's ethical approval was obtained from West Virginia University (Protocol numbers 1311139985 and 1711852730) and

Study 2's ethical approval was obtained from the University of Connecticut (Protocol number X20-0048).

Informed consent Was obtained from the individuals who participated in the studies.

Competing interests The authors have no competing interests to declare that are relevant to the content of this article.

References

Aguinis, H., Villamor, I., & Ramani, R. S. (2021). MTurk research: Review and recommendations. *Journal of Management*, *47*(4), 823–837.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179–211.

Arnocky, S., Woodruff, N., & Schmitt, D. P. (2016). Men's sociosexuality is sensitive to changes in mate availability. *Personal Relationships*, *23*(1), 172–181.

Arnocky, S., Desrochers, J., Rotella, A., Albert, G., Hodges-Simeon, C., Locke, A., Belanger, J., Lynch, D., & Kelly, B. (2021). Men's Mate Value Correlates with a Less Restricted Sociosexual Orientation: A Meta-Analysis. *Archives of Sexual Behavior*, 1–11.

Bai, H. (2018). Evidence that A Large Amount of Low Quality Responses on MTurk Can Be Detected with Repeated GPS Coordinates. https://www.maxhuibai.com/blog/evidence-that-responses-from-repeating-gps-are-random

Barrada, J. R., Castro, Á., Correa, A. B., & Ruiz-Gómez, P. (2018). The tridimensional structure of sociosexuality: Spanish validation of the Revised Sociosexual Orientation Inventory. *Journal of Sex & Marital Therapy*, *44*(2), 149–158.

Blasco-Belled, A., Zyskowska, E., Terebu, M., Włodarska, K. A., & Rogoza, R. (2022). Sociosexual Orientations and Well-Being: Differences Across Gender. *International Journal of Sexual Health*, *34*(2), 254–266.

Chen, B. B. (2017). Insecure attachment, resource control, and unrestricted sociosexuality: From a life history perspective. *Personality and Individual Differences*, *105*, 213–217.

Conroy-Beam, D., Goetz, C. D., & Buss, D. M. (2015). Why do humans form long-term mate-ships? An evolutionary game-theoretic model. *Advances in Experimental Social Psychology*, *51*, 1–39.

Curtis, V. A. (2007). Dirt, disgust and disease: A natural history of hygiene. *Journal of Epidemiology & Community Health*, *61*(8), 660–664.

Díaz, A., Soriano, J. F., & Beleña, Á. (2016). Perceived vulnerability to disease questionnaire: Factor structure, psychometric properties and gender differences. *Personality and Individual Differences*, *101*, 42–49.

Díaz, A., Beleña, Á., & Zueco, J. (2020). The role of age and gender in perceived vulnerability to infectious diseases. *International Journal of Environmental Research and Public Health*, *17*(2), 485.

Dreyfuss, E. (2018). A Bot Panic Hits Amazon's Mechanical Turk. Wired. https://www.wired.com/story/amazon-mechanical-turk-bot-panic/

Duncan, L. A., Schaller, M., & Park, J. H. (2009). Perceived vulnerability to disease: Development and validation of a 15-item self-report instrument. *Personality and Individual Differences*, *47*(6), 541–546.

Fincher, C. L., Thornhill, R., Murray, D. R., & Schaller, M. (2008). Pathogen prevalence predicts human cross-cultural variability in individualism/collectivism. *Proceedings of the Royal Society B: Biological Sciences, 275*(1640), 1279–1285.

Fleischer, A., Mead, A. D., & Huang, J. (2015). Inattentive responding in MTurk and other online samples. *Industrial and Organizational Psychology*, *8*(2), 196–202.

Gangestad, S. W., & Simpson, J. A. (2000). The evolution of human mating: Trade-offs and strategic pluralism. *Behavioral and Brain Sciences*, *23*, 573–587.

Gettler, L. T., Kuo, P. X., Rosenbaum, S., Avila, J. L., McDade, T. W., & Kuzawa, C. W. (2019). Sociosexuality, testosterone, and life history status: Prospective associations and longitudinal changes among men in Cebu, Philippines. *Evolution and Human Behavior*, *40*(2), 249–258.

Hall, N. M. (2012). Sociosexuality, human immunodeficiency virus (HIV) susceptibility, and sexual behavior among African American women. *Journal of AIDS and HIV research*, *5*(2), 43–51.

Hall, N. M., & Pichon, L. C. (2014). Gender roles, sociosexuality, and sexual behavior among US Black women. *Health Psychology and Behavioral Medicine*, *2*(1), 171–182.

He, F., Li, D., Cao, R., Zeng, J., & Guan, H. (2014). The attitude-behavior discrepancy in medical decision making. *Iranian Red Crescent Medical Journal*, *16*(12), 1–5.

Henrich, J. (2015). *The secret of our success: How Culture Is Driving Human Evolution, Domesticating Our Species, and Making Us Smarter*. Princeton University Press.

Hill, S. E., Boehm, G. W., & Prokosch, M. L. (2016). Vulnerability to disease as a predictor of faster life history strategies. *Adaptive Human Behavior and Physiology*, *2*(2), 116–133.

Hlay, J. K., Albert, G., Batres, C., Richardson, G., Placek, C., Arnocky, S., Lieberman, D., & Hodges-Simeon, C. R. (2021). The evolution of disgust for pathogen detection and avoidance. *Scientific Reports*, *11*(1), 13468.

Jonason, P. K., Li, N. P., Webster, G. D., & Schmitt, D. P. (2009). The dark triad: Facilitating a short-term mating strategy in men. *European Journal of Personality*, *23*(1), 5–18.

Jones, D. N., & Curtis, S. R. (2017). Emophilia, sociosexuality, and anxious attachment: Approach and inhibition differences. *Personality and Individual Differences*, *106*, 325–328.

Mafra, A. L., Defelipe, R. P., Varella, M. A. C., Townsend, J. M., & Valentova, J. V. (2021). Mate value, intrasexual competition and sociosexual desire drive Brazilian women's well- being. *Evolutionary Human Sciences*, *3*, E25.

Makhanova, A., & Shepherd, M. A. (2020). Behavioral immune system linked to responses to the threat of COVID-19. *Personality and Individual Differences*, *167*, 110221.

Makhanova, A., Plant, E. A., Monroe, A. E., & Maner, J. K. (2019). Binding together to avoid illness: Pathogen avoidance and moral worldviews. *Evolutionary Behavioral Sciences*, *13*(2), 182–204.

Marcinkowska, U. M., Mijas, M., Koziara, K., Grebe, N. M., & Jasienska, G. (2021). Variation in sociosexuality across natural menstrual cycles: Associations with ovarian hormones and cycle phase. *Evolution and Human Behavior*, *42*(1), 35–42.

Mogilski, J. K., Mitchell, V. E., Reeve, S. D., Donaldson, S. H., Nicolas, S. C., & Welling, L. L. (2020). Life history and multi-partner mating: A novel explanation for moral stigma against consensual non-monogamy. *Frontiers in Psychology*, *10,* 03033.

Moran, J. B., Kerry, N., Goh, J. X., & Murray, D. R. (2021). Parasites and promiscuity: Acute disease salience leads to more restricted sexual attitudes. *Journal of Social and Personal Relationships*, *38*(11), 3333–3349.

Murray, D. R., & Schaller, M. (2010). Historical prevalence of infectious diseases within 230 geopolitical regions: A tool for investigating origins of culture. *Journal of Cross-Cultural Psychology*, *41*(1), 99–108.

Nascimento, B. S., Hanel, P. P., Monteiro, R. P., Gouveia, V. V., & Little, A. C. (2018). Sociosexuality in Brazil: Validation of the SOI-R and its correlates with personality, self-perceived mate

value, and ideal partner preferences. *Personality and Individual Differences*, *124*, 98–104.
Oaten, M., Stevenson, R. J., & Case, T. I. (2009). Disgust as a disease-avoidance mechanism. *Psychological Bulletin*, *135*(2), 303–321.
Oyserman, D., Coon, H. M., & Kemmelmeier, M. (2002). Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychological Bulletin*, *128*(1), 3–72.
Penke, L., & Asendorpf, J. B. (2008). Beyond global sociosexual orientations: A more differentiated look at sociosexuality and its effects on courtship and romantic relationships. *Journal of Personality and Social Psychology*, *95*(5), 1113–1135.
Prokosch, M. L., Airington, Z., & Murray, D. R. (2021). Investigating the relationship between olfactory acuity, disgust, and mating strategies. *Evolution and Human Behavior*, *42*(2), 113–120.
Quist, M. C., Watkins, C. D., Smith, F. G., Little, A. C., DeBruine, L. M., & Jones, B. C. (2012). Sociosexuality predicts women's preferences for symmetry in men's faces. *Archives of Sexual Behavior*, *41*(6), 1415–1421.
Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, *48*(2), 1–36.
Rouse, S. V. (2020). Reliability of MTurk data from Masters and Workers. *Journal of Individual Differences*, *41*, 30–36.
Schaller, M. (2006). Parasites, behavioral defenses, and the social psychological mechanisms through which cultures are evoked. *Psychological Inquiry*, *17*(2), 96–101.
Schaller, M. (2016). The behavioral immune system. In D. M. Buss (Ed.), *The handbook of evolutionary psychology* (2nd edition, Vol. 1, pp. 206–224). Wiley.
Schaller, M., & Duncan, L. A. (2007). The behavioral immune system: Its evolution and social psychological implications. In J. P. Forgas, M. G. Haselton, & W. von Hippel (Eds.), *Evolution and the social mind: Evolutionary psychology and social cognition* (pp. 293–307). Psychology.
Schaller, M., & Murray, D. R. (2008). Pathogens, personality, and culture: Disease prevalence predicts worldwide variability in sociosexuality, extraversion, and openness to experience. *Journal of Personality and Social Psychology*, *95*(1), 212–221.
Schaller, M., & Park, J. H. (2011). The behavioral immune system (and why it matters). *Current Directions in Psychological Science*, *20*(2), 99–103.
Schaller, M., Park, J. H., & Kenrick, D. T. (2007). Human evolution and social cognition. In R. I. M. Dunbar, & L. Barrett (Eds.), *Oxford handbook of evolutionary psychology* (pp. 491–504). Oxford University Press.
Schmitt, D. P. (2005a). Sociosexuality from Argentina to Zimbabwe: A 48-nation study of sex, culture, and strategies of human mating. *Behavioral and Brain Sciences*, *28*(02), 247–275.
Schmitt, D. P. (2005b). Measuring sociosexuality across people and nations: Revisiting the strengths and weaknesses of cross-cultural sex research. *Behavioral and Brain sciences*, *28*(2), 297–304.
Seal, D. W., & Agostinelli, G. (1994). Individual differences associated with high-risk sexual behaviour: Implications for intervention programmes. *Aids Care*, *6*(4), 393–397.
Shook, N. J., & Oosterhoff, B. (2020). Testing the effects of pathogen threat and sexual strategies on political ideology. *Politics and the Life Sciences*, *39*(2), 187–199.
Shook, N. J., Sevi, B., Lee, J., Oosterhoff, B., & Fitzgerald, H. N. (2020). Disease avoidance in the time of COVID-19: The behavioral immune system is associated with concern and preventative health behaviors. *PloS ONE, 15*(8), e0238015.
Simpson, J. A., & Gangestad, S. W. (1991). Individual differences in sociosexuality: Evidence for convergent and discriminant validity. *Journal of Personality and Social Psychology*, *60*(6), 870–883.
Soper, D. S. (2022). *Significance of the difference between two correlations calculator* [Software]. https://www.danielsoper.com/statcalc
Tybur, J. M., Bryan, A. D., Magnan, R. E., & Hooper, A. E. C. (2011). Smells like safe sex: Olfactory pathogen primes increase intentions to use condoms. *Psychological Science*, *22*(4), 478–480.
Tybur, J. M., Lieberman, D., Kurzban, R., & DeScioli, P. (2013). Disgust: Evolved function and structure. *Psychological Review*, *120*(1), 65–84.
Tybur, J. M., Frankenhuis, W. E., & Pollet, T. V. (2014). Behavioral immune system methods: Surveying the present to shape the future. *Evolutionary Behavioral Sciences*, *8*(4), 274–283.