

Support for a formal theory of sexual orientation with new data obtained from 572,128 people in 88 countries who completed questionnaires in their native languages

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Support for a formal theory of sexual orientation with new data obtained from 572,128 people in 88 countries who completed questionnaires in their native languages

In a study published in 2023 with data from 1,150,938 English-speaking people from 215 countries and territories, researchers found support for a formal “social pressure theory” (SPT) of sexual orientation, according to which social pressure obscures natural bisexual inclinations – an idea proposed by Sigmund Freud, Alfred Kinsey, and others. In the present study, we expanded this research to include an analysis of data from a new sample of 572,128 people in 88 countries who had completed translations into their native language of the English version of the online sexual orientation questionnaire used in the above-mentioned study. The present study confirms findings from the earlier study that sexual orientation inclinations are not categorical but rather are best characterized as existing on a continuum from exclusive opposite-sex to exclusive same-sex inclinations. In the new study, we have expanded this work as follows: (a) We have developed a credible way of quantifying heteronormative social pressure (a variable we call *S*) in 155 different countries worldwide, with values varying across the entire scale, from 0.00 to 1.00. (b) We were able to predict the distribution of sexual orientation inclinations in different countries using *S*, thus providing validity evidence to support some aspects of SPT. (c) We show that how we conceptualize sexual orientation is limited by how we measure it. We conclude that SPT may be a useful theoretical and quantitative tool for understanding how heteronormative social pressure suppresses same-sex sexual inclinations.

Keywords: sexual orientation; social pressure theory of sexual orientation; Epstein Sexual Orientation Inventory; mean sexual orientation; sexual orientation continuum

Introduction

Although it is common today for people to believe that sexual orientation is a categorical phenomenon with most people falling into two (gay or straight) or three (gay, bisexual, or straight) categories (Bailey et al., 2016), these designations were only invented in the late 1800s (Takacs, 2024), and they did not become commonplace until the early 1900s (Ambrosino, 2017; Blank, 2012). Some scholars suggest that the word “bisexuality” did not become commonplace in English-speaking countries until well into the 1900s (Berg, 2020). “Straight,” the most socially accepted of these labels, is used by most people no matter what their actual sexual inclinations (Bostwick et al., 2010; Copen et al., 2016; Epstein et al., 2012, 2023; Herbenick et al., 2010; Herbenick et al., 2017; Joloza et al., 2010; Ward et al., 2014).

Before this sort of categorization took hold, people were aware that humans often engaged in opposite-sex (OS) sexual behavior, that they sometimes engaged in same-sex (SS) sexual behavior, and that sometimes the same person did both. But these tendencies were generally viewed as *behaviors*, not as indicators of a sexual identity. This was true, for example, in ancient Greece and ancient Rome (Cantarella, 1992), as well as in Renaissance England (Bray, 1982). In what is sometimes regarded as the first book of love poems ever written (in approximately 1022 CE), Ibn Hazm introduced each poem with a few paragraphs of background information (Hazm, 1981). Sometimes the poem was about his love for a female slave or servant and sometimes about his love for a woman of his own social status. The remarkable thing about the collection is that, from time to time, the author shifts smoothly to talking about his love for a boy or man. Sometimes his poems were about love relationships between his male friends and females or males. If Ibn Hazm found anything odd about same-sex sexual behavior, there is no trace of his discomfort in his remarkable book, *The Ring and the Dove*.

In multiple publications beginning in the early 1900s, Sigmund Freud insisted that bisexuality was the natural norm for human beings (Epstein et al., 2023; Freud, 1930, 1937, 1950) and even that heterosexuality can be a precursor of neurosis (Freud, 1910). Freud's assertions were not data-based, but just 9 years after Freud died in 1939, pioneering sex researcher Alfred Kinsey and his colleagues published a landmark book called *Sexual Behavior in the Human Male* (Kinsey et al., 1948), in which they declared that sexual orientation existed on a continuum from exclusive opposite-sex inclinations to exclusive same-sex inclinations. Their conclusions were based on in-depth, face-to-face interviews with 5,300 men, and they were emphatic about their findings: "It is a fundamental of taxonomy that nature rarely deals with discrete categories.... The living world is a continuum in each and every one of its aspects" (Kinsey et al., 1948). This viewpoint was endorsed many years later in a public statement released by the American Psychological Association and 12 other professional organizations (Just the Facts Coalition, 2008). It has also been known for millennia that emotional bonding is not just an opposite-sex phenomenon; it frequently occurs between members of the same sex, with or without a sexual component (Bukowski et al., 1993; Ferrara & Vergara, 2024; Fox, 2024; Nielson et al., 2020).

Perhaps the reader has noted an odd trend here. The usual trend in the natural sciences has been to begin with categorical terms borrowed from the vernacular (Culotta, 2012; Jorde & Wooding, 2004) and then, over time, to recognize that these terms actually describe *continuous* variables (Luce & Narens 1987; de la Mettrie et al., 2007; Van Loon et al., 2024). In our everyday lives, for example, we freely use color names to describe the objects around us, but physicists have known since the early 1900s that these labels correspond roughly to small regions of the electromagnetic continuum (McSweeney, 2019; Cerf et al., 2007). Categories usually exist on ordinal or nominal scales of low resolution.

Shifting our focus from categorical to continuous variables not only gets us closer to truth (since, as Kinsey reminded us, “the living world is a continuum”), it also allows scientists to use mathematics to analyze the subject matter. Mathematics lets us measure characteristics of the subject matter precisely, and, more important, it allows us to make precise predictions about how the subject matter will behave.

When it comes to sexual orientation, the odd trend is that for millennia, it was viewed as a continuous variable (that is, as behavior that could be expressed in a range of different ways in different individuals), but then, beginning in the late 1800s, it was increasingly viewed as a categorical variable, with people arguing to this day about the validity of the categories. Because one necessarily errs when applying categorical labels to a continuous phenomenon, in the US today, the failure of two or three labels to accurately describe sexual orientation has led to the creation of dozens of new labels, each intended to capture nuances in the variability of individual sexual tendencies (see S1 Text for a list of 25 such labels) (Cerf et al., 2007; Zambon, 2025). Efforts by Kinsey and others (Epstein et al., 2012, 2023; Chivers et al., 2010; Ellis et al., 1987; Epstein & Robertson, 2014; Freud & Brill, 1916; Haslam, 1997; Kraemer et al., 2006; Savin-Williams, 2014; Sell, 1997; Thompson & Morgan, 2008; Vrangalova & Savin-Williams, 2012) to push us back toward continuous thinking has largely failed (Hunt & Hunt, 2018). At one extreme, some people insist that sexual orientation exists in one category only – heterosexuality – whereas, at the other extreme, people insist that sexual orientation exists in dozens of different categories (Zambon, 2025).

As you will see in the present paper, our research group, expanding on Kinsey’s work, accepts what we see as the obvious fact that sexual orientation is a continuous variable. Moreover, we use mathematics in a credible way to understand and even to predict some aspects of sexual orientation. The present paper is a follow-up to a study

published in 2023 with more than 1.1 million participants from 215 countries and territories (Epstein et al., 2023). The authors used a new online sexual orientation questionnaire to evaluate same-sex and opposite-sex sexual inclinations (fantasies, behaviors, and attractions) on 19-point scale (Epstein et al., 2023; Kinsey et al., 1948) concluded that sexual orientation is not a categorical variable but rather that it exists on a continuum (Epstein et al., 2012). Like Freud, the authors also concluded that the natural human norm for sexual orientation is probably bisexuality and that same-sex and opposite-sex inclinations probably exist independently of each other in each individual (Epstein et al., 2023; Freud, 1930, 1937, 1950).

They also introduced a formal, mathematical theory of sexual orientation called “social pressure theory” (SPT), which they presented both mathematically (see Supplementary Text 4 in reference 11, accessible at <https://is.gd/rTWB1e>) and in the form of a computational model (see <https://is.gd/JzCnCz>). The principal independent variable in the model is S , a variable representing social pressure. Positive values of S , which varies from 0.00 to 1.00, where 1.00 is the highest possible level of pressure, indicate that society is forcing people to act exclusively on their opposite-sex sexual inclinations. SPT assumes that in an ideal society in which the value of S is 0, sexual inclinations will be roughly normally distributed on a histogram showing the number of people who have sexual inclinations varying between 0 (signifying exclusive opposite-sex inclinations) and 18 (signifying exclusive same-sex inclinations) (Figure 1).

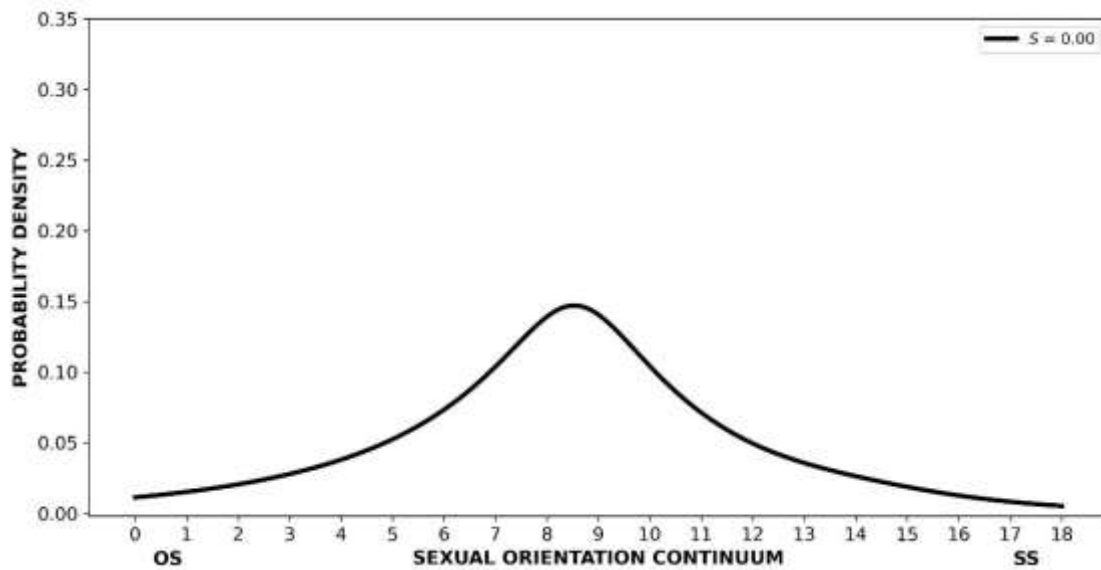


Figure 1. Theoretical distribution of sexual orientation inclinations in an environment in which there is no social pressure to be straight ($S = 0$). The distribution of scores, shown above as a probability density curve, is roughly normal.

As values of S increase from 0 to 1, that roughly-normal curve becomes increasingly positively skewed until, at some point, it appears to break; in other words, at very high levels of social pressure, the curve becomes bimodal, with a large mode near the opposite-sex end of the distribution and a smaller mode near the same-sex end of the distribution (Figure 2; cf. Figure S1). The smaller mode is indicative of people whose same-sex sexual inclinations are so strong that they resist heteronormative pressures, often no matter what the consequences (Epstein et al., 2023). Unfortunately, at least from some perspectives, this bimodal distribution creates the mistaken impression that two different types of sexual orientation – and perhaps even that two different types of human beings – exist: heterosexuals and homosexuals.

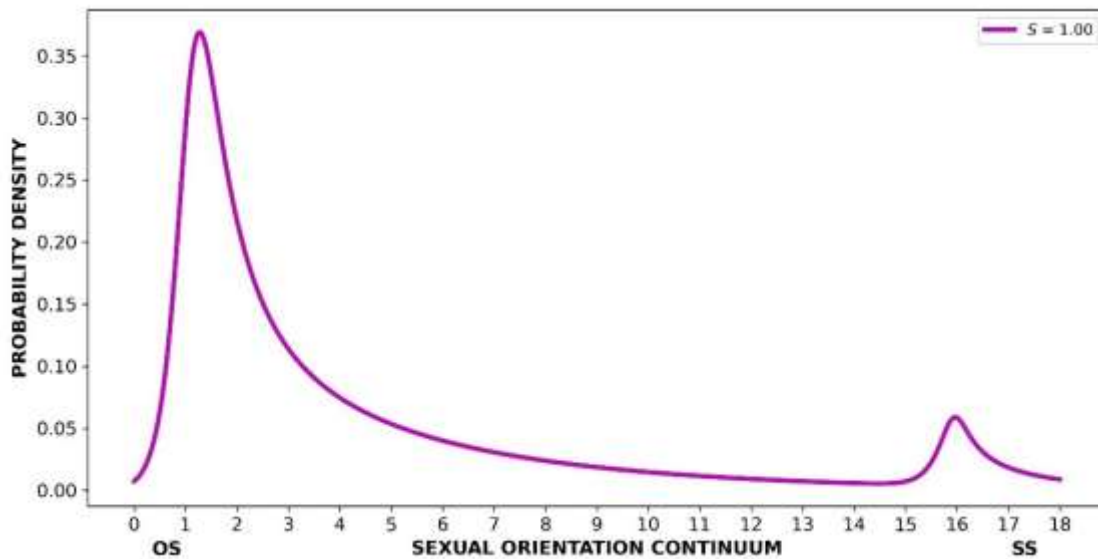


Figure 2. Theoretical distribution of sexual-orientation inclinations in a social environment in which pressure to be straight (heteronormative pressure) is at some maximum value ($S = 1$). As social pressure increases from 0, the curve becomes more positively skewed, and, at some point, it appears to break, becoming bimodal, with a large mode at the OS end of the distribution and a smaller mode at the SS end of the distribution.

Although participants in the study were from every country and territory in the world (Epstein et al., 2023), they all completed the questionnaire in English. Their common language alone might have guaranteed that they shared certain cultural characteristics, including their thinking about sexual orientation – their own and other people’s, perhaps. That study also did not examine differences in sexual orientation by country or region. In the present study, we will begin the process of comparing sexual orientation across countries and regions by looking at people’s scores on translations of the English version of the ESOI into 12 other languages: Arabic, Chinese (both traditional and simplified), Dutch, French, German, Hungarian, Italian, Japanese, Korean, Malay, and Spanish.

In the present paper, we will also introduce what we believe is a rigorous and rational way of calculating values of S for 155 countries worldwide, and we will use S to test the validity of SPT by comparing distributions of sexual orientation for countries with different values of S .

Note that in the present study, we did not expect to see dramatic shifts in the distributions of sexual orientation scores for countries with different values of S (Figure S1). Neither did we expect to find the bimodal distribution that SPT predicts will occur in countries with high values of S (Figure 2). By having our participants complete the questionnaire online anonymously, we removed all or nearly all traces of the heteronormative social pressure they were normally subjected to daily. In a way, we removed our participants from their normal environments and took them to “Cyber Island,” where one’s sexual orientation is never judged. Thus, we predicted that the overall distribution of scores for people in each country would be roughly normal (cf. Epstein et al., 2023).

Because of people’s long history of socialization, however, we expected our participants to bring with them at least some remnant of that history, and we therefore predicted that the higher the value of S for any given country, the greater the positive skew we would find in our near-normal distributions. For widely differing values of S , we expected to see shifts (as measured by mean sexual orientation scores on the ESOI) that were significantly different statistically. We will return to this issue in our Discussion section.

Methods

Ethics statement

The federally registered Institutional Review Board (IRB) of the sponsoring institution (American Institute for Behavioral Research and Technology) approved this study with exempt status under and a waiver of the requirement for informed consent under U.S. Department of Health and Human Services regulations (45 CFR 46.116(d), 45 CFR 46.117(c)(2), and 45 CFR 46.111) because (a) the anonymity of participants was preserved

and (b) the risk to participants was minimal. Written informed consent from participants' legal guardian or next of kin was not required to participate in this study in accordance with institutional requirements and U.S. federal laws and regulations. All methods were performed in accordance with the relevant guidelines and regulations. The IRB is registered with the Office for Human Research Protections (OHRP) under number IRB00013269, and the Federalwide Assurance number for the IRB is FWA00032343.

Participants

The present study is based on an analysis of scores on 12 non-English versions of the ESOI obtained between April 2007 and April 2025 from a sample of 572,128 people in 88 countries (60.0% from Europe, East Asia, and the Middle East). The initial data set contained 680,142 records and was cleaned as follows: If people completed the test more than one time in a day, only the first instance in which they completed the entire test was preserved. We also removed incomplete cases and cases in which people reported that their fluency in the language of the test was less than 6 on a scale from 1 to 10, where 1 was labeled "Not fluent" and 10 was labeled "Highly fluent."

The self-reported demographic characteristics of the participants were as follows: Ages ranged from 15 to 95 ($M = 21.5$, $SD = 7.6$, median = 19). The sample was 69.4% ($n = 396,958$) female, 28.5% ($n = 162,997$) male, and 1.5% ($n = 8,344$) other; 0.7% ($n = 3,829$) chose not to identify their gender. The racial/ethnic distribution was as follows: 37.6% ($n = 215,220$) Asian, 32.6% ($n = 186,505$) White, 21.7% ($n = 124,077$) Arab, 4.4% ($n = 25,193$) Hispanic, 2.0% ($n = 11,227$) other, 0.6% ($n = 3,246$) Black, 0.4% ($n = 2,055$) Native American; .8% ($n = 4,661$) chose not to identify their race/ethnicity. Participants labeled their SO as follows: 39.3% ($n = 224,947$) unsure, 31.4% ($n = 179,599$) straight, 16.1% ($n = 92,280$) bisexual, 8.4% ($n = 47,897$) gay/lesbian, 3.2% ($n = 18,108$) other, 0.1% ($n = 413$)

asexual; 1.6% ($n = 8,884$) chose not to identify their SO. Participants reported their educational attainment level as follows: 16.5% ($n = 94,243$) had not completed high school, 45.5% ($n = 260,309$) had a high school diploma, 7.6% ($n = 43,582$) had an associate's degree or equivalent, 24.0% ($n = 137,313$) had a bachelor's degree, 4.7% ($n = 27,026$) had a master's degree, and 1.1% ($n = 6,322$) had a doctorate. Participants were also asked whether they had ever changed their SO and to estimate, on two 10-point scales, how much uncertainty and distress they felt regarding their SO.

Procedures

The twelve questionnaires in the present study were translations of the questionnaire used in the 2023 ESOI study, and contained the same items and scoring method (Epstein et al., 2023). All the questionnaires were translated by native speakers and then reverse-translated native English speakers who were fluent in the other language. Minor adjustments were made where necessary by native speakers. Since the questionnaires were posted at public websites (Text S4), we had no control over sampling, and it is possible that an online sexual orientation questionnaire will attract the attention of people who are not representative of the general population. We will discuss this issue more in the Limitations and Future Research section.

The ESOI was designed to be relatively simple, and its design was informed by previously developed instruments that measured sexual orientation on a continuous scale by assessing an individual's sexual behaviors, attraction, and fantasies. The first of such scales was the Heterosexual-Homosexual Rating Scale, also known as the "Kinsey Scale" (Kinsey et al., 1948; Klein, 1993; Storms, 1980). Our new questionnaire contained 18 items, half of which asked about SS sexual fantasies, attractions, and behaviors, both past and present, and the other half of which asked about OS inclinations of the same sort (see

Text S2 for the list of questionnaire items and Text S3 for the scoring system). Upon completing the questionnaire, participants were given measures of their same-sex and opposite-sex inclinations, their sexual orientation range (SOR, the range of points between and including the points associated with their SS and OS inclinations), their mean sexual orientation (MSO, the point halfway between the points associated with their SS and OS inclinations), and their sex drive (the average of the values of their SS and OS inclinations), all derived from questionnaire responses (see Text S3).

Calculating social pressure (S)

In order to calculate a social pressure score (S) for as many countries as possible, we gathered existing data from two organizations – Our World in Data and the UCLA School of Law Williams Institute – that had measured global attitudes and regulations related to non-heterosexuality (Equaldex, 2023a, 2023b, 2023c, 2024a, 2024b; Mignot, 2022; UCLA School of Law Williams Institute, 2021; Velasco, 2019, 2020a, 2020b, 2020c, 2020d, 2020e, 2020f, 2020g, 2020h, 2020i). We compiled these data into one data set, organizing them by country. The final dataset had a total of 20 variables that could influence S, such as the legality of same-sex marriage, the legality of same-sex sexual acts, and gay adoption rights. Table 1 lists all 20 variables in our dataset and the original scale of the variable. After combining the data, we normalized the variables using the following formula:

$$z_i = \frac{x_i - \min(x)}{\max(x) - \min(x)}$$

where z_i is the normalized value, x_i is the original value, $\min(x)$ is the minimum value in the dataset, and $\max(x)$ is the maximum value in the dataset.

Table 1. 20 variables used to calculate the social pressure score of 155 countries (in alphabetical order).

Variable Name	Original Scale
1. Censorship of LGBT issues	1 (no censorship) to 7 (imprisonment as punishment)
2. Civil union for same-sex partners	0 (no civil union) to 1 (civil union)
3. Constitution protections against discrimination based on sexual orientation/gender identity	0 (no protections) or 1 (protections)
4. Conversion therapies banned	1 (not banned) to 4 (banned)
5. Discrimination based on sexual orientation or gender identity	1 (illegal) to 4 (no protections)
6. Employment discrimination based on sexual orientation or gender identity is prohibited	0 (discrimination not prohibited) to 1 (discrimination prohibited)
7. Global Acceptance Index	0 (least accepting) to 10 (most accepting)
8. Hate crimes based on sexual orientation or gender identity are an aggravating circumstance	0 (no) to 1 (yes)
9. Inciting crimes based on sexual orientation or gender identity is illegal	0 (not illegal) to 1 (illegal)
10. Joint adoptions by same-sex partners	1 (same-sex adoption is legal) to 6 (same-sex adoption is illegal)
11. Legal status of same-sex sexual acts	1 (legal) to 6 (illegal)
12. LGB people allowed to openly serve in the military	0 (banned) to 1 (allowed)
13. LGB people banned from the military	0 (not banned) to 1 (banned)
14. LGBT+ rights index	-5 (most anti-LGBT policies) to 13 (most pro-LGBT policies)
15. Marriage for same-sex partners	0 (not legal) or 1 (legal)
16. Marriage for same-sex partners banned	0 (not banned) or 1 (banned)
17. Public morality laws on non-traditional sexual relations	0 (no) to 1 (yes)
18. Same-sex sexual acts legal	0 (no) to 1 (yes)
19. Same-sex sexual acts illegal	0 (most legal) to 1 (most illegal)
20. Same-sex sexual acts punishable by death	0 (no) to 1 (yes)

Note: These variables were obtained from Our World in Data and the UCLA School of Law Williams Institute (see above for a complete list of references). They are shown here in their original form. For present purposes, some variables had to be reverse scored, and all were normalized using the formula shown in the text. Where two variables seem to be redundant (e.g., 12 & 13; 15 & 16; 18 & 19), that is because different sources described these variables in different ways.

We then used principal component analysis (PCA) to calculate S for each country from our 20 variables. Specifically, we used the R function `princomp()` to calculate a score for each principal component. We used the scores from the first principal component (PC1) as the S value for each country, because PC1 captures the majority of the variance related to social pressure. We then normalized the values of S so that they ranged on a scale from 0 to 1, in which a score of 0 indicated no social pressure to be heterosexual and a score of 1 indicated high social pressure to be heterosexual. We were able to calculate an S value for a total of 155 countries (Table S1).

Results

Distribution of MSO scores

A histogram of mean sexual orientation (MSO) scores for the full dataset showed the distribution of scores to be roughly normal, with a slight negative skew (-0.39) (Figure 3). In the earlier study we mentioned above ($n = 1,150,538$, with data obtained from people in 215 countries and territories who completed the questionnaire in English), MSO scores were also distributed roughly normally, with a slight positive skew (0.10) (Epstein et al., 2023). The mean MSO score in the present study was 10.2 ($SD = 3.39$, median = 10.5).

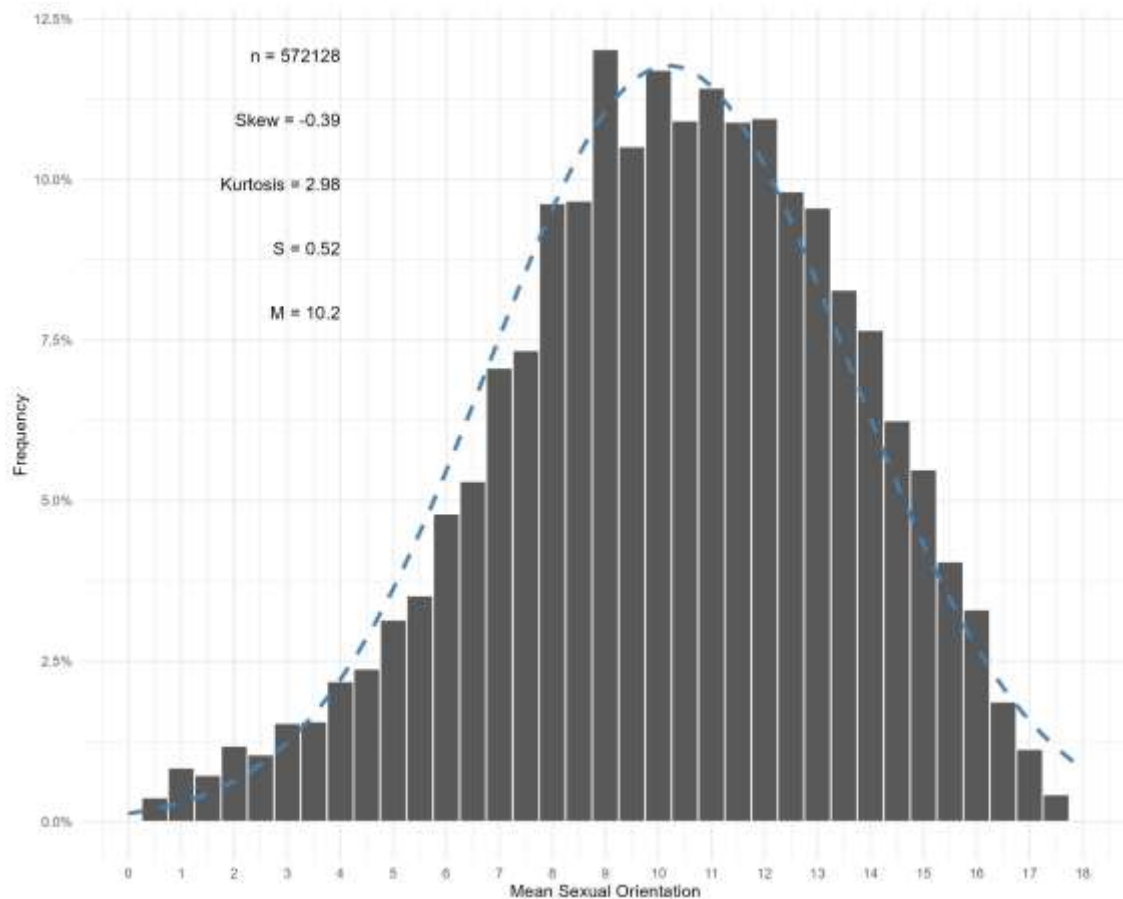


Figure 3. A histogram of mean sexual orientation (MSO) scores for the full non-English dataset. A score of 0 indicates exclusive opposite sex inclinations, a score of 18 indicates exclusive same-sex inclinations, and intermediate values suggest a mix of OS and SS inclinations. The normal curve was generated by `stat_function()` in the `ggplot2` package in R.

The mean MSO found in the present study was significantly larger than the mean MSO found in the 2023 study mentioned above ($M_{\text{Non-English}} = 10.2$, $M_{\text{English}} = 8.52$, $t = 305.62$, $p < .001$). We will discuss possible reasons for this difference in the Discussion section.

Analysis by country

As we noted above, Social Pressure Theory (SPT) predicts that as S increases, the distribution of MSO scores will shift to the left on the sexual orientation continuum; in other words, the mean MSO will decrease (suggesting a higher rate of OS sexual

inclinations). We sought to test this theory by first looking graphically at the relationship between S values and mean MSO scores. To increase the accuracy of this analysis, we restricted it to countries having n 's of at least 1,000. 27 of the 88 countries in this study met this criterion (see caption of Figure 4 for the list of countries). As shown in Figure 4, the relationship between S values and MSO scores was consistent with the SPT prediction. A logarithmic regression found that S significantly predicted the mean MSO of a country ($F = 1.934 \times 10^5$, $p < .001$). 32% of the variance in mean MSO scores was explained by the S values.

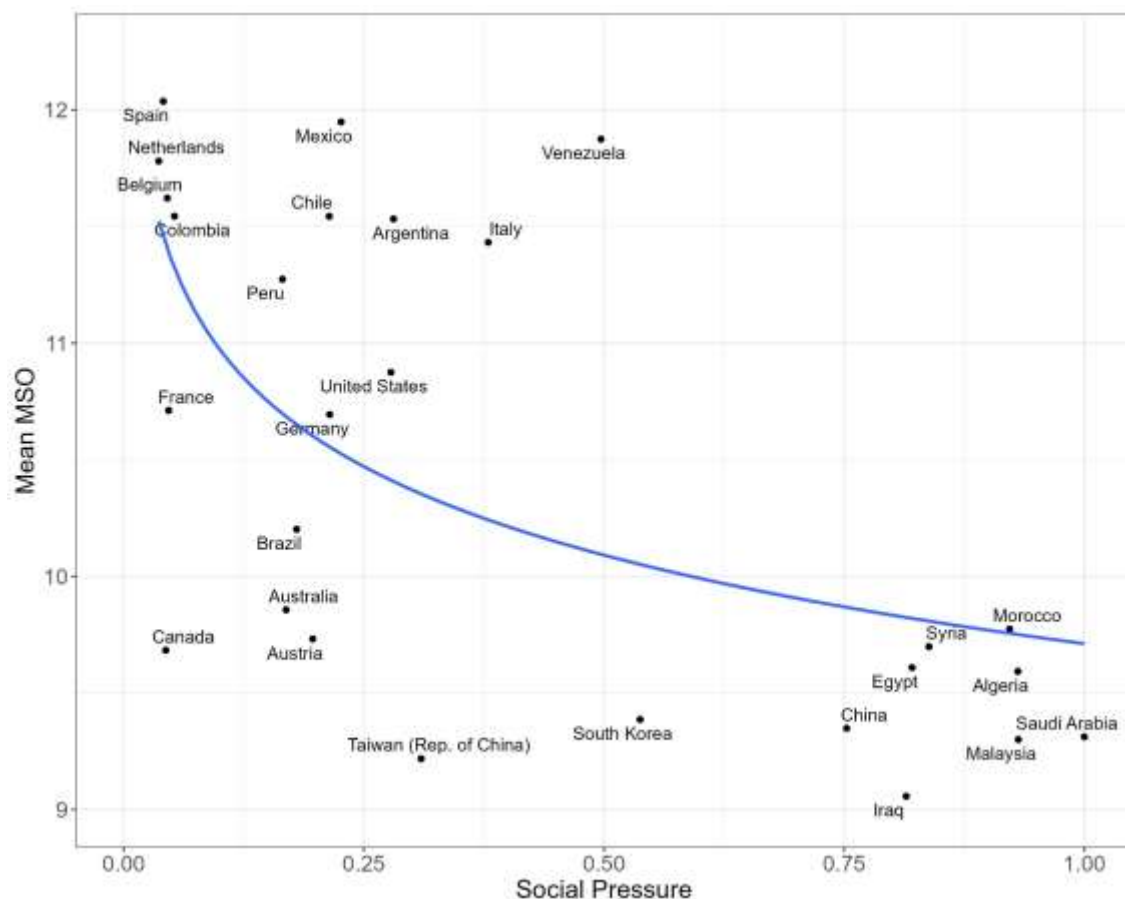


Figure 4. A scatterplot and logarithmic regression line of social pressure values vs. mean MSO scores for countries where $n > 1000$ (Algeria, Argentina, Australia, Austria Belgium, Brazil, Canada, Chile, China, Colombia, Egypt, France, Germany, Iraq, Italy, Malaysia, Mexico, Morocco, Netherlands, Peru, Saudi Arabia, South Korea, Spain, Syria, Taiwan, United States, Venezuela). The logarithmic regression was statistically significant ($r^2 = 0.32$, $p < .001$).

We also examined this issue by selecting three countries with relatively large n 's and three very different S values: the Netherlands ($n = 7,546$, $S = 0.04$), Italy ($n = 117,416$, $S = 0.38$), and Saudi Arabia ($n = 59,286$, $S = 1.00$). In order to select these countries, we picked the country with the largest n from three different ranges of S values – the top 25 S values (range 0.00 to 0.25), the middle 25 S values (range: 0.37 to 0.62), and the bottom 25 S values (range: 0.75 to 1.00). (We could not use the top, middle, and bottom thirds, because the country with the largest n in the top third was Taiwan, which was at the low end of that third with an S of 0.31 – too close to Italy's S of 0.38.) See Table S2 in the Supplementary Materials for the demographic breakdown of the samples from these three countries (Table S2).

For the Netherlands, both the mean MSO ($M = 11.78$) and the negative skew (-0.70) were relatively large, meaning that a relatively large group of people reported having strong same-sex inclinations (Figure S2). For Italy, the mean MSO ($M = 11.43$) was more centered on the continuum, and the negative skew (-0.53) was smaller than that of the Netherlands (Figure S3). For Saudi Arabia, the mean MSO ($M = 9.31$) was smaller still, and the negative skew ($-.30$) was smaller than that of Italy (Figure S4), meaning that a larger proportion of the population reported having strong opposite-sex inclinations. The distribution of MSO scores for Saudi Arabia was not bimodal. These findings were consistent with the predictions we mentioned in our Introduction. In particular, we found that the differences between the mean MSO scores for Italy, the Netherlands, and Saudi Arabia were significantly different ($F = 9889.59$, $p < .001$). Post hoc tests showed significant differences between the mean MSO scores for the Netherlands and Italy ($M_{Netherlands} = 11.78$, $M_{Italy} = 11.43$, mean difference = 0.35, 95% CI [0.26, 0.44], $p < .001$), between Italy and Saudi Arabia ($M_{SaudiArabia} = 9.31$, mean difference = 2.12, 95% CI [2.08,

2.16], $p < .001$), and between the Netherlands and Saudi Arabia (mean difference = 2.47, 95% CI [2.38, 2.56], $p < .001$).

We also compared the SO inclinations in these three countries by overlapping the normal curves estimated for each country on a single graph (Figure 5). The shifts in these curves, from more negatively skewed for the Netherlands, to somewhat less negatively skewed for Italy, to more nearly normal for Saudi Arabia, are also consistent with our predictions.

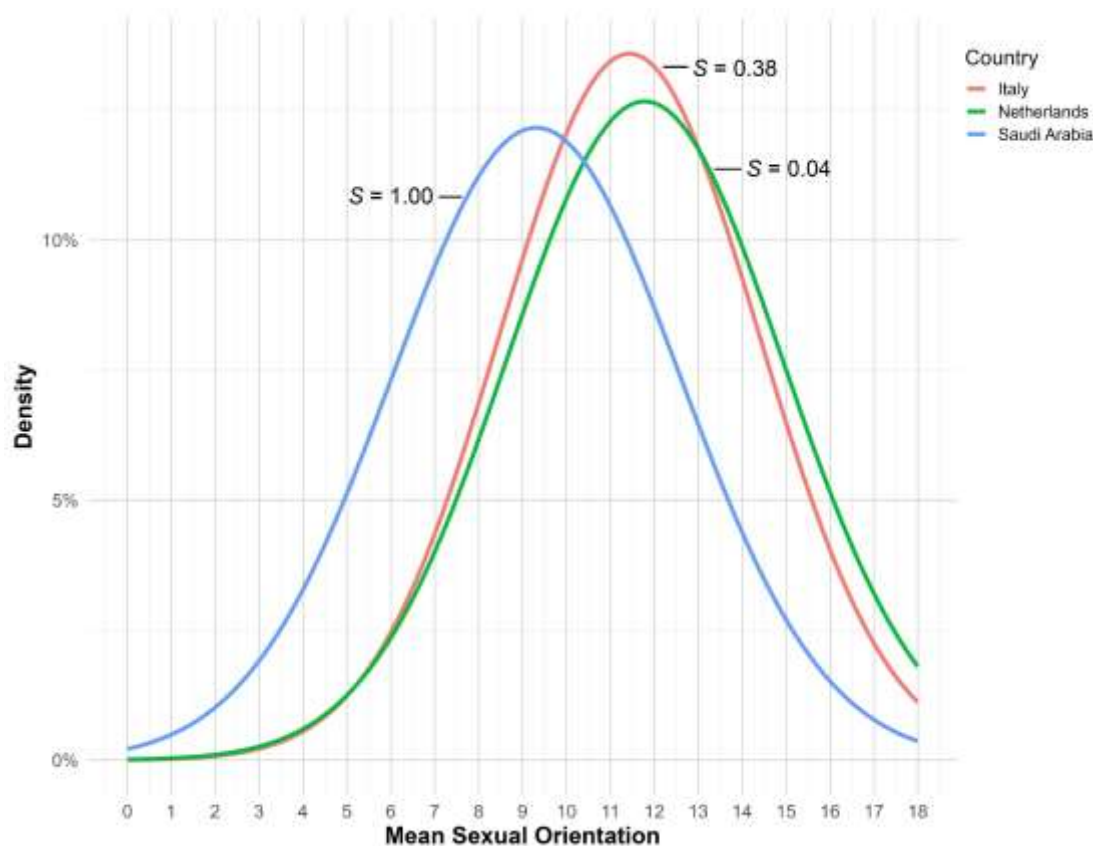


Figure 5. Estimated normal distribution curves for each of the three countries of interest: the Netherlands, with a very low S (orange curve); Italy, with a moderate S (blue curve); and Saudi Arabia, with a high S (green curve). As predicted by SPT, the greater the heteronormative social pressure, the more people shifted toward opposite-sex sexual inclinations.

Discussion

Major findings

The present study advances a quantitative understanding of sexual orientation in two ways that were not addressed in the large, worldwide study of sexual orientation which employed an English version of the ESOI and was published in *Frontiers in Psychology* in 2023 (Epstein et al., 2023). First, it introduced an objective method for assigning values to our heteronormative social pressure variable *S*, varying from 0 (indicating no pressure) to 100 (indicating a theoretical maximum pressure). Based on available data, we were able to compute such values for 155 countries (Table S1).

Second, we offered two types of evidence that support the Social Pressure Theory (SPT) model of sexual orientation presented by Epstein et al. (2023). Specifically, we found – for the 27 countries in our study with *n*'s greater than 1,000 – a significant curvilinear relationship between *S* values and mean MSO values which is consistent with SPT (Figure 4). In other words, generally speaking, we found, as SPT predicts, that as heteronormative social pressure increases, so do opposite-sex sexual inclinations. Overall, 32% of the variance in mean MSO scores was explained by the *S* values we found ($p < .001$).

The present study also confirms earlier reports that sexual orientation lies on a continuum from exclusive opposite-sex sexual inclinations to exclusive same-sex sexual inclinations, with most people having sexual inclinations that are in between these two extremes (Epstein et al., 2012, 2023). Again, as in the previous studies mentioned, a histogram of MSO scores showed these scores to be roughly normally distributed. Notably, the Epstein et al. (2023) study found this effect with a sample of 1,150,938 people from 215 countries and territories using an English version of the ESOI. In the present study, a

similar effect was found using 12 foreign translations of the ESOI taken by 572,128 people from 88 countries.

As we predicted, we did not find dramatic shifts between the MSO distributions for the Netherlands ($S = 0.04$), Italy ($S = 0.38$), and Saudi Arabia ($S = 1.00$). For the MSO distribution for Saudi Arabia, we also did not find the bimodal distribution predicted by SPT (Figure 2, Figure S4). Instead, as we noted in our Introduction, we predicted that because our measurement method shielded our participants from heteronormative social pressure (see Robertson et al., 2017) – but not, of course, from their history of socialization – we would find only relatively small shifts in the distributions toward the opposite-sex end of the scale, which is indeed what we found (Figure 5).

Limitations and future research

Magnitude of the MSO

As we noted earlier, the mean MSO in the present study ($M = 10.2$) was significantly different than the mean MSO found in the large worldwide study published in 2023 (Epstein et al., 2023) ($M = 8.52$). The demographic breakdown of our sample could offer one possible explanation for this difference. The percentage of self-labeled female participants in the present study (69.4%) was significantly larger than the percentage of self-labeled female participants in the 2023 study (54.2%, $z = 152.90$, $p < .001$). Females tend to score more toward the SS end of the SO continuum than males (Epstein et al., 2023), possibly because females are generally allowed more flexibility in their sexuality than males (Bettinsoli et al., 2019; Dodge et al., 2016; Hinrichs & Rosenberg, 2002; Keinan-Bar et al., 2026). Additionally, the percentage of self-labeled lesbian, gay, and bisexual (LGB) participants in the present study (24.5%) was significantly larger than the percentage of LGB participants in the 2023 study (21.3%, $z = 22.90$, $p < .001$).

We lean toward a simpler explanation for the difference, however. The data in the 2023 study were collected between 2013 and 2021; whereas the data in the present study were collected between 2007 and 2025, with more than 50% of those data collected between 2019 and 2025. Foreign translations were introduced in 2007, 2014, 2016, 2019, and 2020; as more translations were posted, the rate of data collection increased. To put this another way, one can reasonably argue that the data in the present study are newer than the data in the 2023 study. Because tolerance for non-heterosexuality has generally increased over the past two decades (Poushter & Kent, 2020; Flores, 2021), it should not be surprising that people who completed the ESOI more recently would have higher MSO scores (meaning that more people scored toward the same-sex end of the SO continuum).

A few countries have recently implemented laws that impose harsher penalties for same-sex sexual behavior (Mujugira et al., 2024; Andersson, 2022), but generally the trend has been in the other direction. At this writing (March 6, 2026), CNN has reported that Pope Leo XIV recently met privately with Reverend James Martin, a priest from New York who has been an outspoken advocate for LGBTQ Catholics, and expressed to Martin his intention to continue to make the Catholic Church open and welcoming to LGBTQ people (Lamb, 2025) – a significant indicator of worldwide trends.

Time frames and translations

The years in which the data in the present study were collected is also relevant to our calculation of social pressure. The 20 variables that we used to calculate the *S* scores for 155 countries were collected between 2019 and 2024. Some of the data in our dataset, however, were collected as early as 2007. We cannot determine definitively to what extent the difference between these two time frames affected our results. Future research should aim, to the extent that this is possible, to measure *S* scores and MSO distributions over the same time period.

It should also be noted that the earlier study used only the English version of the ESOI; whereas the present study used 12 foreign translations of the English version. All the translations were created by native speakers of the relevant languages, and we also looked at reverse translations to measure the accuracy of the translations. The problem here is that even if the translations were accurate in some sense, the content of the questions themselves might have been understood differently in different cultures (Pelletier & Nefdt, 2025). As the old Italian proverb reminds us, *traduttore, traditore*. To put this another way, we cannot say for sure that translations of the ESOI were interpreted the same way by the wide range of people who completed the questionnaire.

Sampling issues

One limitation in the present study is its large convenience sample. We had no control over who completed our questionnaire, and it is possible – perhaps even likely – that people who take an online test of sexual orientation are different in nontrivial ways from the general population of the world or of their country of residence. While the proportion of self-labeled non-straight individuals in our sample (67.1%) was lower than the proportion found in the data from the Epstein et al. (2023) study (75.6%), the proportion in the current study is still above most current estimates of the proportion of non-straight individuals in the US and other countries (Ipsos, 2023). These estimates have varied in recent years from between 3 and 22.2% (Bostwick et al., 2010; Coffman et al., 2016; Copen et al., 2016; Epstein et al., 2012; Herbenick et al., 2010, 2017; Ipsos, 2023; Joloza et al., 2010; Priebe & Svedin, 2013; Ward et al., 2014).

This limitation is offset to some extent by two factors: First, a growing number of studies have shown that when people take anonymous online tests – especially tests that examine socially sensitive issues – they are more honest than they are when questioned by virtually any other means, including face-to-face interviews, phone interviews, and paper-

and-pencil tests (Ong & Weiss, 2000; Trau et al., 2013; Robertson et al., 2017). Two recent studies suggest that when assessing sexual orientation, intrusive studies might conclude, erroneously, that non-heterosexuals comprise less than 5% of a population, while anonymous online tests find that non-heterosexuals comprise between 7.2% and 22.2% of the same population (Epstein et al., 2012; Herbenick et al., 2010; Robertson et al., 2017). With intrusive tests or interviews, people tend to lie to adhere to social norms. Joseph Weizenbaum, creator of the world's first successful conversational computer program – Eliza, which pretended to be a therapist – noticed back in 1967 how readily people divulged secrets when they were communicating with Eliza, a computer program they believed to be inherently objective and nonjudgmental (Weizenbaum, 1966; Natale, 2019). To this day, people mistakenly believe that bots are more trustworthy than people (Bogert et al., 2021; Oracle, 2019), although bots controlled by the new generative AI's might be changing people's minds on that issue.

Second, large-scale online surveys give researchers easy access to large and diverse groups of subjects at low cost. All samples are biased in some way, and we would argue (as others have before us) that a worldwide online sample probably yields more informative and valid results than any of the thousands of studies that have been conducted with small numbers of students at a single college or university (cf. Goodwin & Goodwin, 2016; Kühberger et al., 2014; Reips, 2012).

Bear in mind also that other sexuality researchers, such as Alfred Kinsey, asserted long ago that sexual orientation lies on a continuum (Kinsey et al., 1948). Kinsey's assertion was consistent with Sigmund Freud's belief that the norm for human sexuality was bisexuality (Freud, 1930, 1937, 1950).

Because of our concerns about the validity of our sample in the present study, we conducted four additional analyses that suggested that the MSO distributions we found in

our samples (Figs. 3 and 5) might be giving us a true picture of how sexual orientation actually varies today in many countries – or at least that we might be getting closer to the truth of the matter:

- (1) For the country for which we had the most data – Italy ($n = 117,416$) – we drew a random sample that roughly matched two demographic characteristics of Italy’s population: gender (Galan, 2025) and sexual orientation (Romano, 2013), with the latter study employing a commonly used intrusive survey methodology that did not protect the identities of the people being questioned. (Before completing a paper questionnaire, participants were interviewed face-to-face about their attitudes toward LGBTQ people.) The resulting sample had a total of 31,292 people (49.2% female, 50.8% male, 97.7% straight, 2.3% non-straight). The MSO distribution for this sample had a slight negative skew (-0.42 , Figure S5) and a mean MSO similar to that of our total sample ($M_{\text{Total}} = 10.2$, $M_{\text{ItalySample}} = 10.4$). In other words, even in a sample of people almost all of whom labeled themselves straight, the distribution of MSO scores closely matched that of our entire sample.
- (2) We compared MSO distributions for people who reported that they had changed their sexual orientation to people who said they had not. The distribution for people who had changed their sexual orientation was more negatively skewed than the distribution for people who had not ($Skew_{\text{Change}} = -0.45$, $Skew_{\text{No-Change}} = -0.31$, Figure S6). This pattern matched the pattern found in the English sample (Epstein et al., 2023), and it suggests that when people “come out,” they are usually shifting toward the same-sex end of the SO continuum.
- (3) We compared MSO distributions for people who reported feeling considerable distress about their sexual orientation (above 7) to people who reported feeling little distress about their sexual orientation (under 4). The distribution for people who

reported high levels of distress was more negatively skewed than the distribution for people who reported low levels of distress ($Skew_{\text{High-Distress}} = -0.38$, $Skew_{\text{Low-Distress}} = -0.29$, Figure S7). This pattern again matched the pattern found in the English sample (Epstein et al., 2023), and it suggests that the distress is associated with heteronormative pressure.

- (4) We compared MSO distributions for people who reported feeling considerable uncertainty about their sexual orientation (above 7) to people who reported feeling little uncertainty about their sexual orientation (under 4). The distribution for people who reported high levels of uncertainty was more negatively skewed than the distribution for people who reported low levels of uncertainty ($Skew_{\text{High-Uncertainty}} = -0.48$, $Skew_{\text{Low-Uncertainty}} = -0.26$, Figure S8). This pattern again matched the pattern found in the English sample (Epstein et al., 2023), and it suggests that uncertainty about one's sexual orientation is associated with heteronormative pressure.

All four of these analyses show patterns consistent with how, according to SPT, heteronormative social pressure should be impacting large populations in which, under ideal conditions, MSO scores might be roughly normally distributed. These analyses do not settle the issue, however; our sample might be deeply flawed, or it might be getting us closer to the truth about sexual orientation.

The measurement dilemma: Which self is real?

Finally, we would like to bring to light a troubling issue pertaining to survey studies of sexual orientation. Let's say, for the sake of argument, that our online, anonymized SO questionnaire truly brought people to Cyber Island, where they were no longer subjected to heteronormative social pressure (except, perhaps, the pressure they might still have felt as a result of socialization). On Cyber Island – at least in theory – people speak *the truth* about

their usually hidden sexual inclinations. That gave us the kinds of near-normal curves we saw in Figure 3.

So how might we find the curves predicted by SPT (Figure 2)? Here we are in a true Catch-22 situation. We can easily find the curves predicted by SPT *simply by using an intrusive (and therefore flawed) survey method*. In fact, in a 2016 review article by J. Michael Bailey and his colleagues, by combining data from over 60 different samples – all of which, we believe, were collected using various intrusive survey methods – the authors found a bimodal curve similar to the one predicted by SPT (see Figure S9). So if we employ the kind of flawed survey method that causes people to lie about their sexual orientation, the predictions of SPT are confirmed. But are those predictions *truly* confirmed when we are employing a flawed survey methodology? (Be careful how you answer that question!)

We are saying, in effect, that when it comes to sexual orientation, people might simply show their socially acceptable sides, or they might reveal their innermost feelings and inclinations. When we use traditional intrusive survey methods, we see people's social selves, but when we move them temporarily to Cyber Island, we see their hidden selves. Which selves are "real"? As physicist and Nobel laureate Werner Heisenberg said long ago, "What we observe is not nature itself, but nature exposed to our method of questioning." Unfortunately, when it comes to sexual orientation, how we measure it can greatly impede our knowing.

Regarding future research, this project is very much ongoing. We continue to collect data from the 13 versions of the ESOI previously mentioned, and other translations will be posted over the next year or so. Ultimately, as we analyze more data, we hope to have a clearer picture of sexual inclinations worldwide. We are also working to improve our quantitative models both to improve the accuracy and validity of our measure of

heteronormative social pressure (S) and to improve the model presented by Epstein et al. (2023) for predicting how sexual inclinations are distributed in a population.

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Authors' contributions

RE conceived of and designed the study, supervised data collection, and drafted the manuscript; JP, AN, and NW analyzed data and helped to prepare the manuscript. AR developed the method for calculating S by country. All authors read and approved the final manuscript.

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Data availability

Anonymized raw data employed in the present study will be made available at Zenodo.org upon acceptance of the manuscript. Anonymized raw data can also be requested by writing to info@aibrt.org.

References

- Ambrosino, B. (2017, March 15). *The invention of 'heterosexuality'*. BBC.
<https://www.bbc.com/future/article/20170315-the-invention-of-heterosexuality>
- Andersson, J. (2022, November 2022). *Russia passes 'Answer to Blinken' gay propaganda law*. BBC News. <https://www.bbc.com/news/world-europe-63747732>
- Bailey, J. M., Vasey, P. L., Diamond, L. M., Breedlove, S. M., Vilain, E., & Epprecht, M. (2016). Sexual orientation, controversy, and science. *Psychological Science in the Public Interest*, 17(2), 45–101. <https://doi.org/10.1177/1529100616637616>
- Berg, A. (2020, September 23). *The evolution of the word “bisexual” — and why it’s still misunderstood*. NBC News. <https://www.nbcnews.com/feature/nbc-out/evolution-word-bisexual-why-it-s-still-misunderstood-n1240832>
- Bettinsoli, M. L., Suppes, A., & Napier, J. L. (2019). Predictors of attitudes toward gay men and lesbian women in 23 countries. *Social Psychological and Personality Science*, 11(5), 697–708; <https://doi.org/10.1177/1948550619887785>
- Blank, H. (2012). *Straight: The Surprisingly Short History of Heterosexuality*. Beacon Press.
- Bogert, E., Schecter, A., & Watson, R. T. (2021). Humans rely more on algorithms than social influence as a task becomes more difficult. *Scientific Reports*, 11, 8028. <https://doi.org/10.1038/s41598-021-87480-9>
- Bostwick, W. B., Boyd, C. J., Hughes, T. L., & McCabe, S. E. (2010). Dimensions of sexual orientation and the prevalence of mood and anxiety disorders in the United States. *American Journal of Public Health*, 100, 468–475. <https://doi.org/10.2105/ajph.2008.152942>
- Bray, A. (1982). *Homosexuality in Renaissance England*. Gay Men’s Press.

- Bukowski, W. M., Gauze, C., Hoza, B., & Newcomb, A. F. (1993). Differences and consistency between same-sex and other-sex peer relationships during early adolescence. *Developmental Psychology*, 29(2), 255–263.
<https://doi.org/10.1037/0012-1649.29.2.255>
- Cantarella, E. (1992). *Bisexuality in the Ancient World*. Yale University Press.
- Cerf, N. J., Leuchs, G., & Polzik, E. S. (2007). *Quantum Information With Continuous Variables of Atoms and Light*. World Scientific. <https://doi.org/10.1142/p489>
- Chivers, M. L., Seto, M. C., Lalumière, M. L., Laan, E., & Grimbos, T. (2010). Agreement of self-reported and genital measures of sexual arousal in men and women: A meta-analysis. *Archives of Sexual Behavior*, 39, 5–56. <https://doi.org/10.1007/s10508-009-9556-9>
- Coffman, K. B., Coffman, L. C., & Ericson, K.M.M. (2016). The size of the LGBT population and the magnitude of anti-gay sentiment are substantially underestimated. *Management Science*, 63(10), 3168-3186.
<https://doi.org/10.1287/mnsc.2016.2503>
- Copen, C. E., Chandra, A., & Febo-Vasquez, I. (2016). Sexual behaviors, sexual attraction, and sexual orientation among adults aged 18-44 in the United States: Data from the 2011-2013 National Survey of Family Growth. *National Health Statistics Reports*, 88, 1–14.
- Culotta, E. (2012). Roots of racism. *Science*, 336(6083), 825–827.
<http://doi.org/10.1126/science.336.6083.825>
- de la Mettrie, R., Saint-Léger, D., Loussouarn, G., & Garcel, A. (2007). Shape variability and classification of human hair: A worldwide approach. *Human Biology*, 79(3), 265–281. <http://doi.org/10.1353/hub.2007.0045>

- Dodge, B., Herbenick, D., Friedman, M. R., Schick, V., Fu, T. -C., Bostwick, W., Bartelt, E., Muñoz-Laboy, M., Pletta, D., Reece, M., Sandfort, T. G. M. (2016). Attitudes toward bisexual men and women among a nationally representative probability sample of adults in the United States. *PLOS ONE*, 11(10), e0164430.
<https://doi.org/10.1371/journal.pone.0164430>
- Ellis, L., Burke, D., & Ames, M. A. (1987). Sexual orientation as a continuous variable: A comparison between the sexes. *Archives of Sexual Behavior*, 16, 523–529.
<https://doi.org/10.1007/bf01541716>
- Epstein, R., McKinney, P., Fox, S., & Garcia, C. (2012). Support for a fluid-continuum model of sexual orientation: A large-scale internet study. *Journal of Homosexuality*, 59(10), 1356–1381. <https://doi.org/10.1080/00918369.2012.724634>
- Epstein, R., & Robertson, R. E. (2014). How to measure sexual orientation range and why it's worth measuring. *Journal of Bisexuality*, 14(3-4), 391–403.
<https://doi.org/10.1080/15299716.2014.933378>
- Epstein, R., Wang, H., & Zankich, V. R. (2023). Is everyone a mix of straight and gay? A social pressure theory of sexual orientation, with supporting data from a large global sample. *Frontiers in Psychology*, 14.
<https://doi.org/10.3389/fpsyg.2023.1187377>
- Equaldex. (2023a). *Censorship of LGBT+ issues* [Data set]. Our World in Data.
<https://web.archive.org/web/20240527002222/https://ourworldindata.org/grapher/censorship-of-lgbt-issues>
- Equaldex. (2023b). *Joint adoptions by same-sex partners* [Data set]. Our World in Data.
<https://web.archive.org/web/20240605183457/https://ourworldindata.org/grapher/joint-adoptions-same-sex-partners-equaldex>

- Equaldex. (2023c). *Marriage for same-sex partners* [Data set]. Our World in Data.
<https://web.archive.org/web/20240605181839/https://ourworldindata.org/grapher/marriage-same-sex-partners-equaldex>
- Equaldex. (2024a). *Discrimination based on sexual orientation or gender identity* [Data set]. Our World in Data. <https://ourworldindata.org/grapher/discrimination-lgbt-equaldex>
- Equaldex. (2024b). *Legal status of same-sex sexual acts* [Data set]. Our World in Data.
<https://ourworldindata.org/grapher/same-sex-sexual-acts-equaldex>
- Ferrara, A. P., & Vergara, D. P. (2024). Theorizing mankeeping: The male friendship recession and women's associated labor as a structural component of gender inequality. *Psychology of Men & Masculinities*, 25(4), 391–401. <https://doi.org/10.1037/men0000494>
- Flores, A. R. (2021). Social acceptance of LGBTI people in 175 countries and locations. *UCLA School of Law Williams Institute*.
<https://williamsinstitute.law.ucla.edu/publications/global-acceptance-index-lgbt/>
- Freud, S. (1930). *Civilization and its discontents*. Internationaler Psychoanalytischer Verlag Wien.
- Freud, S. (1937). Analysis terminable and interminable. In J. Strachey (Ed.), *The Standard Edition of the Complete Psychological Works of Sigmund Freud* (Vol. 23, pp. 209–253). Hogarth Press.
- Freud, S. (1950). *Extracts from the Fliess Papers*.
- Freud, S. (1910). *Three contributions to the theory of sex* (A. A. Brill, Trans.) The Journal of Nervous and Mental Disease Publishing Company.
- Freud, S., & Brill, A. A. (1916). *Three contributions to the theory of sex* (A. A. Brill, Trans.; 2nd ed.). Nervous and Mental Disease Publishing Co.

- Fox, E. (2024). Toward a sociological perspective on the gender and sexuality of friendship. *Sociology Compass*, 18(8), e13263. <http://doi.org/10.1111/soc4.13263>
- Galan, S. (2025). Population in Italy in 2025, by gender. *Statista*.
<https://www.statista.com/statistics/786485/population-by-gender-in-italy/>
- Goodwin, K. A., & Goodwin, C. J. (2016). *Research in psychology: Methods and design* (8th ed.). Wiley.
- Haslam, N. (1997). Evidence that male sexual orientation is a matter of degree. *Journal of Personality and Social Psychology*, 73(4), 862–870. <https://doi.org/10.1037/0022-3514.73.4.862>
- Ḥazm, I. (1981). *The Ring of the Dove* (A. Arberry, Trans.). Luzac Oriental. (Original work published 1022).
- Herbenick, D., Bowling, J., Fu, T. –C., Dodge, B., Guerra-Reyes, L., & Sanders, S. (2017). Sexual diversity in the United States: Results from a nationally representative probability sample of adult women and men. *PLOS ONE*, 12(7), e0181198. <https://doi.org/10.1371/journal.pone.0181198>
- Herbenick, D., Reece, M., Schick, V., Sanders, S. A., Dodge, B., & Fortenberry, J. D. (2010). Sexual behavior in the United States: Results from a national probability sample of men and women ages 14-94. *The Journal of Sexual Medicine*, 7(5), 255–265. <https://doi.org/10.1111/j.1743-6109.2010.02012.x>
- Hinrichs, D. W., & Rosenberg, P. J. (2002). Attitudes toward gay, lesbian, and bisexual persons among heterosexual liberal arts college students. *Journal of Homosexuality*, 43(1), 61–84. https://doi.org/10.1300/j082v43n01_04
- Hunt, S., & Hunt, E. (2018). Sexual fluidity: An integrative review. *European Scientific Journal*, 14(32), 182. <https://doi.org/10.19044/esj.2018.v14n32p182>

Ipsos (2023). *LGBT+ PRIDE 2023: A 30-Country Ipsos Global Advisor Survey*.

<https://www.ipsos.com/sites/default/files/ct/news/documents/2023-05/Ipsos%20LGBT%2B%20Pride%202023%20Global%20Survey%20Report%20-%20rev.pdf>

Joloza, T., Evans, J., O'Brien, R., & Potter-Collins, A. (2010). *Measuring Sexual Identity: An Evaluation Report*. UK Office of National Statistics.

Jorde, L. B., & Wooding, S. P. (2004). Genetic variation, classification and 'race'. *Nature Genetics*, 36(11), S28–S33. <http://doi.org/10.1038/ng1435>

Just the Facts Coalition. (2008). *Just the facts about sexual orientation and youth: A primer for principals, educators, and school personnel*. American Psychological Association. <http://www.apa.org/pi/lgbc/publications/justthefacts.html>

Keinan-Bar, S., Bar-Anan, Y., & Joel, D. (2026). Gender-specificity in sexual attraction and fantasies: Evidence from self-report and indirect measures. *The Journal of Sex Research*, 63(3), 443–459. <https://doi.org/10.1080/00224499.2025.2545965>

Kinsey, A. C., Pomeroy, W. B., & Martin, C. E. (1948). *Sexual Behavior in the Human Male*. Bloomington Indiana University Press.

Klein, F. (1993). *The bisexual option* (2nd ed.). Harrington Park Press/Haworth Press.

Kraemer, B., Noll, T., Delsignore, A., Milos, G., Schnyder, U., & Hepp, U. (2006). Finger length ratio (2D:4D) and dimensions of sexual orientation. *Neuropsychobiology*, 53(4), 210–214. <https://doi.org/10.1159/000094730>

Kühberger, A., Fritz, A., & Scherndl, T. (2014). Publication bias in psychology: A diagnosis based on the correlation between effect size and sample size. *PLOS ONE*, 9(9), e105825. <https://doi.org/10.1371/journal.pone.0105825>

- Lamb, C. (2025, September 6). *A historic pilgrimage: Why LGBTQ Catholics hope Pope Leo will take up Francis' legacy*. CNN.
<https://edition.cnn.com/2025/09/06/europe/lgbtq-catholics-pope-leo-pilgrimage-intl>
- Luce, R. D., & Narens, L. (1987). Measurement scales on the continuum. *Science*, 236(4808), 1527–1532. <http://doi.org/10.1126/science.236.4808.1527>
- McSweeney, K. (2019, March 4). Einstein's contributions are still rocking the space-time continuum. *Northrop Grumman*. <https://now.northropgrumman.com/einsteins-contributions-are-still-rocking-the-space-time-continuum>
- Mignot. (2022). *Legal status of same-sex sexual acts* [Data set]. Our World in Data.
<https://web.archive.org/web/20240621152322/https://ourworldindata.org/grapher/legal-status-of-same-sex-sexual-acts>
- Mjugira, A., Muwonge, T., Aliganyira, B., & Okoboi, S. (2024). Uganda's Anti-Homosexuality Act undermines public health. *Journal of the International AIDS Society*, 27(5), e26259. <https://doi.org/10.1002/jia2.26259>
- Natale, S. (2019). If software is narrative: Joseph Weizenbaum, artificial intelligence and the biographies of ELIZA. *New Media & Society*, 21(3), 712-728.
<http://dx.doi.org/10.1177/1461444818804980>
- Nielson, M., Flannery, K., Martin, C., & Hanish, L. (2020). Does gender-bending help or hinder friending? The roles of gender and gender similarity in friendship dissolution. *Developmental Psychology*, 56(6), 1157–1169.
<https://doi.org/10.1037/dev0000930>
- Ong, A. D., & Weiss, D. J. (2000). The impact of anonymity on responses to sensitive questions. *Journal of Applied Social Psychology*, 30(8), 1691–1708.
<https://doi.org/10.1111/j.1559-1816.2000.tb02462.x>

Oracle. (2019). *From fear to enthusiasm: Artificial intelligence is winning more hearts and minds in the workplace*. Oracle and Future Workplace.

<https://go.oracle.com/LP=86149?elqCampaignId=230263>

Pelletier, F. J., & Nefdt, R. M. (2025). *Linguistic Relativity: An essential guide to past debates and future prospects*. Oxford University Press.

<https://doi.org/10.1093/9780197799871.001.0001>

Poushter, J., & Kent, N. (2020, June 25). The global divide on homosexuality persists but increasing acceptance in many countries over past two decades. *Pew Research Center*.

<https://www.pewresearch.org/global/2020/06/25/global-divide-on-homosexuality-persists/>

Priebe, G., & Svedin, C. G. (2013). Operationalization of three dimensions of sexual orientation in a national survey of late adolescents. *The Journal of Sex Research*, 50(8), 727–738.

<https://doi.org/10.1080/00224499.2012.713147>

Reips, U. D. (2012). Using the Internet to collect data. In H. Cooper (Ed.), *APA handbook of research methods in psychology* (Vol. 2). American Psychological Association.

Robertson, R. E., Tran, F. W., Lewark, L. N., & Epstein, R. (2017). Estimates of non-heterosexual prevalence: the roles of anonymity and privacy in survey methodology. *Archives of Sexual Behavior*, 47, 1069–1084.

<https://doi.org/10.1007/s10508-017-1044-z>

Romano, M. C. (2013). La popolazione omosessuale nella società italiana. *ISTAT-Dipartimento delle statistiche sociali e ambientali. Corso di formazione-Strategia nazionale per la prevenzione e il contrasto delle discriminazioni basate sull'orientamento sessuale e sull'identità di genere*, 2015, 26-27.

<https://www.istat.it/comunicato-stampa/la-popolazione-omosessuale-nella-societa-italiana-anno-2011/>

- Savin-Williams, R. C. (2014). An exploratory study of the categorical versus spectrum nature of sexual orientation. *The Journal of Sex Research*, 51(4), 446–453.
<https://doi.org/10.1080/00224499.2013.871691>
- Sell, R. L. (1997). Defining and measuring sexual orientation: A review. *Archives of Sexual Behavior*, 26, 643–658. <https://doi.org/10.1023/a:1024528427013>
- Storms, M. D. (1980). Theories of sexual orientation. *Journal of Personality and Social Psychology*, 38(5), 783–792. <https://doi.org/10.1037/0022-3514.38.5.783>
- Takacs, J. (2004). The double life of Kertbeny. In G. Hekma (Ed.), *Past and Present of Radical Sexual Politics* (pp. 26–40). Mosse Foundation.
- Thompson, E. M., & Morgan, E. M. (2008). “Mostly straight” young women: Variations in sexual behavior and identity development. *Developmental Psychology*, 44(1), 15–21. <https://doi.org/10.1037/0012-1649.44.1.15>
- Trau, R. N. C., Hartel, C. E. J., & Hartel, G. F. (2013). Reaching and hearing the invisible: organizational research on invisible stigmatized groups via web surveys. *British Journal of Management*, 24(4), 532–541. <https://doi.org/10.1111/j.1467-8551.2012.00826.x>
- UCLA School of Law Williams Institute. (2021). *Global Acceptance Index* [Data set].
<https://williamsinstitute.law.ucla.edu/projects/gai/>
- Van Loon, A. F., Kchouk, S., Matanó, A., Tootoonchi, F., Alvarez-Garretón, C., Hassaballah, K. E. A., Wu, M., Wens, M. L. K., Shyrokaya, A., Ridolfi, E., Biella, R., Nagavciuc, V., Barendrecht, M. H., Bastos, A., Cavalcante, L., de Vries, F. T., Garcia, M., Mård, J., Streefkerk, I. N., ... Werner, M. (2024). Review article: Drought as a continuum – Memory effects in interlinked hydrological, ecological, and social systems. *Natural Hazards and Earth System Sciences*, 24(9), 3173–3205.
<http://doi.org/10.5194/nhess-24-3173-2024>

Velasco. (2019). *Inciting crimes based on sexual orientation or gender identity is illegal*

[Data set]. Our World in Data. <https://ourworldindata.org/grapher/inciting-hatred-laws-lgbt>

Velasco. (2020a). *Constitution protections against discrimination based on sexual orientation or gender identity* [Data set]. Our World in Data.

<https://ourworldindata.org/grapher/constitutional-protections-lgbt>

Velasco. (2020b). *Conversion therapies banned* [Data set]. Our World in Data.

<https://ourworldindata.org/grapher/conversion-therapies-banned>

Velasco. (2020c). *Employment discrimination based on sexual orientation or gender identity prohibited* [Data set]. Our World in Data.

<https://ourworldindata.org/grapher/employment-discrimination-bans-lgbt>

Velasco. (2020d). *Hate crimes based on sexual orientation or gender identity are an aggravating circumstance* [Data set]. Our World in Data.

<https://ourworldindata.org/grapher/hate-crime-protections-lgbt>

Velasco. (2020e). *Lesbian, gay, and bisexual people allowed to openly serve in the military*

[Data set]. Our World in Data. <https://ourworldindata.org/grapher/lgb-military-velasco>

Velasco. (2020f). *LGBT+ rights index* [Data set]. Our World in Data.

<https://ourworldindata.org/grapher/lgbt-rights-index>

Velasco. (2020g). *Public morality laws on non-traditional sexual relations* [Data set]. Our

World in Data. <https://ourworldindata.org/grapher/public-morality-laws-on-non-traditional-sexual-relations#explore-the-data>

Velasco. (2020h). *Same-sex sexual acts legal* [Data set]. Our World in Data.

<https://ourworldindata.org/grapher/same-sex-sexual-acts-legal>

- Velasco. (2020i). *Same-sex sexual acts punishable by death* [Data set]. Our World in Data. <https://ourworldindata.org/grapher/same-sex-sexual-acts-punished-by-death>
- Vrangalova, Z., & Savin-Williams, R. C. (2012). Mostly heterosexual and mostly gay/lesbian: Evidence for new sexual orientation identities. *Archives of Sexual Behavior*, 41, 85–101. <https://doi.org/10.1007/s10508-012-9921-y>
- Ward, B. W., Dahlhamer, J. M., Galinsky, A. M., & Joestl, S. S. (2014). Sexual orientation and health among U.S. adults: National health interview survey, 2013. *National Health Statistics Reports*, 77, 1–10. <https://pubmed.ncbi.nlm.nih.gov/25025690/>
- Weizenbaum, J. (1966). ELIZA—a computer program for the study of natural language communication between man and machine. *Communications of the ACM*, 9(1), 36–45. <https://doi.org/10.1145/365153.365168>
- Zambon, V. (2025, March 26). *What are the different types of sexualities?* Medical News Today. <https://www.medicalnewstoday.com/articles/types-of-sexuality>

Supplementary Materials

Supplementary Text S1. 25 sexual orientation labels.

- | | | |
|----------------|---------------------------|-------------------|
| 1. Lesbian | 10. Cupiosexual | 19. Omnisexual |
| 2. Gay | 11. Demisexual | 20. Pansexual |
| 3. Bisexual | 12. Graysexual | 21. Polysexual |
| 4. Queer | 13. Gynesexual | 22. Sapiosexual |
| 5. Questioning | 14. Heterosexual | 23. Skoliosexual |
| 6. Asexual | 15. Homosexual | 24. Spectrasexual |
| 7. Androsexual | 16. Libidoist Asexual | 25. Straight |
| 8. Autosexual | 17. Monosexual | |
| 9. Bicurious | 18. Non-Libidoist Asexual | |

Supplementary Text S2. 18 questionnaire items.

1. Have you ever felt sexually attracted to a member of the same sex? (No/Yes)
2. How strongly are you sexually attracted to members of the same sex? (Not at all /Moderately/Very Strongly)
3. Have you ever had a dream about a sexual encounter with a member of the same sex? (No/Yes)
4. Have you ever had a waking fantasy about a sexual encounter with a member of the same sex? (No/Yes)
5. Have you ever felt sexually aroused when you've had any exposure to two people of your same gender having a sexual encounter (through gossip, a video, or some other means)? (No/Yes)
6. Have you ever voluntarily had sexual contact (such as kissing or petting) with a member of the same sex? (No/Yes)
7. Would you be willing to have sexual relations with someone of the same sex? (No/Maybe/Yes)
8. How frequent are your same-sex sexual fantasies or dreams? (Never Have Them/ Rare or Occasional/Frequent)
9. How frequent are your same-sex sexual encounters? (Never Have Them/Rare or Occasional/Frequent)
10. Have you ever felt sexually attracted to a member of the opposite sex? (No/Yes)
11. How strongly are you sexually attracted to members of the opposite sex? (Not at all /Moderately/Very Strongly)
12. Have you ever had a dream about a sexual encounter with a member of the opposite sex? (No/Yes)
13. Have you ever had a waking fantasy about a sexual encounter with a member of the opposite sex? (No/Yes)

14. Have you ever felt sexually aroused when you've had any exposure to someone of your gender having a sexual encounter with someone of the opposite sex (through gossip, a video, or some other means)? (No/Yes)
15. Have you ever voluntarily had sexual contact (such as kissing or petting) with a member of the opposite sex? (No/Yes)
16. Would you be willing to have sexual relations with someone of the opposite sex? (No/Yes)
17. How frequent are your opposite-sex sexual fantasies or dreams? (Never Have Them /Rare or Occasional/Frequent)
18. How frequent are your opposite-sex sexual encounters? (Never Have Them/Rare or Occasional/Frequent)

Supplementary Text S3. Questionnaire scoring.

The questionnaire was scored as follows: Questions 1 to 9 asked about same-sex attraction, fantasies, and behavior, past and present. Questions 1, 3, 4, 5, and 6 were scored on a 0-2 scale (No = 0; Yes = 2), and questions 2, 7, 8, and 9 were also scored on a 0-2 scale (No, Not at all, Never have them = 0; Maybe, Moderately, Rare or Occasional = 1; Yes, Very Strongly, Frequently = 2). Questions 10 to 18 were the opposite-sex versions of questions 1 to 9 and were reverse scored so that questions 10, 12, 13, 14, and 15 were on a 0-2 scale (No = 2; Yes = 0), and questions 11, 16, 17, and 18 were also on a 0-2 scale (No, Not at all, Never have them = 2; Maybe, Moderately, Rare or Occasional = 1; Yes, Very Strongly, Frequently = 0). The score on each question is represented below by I_n , where n is the question number:

$$\text{SSRawScore} = I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + I_7 + I_8 + I_9$$

$$\text{OSReverseScore} = I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15} + I_{16} + I_{17} + I_{18}$$

$$\text{OSRawScore} = 18 - \text{OSReverseScore}$$

$$\text{MSO} = .5 * (\text{SSRawScore} + \text{OSReverseScore})$$

$$\text{SOR} = \text{Lesser value} (\text{SSRawScore}, \text{OSRawScore})$$

$$\text{SexDrive} = .5 * (\text{SSRawScore} + \text{OSRawScore})$$

Supplementary Text S4. Questionnaire links.

English questionnaire: <https://mysexualorientation.com>

Arabic questionnaire: <https://mysexualorientation.com/Arabic>

Chinese (Simplified) questionnaire: <https://mysexualorientation.com/chinese/simplified>

Chinese (Traditional) questionnaire: <https://mysexualorientation.com/chinese/traditional>

Dutch questionnaire: <https://seksuelegeaardheid.com/>

French questionnaire: <https://monorientationsexuelle.com/>

German questionnaire: <https://meinesexuelleidentitat.com/>

Hungarian questionnaire: <https://szexualisorientaciom.com/>

Italian questionnaire: <https://mioorientamentosessuale.com/>

Japanese questionnaire: <https://drrobertepstein.com/ESOI/jp/>

Korean questionnaire: <https://drrobertepstein.com/ESOI/Korean>

Malay questionnaire: <https://mysexualorientation.com/malay>

Spanish questionnaire: <https://miorientacionsexual.com/>

Supplementary Table S1. The 155 countries where data were collected, in ascending numerical order by the value of *S*.

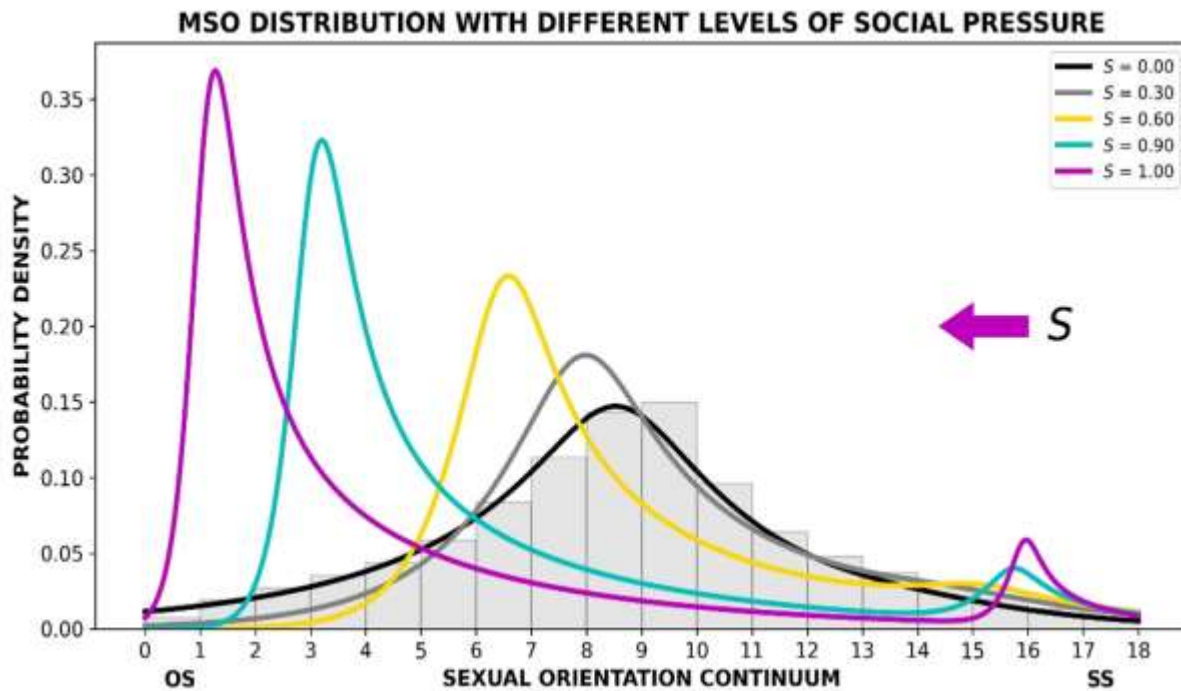
Country	<i>S</i>	Country	<i>S</i>	Country	<i>S</i>	Country	<i>S</i>
Malta	0.00	Norway	0.05	Brazil	0.18	Romania	0.25
Sweden	0.00	Luxembourg	0.05	Austria	0.20	Montenegro	0.27
Portugal	0.01	Colombia	0.05	Serbia	0.21	United States	0.28
Netherlands	0.04	South Africa	0.10	Slovenia	0.21	Argentina	0.28
United Kingdom	0.04	Bolivia	0.12	Chile	0.21	Honduras	0.29
Spain	0.04	Croatia	0.12	Germany	0.21	Israel	0.29
Finland	0.04	Ireland	0.13	Ecuador	0.22	Andorra	0.30
Denmark	0.04	Greece	0.16	Mexico	0.23	Taiwan	0.31
Uruguay	0.04	Peru	0.17	Estonia	0.23	Hungary	0.31
Canada	0.04	Australia	0.17	Switzerland	0.23	Iceland	0.32
Belgium	0.05	New Zealand	0.17	Lithuania	0.24	Nicaragua	0.35
France	0.05	Albania	0.18	Bulgaria	0.25	Slovakia	0.35

Georgia	0.36	Ukraine	0.48	Burkina Faso	0.59	Laos	0.66
Czechia	0.36	Philippines	0.48	Madagascar	0.59	Gabon	0.66
Thailand	0.36	El Salvador	0.49	Lesotho	0.61	Panama	0.66
Mongolia	0.36	Bahamas	0.50	Rwanda	0.62	Antigua and Barbuda	0.67
Angola	0.37	Venezuela	0.50	Turkey	0.62	Kazakhstan	0.68
Italy	0.38	Mozambique	0.52	Russia	0.63	Azerbaijan	0.68
Suriname	0.39	Nepal	0.53	Vietnam	0.64	Bahrain	0.69
Cuba	0.39	South Korea	0.54	Singapore	0.65	Paraguay	0.69
Poland	0.40	India	0.55	Chad	0.65	Tajikistan	0.70
Costa Rica	0.43	Botswana	0.56	Haiti	0.65	Jordan	0.70
Cape Verde	0.43	Belize	0.56	Armenia	0.65	Barbados	0.71
Cyprus	0.43	North Macedonia	0.56	Kyrgyzstan	0.65	Djibouti	0.71
Moldova	0.45	Dominican Republic	0.58	Mali	0.65	Grenada	0.74
Japan	0.46	Guatemala	0.58	Benin	0.65	Namibia	0.74
Latvia	0.47	Mauritius	0.59	Cambodia	0.66	Sierra Leone	0.75

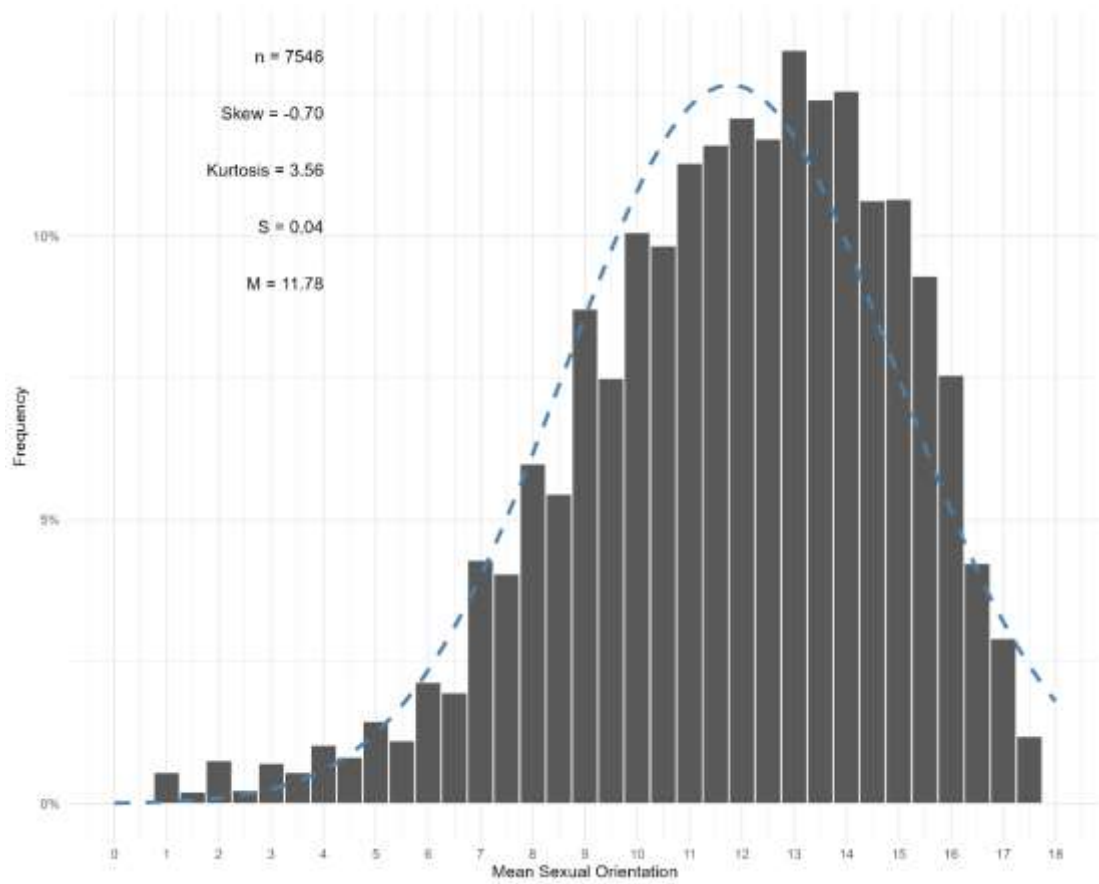
China	0.75	Guyana	0.80	Syria	0.84	Libya	0.91
Burundi	0.76	Myanmar	0.81	Pakistan	0.84	Morocco	0.92
Dominica	0.76	Kenya	0.81	Sudan	0.84	Algeria	0.93
Liberia	0.76	Iraq	0.81	Sri Lanka	0.85	Qatar	0.93
Bhutan	0.76	Togo	0.82	Bangladesh	0.85	Malaysia	0.93
Malawi	0.76	Egypt	0.82	Uzbekistan	0.85	Afghanistan	0.94
Niger	0.78	Comoros	0.82	Kuwait	0.88	Mauritania	0.94
Belarus	0.78	Guinea	0.82	Zambia	0.88	Nigeria	0.95
Zimbabwe	0.78	South Sudan	0.82	Ethiopia	0.89	Yemen	0.97
Trinidad and Tobago	0.80	Senegal	0.83	Uganda	0.90	Iran	0.98
Jamaica	0.80	Gambia	0.83	Tunisia	0.90	Saudi Arabia	1.00
Ghana	0.80	Indonesia	0.83	Cameroon	0.90		

Supplementary Table S2. Demographic characteristics of the Netherlands, Italy, and Saudi Arabia samples.

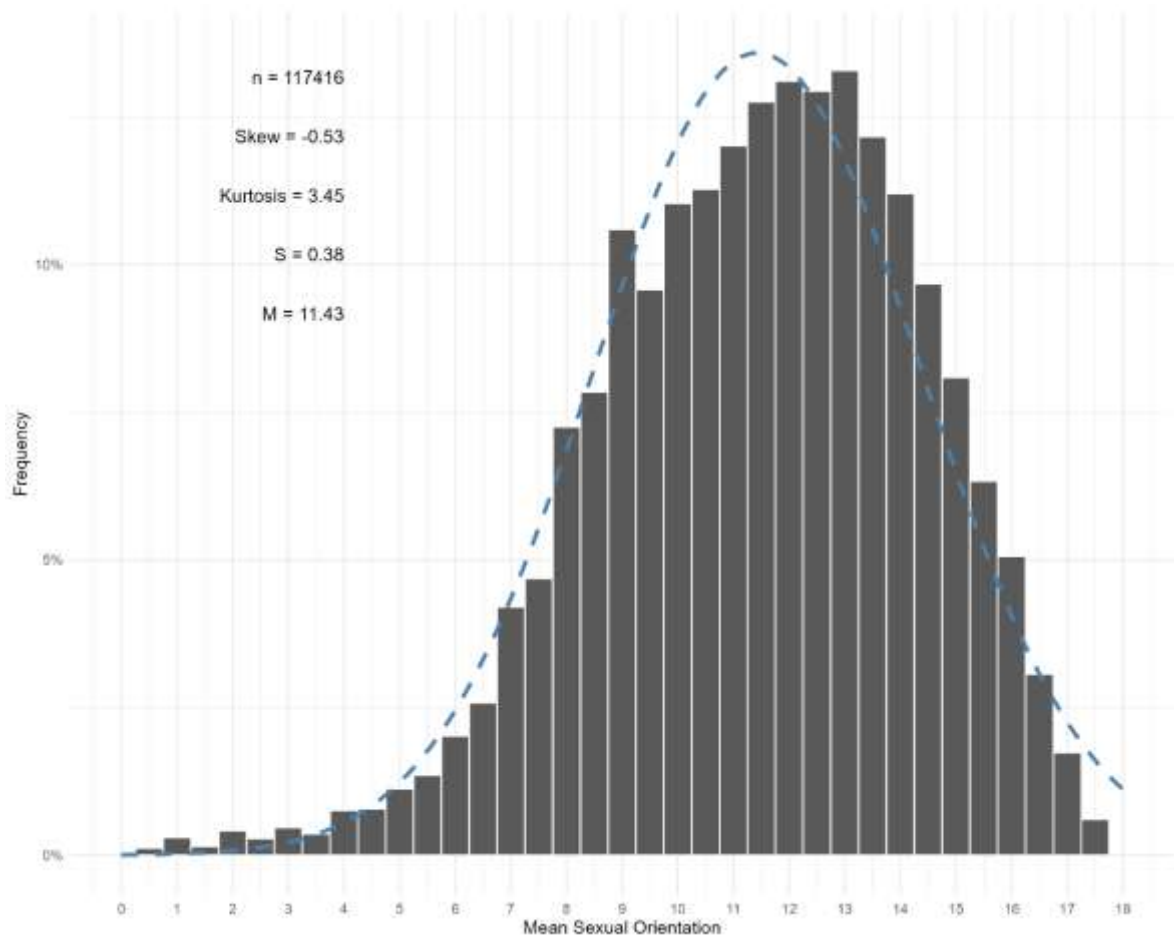
		Netherlands	Italy	Saudi Arabia
Mean Age (SD)		29.2 (14.8)	21.1 (8.2)	20.6 (5.0)
		<i>n</i> (%)		
Gender	Female	4,078 (54.0)	78,564 (66.9)	42,810 (72.2)
	Male	3,385 (44.9)	37,714 (32.1)	16,046 (27.1)
	Other	83 (1.1)	1,118 (1.0)	430 (0.7)
Sexual Orientation	Asexual	0 (0.0)	1 (0.0)	0 (0.0)
	Bisexual	1,305 (17.3)	13,032 (11.1)	9,499 (16.0)
	Gay/Lesbian	542 (7.2)	8,036 (6.8)	7,564 (12.8)
	Straight	2,164 (28.7)	39,871 (34.0)	21,031 (35.5)
	Other	168 (2.2)	2,068 (1.8)	1,386 (2.3)
	Unsure	3,367 (44.6)	54,508 (46.3)	19,806 (33.4)
Race/Ethnicity	Arab	77 (1.0)	171 (0.1)	59,277 (100.0)
	Asian	263 (3.5)	798 (0.7)	3 (0.0)
	Black	132 (1.7)	837 (0.7)	0 (0.0)
	Hispanic	68 (0.9)	1,481 (1.3)	1 (0.0)
	Other	339 (4.5)	2,068 (1.7)	3 (0.0)
	White	6,499 (86.1)	112,060 (95.4)	2 (0.0)
Level of Education	None	902 (12.0)	9,739 (8.3)	11,650 (19.7)
	High School	2,659 (35.2)	76,636 (65.3)	29,310 (49.4)
	Higher Vocational	1,420 (18.8)	1 (0.0)	
	Associates	25 (0.3)	12,404 (10.6)	2,857 (4.8)
	Bachelor's	455 (6.0)	10,582 (9.0)	14,327 (24.2)
	Master's	588 (7.8)	6,667 (5.7)	778 (1.3)
	Doctorate	50 (0.7)	1,387 (1.2)	364 (0.6)



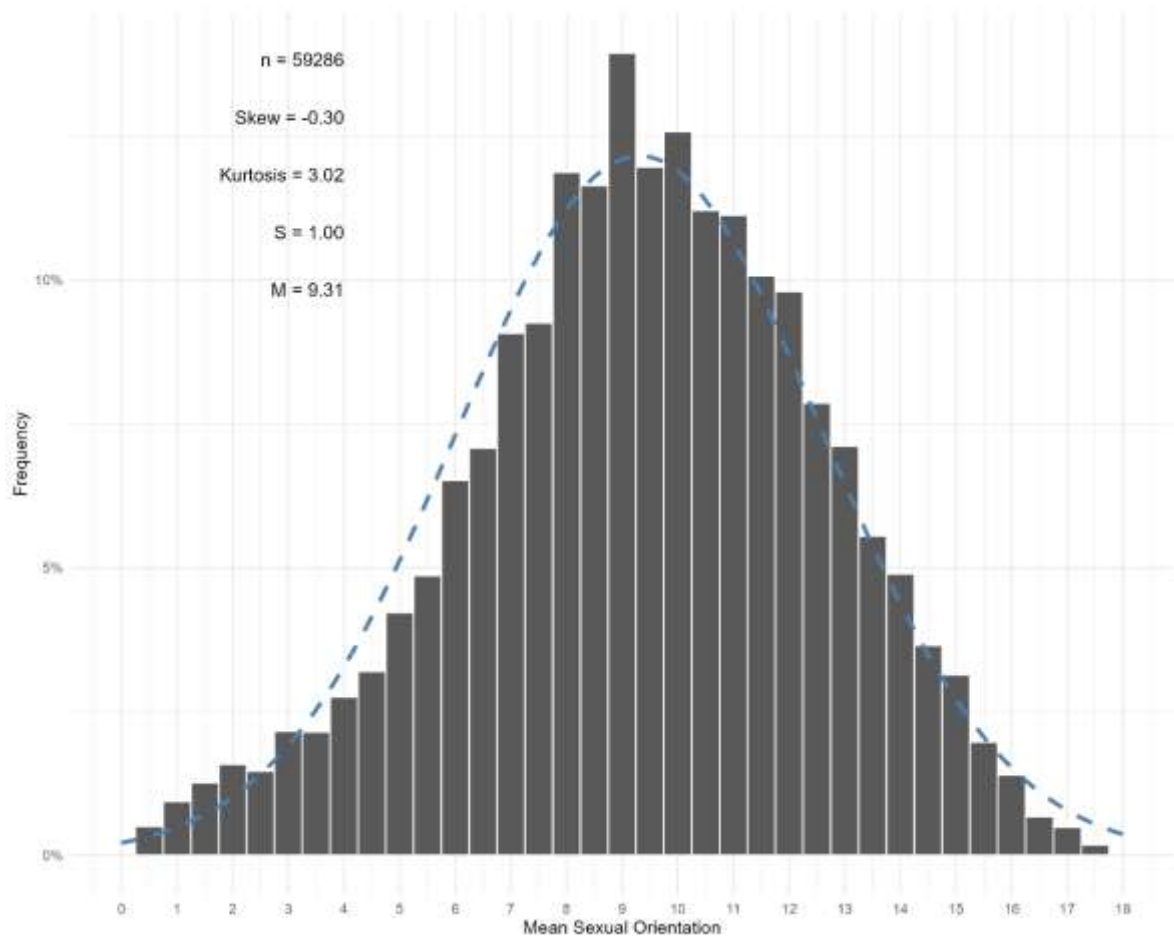
Supplementary Figure S1. Five theoretical curves showing how sexual orientation inclinations change as heteronormative pressure increases. Reprinted from Epstein et al. (2023) under a CC BY license, with permission from the American Institute for Behavioral Research and Technology, original copyright 2023. This figure is similar but not identical to the original image and is therefore for illustrative purposes only.



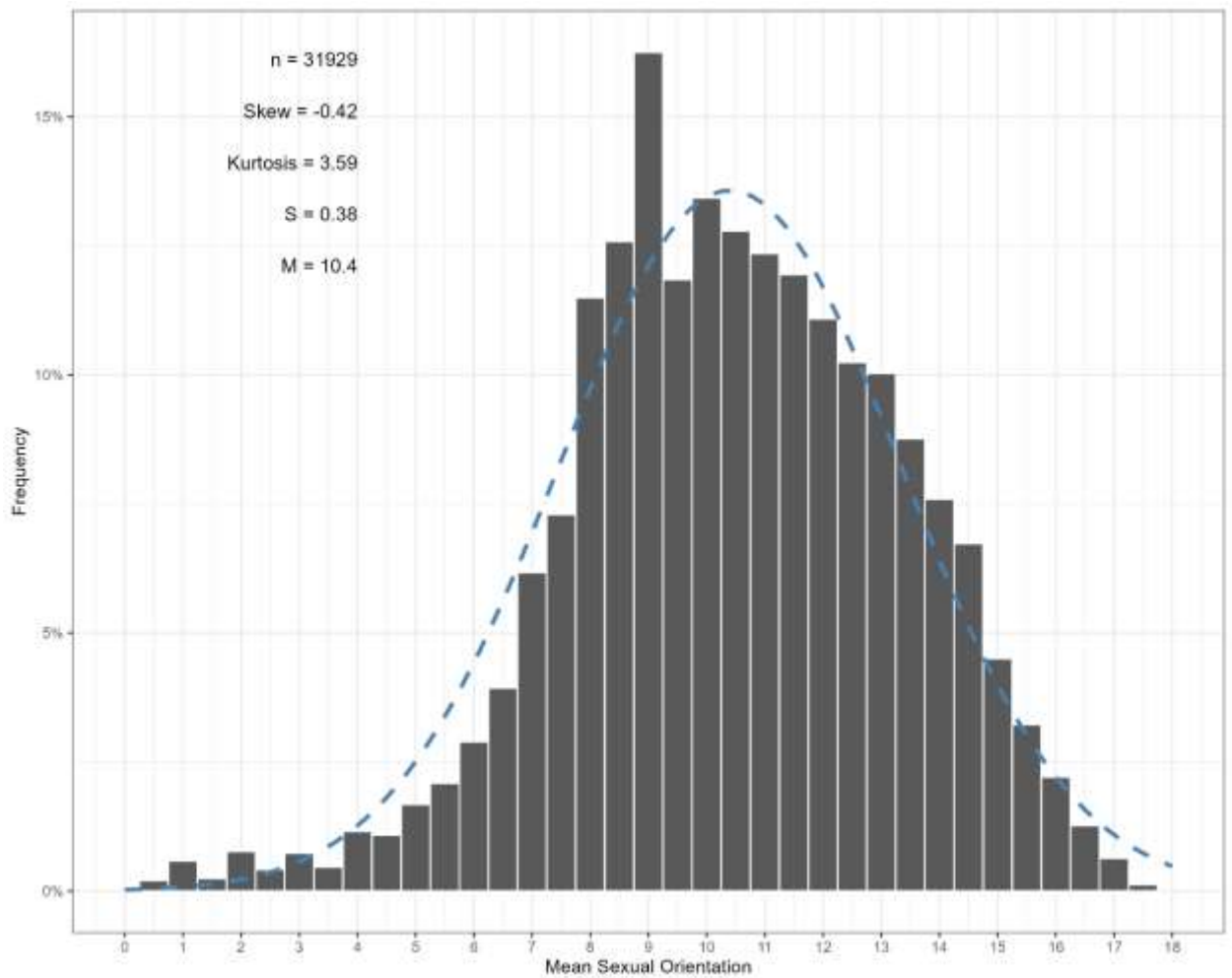
Supplementary Figure S2. A histogram of mean sexual orientation (MSO) scores for Netherlands.



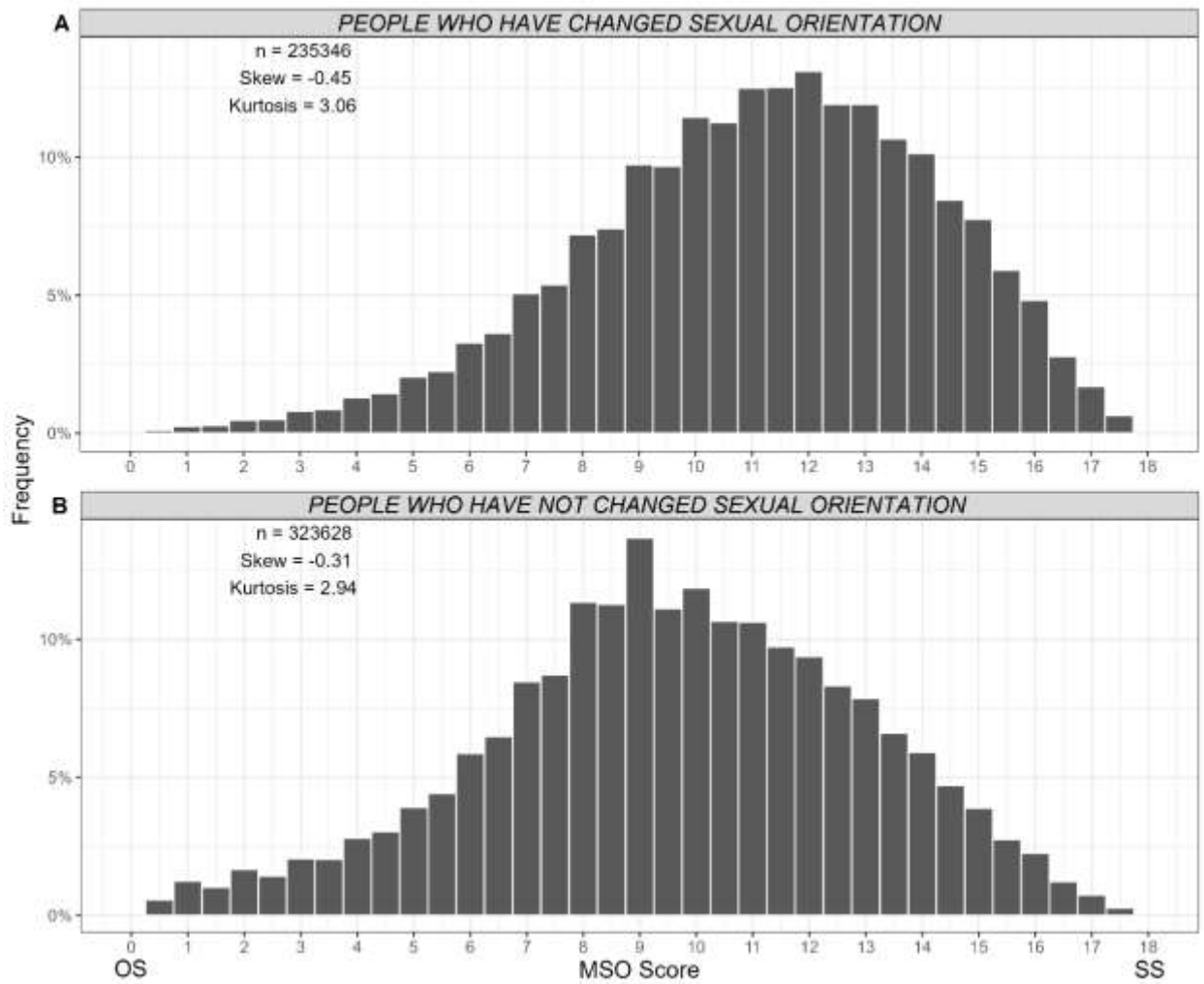
Supplementary Figure S3. A histogram of mean sexual orientation (MSO) scores for Italy.



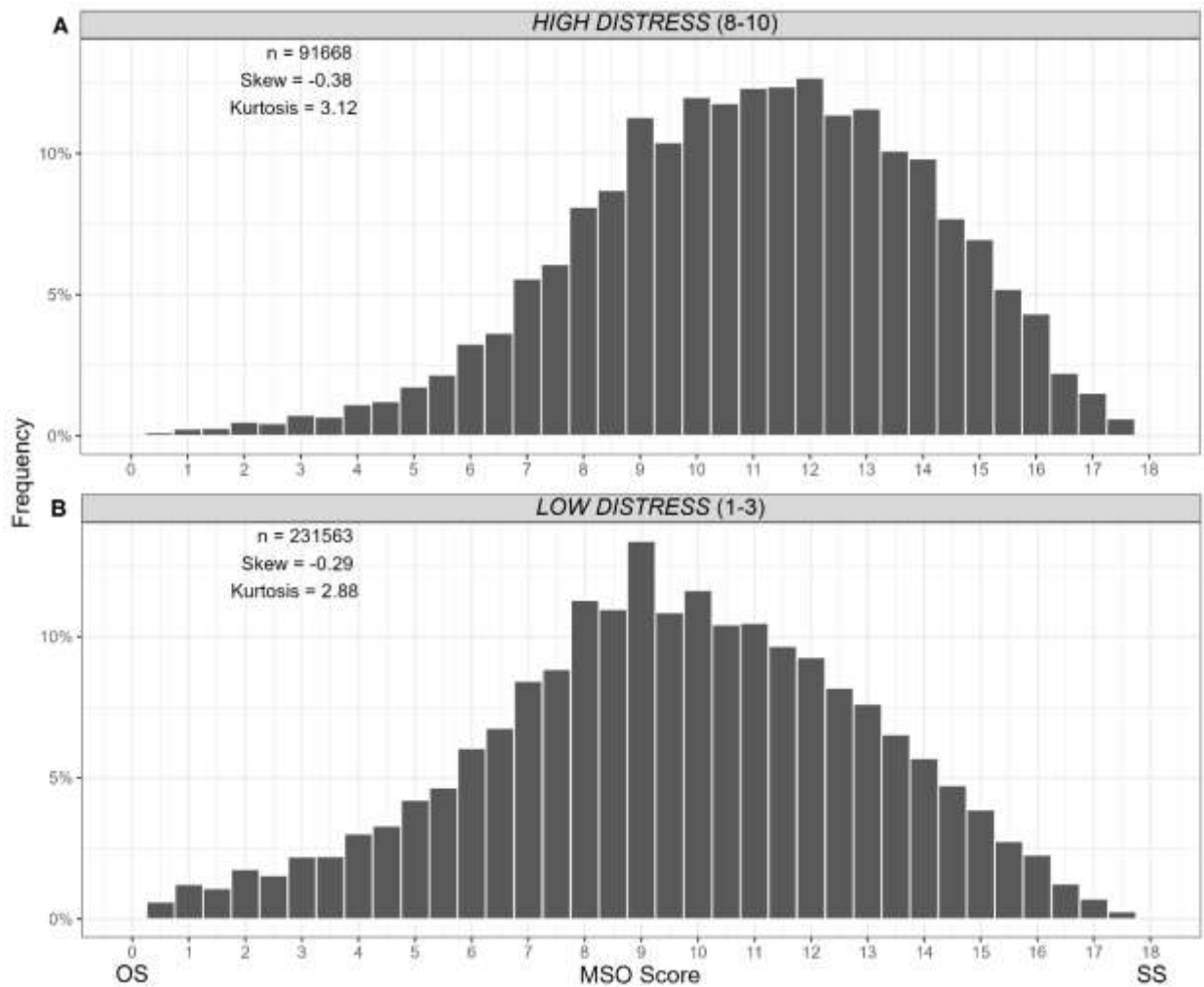
Supplementary Figure S4. A histogram of mean sexual orientation (MSO) scores for Saudi Arabia.



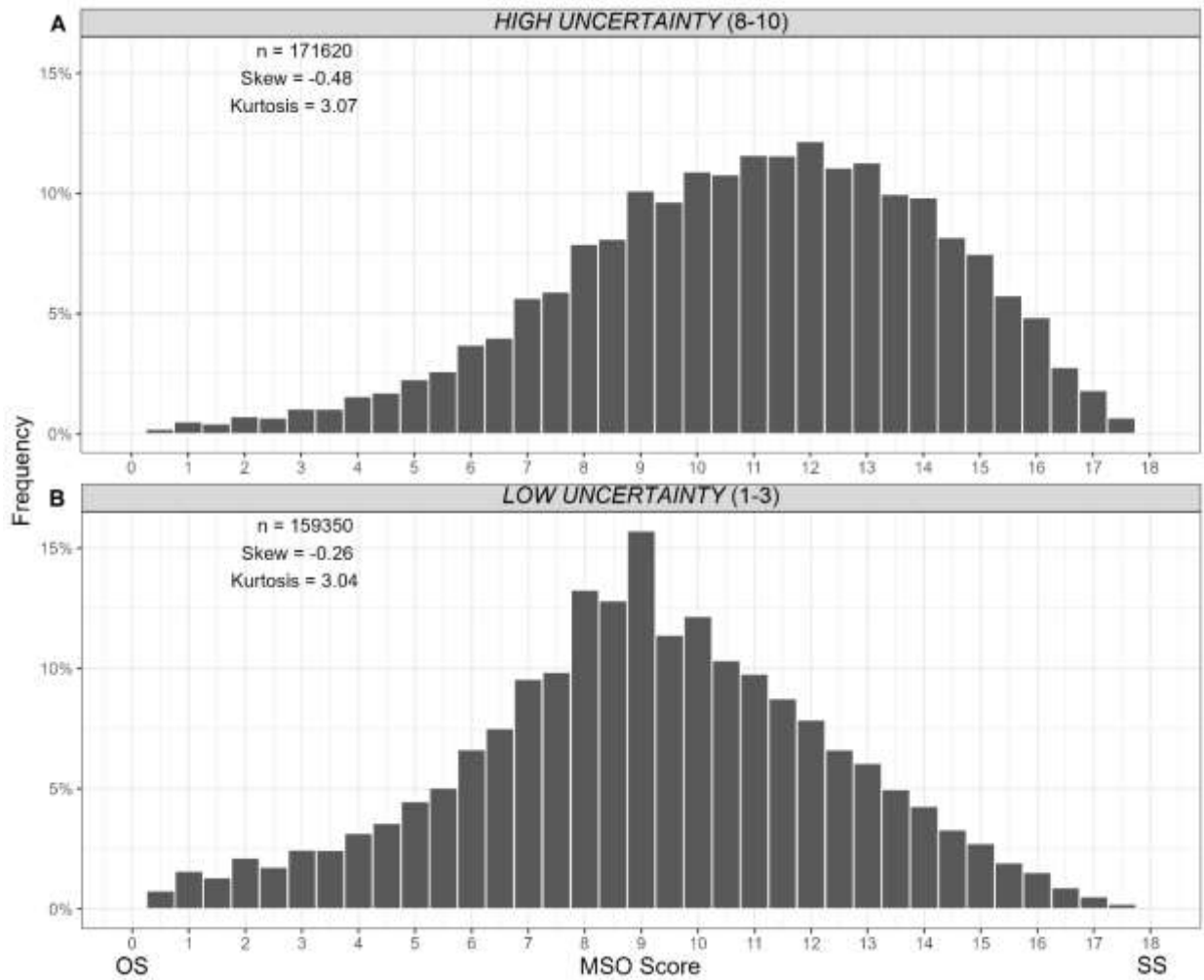
Supplementary Figure S5. Stratified random sampling of the data from Italy. The graph was created by taking random samples of individuals in our dataset from Italy to match the proportions of gender and sexual orientation of the general population of Italy (Romano, 2013; Galan, 2025).



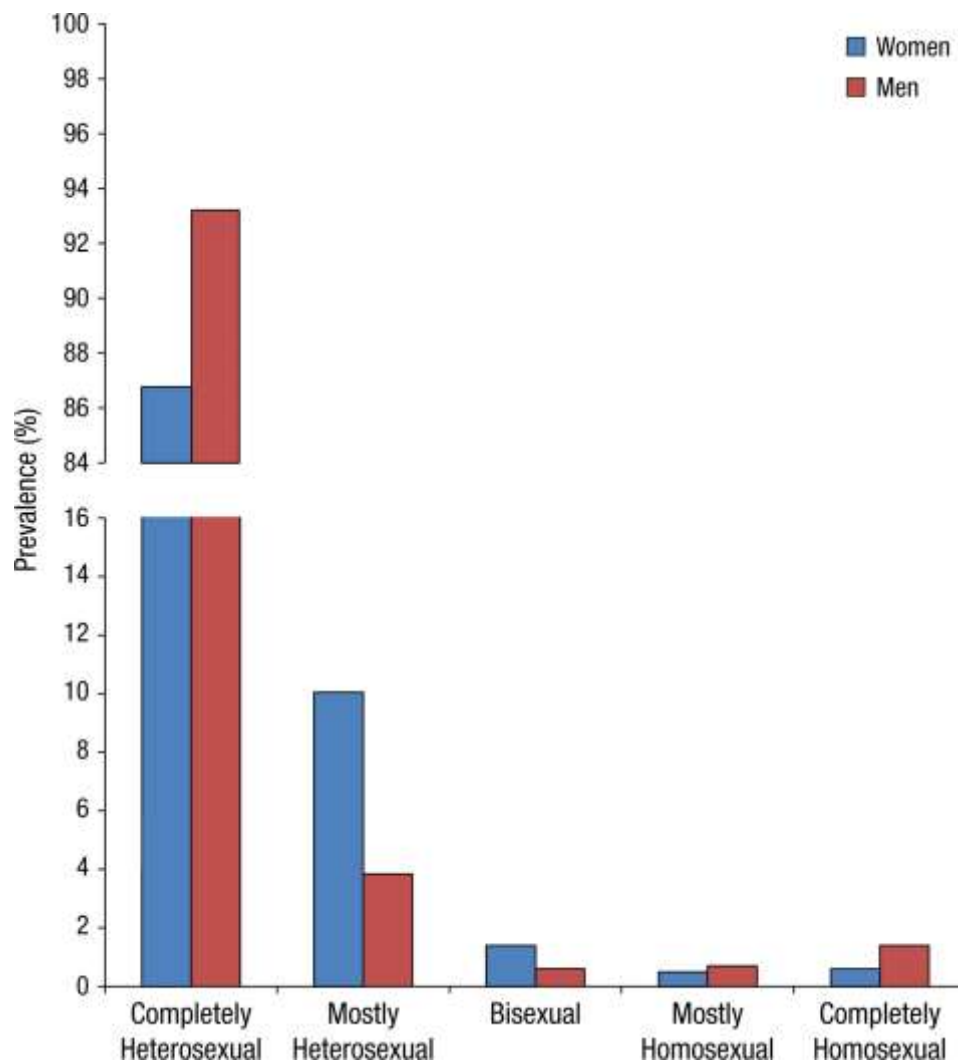
Supplementary Figure S6. Histograms of MSO scores for study participants who said they had changed (Graph A) and have never changed (Graph B) their sexual orientation.



Supplementary Figure S7. Histograms of MSO scores for study participants reporting high distress (Graph A, values 8-10) and low distress (Graph B, values 1-3) regarding their sexual orientation.



Supplementary Figure S8. Histograms of MSO scores for study participants reporting high uncertainty (Graph A, values 8-10) and low uncertainty (Graph B, values 1-3) regarding their sexual orientation.



Supplementary Figure S9. Figure 1 from Bailey et al. (2016) reprinted with permission from the corresponding author. The figure shows the average prevalence for five categories of sexual orientation with data from 188,907 Western adults.