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REVIEW ARTICLE

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Infertility and same-sex attraction in women

Satoshi Kanazawa | Adrien Larere

Department of Management, London School of Economics and Political Science, London, UK

Correspondence
Satoshi Kanazawa, Department of Management, London School of Economics and Political Science, Houghton Street, London, WC2A 2AE, UK.
Email: S.Kanazawa@lse.ac.uk

Abstract

A polygyny hypothesis of female sexual fluidity proposes that women may have been evolutionarily selected to be sexually fluid, in order to have occasional sex with their cowives in polygynous marriage to reduce tension and conflict inherent in such marriage, while at the same time reproducing children with their husbands. Among others, the hypothesis predicts that women who are biologically (but not surgically) infertile would experience greater same-sex attraction. Biological infertility stems from natural, evolutionarily familiar causes such as menopause, whereas surgical infertility stems from artificial, evolutionarily novel causes such as tubal ligation or hysterectomy. Consistent with the prediction, the analyses of the National Survey of Family Growth data showed that biological infertility, but not surgical infertility, was significantly associated with same-sex self-identified labels, behavior and sexual attraction in women. Biological infertility nearly doubled the odds of women having engaged in same-sex behavior and the number of same-sex partners in the last 12 months and nearly tripled the number of same-sex partners in life. In sharp contrast, biological infertility was not associated (and surgical infertility was significantly negatively associated) with same-sex attraction in men.

KEYWORDS
bisexuality, evolutionary psychology, homosexuality, sexual orientation

1 | INTRODUCTION

Homosexuality presents a theoretical challenge to evolutionary psychology,[1] the theoretical "bottom line" of which is reproductive success. One of the first questions that evolutionary psychologists often receive as soon as they tell people—fellow academics and civilians alike—that they are evolutionary psychologists is "What about homosexuality?" A series of popular introductions to the field have asked, and failed to answer, why homosexuality exists.[2–4] There have been several theories proposed to explain male homosexuality, such as the kin selection hypothesis,[5,6] the balancing selection hypothesis,[7–10] and the fraternal birth order effect*.[11–14] There has been historically less theoretical development in the explanation for female homosexuality.

Diamond[15,16] and Bailey[17] were among the first to suggest that women may be sexually fluid. They documented that women who identified as 100% heterosexual sometimes found themselves sexually attracted to and aroused by women as well as men. Following their groundbreaking work, Kanazawa[18] proposed a polygyny hypothesis of female sexual fluidity. The hypothesis proposes that, given the human evolutionary history of mild polygyny, women may have been evolutionarily selected to be sexually fluid so that they could occasionally have sex with their cowives in order to reduce the conflict and tension common among cowives of nonsororal polygynous marriages (where cowives are not biological sisters) while at the same time maintaining their heterosexual relationships with their husband for the purpose of reproduction. There is ethnographic evidence from Africa, Imperial China, and the United States (among fundamentalist Mormons) that cowives occasionally have sex with each other[18] and primatologists have observed that female bonobos engage in genitogenital rubbing to reduce tension

and build alliances with other females.[19–21] Further consistent with the hypothesis, the quantitative empirical analyses of data from the National Longitudinal Study of Adolescent Health (Add Health) show that sexually more fluid women are reproductively more successful, suggesting that female sexual fluidity may have been evolutionarily selected, and that the experience of marriage and parenthood early in adulthood increases women's sexual fluidity later in adulthood.[18]

Not only does the polygyny hypothesis offer an evolutionary explanation for female sexual fluidity, it also provides potential solutions to many theoretical and empirical puzzles in evolutionary psychology and sex research, such as why heterosexual men find lesbian sex arousing, why heterosexual men often encourage their wives and girlfriends to engage in lesbian relationships when they would react in the opposite way to their heterosexual affairs, and why menstrual synchrony might occur.[18] Another empirical puzzle is the sharp sex difference in the correlation between the number of opposite-sex partners and the number of same-sex partners. Among men, the correlation is significantly negative, suggesting that there are straight men and gay men as largely separate categories of men. In contrast, among women, the same correlation is significantly positive, and the magnitude of correlation is largely consistent (though not identical) across all categories of women by their self-identified labels. If we label women who have sex with women "lesbians," and women who never have sex with women "straight women," then we have a very curious situation where "lesbians" have far more male sex partners than "straight women" do.[18,22]

The hypothesis explains this puzzle by proposing that women may not have category-specific[23] sexual orientations in the same sense that men do, and instead that women's sexual attraction may be a by-product of their sociosexual orientation, "differences in individuals' implicit prerequisites to entering a sexual relationship." [24, p.70]. Women with restricted sociosexual orientation "require relatively more time and stronger attachment to, commitment to, and closeness with their romantic partners before they are willing to enter a sexual relationship with them," whereas women with unrestricted sociosexual orientation "require relatively less time with and weaker attachment to their partners before engaging in sex with them" [24, p.71].

If most women are evolutionarily selected to be heterosexually attracted most (say, 95%) of the time but experience same-sex attraction in a small fraction (say, 5%) of the time, then, if a woman has a small number of sexual partners, most or all of them are statistically likely to be men. However, as sociosexually less restricted women increase the number of sexual partners, many of them are statistically likely to be women, while at the same time having sex with an even larger number of men. Women's unrestricted sociosexual orientation therefore increases the number of same-sex partners. This model of female sexual attraction as a by-product of sociosexual orientation can explain why the correlation between the number of male sex partners and the number of female sex partners is significantly positive among women, when it is significantly negative among men, who are usually born either gay or straight,[25–27] although the latest meta-analysis[28] suggests that bisexual orientation in some men may be genuine. This model cannot explain exclusive lesbians, but only 0.3% of American women[18] and 0.7% of Australian women[29] fall into this category.[†]

Consistent with the polygyny hypothesis of female sexual fluidity,[18] an analysis of the Add Health data shows that women's apparent sexual orientation is a function of their sociosexual orientation.[30] One developmental factor that has consistently been shown to influence sociosexual orientation is father absence in childhood.[31–34] The analysis[30] shows that girls (but not boys) who experienced father absence in childhood were significantly more likely to experience same-sex attraction as adults, measured by their self-identified labels, sexual behavior, and romantic attraction. However, the association between father absence and same-sex attraction disappears entirely once women's sociosexual orientation, measured by the onset of their heterosexual activities, number of heterosexual partners, and attitudes toward relationship commitment, is statistically controlled, suggesting that their apparent sexual orientation (their degree of same-sex attraction) may partially be a by-product of their sociosexual orientation.

If women are evolutionarily selected to be sexually fluid so that they can occasionally have sex with their cowives in order to reduce the conflict and tension inherent in nonsororal polygynous marriages, while at the same time being heterosexually attracted most of the time so that they can reproduce with their husbands and achieve reproductive success, then other developmental consequences may follow. For example, women who are menopausal or otherwise infertile have no need to be heterosexually attracted to their husbands for reproductive purposes any longer, so such women may experience greater same-sex attraction than women who are still reproductively fertile. Such infertile women would still need to maintain harmonious relationships with their cowives in order to raise their children together. Infertile women could therefore still benefit from having sex with their cowives occasionally, even if there was no reproductive need to engage in sexual relationships with their husbands for the purpose of reproduction. Hence, a key prediction directly derived from the polygyny hypothesis of female sexual fluidity is that infertility increases same-sex attraction in women.

However, the hypothesis does *not* predict that all forms of infertility lead to greater same-sex attraction. Infertility may stem from *biological*, evolutionarily familiar causes, such as menopause in women, or low sperm count in men, or it may stem from *surgical*, evolutionarily novel causes, such as tubal ligation and hysterectomy in women or vasectomy in men. A fundamental premise of evolutionary psychology is that the human brain is designed for and adapted to the conditions of the ancestral environment[35–37] and, as such, the human brain has difficulty comprehending and dealing with evolutionarily novel entities and situations that did not exist in the ancestral environment.[38–40] The polygyny hypothesis of female sexual fluidity therefore leads to the prediction that only *biological* infertility, induced by menopause and other natural, physiological causes, would increase same-sex attraction in women. The hypothesis would predict that *surgical* infertility, induced by tubal ligation, hysterectomy, vasectomy of their spouses, and other modern medical

procedures, would *not* increase same-sex attraction in women, because women's brains would have difficulty comprehending such evolutionarily novel causes of infertility that did not exist in the ancestral environment.[‡] The polygyny hypothesis leads to the further prediction that infertility—whether biological or surgical—would *not* have a similar effect on men's same-sex attraction, because men do have stable sexual orientations that are usually determined at birth.[27] Given the human evolutionary history of polygyny, not polyandry, men would not have been evolutionarily equipped with the need to have sex with their cohusbands to reduce tension and conflict in their marriage.

Our empirical analyses below will test the following hypotheses:

H1 Biological infertility is associated with women's greater tendency to experience same-sex attraction.

H2 Surgical infertility is *not* associated with women's greater tendency to experience same-sex attraction.

H3 Neither biological nor surgical infertility is associated with men's greater tendency to experience same-sex attraction.

It is important to emphasize that, consistent with most evolutionary psychological hypotheses,[41] the shift in same-sex attraction predicted in H1 occurs largely unconsciously, not as a result of deliberate calculations or decision-making.

2 | MATERIALS AND METHODS

2.1 | Data

The National Survey of Family Growth (NSFG), conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention (CDC), gathers information on family life, marriage and divorce, pregnancy, infertility, use of contraception, and general and reproductive health. Each NSFG cycle gathers information from a different, cross-sectional, nationally representative sample. The first five cycles, administered in 1973, 1976, 1982, 1988, and 1995, included nationally representative samples of women aged 15–44 years in the civilian, noninstitutionalized population of the United States. Starting with Cycle 6 (2002), NSFG included independent samples of men aged 15–44 years. After Cycle 6, NSFG switched from periodic to continuous interviewing, and conducted three further cycles in 2006–2010, 2011–2013, and 2013–2015. We used a combined sample from the two latest continuous cycles for our analysis (2011–2013 and 2013–2015), which contained 11 300 women and 9321 men. Details of the data and sampling are available at the CDC website (https://www.cdc.gov/nchs/nsfg/). It is important to note that the NSFG is a general survey of marriage and family, not specifically about sexual orientation or same-sex attraction.

Sex researchers identify four different measures of sexual orientation.[27,42] In increasing order of accuracy and freedom from conscious manipulation, they are: self-identified labels ("homosexual," "bisexual," "heterosexual"); actual sexual behavior (with whom individuals have sex); self-reported sexual feelings and romantic attraction (fantasies and desires); and genital or brain responses (physiologically measured arousal to male or female images). NSFG included the first three measures of same-sex attraction (self-identified labels, actual sexual behavior, sexual attraction); it did not contain any physiological measures of genital or brain responses.

Most questions in the NSFG surveys were asked in personal interviews. However, given their highly sensitive nature, all questions about same-sex behavior and attraction were asked in ACASI (Audio Computer-Assisted Self-Interview). The interviewer handed a laptop computer and a headset to the respondent and walked away. The respondent then listened to the questions on the headset and entered their responses on the laptop alone, away from the interviewer. The use of ACASI significantly reduces the underreporting of same-sex sexual behavior.[43] Table 1 presents descriptive statistics (mean, standard deviation, minimum, and maximum) for all variables used in the regression analyses below, separately by sex.

2.2 | Dependent variables: Same-sex attraction

2.2.1 | Self-identified labels

For a measure of self-identified labels, NSFG asked its respondents "Do you think of yourself as…," for which the respondent could choose: 1 = "heterosexual or straight" (10 162 women, 8809 men); 2 = "bisexual" (799 women, 203 men); or 3 = "homosexual, gay, or lesbian" (211 women, 207 men). Further, we collapsed the original trinary measure into a binary measure of self-identified labels: 1 if the respondent identified as either "homosexual, gay, or lesbian" or "bisexual," and 0 if the respondent identified as "heterosexual or straight." We analyzed the first (original) dependent variable with ordinal regression, and the second (collapsed) dependent variable with binary logistic regression.

2.2.2 | Sexual behavior

NSFG asked numerous questions about the respondents' same-sex behavior. First, it asked how many same-sex sexual partners the respondents have had in their lifetime and in the last 12 months. Both of these measures were highly skewed in their distributions. We therefore took natural logs of both of these measures and analyzed them with ordinary least squares regression. We first added an epsilon (0.0001) to all raw counts of the number of same-sex sexual partners so that the natural log transformation was still possible even when the raw count was 0. Further, NSFG asked its respondents binary questions about whether they had ever: (1) engaged in any same-sex behavior in their lifetime; (2) performed oral sex on a same-sex partner in their lifetime; and (3) received oral sex from a same-sex partner in their lifetime. We analyzed each of these binary responses with binary logistic regression.

TABLE 1 Descriptive statistics by sex[a]

	Women	Men
Self-identified labels (original)	1.11	1.07
	(0.37)	(0.33)
	[1.0–3.0]	[1.0–3.0]
Self-identified labels (binary)	0.09	0.04
	(0.29)	(0.21)
	[0.0–1.0]	[0.0–1.0]
Sexual behavior		
ln(Lifetime number of same-sex sexual partners)	−7.42	−8.64
	(3.80)	(2.36)
	[−9.21 to 4.94]	[−9.21 to 2.30]
ln(Number of same-sex sex partners in last 12 months)	−8.65	−8.90
	(2.24)	(1.72)
	[−9.21 to 3.40]	[−9.21 to 1.79]
Ever engaged in any same-sex behavior	0.18	0.06
	(0.39)	(0.23)
	[0.0–1.0]	[0.0–1.0]
Ever performed oral sex on a same-sex partner	0.11	0.05
	(0.32)	(0.21)
	[0.0–1.0]	[0.0–1.0]
Ever received oral sex on a same-sex partner	0.14	0.05
	(0.34)	(0.22)
	[0.0–1.0]	[0.0–1.0]
Sexual attraction	1.33	1.18
	(0.74)	(0.68)
	[1.0–5.0]	[1.0–5.0]
Biological infertility	0.02	0.03
	(0.15)	(0.18)
	[0.0–1.0]	[0.0–1.0]
Surgical infertility	0.15	0.04
	(0.35)	(0.18)
	[0.0–1.0]	[0.0–1.0]
Age	28.75	28.14
	(8.39)	(8.69)
	[15.0–45.0]	[15.0–45.0]
Survey year	2013.24	2013.19
	(1.21)	(1.20)
	[2011–2015]	[2011–2015]
Black	0.23	0.21
	(0.42)	(0.40)
	[0.0–1.0]	[0.0–1.0]
Other race	0.12	0.13
	(0.32)	(0.34)
	[0.0–1.0]	[0.0–1.0]
Hispanicity	0.25	0.23
	(0.43)	(0.42)
	[0.0–1.0]	[0.0–1.0]
Education	13.11	12.74
	(2.74)	(2.65)
	[9.0–19.0]	[9.0–19.0]
Earnings	5.65	6.85
	(4.35)	(4.68)
	[0.0–15.0]	[0.0–15.0]
Frequency of church attendance	2.67	2.27
	(2.18)	(2.14)
	[0.0–6.0]	[0.0–6.0]
Self-described health	3.83	3.93
	(0.96)	(0.92)
	[1.0–5.0]	[1.0–5.0]
BMI	27.47	26.91
	(6.63)	(5.34)
	[16.0–50.0]	[15.0–48.0]

[a]Main entries are means. (Entries in parentheses are standard deviations.) [Numbers in brackets are minima–maxima.]

2.2.3 | Sexual attraction

For a measure of sexual attraction, NSFG asked its respondents: "People are different in their sexual attraction to other people. Which best describes your feelings? Are you…," to which they could respond: (1) only attracted to opposite-sex partners (8843 women, 8420 men), (2) mostly attracted to opposite-sex partners (1448 women, 400 men), (3) equally attracted to opposite-sex and same-sex partners (676 women, 185 men), (4) mostly attracted to same-sex partners (122 women, 79 men), and (5) only attracted to same-sex partners (135 women, 173 men). We analyzed this measure of sexual attraction with ordinal regression.

2.3 | Independent variables: Biological and surgical infertility

NSFG asked its respondents whether they had undergone any sterilizing operation (tubal ligation or hysterectomy for women, vasectomy for men). If the respondent had not had any sterilizing operation, then NSFG asked whether they were physically able to have a(nother) child. On the basis of these questions, NSFG classified all respondents on their fertility: fertile (9411 women, 8638 men), biologically infertile (243 women, 305 men), and surgically infertile (1646 women, 330 men). From this variable, we constructed two dummy variables: biological infertility (1 if biologically infertile, 0 otherwise), and surgical infertility (1 if surgically infertile, 0 otherwise). The reasons that women gave for being biologically infertile were "problems with ovulation," "problems with uterus, cervix, or fallopian tubes," "illnesses

TABLE 2 Cross-tabulations of categorical dependent variables and fertility status by sex

	Fertility status		
	Fertile	Surgically sterile	Biologically sterile
Women			
Self-identified labels			
Heterosexual	8448	1516	198
	90.8%	93.1%	83.2%
Bisexual	675	92	32
	7.3%	5.6%	13.4%
Homosexual	182	21	8
	2.0%	1.3%	3.4%
Total	9305	1629	238
	100.0%	100.0%	100.0%
Any same-sex behavior			
No	7636	1345	169
	81.7%	82.1%	70.4%
Yes	1711	293	71
	18.3%	17.9%	29.6%
Total	9347	1638	240
	100.0%	100.0%	100.%
Give oral sex			
No	8314	1443	188
	88.9%	88.1%	78.3%
Yes	1037	195	52
	11.1%	11.9%	21.7%
Total	9351	1638	240
	100.0%	100.0%	100.0%
Receive oral sex			
No	8134	1397	183
	87.0%	85.3%	76.3%
Yes	1218	241	57
	13.0%	14.7%	23.8%
Total	9352	1638	240
	100.0%	100.0%	100.0%
Sexual attraction			
Only opposite-sex	7310	1369	164
	78.2%	83.6%	68.3%
Mostly opposite-sex	1256	152	40
	13.4%	9.3%	16.7%
Equally same-sex and opposite-sex	557	92	27
	6.0%	5.6%	11.3%
Mostly same-sex	111	7	4
	1.2%	0.4%	1.7%
Only same-sex	113	17	5
	1.2%	1.0%	2.1%
Total	9347	1637	240
	100.0%	100.0%	100.0%

TABLE 2 (Continued)

	Fertility status		
	Fertile	Surgically sterile	Biologically sterile
Men			
Self-identified labels			
Heterosexual	8211	324	274
	95.5%	98.5%	93.5%
Bisexual	193	5	5
	2.2%	1.5%	1.7%
Homosexual	193	0	14
	2.2%	0.0%	4.8%
Total	8597	329	293
	100.0%	100.0%	100.0%
Any same-sex behavior			
No	8120	314	280
	94.2%	95.4%	93.6%
Yes	504	15	19
	5.8%	4.6%	6.4%
Total	8624	329	299
	100.0%	100.0%	100.%
Give oral sex			
No	8236	317	284
	95.4%	96.4%	95.0%
Yes	394	12	15
	4.6%	3.6%	5.0%
Total	8630	329	299
	100.0%	100.0%	100.0%
Receive oral sex			
No	8174	317	281
	94.8%	96.4%	94.0%
Yes	452	12	18
	5.2%	3.6%	6.0%
Total	8626	329	299
	100.0%	100.0%	100.0%
Sexual attraction			
Only opposite-sex	7836	317	267
	90.8%	96.6%	89.9%
Mostly opposite-sex	384	7	9
	4.4%	2.1%	3.0%
Equally same-sex and opposite-sex	174	4	7
	2.0%	1.2%	2.4%
Mostly same-sex	77	0	2
	0.9%	0.0%	0.7%
Only same-sex	161	0	12
	1.9%	0.0%	4.0%
Total	8632	328	297
	100.0%	100.0%	100.0%

or treatment for other illnesses such as cancer," "menopause," and "other reasons." NSFG did not explore the reasons for men's biological infertility.

Table 2 presents the cross-tabulation of each categorical and binary dependent variable and fertility status, separately by sex. Figures S1–S4 in the online supplementary material present the same information graphically.

2.4 | Control variables

In all regression equations, we controlled for the respondent's age, survey year, race (with two dummy variables for black and other race, with white as the reference category), Hispanicity (1 if Hispanic, 0 otherwise), education (number of years of schooling), earnings (on a 16-point equidistant ordinal scale from 0 = no earnings, 1 = "under $96/week" to 15 = "$1923 or more/week"), frequency of church attendance (on a 7-point ordinal scale from 0 = "never" to 6 = "more than once a week"), self-described health (on a 5-point ordinal scale from 1 = "poor" to 5 = "excellent"), and BMI (as another measure of health). It is important to control for age and survey year because birth cohort significantly affects women's (but not men's) likelihood of same-sex self-identified labels, behavior, and attraction,[44] and lifetime measures of whether a respondent has ever engaged in anything cannot decrease with age. It is also important to control for demographic variables because both sexual orientation and attitude toward homosexuality (and hence willingness to admit same-sex attraction on surveys) vary by race, ethnicity, education, class, and religiosity.[45,46] Because many causes of biological infertility (other than menopause) stem from poor health, it is important to control for health to separate the effect of poor health from that of biological infertility.

2.5 | Ethical approval

No ethical approval was necessary because there were no human or animal subjects involved in the research.

3 | RESULTS

3.1 | Results for women

The analyses of the NSFG data for women supported both H1 and H2, and showed that biological infertility was significantly positively associated with same-sex attraction measured by self-identified labels, behavior, and attraction in women, but surgical infertility was not.

3.1.1 | Self-identified labels

Table 3, Column (1), and Table 4, Column (1), show that, controlling for age, survey year, race, Hispanicity, education, earnings, frequency of church attendance, and health, biological infertility was significantly associated with women's same-sex self-identified labels, both in ordinal regression ($b = 0.687$, SE = 0.187, $P < 0.001$, 95% CI 0.321–1.053) and in binary logistic regression ($b = 0.688$, SE = 0.188, $P < 0.001$, 95% CI 0.320–1.056). The unstandardized regression coefficient of 0.688 in the binary logistic regression meant that being biologically infertile doubled women's odds of having same-sex self-identified labels ($e^{0.688} = 1.990$). In sharp contrast, Table 3, Column (2), and Table 4, Column (2), show that, net of the same control variables, women's surgical infertility had no association with their self-identified labels either in ordinal regression ($b = -0.201$, SE = 0.119, $P = 0.093$, 95% CI −0.434 to 0.033) or in binary logistic regression ($b = -0.196$, SE = 0.120, $P = 0.102$, 95% CI −0.431 to 0.039).

As Table 2 and Figure S1 show, relative to fertile and surgically infertile women, biologically infertile women were less likely to identify themselves as heterosexual, and more likely to identify as bisexual or homosexual.

3.1.2 | Sexual behavior

Table 5, Column (1), and Table 6, Column (1), show that, net of the same control variables, women's biological infertility was significantly positively associated with the natural logs of lifetime number of same-sex partners ($b = 1.057$, SE = 0.256, $P < 0.001$, 95% CI 0.555–1.559) and of number of same-sex partners in the last 12 months ($b = 0.554$, SE = 0.153, $P < 0.001$, 95% CI 0.254–0.854). The unstandardized coefficients suggested that women's biological infertility nearly tripled the lifetime number of same-sex partners ($e^{1.057} = 2.878$) and nearly doubled the number of same-sex partners in the last 12 months ($e^{0.554} = 1.740$). Table 7, Column (1), Table 8, Column (1), and Table 9, Column (1), show that women's biological infertility was also significantly associated with their ever having engaged in any same-sex behavior ($b = 0.589$, SE =0.153, $P < 0.001$, 95% CI 0.289–0.889), ever received oral sex from a woman ($b = 0.614$, SE =0.163, $P < 0.001$, 95% CI 0.295–0.934), and ever performed oral sex on a woman ($b = 0.655$, SE =0.168, $P < 0.001$, 95% CI 0.326–0.984). The unstandardized coefficients meant that women's biological infertility nearly doubled the odds of ever engaging in such same-sex behavior (any: $e^{0.589} = 1.802$; receiving: $e^{0.614} = 1.848$; performing: $e^{0.655} = 1.925$). Once again, in sharp contrast, Table 7, Column (2), Table 8, Column (2), and Table 9, Column (2), show that women's surgical infertility had no association with any measure of same-sex behavior (lifetime: $b = -0.114$, SE = 0.116, $P = 0.327$, 95% CI −0.341 to 0.113; 12 months: $b = -0.155$, SE = 0.069, $P = 0.025$, 95% CI −0.290 to −0.020; any: $b = -0.072$, SE = 0.081, $P = 0.379$, 95% CI −0.231 to 0.087; receiving: $b = 0.017$, SE = 0.089, $P = 0.851$, 95% CI −0.157 to 0.191; giving: $b = -0.098$, SE = 0.096, $P = 0.309$, 95% CI −0.286 to 0.090). As Table 2 and Figure S2 show, relative to fertile and surgically infertile women, biologically infertile women had far more same-sex partners in their lifetime and in the last 12 months. Table 2 and Figure S3 similarly show that biologically infertile women were more likely to

TABLE 3 Association between biological and surgical infertility and self-identified labels (original measure)[a]

	Women		Men	
	(1)	(2)	(3)	(4)
Biological infertility	0.687***		0.292	
	(0.187)		(0.273)	
Surgical infertility		−0.201		−0.928*
		(0.119)		(0.463)
Age	−0.032***	−0.027***	0.006	0.008
	(0.005)	(0.006)	(0.008)	(0.008)
Survey year	0.074*	0.074*	0.006	0.006
	(0.029)	(0.029)	(0.044)	(0.044)
Race				
Black	0.240**	0.234**	0.054	0.040
	(0.087)	(0.087)	(0.139)	(0.139)
Other	0.131	0.125	−0.214	−0.224
	(0.115)	(0.114)	(0.169)	(0.168)
Hispanicity	−0.248**	−0.252**	0.276*	0.265*
	(0.090)	(0.090)	(0.129)	(0.129)
Education	−0.040*	−0.046**	0.124***	0.124***
	(0.017)	(0.017)	(0.024)	(0.023)
Earnings	−0.028*	−0.030**	−0.083***	−0.082***
	(0.011)	(0.011)	(0.015)	(0.015)
Frequency of church attendance	−0.236***	−0.236***	−0.140***	−0.136***
	(0.018)	(0.018)	(0.027)	(0.027)
Self-described health	−0.224***	−0.237***	−0.072	−0.072
	(0.038)	(0.038)	(0.059)	(0.059)
BMI	0.014**	0.015**	−0.015	−0.015
	(0.005)	(0.005)	(0.011)	(0.011)
Threshold[b]				
Y = 1	149.022	149.430	15.897	15.213
	(58.569)	(58.585)	(87.726)	(87.785)
Y = 2	150.662	151.068	16.596	15.913
	(58.569)	(58.585)	(87.726)	(87.785)
Nagelkerke pseudo R^2	0.076	0.074	0.026	0.027
Number of cases	10 121	10 121	8708	8708

[a]Main entries are unstandardized regression coefficients.
(Entries in parentheses are standard errors.)
[b]"Threshold" is an ordinal regression equivalent of the OLS intercept.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

have ever engaged in any same-sex behavior, received cunnilingus from a woman, and performed cunnilingus on a woman than fertile and surgically infertile women.

3.1.3 | Sexual attraction

Table 10, Column (1), shows that women's biological infertility was significantly associated with their same-sex attraction in an ordinal regression ($b = 0.610$, SE = 0.146, $P < 0.001$, 95% CI 0.323–0.896). In sharp contrast, Table 10, Column (2), shows that women's surgical fertility had no association with their same-sex attraction ($b = -0.142$, SE = 0.082, $P = 0.084$, 95% CI −0.303 to 0.019). Table 2 and Figure S4 show that biologically infertile women were far less likely to be only attracted to men, and more likely to be mostly attracted to men, equally attracted to men and women, mostly attracted to women, and only attracted to women, than either fertile or surgically infertile women.

TABLE 4 Association between biological and surgical infertility and self-identified labels (collapsed into binary)[a]

	Women		Men	
	(1)	(2)	(3)	(4)
Biological infertility	0.688***		0.278	
	(0.188)		(0.275)	
Surgical infertility		−0.196		−0.907*
		(0.120)		(0.461)
Age	−0.033***	−0.028***	0.005	0.008
	(0.005)	(0.006)	(0.008)	(0.008)
Survey year	0.070*	0.071*	0.008	0.008
	(0.029)	(0.029)	(0.044)	(0.044)
Race				
Black	0.218**	0.213*	0.046	0.033
	(0.088)	(0.088)	(0.139)	(0.139)
Other	0.131	0.106	−0.213	−0.222
	(0.115)	(0.115)	(0.169)	(0.168)
Hispanicity	−0.257**	−0.261**	0.275*	0.264*
	(0.091)	(0.091)	(0.129)	(0.129)
Education	−0.040*	−0.046**	0.122***	0.121***
	(0.017)	(0.017)	(0.024)	(0.024)
Earnings	−0.029*	−0.031**	−0.083***	−0.082***
	(0.011)	(0.011)	(0.015)	(0.015)
Frequency of church attendance	−0.236***	−0.235***	−0.139***	−0.135***
	(0.018)	(0.018)	(0.027)	(0.027)
Self-described health	−0.228***	−0.241***	−0.073	−0.073
	(0.038)	(0.038)	(0.059)	(0.059)
BMI	0.014**	0.015**	−0.014	−0.014
	(0.005)	(0.005)	(0.011)	(0.011)
Constant	−141.157	−142.084	−19.325	−18.715
	(58.656)	(58.668)	(87.817)	(87.883)
Nagelkerke pseudo R^2	0.085	0.083	0.029	0.031
Number of cases	10 121	10 121	8708	8708

[a]Main entries are unstandardized regression coefficients.
(Entries in parentheses are standard errors.)
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

3.2 | Results for men

The analyses of the NSFG data for men supported H3 and showed that neither biological nor surgical fertility was significantly positively associated with same-sex attraction by any measure in men.

In sharp contrast to the results for women, net of the same control variables, men's biological infertility was not at all associated with their same-sex self-identified labels (ordinal: $b = 0.292$, SE = 0.273, $P = 0.286$, 95% CI −0.244 to 0.827; binary logistic: $b = 0.278$, SE = 0.275, $P = 0.313$, 95% CI −0.261 to 0.817), same-sex behavior (lifetime: $b = -0.018$, SE = 0.148, $P = 0.905$, 95% CI −0.308 to 0.272; 12 months: $b = 0.148$, SE = 0.108, $P = 0.169$, 95% CI −0.064 to 0.360; any: $b = -0.075$, SE = 0.266, $P = 0.779$, 95% CI −0.596 to 0.446; receiving: $b = 0.054$, SE = 0.267, $P = 0.840$, 95% CI −0.469 to 0.577; giving: $b = 0.011$, SE = 0.293, $P = 0.970$, 95% CI −0.563 to 0.585), or same-sex sexual attraction ($b = -0.006$, SE = 0.222, $P = 0.979$, 95% CI −0.441–0.429) (see Column (3) in Tables 3–10). Further, once again in sharp contrast to the results for women, men's surgical infertility was significantly *negatively* associated with their same-sex self-identified labels (ordinal: $b = -0.928$, SE = 0.463, $P = 0.045$, 95% CI −1.836 to −0.020; binary logistic: $b = -0.907$, SE = 0.461, $P = 0.049$, 95% CI −1.811 to −0.003), same-sex behavior (lifetime: $b = -0.306$, SE = 0.140, $P = 0.029$, 95% CI −0.580 to −0.032; 12 months: $b = -0.231$, SE = 0.102, $P = 0.024$, 95% CI −0.431 to −0.031; any: $b = 0$–0.576, SE = 0.285, $P = 0.043$, 95% CI −1.135 to −0.017; receiving: $b = -0.774$, SE = 0.318, $P = 0.015$, 95% CI −1.397 to −0.151; giving: $b = -0.433$, SE = 0.307, $P = 0.160$, 95% CI −1.035 to 0.169), and same-sex sexual attraction

TABLE 5 Association between biological and surgical infertility and behavior (natural log of lifetime number of same-sex partners)[a]

	Women		Men	
	(1)	(2)	(3)	(4)
Biological infertility	1.057***		−0.018	
	(0.256)		(0.148)	
	0.040		*−0.001*	
Surgical infertility		−0.114		−0.306*
		(0.116)		(0.140)
		−0.011		*−0.024*
Age	−0.015**	−0.011*	0.015***	0.016***
	(0.005)	(0.006)	(0.004)	(0.004)
	−0.033	*−0.025*	*0.054*	*0.058*
Survey year	0.009	0.011	−0.019	−0.020
	(0.031)	(0.031)	(0.021)	(0.021)
	0.003	*0.003*	*−0.010*	*−0.010*
Race				
Black	0.139	0.136	−0.090	−0.100
	(0.096)	(0.096)	(0.067)	(0.067)
	0.015	*0.015*	*−0.015*	*−0.017*
Other	−0.606***	−0.607***	−0.125	−0.135
	(0.121)	(0.121)	(0.079)	(0.079)
	−0.050	*−0.050*	*−0.017*	*−0.019*
Hispanicity	−0.470***	−0.471***	0.057	0.052
	(0.093)	(0.093)	(0.065)	(0.065)
	−0.052	*−0.053*	*0.010*	*0.009*
Education	−0.001	−0.005	0.077***	0.077***
	(0.017)	(0.017)	(0.012)	(0.012)
	−0.001	*−0.003*	*0.085*	*0.086*
Earnings	0.009	0.007	−0.033***	−0.032***
	(0.011)	(0.011)	(0.008)	(0.008)
	0.010	*0.008*	*−0.064*	*−0.062*
Frequency of church attendance	−0.285***	−0.285***	−0.054***	−0.053***
	(0.018)	(0.018)	(0.012)	(0.012)
	−0.160	*−0.160*	*−0.048*	*−0.047*
Self-described health	−0.343***	−0.357***	−0.125***	−0.124***
	(0.042)	(0.042)	(0.029)	(0.029)
	−0.085	*−0.089*	*−0.048*	*−0.048*
BMI	0.012*	0.013*	−0.004	−0.004
	(0.006)	(0.006)	(0.005)	(0.005)
	0.021	*0.023*	*−0.009*	*−0.009*
Constant	−24.041	−27.210	29.134	30.356
	(62.500)	(62.558)	(42.587)	(42.575)
R^2	0.046	0.044	0.013	0.014
Number of cases	10 133	10 133	8717	8717

[a]Main entries are unstandardized regression coefficients.
(Entries in parentheses are standard errors.)
Italicized entries are standardized regression coefficients.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

TABLE 6 Association between biological and surgical infertility and behavior (natural log of number of same-sex partners in last 12 months)[a]

	Women		Men	
	(1)	(2)	(3)	(4)
Biological infertility	0.554***		0.148	
	(0.153)		(0.108)	
	0.036		*0.015*	
Surgical infertility		−0.155*		−0.231*
		(0.069)		(0.102)
		−0.025		*−0.025*
Age	−0.019***	−0.015***	0.003	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
	−0.071	*−0.057*	*0.016*	*0.022*
Survey year	0.011	0.011	−0.012	−0.012
	(0.019)	(0.019)	(0.015)	(0.015)
	0.006	*0.006*	*−0.008*	*−0.009*
Race				
Black	0.329***	0.328***	0.064	0.057
	(0.057)	(0.058)	(0.049)	(0.049)
	0.061	*0.061*	*0.015*	*0.013*
Other	−0.060	−0.063	−0.122*	−0.127*
	(0.072)	(0.072)	(0.058)	(0.058)
	−0.008	*−0.009*	*−0.023*	*−0.024*
Hispanicity	−0.049	−0.053	0.097*	0.093*
	(0.056)	(0.056)	(0.047)	(0.047)
	−0.009	*−0.010*	*0.023*	*0.022*
Education	−0.017	−0.021*	0.055***	0.055***
	(0.010)	(0.010)	(0.008)	(0.008)
	−0.020	*−0.026*	*0.084*	*0.084*
Earnings	−0.005	−0.006	−0.019***	−0.018***
	(0.007)	(0.007)	(0.005)	(0.005)
	−0.010	*−0.012*	*−0.050*	*−0.049*
Frequency of church attendance	−0.108***	−0.107***	−0.039***	−0.038***
	(0.011)	(0.011)	(0.009)	(0.009)
	−0.103	*−0.102*	*−0.048*	*−0.046*
Self-described health	−0.083***	−0.092***	−0.016	−0.016
	(0.025)	(0.025)	(0.021)	(0.021)
	−0.035	*−0.039*	*−0.008*	*−0.009*
BMI	0.004	0.005	−0.003	−0.003
	(0.004)	(0.004)	(0.004)	(0.004)
	0.011	*0.014*	*−0.008*	*−0.008*
Constant	−28.879	−29.351	15.218	15.514
	(37.391)	(37.410)	(31.054)	(31.048)
R^2	0.023	0.022	0.008	0.008
Number of cases	10 144	10 144	8722	8722

[a]Main entries are unstandardized regression coefficients.
(Entries in parentheses are standard errors.)
Italicized entries are standardized regression coefficients.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

TABLE 7 Association between biological and surgical infertility and sexual behavior (whether they have ever engaged in any same-sex sexual behavior in lifetime)[a]

	Women		Men	
	(1)	(2)	(3)	(4)
Biological infertility	0.589***		−0.075	
	(0.153)		(0.266)	
Surgical infertility		−0.072		−0.576*
		(0.081)		(0.285)
Age	−0.013***	−0.010*	0.026***	0.028***
	(0.004)	(0.004)	(0.007)	(0.007)
Survey year	0.005	0.006	−0.043	−0.044
	(0.021)	(0.021)	(0.038)	(0.038)
Race				
Black	0.107	0.103	−0.197	−0.213
	(0.065)	(0.065)	(0.128)	(0.128)
Other	−0.507***	−0.509***	−0.243	−0.261
	(0.098)	(0.098)	(0.149)	(0.149)
Hispanicity	−0.343***	−0.343***	0.107	0.100
	(0.069)	(0.069)	(0.117)	(0.117)
Education	0.005	0.002	0.122***	0.123***
	(0.012)	(0.012)	(0.020)	(0.020)
Earnings	0.008	0.007	−0.055***	−0.053***
	(0.008)	(0.008)	(0.013)	(0.013)
Frequency of church attendance	−0.200***	−0.199***	−0.094***	−0.091***
	(0.013)	(0.013)	(0.023)	(0.023)
Self-described health	−0.223***	−0.232***	−0.213***	−0.211***
	(0.029)	(0.028)	(0.051)	(0.051)
BMI	0.008	0.009*	−0.006	−0.006
	(0.004)	(0.004)	(0.009)	(0.009)
Constant	−9.660	−11.614	83.238	85.834
	(43.252)	(43.239)	(76.402)	(76.461)
Nagelkerke pseudo R^2	0.072	0.070	0.034	0.035
Number of cases	10 151	11 151	8733	8733

[a]Main entries are unstandardized regression coefficients.
(Entries in parentheses are standard errors.)
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

($b = 0–0.782$, SE = 0.317, $P = 0.014$, 95% CI −1.402 to −0.161) (see Column (4) in Tables 3–10).

4 | DISCUSSION

We tested three novel predictions derived from the polygyny hypothesis of female sexual fluidity, which posits that women may have been evolutionarily selected to be sexually fluid to facilitate their occasionally having sex with their cowives in polygynous marriages during evolutionary history, to reduce tension and conflict inherent in such marriages, while at the same time motivating them to have sexual intercourse with their husbands in order to reproduce children. Consistent with the predictions, analyses of the NSFG data revealed that women's biological infertility was significantly associated with higher levels of same-sex attraction, whether measured by self-identified labels, sexual behavior, or sexual attraction. Further consistent with the hypothesis, women's surgical infertility was not at all associated with their same-sex attraction by any measure. In sharp contrast, men's biological infertility was not associated with their same-sex attraction, while their surgical infertility was significantly negatively associated with it.

H3 predicted that neither biological nor surgical fertility would increase men's tendency to experience same-sex attraction, and, technically, the data analyses supported this hypothesis. Neither biological nor surgical infertility was significantly positively associated

TABLE 8 Association between biological and surgical infertility and sexual behavior (whether they have ever received oral sex from a same-sex partner in lifetime)[a]

	Women		Men	
	(1)	(2)	(3)	(4)
Biological infertility	0.614***		0.054	
	(0.163)		(0.267)	
Surgical infertility		0.017		−0.774*
		(0.089)		(0.318)
Age	−0.004	−0.004	0.028***	0.030***
	(0.004)	(0.005)	(0.007)	(0.007)
Survey year	0.014	0.015	−0.052	−0.053
	(0.024)	(0.024)	(0.040)	(0.040)
Race				
Black	0.295***	0.291***	−0.264	−0.283*
	(0.072)	(0.072)	(0.137)	(0.137)
Other	−0.429***	−0.429***	−0.345*	−0.365*
	(0.113)	(0.113)	(0.161)	(0.161)
Hispanicity	−0.371***	−0.369***	0.074	0.063
	(0.079)	(0.079)	(0.125)	(0.125)
Education	−0.030*	−0.030*	0.131***	0.132***
	(0.014)	(0.014)	(0.021)	(0.021)
Earnings	0.009	0.008	−0.053***	−0.051***
	(0.009)	(0.009)	(0.014)	(0.014)
Frequency of church attendance	−0.200***	−0.200***	−0.113***	−0.109***
	(0.015)	(0.015)	(0.025)	(0.025)
Self-described health	−0.232***	−0.240***	−0.227***	−0.225***
	(0.032)	(0.032)	(0.053)	(0.053)
BMI	0.009	0.009*	−0.007	−0.007
	(0.005)	(0.005)	(0.010)	(0.010)
Constant	−27.501	−30.993	100.661	103.570
	(48.899)	(48.884)	(80.373)	(80.465)
Nagelkerke pseudo R^2	0.067	0.065	0.041	0.043
Number of cases	10 153	11 153	8734	8734

[a]Main entries are unstandardized regression coefficients.
(Entries in parentheses are standard errors.)
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

with men's same-sex attraction by any of the eight measures. We did not predict the significantly negative association between surgical infertility and same-sex attraction in men. However, in retrospect, such negative association makes perfect sense. Straight men are those primarily in danger of impregnating women, as homosexual intercourse cannot result in pregnancies. Surgical infertility is both costly and painful to achieve. Only straight men are therefore likely to bother to go through the trouble of surgical infertility. We therefore suspect that the negative association between surgical infertility and same-sex attraction in men reflects a reverse causal order, where straight men are significantly more likely to undergo surgical procedures to achieve infertility, rather than men who undergo surgical infertility subsequently exhibiting lesser tendency toward same-sex attraction.

There are some limitations to the present study. As with every statistical analysis, our results are only as valid as the underlying assumptions of the statistical model used. In particular, the proportional odds model of ordinal regression assumes that the effects of independent variables are proportional across all thresholds of the dependent variable.[47] It is important to interpret our results cautiously with this assumption in mind.

One potential criticism of our contention that women are evolutionarily selected to be sexually fluid is the relatively low incidence of same-sex self-identified labels, behavior, and attraction in a nationally representative sample of American women, such as the NSFG data that we used here, even among biologically infertile women. If women are evolutionarily selected to be

TABLE 9 Association between biological and surgical infertility and sexual behavior (whether they have ever given oral sex to a same-sex partner in lifetime)[a]

	Women		Men	
	(1)	(2)	(3)	(4)
Biological infertility	0.655***		0.011	
	(0.168)		(0.293)	
Surgical infertility		−0.098		−0.433
		(0.096)		(0.307)
Age	−0.002	0.001	0.021**	0.023**
	(0.004)	(0.005)	(0.008)	(0.008)
Survey year	0.028	0.029	−0.017	−0.017
	(0.026)	(0.026)	(0.043)	(0.043)
Race				
Black	0.089	0.084	−0.164	−0.176
	(0.079)	(0.079)	(0.143)	(0.143)
Other	−0.378**	−0.381**	−0.257	−0.270
	(0.119)	(0.119)	(0.169)	(0.169)
Hispanicity	−0.447***	−0.448***	0.024	0.019
	(0.086)	(0.086)	(0.135)	(0.135)
Education	−0.025	−0.029	0.141***	0.141***
	(0.015)	(0.015)	(0.022)	(0.022)
Earnings	0.003	0.001	−0.058***	−0.056***
	(0.010)	(0.010)	(0.015)	(0.015)
Frequency of church attendance	−0.201***	−0.200***	−0.124***	−0.122***
	(0.016)	(0.016)	(0.027)	(0.027)
Self-described health	−0.237***	−0.248***	−0.163**	−0.162**
	(0.034)	(0.034)	(0.058)	(0.057)
BMI	0.013**	0.014**	−0.003	−0.003
	(0.005)	(0.005)	(0.010)	(0.010)
Constant	−56.129	−58.465	29.270	30.853
	(52.505)	(52.495)	(85.674)	(85.723)
Nagelkerke pseudo R^2	0.066	0.063	0.034	0.035
Number of cases	10 151	10 151	8735	8735

[a]Main entries are unstandardized regression coefficients.
(Entries in parentheses are standard errors.)
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

sexually fluid, why do most (or all) of them not experience same-sex attraction?

One possibility may be that the activation of evolved psychological or physiological mechanisms often requires environmental triggers, and if the environment lacks the appropriate triggers, the evolved mechanism may never be activated. A physiological example may illustrate this point. Human beings (and other related species) have an evolved physiological mechanism to develop calluses on their hands if they use their hands in repeated activities involving friction. Every human being has this evolved mechanism to develop calluses on their hands. Yet, in a representative sample of Americans, very few individuals have calluses on their hands, because few individuals today engage in manual activities that cause calluses to develop on their hands. Most people work in offices using computers, not as farmers or coal miners, let alone hunter-gatherers. The necessary environmental trigger for callus development is absent in most contemporary Americans' lives, so they do not develop calluses on their hands, even though every single one of them has an evolved physiological mechanism for it. Similarly, even if all women are evolutionarily selected to be sexually fluid in order to reduce tension and conflict inherent in polygynous marriage, they may not develop same-sex self-identified labels, behavior, and attraction if the necessary environmental triggers are missing. In this case, one of the crucial environmental triggers might be polygynous marriage and the presence of cowives in the household, which most American women do not experience. There is indeed ethnographic evidence

TABLE 10 Association between biological and surgical infertility and sexual attraction[a]

	Women		Men	
	(1)	(2)	(3)	(4)
Biological infertility	0.610***		−0.006	
	(0.146)		(0.222)	
Surgical infertility		−0.142		−0.782*
		(0.082)		(0.317)
Age	−0.038***	−0.034***	−0.005	−0.003
	(0.004)	(0.004)	(0.006)	(0.006)
Survey year	0.039	0.039	0.019	0.018
	(0.020)	(0.020)	(0.031)	(0.031)
Race				
Black	0.111	0.109	−0.014	−0.029
	(0.063)	(0.063)	(0.102)	(0.102)
Other	0.001	−0.003	0.070	0.056
	(0.081)	(0.081)	(0.112)	(0.112)
Hispanicity	−0.203**	−0.204**	0.195*	0.189*
	(0.063)	(0.063)	(0.093)	(0.093)
Education	0.038***	0.034**	0.119***	0.119***
	(0.011)	(0.012)	(0.017)	(0.017)
Earnings	−0.010	−0.011	−0.077***	−0.075***
	(0.008)	(0.008)	(0.011)	(0.011)
Frequency of church attendance	−0.217***	−0.216***	−0.105***	−0.103***
	(0.012)	(0.012)	(0.019)	(0.019)
Self-described health	−0.226***	−0.236***	−0.091*	−0.090*
	(0.027)	(0.027)	(0.043)	(0.043)
BMI	0.012**	0.013**	−0.010	−0.010
	(0.004)	(0.004)	(0.008)	(0.008)
Threshold[b]				
Y = 1	78.505	78.584	40.676	39.166
	(41.022)	(41.023)	(63.275)	(63.312)
Y = 2	79.664	79.740	41.396	39.885
	(41.022)	(41.023)	(63.275)	(63.312)
Y = 3	80.998	81.073	41.933	40.423
	(41.022)	(41.023)	(63.275)	(63.312)
Y = 4	81.654	81.729	42.321	40.811
	(41.022)	(41.023)	(63.275)	(63.312)
Nagelkerke pseudo R^2	0.076	0.075	0.026	0.027
Number of cases	10 150	10 150	8738	8738

[a]Main entries are unstandardized regression coefficients.
(Entries in parentheses are standard errors.)
[b]"Threshold" is an ordinal regression equivalent of the OLS intercept.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

that the presence of cowives often does trigger same-sex attraction, even in the United States.[18]

The NSFG data showed a sexually dimorphic pattern of association between biological infertility and same-sex attraction. Biological infertility was positively associated with same-sex attraction among women, but not at all associated with it among men. Such a sexually dimorphic pattern suggests equally sexually dimorphic selection forces. One potential sexually dimorphic selection force may be provided by mild polygyny throughout human evolutionary history, where women had cowives while men did not have cohusbands.[48,49]

It would be difficult to propose an alternative explanation for why biologically infertile women would experience increased same-sex attraction while surgically infertile women do not, while biological infertility does not at all affect men's same-sex attraction and surgical infertility decreases it. However, more research is clearly necessary to subject this new hypothesis to further empirical tests, in particular, evaluating its empirical validity in comparison to rival theories.[15,50,51] Baumeister[50] argues that women exhibit greater erotic plasticity (similar to sexual fluidity) because women's sexuality fluctuates with social and cultural factors to a greater extent than men's sexuality does, but concedes that the reason for this sex difference is unclear. Diamond[15] explains female sexual fluidity by the fact that women are only able to conceive for a few days of the month during ovulation, and for the rest of the time women have no evolutionary motive to pursue reproductive (heterosexual) sex. Kuhle and Radke[51] argue that women have evolved to be sexually fluid in order to facilitate alloparenting. Our finding of the effect of biological infertility on same-sex attraction among women may therefore potentially, and at least partially, be compatible with both Diamond's[15] and Kuhle and Radke's[51] explanations for female sexual fluidity. The data presented in this paper do not necessarily adjudicate between Kanazawa's[18] polygyny hypothesis and theirs. A key prediction of the polygyny hypothesis of female sexual fluidity[18] not shared by any other theory of female sexual fluidity is that women are evolutionarily selected to desire to have sex with their cowives, or, in the context of socially imposed monogamy, their husband's former or future wives and partners.[18]

5 | CONCLUSION

If the polygyny hypothesis of female sexual fluidity turns out to be valid, it has significant implications for science, practice, and society. For example, there have been a few major missteps in the history of psychiatry and sex research. Fifty years ago, most psychiatrists and scientists believed that homosexuality was a form of mental illness. This was the official position of the American Psychiatric Association until 1973.[52,53] Today few psychiatrists or scientists believe that homosexuality is a mental illness. Twenty-five years ago, most psychiatrists and scientists believed that, while homosexuality might no longer be a mental illness, if gay individuals so wished, they could be "cured" of their homosexuality through reparative or conversion therapy. Today few psychiatrists or scientists believe homosexuality can be "cured" (mostly because male homosexuality is largely innate), and they instead recognize that such a practice is potentially harmful to the individuals.[54] The practice is now illegal in an increasing number of jurisdictions.[55] Similarly, most scientists today assume that women have sexual orientations in the same sense as (and because) men do. It is our unquestioned political conviction that men and women are and must be biologically equivalent. If the polygyny hypothesis of female sexual fluidity turns out to be supported, then the current assumption that women have sexual orientations may follow the course of the earlier (and then equally universally and unquestioningly held) views in the history of psychiatry and science.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

AUTHOR CONTRIBUTIONS

AL proposed the original prediction. SK performed the data analyses and wrote the first draft. AL and SK contributed to revisions.

ORCID

Satoshi Kanazawa https://orcid.org/0000-0003-3786-8797

ENDNOTES

*The fraternal birth order effect in itself is not an evolutionary hypothesis, as it merely posits the proximate mechanism for increased probability of male homosexuality and does not specify its ultimate functions. However, Khovanova[56] mathematically proved that the balancing selection hypothesis and the fraternal birth order effect are logically equivalent; they are one and the same theory. Fraternal birth order effect is the proximate mechanism that provides the ultimate function (inclusive fitness) via the mechanism specified by the balancing selection hypothesis.

†Other, cross-sectional studies estimate the incidence of homosexuality among women as being higher. However, given female sexual fluidity, such cross-sectional studies, which measure women's sexual orientation at one point in time, overestimate the incidence of exclusive homosexuality among women, as those who identify as lesbian at one point in time may not so identify at a later point.[16] True estimates of exclusive homosexuality among women require longitudinal data with repeated measurements over a long period of time, as in Kanazawa[18] and Fethers et al.[29]

‡Surgical hysterectomy might produce hormonal changes in women that are similar to the hormonal changes that accompany menopause. However, given its evolutionarily novel, sudden and drastically interventionist nature, we hypothesize that surgical hysterectomy is (unconsciously) perceived by women's body and brain differently from developmentally natural and slow menopause.

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