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Childhood and adolescent sexual behaviors predict adult sexual orientations

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Abstract: Anonymous retrospective data were provided by 3,443 adult participants via computer-assisted self-interview. This was the first study focused on determinants of adult sexual orientation to adjust for the effects of same-sex sibling incest. Five measures of adult sexual orientations (ASOs) provided evidence consistent with the theory that ASOs result from early sex-specific romantic attachment, conditioning caused by early sexual experiences with partners, and other experiences, such as early masturbation using human images, acting synergistically with critical period learning, and sexual imprinting. Early same-sex crushes were the most powerful predictor of ASOs, and they also increased the likelihood of engaging in early same-sex partnered and masturbation behaviors. Incestuous experiences with same-sex siblings affected the ASOs of the incest participants. And, lesbian, gay, and bisexual participants tended to have an earlier onset of puberty than heterosexual controls within sexes. However, statistical analyses showed that the incest and puberty effects were mathematically explained by the participant's early sexual experiences with partners and other experiences such as masturbation using human images. Early same-sex crushes were predicted by nuclear family variables implying that same-sex crushes were more likely when the opposite-sex parent modeled an unsatisfactory heterosexual romantic partner.

ABOUT THE AUTHORS

The twelve authors are all collaborating researchers in an interdisciplinary, on-going, multi-institutional collaborative project involving six different West Virginia campuses (an area somewhat inland near the eastern coast of the USA, usually referred to as "the mid-Atlantic region") which resulted in collection of data from 3,541 participants in the interval between 2002 and 2012.

PUBLIC INTEREST STATEMENT

Our study investigated the origins of adult sexual orientations using data anonymously provided by 3,443 adult participants. Evidence from the study was consistent with the theory that the adult sexual orientations of the participants were influenced early in life by the early sex-specific crushes that they had experienced, the early sexual experiences with male or female partners that they had experienced, and the sex-specific images that they had used when they masturbated. The evidence from our study was consistent with the idea that sexual orientations become fixed relatively early in life because they were established while the brain was still growing and malleable, a process known as critical period learning. Our results were consistent with the idea that the sexual orientations of adults cannot be changed and that a person's sexual orientation should not be used as the basis for discrimination.

Subjects: Behavioral Medicine; Development - Soc Sci; Gender; Gender & Development; Gender Studies - Soc Sci

Keywords: adult sexual orientation; romantic attachment; early crushes; bisexual; lesbian; homosexual; conditioning; critical period learning; sexual imprinting; incest

1. Introduction

Based on US probability sample, Laumann, Gagnon, Michael, and Michaels (1994, p. 311) reported that 4.4% of women and 6.2% of men experienced some same-sex attractions, and 4.1% of women and 4.9% of men reported at least one same-sex partner after age 18. However, only .3% of women and 2.4% of men admitted being exclusively attracted to same-sex partners. In their study, Laumann et al. (1994, p. 305) also concluded that 5.2% of married women and 4.7% of married men had experienced some same-gender attraction, but only .1% of married women had a lesbian or bisexual identity and only .6% of married men reported a gay or bisexual identity. The prevalence of same-sex orientations in a New Zealand birth cohort was the same at age 38 as at age 21 (3.7%) in women, but the prevalence of same-sex orientations was significantly higher at age 38 (6.5%) than at age 21 (4.2%) in men (Dickson, van Roode, Cameron, & Paul, 2013). These kinds of empirical data would be far more valuable if they were grounded in a theoretical approach that provided a basis for understanding the data's significance, formulating new hypotheses, and testing those new hypotheses against newly gathered data (Neter, Kutner, Nachtsheim, & Wasserman, 1989).

Theory must account for data showing that sexual preferences and orientations do not neatly fit into merely three categories (e.g. gay, bisexual, and heterosexual). Increasing evidence has suggested for more than half a century that both preferences and orientations are continuously distributed rather than discrete variables (Kinsey, Pomeroy, & Martin, 1948; Kinsey, Pomeroy, Martin, & Gebhard, 1953; Kinsey, Reichert, Cauldwell, & Mozes, 1955; Van Wyk & Geist, 1984). Alternative ways to describe this continuum-like range of preferences and orientations have included (1) using at least five separate categories (Vrangalova & Savin-Williams, 2010, 2012) or (2) using two orthogonal (opposite-sex and same-sex) variables that both exist, to some extent, within a single individual (Beard et al., 2013; Bickham et al., 2007; O'Keefe et al., 2014; Robinett, 2012; Storms, 1980; Stroebel et al., 2013; Whalen, Geary, & Johnson, 1990).

Women's sexual preferences and orientations show greater changes over time than do those of men, as well as a greater probability of varying with the current partner (Baumeister, 2000; Diamond, 2012; Dickson et al., 2013; Peplau, Spaulding, Conley, & Veniegas, 1999). The theoretical basis for understanding the origins of human sexual preferences and orientations is controversial at present, and the descriptions of the origins and changes in women's and men's sexual orientations are very different. In females, the focus has been on the likelihood of adult sexual identity to vary—and to vary with the current partner (Baumeister, 2000; Diamond, 2012; Dickson et al., 2013; Jones & Yarhouse, 2011; Peplau et al., 1999; Spitzer, 2003; Zucker, 2003).

In males, the competing theories can be divided into those that attribute adult sexual preference to biological causes (e.g. genetic, endocrine, and birth order; for reviews see Dawood, Bailey, & Martin, 2009; Hyde, 2005; Mustanski, Chivers, & Bailey, 2002; Schwartz, Kim, Kolundzija, Rieger, & Sanders, 2010) and those that attribute adult sexual preference to the combination of early social learning, classical, and operant conditioning (Beard et al., 2013; Bickham et al., 2007; O'Keefe et al., 2014; Robinett, 2012; Stroebel et al., 2013). For reviews of conditioning studies in humans and animals, see Hoffmann (2012) and Pfaus et al. (2012), respectively.

2. Imprinting and attachment

The observation that birds find, mate with, and (in some species) establish long-term committed relationships with the opposite sex of their species could be taken as proof of a very specific and genetically-based sexual preference. However, biological research has investigated the effects of an egg from one bird species being hatched and raised by parents of a different species. A newly

hatched avian chick imprints on the first “parent” it sees, even if the “parent” is not from the same species (or even genus) as the chick. The imprinted chick follows the caregiver and begs for food from the caregiver until the chick can feed itself. After reaching adulthood, the imprinted bird tries to mate with individuals of its adoptive species, an outcome known as sexual imprinting (Irwin & Price, 1999). Furthermore, when young mallard ducks were raised solely with males, they ignored females as adults and attempted to mate solely with males. On the other hand, when raised with both sexes, mallards select female partners (Schutz, 1965; cited by Bowlby, 1969, p. 163). Sexual imprinting has also been well described in humans (e.g. Aronsson, Lind, Ghirlanda, & Enquist, 2011; Bereczkei, Gyuris, & Weisfeld, 2004; Enquist, Aronsson, Ghirlanda, Jansson, & Jannini, 2011; Nojo, Tamura, & Ihara, 2012). In their study of male zoophiles, Williams and Weinberg (2003) found data showing interspecific sexual imprinting in humans. The first experience was often with an animal (as early as 14 years of age) of the same sex and species that they preferred many years later. Many participants had never had sex with another human (Williams & Weinberg, 2003). Human sexual imprinting that preserves the early acquired preferences for opposite-sex partners or same-sex partners is also a form of critical period learning (Beard et al., 2013; O’Keefe et al., 2014). Because it occurs while the brain is developing (Desmarais, Roeber, Smith, & Pollak, 2012; Fox, Levitt, & Nelson, 2010; Fox & Rutter, 2010; Uylings, 2006), critical period learning also explains the enduring higher interest in sex reported by individuals who begin masturbating while young, as well as by individuals who begin partner sexual experiences while young (Griffee et al., 2014a; Griffee et al., 2014b).

Like imprinting in birds, people attach to their parents (Bowlby, 1969, 1988), even if they are of a race different from their adopting parents. Like sexual imprinting in birds, people sexually imprint on family members or early sexual partners (e.g. Aronsson et al., 2011; Bereczkei et al., 2004; Enquist et al., 2011; Nojo et al., 2012; Williams & Weinberg, 2003). In a process called romantic attachment, people then attach to their sexual partners as adults, (Simpson & Rholes, 1998). When attachment to the biological or adoptive parents has been problematic, the individual’s adult romantic attachment is also negatively affected (Carlson, Alan sroufe, & Egeland, 2004; Henry & Holmes, 1998; Roisman, Collins, Sroufe, & Egeland, 2005; Roisman, Madsen, Henninghausen, Sroufe, & Collins, 2001; Rusby, 2010; Simpson & Rholes, 1998). Pre-adult same-sex crushes, one possible outcome of early romantic attachment, are one of the earliest signs of an emerging same-sex orientation that can persist into adulthood (Bell, Weinberg, & Hammersmith, 1981; Billingham & Hockenberry, 1987; Diamond, 2000, 2002; Hurlock & Klein, 1934; Johnston & Bell, 1995). However, there had not been any successful attempts to elucidate why some people have early same-sex crushes rather than opposite sex crushes. Crushes (Hurlock & Klein, 1934) have also been called passionate friendships (Diamond, 2000), intimate friendships (Diamond, 2002), infatuations (Billingham & Hockenberry, 1987), or romantic emotional attachment (Johnston & Bell, 1995).

3. Biological basis for adult sexual orientations

Humans (*Homo sapiens*), bonobos (*Pan paniscus*), and chimpanzees (*Pan troglodytes*) share approximately 98% of similar DNA. However, human sexual behavior is far more similar to that of bonobos than that of chimpanzees (Anestis, 2004; De Waal & Lanting, 1997; Hashimoto, 1997). Female–female, male–male, and female–male sexual behaviors are prominent among bonobos, and sexual behaviors begin long before sexual maturity is achieved. Evidently, early sexual behavior and the capacity for sexual behaviors with both sexes are ancient evolutionary traits that humans share with bonobos (De Waal & Lanting, 1997; Hashimoto, 1997). Among female bonobos, frequent genital–genital rubbing helps cement friendships and alliances. The same females also engage in coitus with males (Anestis, 2004; De Waal & Lanting, 1997; Hashimoto, 1997). There are several possible reasons why there may be a genetic predisposition in *all* women allowing them to function sexually with other women.

First, it may be that *all* women are potentially capable of expressing an attraction and willingness to interact sexually with other women based on the same mechanisms developed evolutionarily to facilitate males’ mating with females—that are expressed in females to varying degrees depending on their experiences. For an evolutionarily divergent example, cows will ride the hindquarters of

other cows that are in heat, mimicking the behavior expected of a bull. This phenomenon helps farmers time the artificial insemination of cattle (DuPont, 2007). Second, it could be that, as in bonobos, the capacity has conferred a survival advantage to the species. Kuhle and Radtke (2013) have theorized that female sexual fluidity may have provided an evolutionary advantage: by helping women pair up to raise children when they were unable to find the necessary assistance from men.

A closer examination of the theory that *individual* sexual preferences in humans are biologically based (e.g. caused by genetic, endocrine, or birth order differences; Dawood et al., 2009; Hyde, 2005; Mustanski et al., 2002) yields some concerns. First, the report that a “gay gene” had been identified on the X chromosome (Hamer, Hu, Magnuson, Hu, & Pattatucci, 1993) could not be repeated (Rice, Anderson, Risch, & Ebers, 1999) for approximately 20 years, until a much larger sample and genome-wide scan again found evidence of significant, but weak, linkage to chromosome Xq28 and also the pericentromeric region of chromosome 8 (Sanders et al., 2015). The small magnitude of the genetic effects identified was said to preclude the use of a prenatal genetic test for homosexuality (Sanders et al., 2015). Furthermore, the genetic contributions were said to be far from determinant, representing only part of the multifactorial trait’s causation that also appeared to include environmental causes (Sanders et al., 2015). Second, there has been no conclusive evidence that gay men or lesbians have different levels of circulating hormones than heterosexual men or women, respectively (see Mustanski et al., 2002, for review). Third, as mentioned above, Beard et al. (2013) and O’Keefe et al. (2014) have both asserted that evidence for a genetic cause for same-sex orientations based on concordance of identical twins, family studies, or birth order, is vulnerable to confounding by same-sex sibling incest involving the proband and his or her same-sex sibling. That possibility has been ignored despite the investigators having been aware of evidence of a high rate of sibling incest among same-sex twins (e.g. King & McDonald, 1992; Simari & Baskin, 1984). Researchers have continued to cite King and McDonald (1992) as an example of a twin study that had failed to show concordance (e.g. Bailey & Bell, 1993; Bailey, Pillard, Neale, & Agyei, 1993; Dawood et al., 2009; Hershberger, 1997; Mustanski et al., 2002; Schwartz et al., 2010). Yet, they neglected the confounding variable (sibling incest) raised by King and McDonald (1992) as a main point of their article. Unfortunately, a study on the sexual orientations of identical twins raised apart from birth has not been pursued. The studies by Beard et al. (2013) and Stroebel et al. (2013) showed that same-sex sibling incest significantly increased the likelihood that participants would report engaging in adult same-sex behaviors. Same-sex sibling incest also significantly increased the likelihood that participants would self-identify as gay, lesbian, bisexual, or questioning (rather than heterosexual). Same-sex sibling incest would explain concordance between incestuous brother–brother or sister–sister dyads in adult same-sex orientations without any genetic cause being involved (Cameron & Cameron, 1995), no matter whether they were identical twins, fraternal twins, or even non-twin same-sex sibling dyads. In an anonymous computerized study, 8 of 469 male participants with one brother (1.7%) reported sex with the brother (Beard et al., 2013). However, in the data of King and McDonald (1992), 7 of 33 gay or lesbian same-sex twins (21.3%) reported sex with their twin ($\chi^2[1, 502] = 34.02, p < .0001$). This indicates a significantly higher rate of sibling incest among same-sex twin dyads than among non-twin same-sex sibling dyads. A similarly high rate of brother–brother incest (32%) was reported in 25 gay men by Simari and Baskin (1984). Reasons for the high rate of twin sibling incest include being bathed together and sharing a bed for sleeping. These common practices are known risk factors for sibling incest (Griffee, Swindell, et al., 2014). The high likelihood of incest between twins (King & McDonald, 1992) and the effect of same-sex incest on adult orientation (Beard et al., 2013; Stroebel et al., 2013) explains the concordance of sexual orientations between identical twins. The purportedly higher incidence of same-sex orientations in men with older brothers (see Blanchard, 2001; Dawood et al., 2009; Mustanski et al., 2002; Schwartz et al., 2010 for reviews) can be explained by critical period learning (Griffee et al., 2014a; Griffee et al., 2014b). According to that theory, incest between two brothers would have a more profound effect on the younger brother (Beard et al., 2013). The higher incidence may also be explained by other environmental factors (McConaghy et al., 2006). Finally, the earlier onset of puberty in gay men (e.g. Bogaert & Friesen, 2002; Bogaert, Friesen, & Klentrou, 2002; Saghir & Robins, 1973; Savin-Williams, 1995) can be explained by rising levels of testosterone produced by early puberty, the testosterone-driven

increased interest in sex, and sexual behaviors with the only partners to whom they have relatively easy early access (other males, Storms, 1981).

The male victims of sister–brother incest (SBI) reported a counterintuitive increase of same-sex adult orientations and same-sex behaviors (O’Keefe et al., 2014). This peculiarity was explained by the increased interest in sex reported by the child victims of sibling incest. Male victims of SBI were more likely than controls to have experimented with young male partners as children and adolescents (O’Keefe et al., 2014). Those early same-sex experiences were, by their very nature, necessarily conditioning experiences. In addition, the significantly increased incidence of same-sex orientations in the male twins of brother–sister pairs (Bearman & Bruckner, 2002) could be explained by SBI and a mechanism similar to that reported by O’Keefe et al. (2014).

The most obvious reason for the intense interest in whether or not being gay has a biological basis has been the idea that a biological cause provided political help to gay rights advocates. A biological basis implied that being lesbian or gay was not a choice (Brookey, 2001, 2002; Greenberg & Bailey, 1993). This idea explains the timing of the explosion of studies purporting to show a biological basis for same-sex orientations. We hasten to emphasize that the alternative explanation based on early same-sex crushes, conditioning from early experience, sexual imprinting, and critical period learning (Beard et al., 2013; O’Keefe et al., 2014) also implies that being gay is not a choice. Human adult sexual orientation appears to have a nearly indelible nature. Furthermore, the explanation by early crushes, conditioning, critical period learning, and sexual imprinting implies that sexual orientation does not have to be heritable. This suggestion is consistent with the observation that there is no predisposition for children reared by lesbians or gays to self-identify as lesbian or gay, even when the children are the biological offspring of one of the parents (Anderssen, Amlie, & Ytteroy, 2002).

4. Current research objectives

The present study was designed to evaluate the following:

- (1) The effects of early sexual behaviors with partners and early masturbation using images on multiple measures of adult sexual preference and on self-identified adult sexual orientation.
- (2) The effects of early puberty on multiple measures of adult sexual preference and on self-identified adult sexual orientation.
- (3) The effects of having an older same-sex sibling on multiple measures of adult sexual preference and on self-identified adult sexual orientation.
- (4) The effects of sexual behaviors that occurred before the participants reached 18 years of age and adult sexual orientation on the direction of behavior change.
- (5) The effects of early crushes on multiple measures of adult sexual preference and on self-identified adult sexual orientation.
- (6) Statistical predictors for whether early crushes would be primarily on same-sex or opposite-sex individuals.

5. Method

5.1. Participants

A total of 1,242 male participants and 2,201 female participants completed the computer-administered interview. The median age of the males was 21 years ($M = 26.4$, $SD = 11.8$, and range: 18–86 years). The median age of the females was 21 years ($M = 24.7$, $SD = 9.4$, and range: 18–78 years). The education level of the male participants was as follows: 5.9% high school only, 70.9% some college, 14.3% bachelor’s degree, 4.8% master’s degree, and 4.1% doctoral degrees. The education level of the female participants was as follows: 3.0% high school only, 72.6% some college, 17.8% bachelor’s degree, 5.2% master’s degree, and 1.5% doctoral degrees. All participants were over the age of 18 and gave informed consent using forms approved by the relevant institutional review board. The participants

were recruited from a population consisting mainly of undergraduate and graduate college students from six mid-sized, mid-Atlantic college campuses using bulletin board postings and announcements in classes between 2002 and 2012. To obtain a wider base and to increase diversity, we also recruited university faculty and staff, as well as individuals from the same general population who had already completed their education. We included all individuals who were 18 years old or older who were willing to participate in the study after being provided with information about the risks and benefits of the study. The announcement processes were slightly different on each of the campuses. The individual professors typically made announcements to their classes. However, in some cases, the investigators were invited into classes to make the announcements. To increase the number of sexual minority individuals who participated in the study, we attended “Pride” parades and gay and lesbian picnics and worked with gay and lesbian churches and other organizations friendly to sexual minority individuals. Whenever individuals agreed to participate, we encouraged them to bring along friends to participate or to encourage their friends to participate (snowball recruiting). All participants were unpaid, but many of the students received extra credit. Moreover, all participants were volunteers.

5.2. Measures

The CASI program (S-SAPE1, ©S-SAPE, LLC, 2002, P.O. Box 11081, Charleston, WV 25339), the initial scale validation, and some of the items used in the present study have been described by Beard et al. (2013) and O’Keefe et al. (2014) based on subsets of the participants included in the present study. Scale evaluations are also provided below for the full set of participants included in the present paper (see Appendix A for items used in the present research). Items from S-SAPE1©S-SAPE, LLC (in quotes in text, tables and Appendix A) were produced by permission of S-SAPE, LLC, 2002, P.O. Box 11081, Charleston, WV 25339. Permission to reuse must be obtained from the rights holder.

5.2.1. The male sexual orientation scale

We summed the data from 12 of the components in Table 9 of Beard et al. (2013) and Table 1 of the present paper to obtain the total score for the male sexual orientation scale (MSOS). In the male participants, the MSOS alpha was .9600; 82.0% of the 1,242 male participants had scores of zero, 90.3% had scores less than 3, and 95.2% had scores of less than 10. In the female participants, the MSOS alpha was .7016; 9.1% of the 2,201 female participants had scores less than 4, and 14.4% had scores of less than 5. Four of the items (Numbers 1, 5, 6, and 8) can be selected in both the MSOS and the female sexual orientation scale (FSOS). The eight other items can only be scored as “1” on either the MSOS or the FSOS, but not in both scales. Those choices were presented as competing superlatives, meaning that a participant with a score of 12 on one of the two scales could achieve (at most) a scale of four on the other scale.

5.2.2. The female sexual orientation scale

We summed the data from the 12 analogous components in Table 9 of Stroebel et al. (2013) and Table 1 of the present paper to obtain the total score for the FSOS. In the male participants, the FSOS alpha was .8367; 3.5% of the 1,242 male participants had scores of zero. Conversely, 96.5% had scores of greater than zero, 96.6 had scores greater than one, and 92.0% had scores greater than two. In the female participants, the FSOS alpha was .8576; 64.1% of the 2,201 female participants had scores of zero; 91.5% had scores less than 5, and 95.5% had scores less than 7. Conversely, 8.5% had scores of greater than 4, 6.0% had scores greater than 5, and 4.5% had scores greater than 6.

5.2.3. Percent male sexual orientation scale

We created a function that converted the MSOS and FSOS scores into a single mathematical function with male and female sexual orientations on opposite ends of the scale. The function also upwardly adjusted the scores of those who had not yet become sexually active with partners of either sex. We used the following equation to calculate what percent the male–male sexual orientation scale score was of the total male–male and male–female sexual orientation scale scores (PM-SOS): $PM-SOS = 100 \times MSOS / (MSOS + FSOS)$. The value of the PM-SOS was set to “missing data” for the four male participants and the 20 female participants whose MSOS and FSOS scores were both zero. Of

Table 1. Components for FSOS and MSOS adult sexual orientation scales and the frequency of answers among the participants

Components worded for FSOS	Choices ^a	Males		Females	
		FSOS	MSOS	FSOS	MSOS
		Yes ^b (%)	Yes ^b (%)	Yes ^c (%)	Yes ^c (%)
Cheated on her spouse or long-term partner by having sex with women ^d	2	20.6	6.4	3.3	13.5
Sexual fantasy involving an adult female ^d partner is the fantasy topic that best facilitates orgasm while with a favorite partner	5	68.1	6.8	9.2	52.9
Sexual fantasy involving an adult female ^d partner is the fantasy topic that best facilitates orgasm while masturbating	5	84.4	2.8	11.3	55.5
Sexual dreams are usually about experiences with a female ^d adult	5	88.3	7.9	6.5	79.8
Has masturbated while looking at images of adult women ^c	2	74.2	11.6	17.0	21.5
Has engaged in voyeurism directed at women ^d	2	51.7	9.1	9.5	23.2
Most sexually arousing picture: female ^d adult	5	89.7	8.0	20.5	66.1
Engaged in sexual relations of any kind with an adult female ^d	2	78.3	9.7	13.9	83.7
When watching people on the street, his eye is most likely to be caught by an adult female ^d	5	87.8	7.8	9.0	81.4
Currently living with a female long term partner ^e	3	22.9	2.2	2.0	25.7
Favorite type of sex partner is a female ^d	3	89.9	7.3	4.6	91.9
Favorite type of sex partner is an adult female ^d	5	89.5	2.5	5.1	91.5

^aThe number of potential choices from which the participants were able to select their answer. The two-choice items were presented agree/disagree (or yes/no for behavior participation), and the MSOS and FSOS items were different items. The three-choice items offered adult male or female choices scored 0/1 and presented a third choice denying that they were living with a sex partner or had any interest in partner sex scored “0”. The five-choice items offered adult male or female choices (scored 0/1) and in addition they offered male children, female children, and a fifth choice denying that they had such an experience or interest (with the latter three all scored “0”).

^bThe percent are for those among the 1,242 participants agreeing with the statement, engaging in the behavior, or selecting the choice. The corresponding percent for “not” can be found by subtraction.

^cThe percent are for those among the 2,201 participants agreeing with the statement, engaging in the behavior, or selecting the choice. The corresponding percent for “not” can be found by subtraction.

^dFor the MSOS substitute “male” or “men” for “female” or “women”, respectively.

^eFor the MSOS substitute “male.”

the 1,237 male participants whose scores could be calculated, 81.9% had a score of zero, 90% had scores under 20, and 95% had scores under 90. Conversely, 10% had scores of 20 or above, and 5% had scores of 90 or above. Five percent of the 1,237 male participants had scores between 20 and 90 that were consistent with being classified as bisexual. Of the 2,181 female participants whose scores could be calculated, 63.8% had scores of 100; 90.2% had scores over 60, and 95.3% had scores over 38.5. Conversely, 9.8% had scores of 60 or lower, and 5.2% had scores of 40 or lower. Four percent of the 2,181 female participants had scores between 40 and 60 that were consistent with being classified as being bisexual. Ours is the first study to use the PM-SOS.

5.2.4. Behavioral sexual orientation scale

We used the number of times that the respondent reported having adult partners after reaching 18 years of age to define the behavioral sexual orientation scale (BSOS, Bickham et al., 2007). We calculated the behavioral sexual orientation scale (%) as 100 times the number of times that the respondent reported engaging in sexual behaviors of any kind with all adult male partners (SBAMP)

during adulthood divided by the total number of times that the respondent reported engaging in sexual behaviors of any kind with all adult male (SBAMP) and with all adult female partners (SBAFP) during adulthood: $(100 \times \text{SBAMP} / [\text{SBAMP} + \text{SBAFP}])$. The maximum for all behavior entries was 999, with the directions instructing participants to enter 999 for 999 or more. A participant reporting sexual behaviors with only male partners would have a score of 100%. In contrast, a participant reporting sexual behaviors with only female partners would have a score of 0. The BSOS is only defined for participants who have engaged in sexual behavior with a partner as adults. As such, data were available for only 1,014 of the 1,242 male participants for the BSOS. Of those 1,014 participants, 88.1% had a BSOS of zero, and, conversely 11.9% had a BSOS greater than zero. Of those 1,014, 90.1% had a BSOS less than 4.76. For the same reasons, data were available for only 1,882 of the 2,201 female participants for the BSOS. Of those 1,882 participants, 83.7% had a BSOS of 100, and, conversely 16.3% had a BSOS less than 100. Of those 1,882, 9.8% had a BSOS less than 98 and 5% had a BSOS of less than 81.1.

5.2.5. Self-identified sexual orientation

The item presented to the participants and the initial coding was as follows: “The best way to describe how open and honest I am about my sexual preference is: (1) All my friends and family know that I am straight, and that is what I am. (2) All my friends and family know that I am gay, lesbian, bisexual, or trans-gendered, and that is what I am. (3) Some of my friends or family still think that I am straight, but actually I know that I am really gay, lesbian, bisexual, or trans-gendered. (4) My friends and family mostly think that I am straight, but I am really mixed up about whether I am straight or gay, lesbian, bisexual, or trans-gendered. (5) I have no sexual preference, and I have never engaged in any sort of sex with a partner.” The self-identified sexual orientation item was added to the survey program after the first 238 male participants and the first 430 female participants had completed their participation in the study. As such, data on self-identified sexual orientation were available for only a subset of 1,004 of the male participants and a subset of 1,771 of the female participants. For use in the present study, the entries were recoded to create two additional variables for each participant. The binary-dependent variable for the male participants (Gay or Bisexual) was created by recoding four to one. All other entries were recoded to zero (Not Gay or Bisexual). The binary-dependent variable for the female participants (Lesbian or Bisexual) was created by recoding four to one. Again, was all other entries were coded “0” (Not Lesbian or bisexual). For all participants, a three-level nominal variable was created by recoding one to “Heterosexual” two through four to “Gay or Bisexual,” and five to “No Preference Indicated.”

5.3. Crush items

(A) “The best way to describe the genders of the individuals outside my family that I had crushes on (or was in love with) before I hit puberty is: (1) only boys or adult men before I hit puberty (2) only girls or adult women before I hit puberty (3) mostly boys or adult men but some girls or adult women before I hit puberty (4) mostly girls or adult women but some boys or adult men before I hit puberty (5) I never had crushes on anybody outside my family before I hit puberty.”

(B) Item B was identical to Item A except that the phrase “before puberty” was replaced with “after puberty”.

(C) “As a child I always seemed to have a crush on one female or another.”

(D) “As a child I always seemed to have a crush on one male or another.”

Item C and item D were each presented as agree/disagree. For item A and item B, the numbers in parentheses represent the initial coding. To create a total of four binary variables, items A and B were each recoded as follows to produce a total of four binary variables. For the first two binary variables, one and three were recoded to one; all other entries were recoded to zero to code for “mostly males.” For the second two binary variables, two and four were recoded to one; all other entries were recoded to zero to code for “mostly females.” The four crush items were added to the survey program after the first 128 male participants and the first 236 female participants had filed their data.

As such, data on crushes were available for only a subset of 1,114 of the male participants and a subset of 1,965 of the female participants.

5.3.1. *Content validity*

All items for the survey were carefully reviewed and approved by four doctoral-level experts in the field: a psychiatrist trained in psychotherapy, a social worker trained in psychotherapy, a psychologist, and a gynecologist who also trained in psychology.

5.4. **Procedure**

The present study was part of a larger study entitled: “Effects of Recalled Family Attitudes and Childhood Sexual Experiences on Adult Sexual Attitudes and Adjustment.” The institutional review boards at Marshall University, Charleston Area Medical Center/West Virginia University, West Virginia University, West Virginia State University, and Concord University approved this study. All 1,242 male participants and 2,201 female participants were over the age of 18 and gave informed consent using printed forms approved by the relevant institutional review board. Potential participants were invited to participate in a *cradle to the grave study on human sexuality*. No reference to incest was made during the promotion of the study. The research was conducted using the S-SAPE1 computerized anonymous survey instrument (Beard et al., 2013; O’Keefe et al., 2014). Surveys were administered in university computer laboratories that had up to 45 computers to a room. Each room allowed sufficient space between participants so that others were not in a position to see their computer screens. Anonymity was protected by electronic randomized filing of the encrypted results in a hidden random access file filled with fake data as well as simultaneous filing of many fake decoy lines. Decoding was performed on the file containing all respondent’s randomly filed encrypted data. In a 10-min orientation, participants were informed of these protections to their anonymity. It was explained that the S-SAPE1 computerized anonymous survey instrument was designed to obtain a history of sexual experiences and behaviors. Again, participants were informed that they could withdraw from the study at any time they wished. They were then informed about the operation of the screen that presented the sexual behavior items and the sexual behavior subitems. Participants were informed that, for each behavior, they would be asked whether a brother or sister or a mother or a father had been a partner. Items related to incest were presented interspersed among similar items not related to incest. Variables describing behaviors that constituted CSA by adult female and adult male partners were constructed by the computer program to ensure that they were worded similarly to those previously presented that described the same behaviors with female or male partners (a) whose age was within 4 years of the participant’s and (b) whose age was more than 4 years older than the participant’s but under age 18. Similarly, worded items describing sexual behaviors with partners more than 4 years younger were presented after all of the above items had been presented.

5.4.1. *Selection of participants for the study*

From the records of all 1,283 male potential participants available in the database, we selected all 1,242 men who were not transgender. The 41 transgender men were *excluded*, because at the time that the early sexual behaviors occurred, they were genetic and anatomical females. Any sexual behaviors with a sister would have constituted sister–sister incest (SSI), and any sexual behavior with a brother would have constituted brother–sister incest. Similarly, any sexual behavior with an adult would have constituted CSA of an underage female victim by an adult perpetrator. From the records of all 2,258 female potential participants available in the database, we selected all 2,201 women who were not transsexual. The 57 transsexual women were *excluded* because, at the time that the early sexual behaviors occurred, they were genetic and anatomical males. Any sexual behaviors with a sister would have constituted SBI, and any sexual behavior with a brother would have constituted brother–brother incest. Similarly, any sexual behavior with an adult would have constituted CSA of an underage male victim by an adult perpetrator.

6. **Results**

Because of the well-established statistically significant differences in the interest in sex between men and women (Baumeister, Catanese, & Vohs, 2001; Griffee et al., 2014a; Griffee et al., 2014b using data

based on the same participants in the present study), we analyzed the data from the two sexes separately.

6.1. Male participants

Of the 1,242 male participants, 638 reported “sex of any kind” with females of any age before themselves reaching 18 years of age (126 with adult females and 602 with females under 18 years of age). The behavior started at a median of 15 years of age. The 28 who had participated in incest with a sister reported having their first early sexual experience of any kind with a female starting at a mean age that was five years earlier than that of those who did not participate in sex with a sister ($p < .001$). “Sex of any kind” with males of any age (before reaching 18 years of age) was reported by 169 male participants (31 with adult males and 164 with males under 18 years of age). The behavior started at a median of 11 years of age (Table 2). There were 95 male participants who had participated in sex of any kind with both male and female partners before reaching 18 years of age. Sex of any kind with male partners had preceded sex of any kind with female partners by 1.2 ± 4.5 years ($p = .009$ by paired t -test).

Of the 1,242 male participants, 998 reported having masturbated using images of females before 18 years of age. The behavior began at a median of 13 years of age. One hundred and thirty reported having masturbated using images of males before 18 years of age. The behavior began at a median of 14 years of age (Table 2). There were 87 participants who had engaged in masturbating using both male and female images before reaching 18 years of age. Masturbating using female images had preceded masturbating using male images by $.89 \pm 1.25$ years ($p < .001$). There were 582 participants who had participated in sex of any kind with female partners and who had also masturbated using female images. Masturbating using female images had preceded sex of any kind with female partners by $.52 \pm 3.12$ years ($p < .001$). There were 77 participants who had participated in sex of any kind with male partners and who had also masturbated using male images. Sex of any kind with male partners had preceded masturbating using male images by 2.9 ± 3.7 years ($p < .001$).

6.1.1. Pearson correlation analysis of the data from the male participants

The Pearson correlation analysis (Table 3) showed that the MSOS, the BSOS, the PM-SOS, and the self-identified sexual orientation were all significantly positively correlated with the primary predictor variables describing masturbating using male images and sexual behaviors with males before reaching 18 years of age. The MSOS, the BSOS, the PM-SOS, and the self-identified sexual orientation were all significantly negatively correlated with the parallel primary predictor variables describing masturbating with female images and sexual behaviors with female partners. Pearson correlation analysis of the data from the male participants showed that the MSOS, the MSOS, the PM-SOS, and the self-identified sexual orientation were all also significantly positively correlated with the each of the five cross products of the primary variables that included either masturbating using male images or sex of any kind with a male partner or both (variable numbers 12–13 and 15–17 in Table 3). These findings indicated that the male-related behavior was statistically dominant over the female-related behavior in each such case at the level of the Pearson correlation. The sole negative correlation of the MSOS, the MSOS, the PM-SOS, and the self-identified sexual orientation with a cross product was with variable number 14 in Table 3 (the cross product between the variables describing masturbating using female images and sex of any kind with a female partner). Also, note that none of the seven potential predictors related to the number of male or female siblings (variable numbers 18–24) were significantly correlated with MSOS, the MSOS, the PM-SOS, or the self-identified sexual orientation. The age at first orgasm (a measure of the age at which puberty occurred) was significantly negatively correlated with the MSOS, the MSOS, the PM-SOS, and the self-identified sexual orientation.

6.1.2. Predictive effects of early partnered behaviors and early masturbation using images in men

Stepwise regression procedures limited to predictor variable numbers 8–17 in Table 3 arrived at four multiple regression statistical models. The first model was for predicting the participants’ adult male–female sexual orientation as measured by FSOS (Model number 1M, Table 4). The second model was for predicting the participants’ adult male–male sexual orientation as measured by the MSOS (Model

Table 2. Earliest ages for sex with male and female partners and masturbation using male and female images that occurred prior to 18 years of age in those who did and did not participate in SSI or SBI

Variables	Female participants						Male participants					
	SSI			Number of SSI (controls)			SBI			Number of SBI		
	N	Mdn	M ± SD	N	Mdn	M ± SD	N	Mdn	M ± SD	N	Mdn	M ± SD
Sex with												
Female partners	38	7*	6.9 ± 2.2	421	11	10.8 ± 3.9	28	8.5	8.9* ± 4.1	610	15	13.9 ± 3.0
Male partners	26	11**	10.8 ± 4.6	1,199	15	13.7 ± 3.4	13	8.0	9.0** ± 3.6	156	11	10.6 ± 3.9
Masturbation using												
Female images	11	12***	12.6 ± 3.4	290	15	14.2 ± 2.4	24	13	12.9*** ± 2.5	974	13	13.3 ± 2.0
Male images	17	15***	13.6 ± 3.2	422	15	14.5 ± 2.1	4	13	13.0** ± 2.3	126	14	13.9 ± 1.8

* $p < .001$ by Mann-Whitney U test.

** $p = .003$ by Mann-Whitney U test.

***Not statistically significant.

number 2M, Table 4). The third model was for predicting the participants' adult sexual orientation as measured by the PM-SOS (Model number 3M, Table 4). The fourth model was for predicting the participants' adult sexual orientation as measured by the Behavioral Sexual Orientation Scale (Model number 4M, Table 4). The predictors included in the four models were different because they were selected solely based on their predictive power for the four different dependent variables.

6.1.3. Model number 1M, the male–female sexual orientation scale in men

The constant term of 7.019 in Model number 1M indicated that participants who had not reported early experience with female or male partners had a strong tendency to develop a male–female sexual orientation as a default outcome. This finding suggested that the “heterosexual” bias of the culture in which they developed did have a strong influence on their adult male–female sexual orientation. The fifth predictor in Model number 1M included the early sexual experience of the 638 participants with female partners of any age. That observation implied that any sexual experience with a female partner tended to produce conditioning of an adult male–female sexual orientation (positive sign of the regression coefficient). Model number 1M showed negative regression coefficients for predictors one and four (the two predictors exclusively describing masturbating using male images and sex with male partners). That finding provided evidence for reduction in the male–female orientation by early experiences with male partners. The positive sign of predictors three and six in Model number 1M (the cross products involving masturbation using female images and sexual experiences with female partners, respectively) provided evidence that counterconditioning reduced the inhibitory effect of masturbating using male images on the participants' male–female sexual orientation.

6.1.4. Model number 2M through Model number 5M

The sign of each regression coefficient in Model number 2M through Model number 5M (four separate models) for a primary variable related exclusively to sexual behaviors with male partners or masturbating using images of males was positive. The sign of each regression coefficient related to sexual behaviors with females or masturbating using female images and cross products with such a variable was negative. The two exceptions were the positive signs of predictor 8 in Model number 2M and predictor 8 in Model number 3M (the cross product between sex with female and sex with males). Predictor 8 was the weakest predictor in both models as demonstrated both by the fact that

it was the last variable chosen for inclusion in the model and by the fact that it had the lowest effect size, as measured by the partial η^2 statistic.

6.1.5. Evaluation of the four covert measures of adult sexual orientation as predictors of the self-identified sexual orientation in men

Based on the 812 cases with no missing data for any of the four measures, the order of decreasing predictive power for the self-identified sexual orientation was MSOS, PM-SOS, MSOS, and FSOS.

The findings in Model number 2M through Model number 5M provided unequivocal evidence supporting the idea that early sexual behaviors (actual or covert) with male partners tended to condition an adult male–male sexual orientation and that analogous early sexual behaviors with female partners tended to inhibit development of an adult male–male sexual orientation in that participant. These findings also provided strong evidence (in the three cross products involving sexual experiences with female partners or masturbating using images of females) of counterconditioning produced by these two behaviors. Because the constant term (or Y-intercept) provides an estimate of what the scale value was for all participants who reported *not* engaging in *any* of the behaviors used as predictors, the small size of the constant term in Model number 2M (.567) relative to that for Model number 1M was consistent with the idea that the heterosexual bias of the societies (in which our participants developed) provided little impetus to developing a same-sex orientation when conditioning was not available from actual or covert sexual experiences with same-sex partners.

As shown by first two odds-ratios in Model number 5M, associations between endorsing being gay or bisexual as an adult and masturbating using images of males or sex of any kind with male partners before reaching 18 years of age were both *strong* with adjusted odds-ratios of 32 and 17, respectively. We looked at the data from the 1,004 participants included in Model number 5M on a case-by-case basis for the 103 who did and the 901 who did not endorse being gay or bisexual as adults. Sixty-eight % vs. 3.9% had masturbated using images of males. Sixty-one % vs. 8.1% had engaged in sex of any kind with males. Fifty-two % vs. 82.7% had masturbated using images of females. And, 27.2% vs. 7.2% had both masturbated using images of males and engaged in sex of any kind with females. These data were consistent with a multi-causal model since neither masturbating using images of males nor participating in sex of any kind with male partners occurred in every endorsing case. Furthermore, one behavior or the other occurred in only 80.6% of the endorsing cases vs. 10.5% of the non-endorsing cases. Our data were consistent with the idea that engaging in one or both of these behaviors before reaching 18 years of age may have explained the adult sexual identity of 80% of those endorsing being gay or bisexual as adults. It is also possible (and even likely) that some of the formative events did occur after the participants had reached 18 years of age. When we included masturbating using images of males and engaging in sex of any kind with males *before or after* reaching 18 years of age, 90.3% vs. 13.0% had engaged in at least one of the behaviors. This left 9.7% of the adult self-identified sexual gay or bisexual orientations unexplained.

6.1.6. Predictive power of masturbating using human images and engaging in sex with partners in men

We used the Pearson correlation analysis to evaluate the correlations of each of the five measures of adult sexual orientation with a total of 16 potential predictors. The 16 predictors were the 0/1 dummy variable indicating whether or not the behavior occurred, the earliest (age), the latest (age), and the number of times that participants engaged in masturbating using male or female images and the earliest, the latest, and the number of times that participants engaged in sex of any kind with male or female partners (data not shown). It was possible to make several generalizations about the relative sizes of the correlation coefficients in Table 3. First, the correlation coefficients of the latest age that participants engaged in each behavior were more highly correlated with each of the five measures of adult sexual orientation than was the corresponding 0/1 dummy variable measuring whether the behavior had occurred. Second, the latest ages that participants engaged in each behavior were more highly correlated with each of the five measures of adult sexual orientation than was the corresponding variable measuring the number of times that the behavior had

Table 3. Correlations among the variables in the male participants

Variable	1 ^a	2 ^a	3 ^b	4 ^c	5 ^d	6 ^e	7 ^f
Female sexual orientation scale ^a	1	-.736***	-.789***	-.827***	-.669***	-.631***	-.298**
Male sexual orientation scale ^a	-.736***	1	.975***	.905***	.865***	.687***	.322**
Male-male sexual orientation as percent of total male-male and male-female scale scores ^b	-.789***	.975***	1	.923***	.863***	.677***	-.324**
Behavioral sexual orientation scale ³	-.827***	.905***	.923***	1	.815***	.673***	.251*
Self-identified sexual orientation ^d	-.669***	.865***	.863***	.815***	1	.455***g	.156 ns ^h
Latest sex with a male—latest with a female ^e	-.631***	.687***	.677***	.673***	.455***	1	-.001ns ⁱ
Latest masturbation using male images—latest using female images ^f	-.298**	.322**	.324**	.251*	.156ns	-.001ns ⁱ	1
Masturbation while viewing images of adult women before reaching 18 ^a	.425***	-.273***	-.305***	-.318***	-.235***	-.199ns	.085ns
Masturbation while viewing images of adult men before reaching 18 ^a	-.535***	.690***	.686***	.663***	.635***	.536***	.153ns
Sex of any kind with a female before reaching 18 ^a	.240***	-.100***	-.124***	-.124***	-.104***	-.053ns	-.046ns
Sex of any kind with a male before reaching 18 ^a	-.306***	.532***	.507***	.476***	.470***	.143ns	.014ns
Cross product: variables ^a 10 × 11	-.103***	.292***	.259***	.253***	.263***	.029ns	-.007ns
Cross product: variables ^a 8 × 9	-.258***	.367***	.352***	.342***	.379***	.256*	.171ns
Cross product: variables ^a 8 × 10	.296***	-.162***	-.177***	-.190***	-.151***	-.169ns	-.032ns
Cross product: variables ^a 8 × 11	-.057*	.238***	.216***	.184***	.209***	-.041ns	.041ns
Cross product: variables ^a 9 × 10	-.225***	.359***	.331***	.354***	.340***	.266*	.016ns
Cross product: variables ^a 9 × 11	-.523***	.687***	.671***	.670***	.589***	.393**	.097ns
Total number of older brothers and sisters ^a	-.075**	.045ns	.036ns	.014ns	.014ns	-	-
Number of older sisters ^a	-.080**	.052ns	.045ns	.022ns	.023ns	-	-
Number of older brothers ^a	-.033ns	.014ns	.008ns	-.002ns	-.003ns	-	-
Total number of brothers ^a	-.016ns	.011ns	.003ns	.018ns	-.006ns	-	-
Total number of sisters ^a	-.041ns	.045ns	.036ns	.006ns	.006ns	-	-
Total siblings ^a	-.038ns	.038ns	.026ns	.016ns	.000ns	-	-
At least one older brother coded 0/1 ^a 6589	-.022ns	-.005ns	-.008ns	-.017ns	-.010ns	-	-
Age at first orgasm with “never” coded missing	-.019ns ⁱ	-.103***j	-.091**	-.093***k	-.094***l	-	-

Notes: ns denotes not significant and “-” denotes not tested.

^aN = 1,242, ^bN = 1,014, ^cN = 1,237, ^dN = 1,004, ^eN = 78, ^fN = 83, ^gN = 56, ^hN = 67, ⁱN = 33, ^jN = 1,224, ^kN = 1,010, ^lN = 987. Unless indicated by a superscript number, the lesser of the N for columns and rows provides the N for the correlation coefficient placed in the cell in the intersection of each column and row.

*p < .05.

**p < .01.

***p < .001.

occurred. Third, only one of the above 80 Pearson correlation coefficients with a measure of adult sexual orientation was not statistically significant. The number of times that participants engaged in sex with female partners before reaching 18 years of age was not significantly correlated with their adult self-identified sexual orientation. It was not included among the potential predictors for constructing the statistical models described below. We used a stepwise approach to construct a separate statistical model for predicting each of the five measures of adult sexual orientation. We limited

Table 4. Predicting the adult sexual orientations of the male and female participants from early behaviors

Five models for male participants

<i>Model number 1M: Male–female sexual orientation scale, AdjR² = .472, N = 1,242</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Masturbating using male images	-5.006	.444	<.001	.093	10.5
Masturbating using female images	1.897	.163	<.001	.098	80.4
Masturbating using female images × masturbating using male images	2.288	.436	<.001	.022	7.0
Masturbating using male images × sex with males	-2.414	.379	<.001	.032	6.2
Sex with females	.568	.126	<.001	.016	51.4
Masturbating using male images × sex with females	1.054	.400	.008	.006	4.2
Constant	7.109	.145	<.001	.661	-
<i>Model number 2M: Male–male sexual orientation scale, AdjR² = .638, N = 1,242</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Masturbating using male images	6.015	.402	<.001	.154	10.5
Masturbating using female images × masturbating using male images	-2.532	.422	<.001	.028	7.0
Sex with males	2.441	.386	<.001	.031	13.6
Masturbating using female images × sex with males	-2.024	.395	<.001	.021	9.7
Masturbating using male images × sex with males	2.036	.357	<.001	.026	6.2
Masturbating using female images	-.467	.128	<.001	.011	80.4
Masturbating using male images × sex with females	-1.286	.356	<.001	.011	4.2
Sex with females × sex with males	.901	.310	.004	.007	7.6
Constant	.567	.116	<.001	.019	
<i>Model number 3M: Percent male–male sexual orientation scale, AdjR² = .637, N = 1,237</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Masturbating using male images	62.763	3.758	<.001	.185	10.5
Masturbating using female images × masturbating using male images	-28.778	3.942	<.001	.042	7.0
Sex with males	17.738	3.608	<.001	.019	13.7
Masturbating using female images	-6.283	1.207	<.001	.022	80.7
Masturbating using male images × sex with males	16.919	3.340	<.001	.020	6.2
Masturbating using male images × sex with females	-14.910	3.324	<.001	.016	4.2
Masturbating using female images × sex with males	-13.331	3.694	<.001	.010	12.8
Sex with females × sex with males	6.572	2.902	.024	.004	7.7
Constant	7.094	1.097	<.001		
<i>Model number 4M: Behavioral sexual orientation scale, AdjR² = .575, N^d = 1,014</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Masturbating using male images × sex with males	20.721	3.968	<.001	.026	6.2
Masturbating using male images	51.788	4.820	<.001	.103	10.5
Masturbating using female images × masturbating using male images	-22.438	4.837	<.001	.021	7.0
Masturbating using female images	-6.323	1.556	<.001	.016	80.4
Sex with males	16.469	4.026	<.001	.016	13.6
Masturbating using female images × sex with males	-10.737	4.271	.012	.006	9.7

(Continued)

Table 4. (Continued)

Masturbating using male images × sex with females	-8.374	3.341	.012	.006	4.2
Constant	6.454	1.435	<.001	.020	
<i>Model number 5M: Self-identified sexual orientation, Nagelkerke R² = .560, N^e = 1,004 (logistic regression model)</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Odds-ratio	<i>n</i> ₁ % ^b
Masturbating using male images	3.479	.326	<.001	32.415	10.5
Sex with males	2.855	.564	<.001	17.378	13.5
Masturbating using female images	-1.188	.387	.002	.305	79.5
Masturbating using female images × sex with males	-1.554	.685	.023	.211	9.3
Constant	-2.781	.315	<.001		
Five Models for Female Participants					
<i>Model number 1F: Female-female sexual orientation scale, AdjR² = .299, N = 2,201</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> ₁ % ^c
Ever masturbated using female images	3.320	.225	<.001	.090	13.7
Ever sex with females	2.251	.185	<.001	.063	20.9
Ever masturbated using female images × ever masturbated using male images	-1.354	.268	<.001	.011	10.5
Ever masturbated using male images × ever sex with females	-.632	.204	.002	.004	7.7
Ever sex with females × ever sex with males	-.552	.192	.004	.004	15.5
Constant	.471	.044	<.001		
<i>Model number 2F: Female-male sexual orientation scale, AdjR² = .109, N = 2,201</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> ₁ % ^c
Ever masturbated using male images	2.193	.222	<.001	.043	19.9
Ever sex with males	.977	.106	<.001	.037	55.7
Ever masturbated using female images × Ever sex with females	-1.042	.257	<.001	.007	7.1
Ever masturbated using male images × ever sex with males	-.954	.252	<.001	.006	13.4
Ever masturbated using female images	-1.200	.309	<.001	.007	13.7
Ever masturbated using female images × ever masturbated using male images	.829	.348	.017	.003	10.5
Constant	6.165	.078	<.001		
<i>Model number 3F: Percent female-male sexual orientation scale, AdjR² = .275, N = 2,181</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> ₁ % ^c
Ever sex with females	-24.859	1.858	<.001	.076	21.0
Ever masturbated using female images	-31.497	2.261	<.001	.082	13.8
Ever masturbated using female images × ever masturbated using male images	14.020	2.688	<.001	.012	10.6
Ever sex with females × ever sex with males	8.751	1.925	<.001	.009	15.7
Ever masturbated using male images × ever sex with females	7.934	2.046	<.001	.007	7.7
Constant	94.738	.446	<.001		
<i>Model number 4F: Behavioral sexual orientation scale, AdjR² = .054, N^d = 1,882</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> ₁ % ^c

(Continued)

Table 4. (Continued)

Ever sex with females	-17.540	1.850	<.001	.046	22.7
Ever sex with females × ever sex with males	11.663	1.976	<.001	.018	17.3
Ever masturbated using female images × ever sex with males	-4.982	1.472	.001	.006	10.3
Ever masturbated using male images × ever sex with females	5.723	1.818	.002	.005	8.2
Constant	97.983	.451	<.001		
<i>Model number 5F: Self-identified sexual orientation, Nagelkerke R² = .212, N^e = 1,771 (logistic regression model)</i>					
Behaviors before 18 years of age and their cross products used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Odds-ratio	<i>n</i> ₁ % ^b
Ever masturbated using male images × ever sex with females	-.838	.281	.003	.433	8.0
Ever sex with females	1.881	.194	<.001	6.558	20.7
Ever masturbated using female images	1.567	.210	<.001	4.793	13.7
Constant	-3.068	.128	<.001		

^aPredictors are listed from top to bottom in order of decreasing predictive power as determined by the order of stepwise addition to the model.

^bEffect size as measured by the partial *Eta*².

^c*n*₁% is the percent of participants who engaged in the behavior (or in both behaviors for cross products).

^d*N* was reduced for the behavioral sexual orientation score because it could not be calculated for participants who had not been sexually active with partners as adults.

^e*N* was reduced for the self-identified sexual orientation because the self-identified sexual orientation item was added to the survey program after the first 238 male participants and the first 430 female participants had completed their participation.

order is also the order of decreasing effect size for Model number 6M, through Model number 9M, as measured by the partial *Eta*². In Model number 6, all four predictors were latest-age variables. In Model number 7M through Model number 10M, the first three of the four predictors were all latest-age variables. These observations showed that latest-age variables accounted for the lion's share of the variance explained by each of the five statistical models.

The latest age that participants had masturbated using male images before reaching 18 years of age was the most powerful predictor for each of the five measures of sexual orientation (Model number 6M through Model number 10M in Table 5). The sign of the regression coefficient was negative in Model number 6M (predicting the FSOS). The sign of the regression coefficient was positive in Models numbers 7M–10M which predict the MSOS, the MSOS, the PM-SOS, and the self-identified sexual orientation, respectively. The negative sign for the regression coefficient in Model number 6M would be expected from counterconditioning produced by masturbating using male images since the later in life masturbating using male images was continued, the lower the FSOS would be expected to be. On the other hand, higher scores on MSOS, the PM-SOS, the BSOS, and the self-identified sexual orientation all indicate higher degrees of male–male orientation, so the positive sign for the regression coefficient in Models number 7M through 10M would be expected from male–male conditioning produced by masturbating using male images. This is because the later in life the masturbating using male images was continued, the higher each score would be expected to be.

6.1.7. Examination of the data for evidence of critical period learning in men

The variables describing the latest ages that participants had engaged in each of the four behaviors before reaching the age of 18 were more highly correlated with the five measures of adult sexual orientation than the respective 0/1 dummy variables indicating whether the participants had or had-not engaged in the behavior. This finding was consistent with the “latest age” variables containing additional predictive information about the values of the five measures of adult sexual orientation. Based on the idea that critical period learning was an important factor and that the effect of each behavior was due to the combined actions of classical and operant conditioning, we tested the

Table 5. Predicting the adult sexual orientations of the male and female participants from latest ages participants engaged in behaviors

Models number 6M–number 13M for male participants

<i>Model number 6M: Male–female sexual orientation scale, AdjR² = .442, N = 1,242</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	B	SE	p	Effect size ^b	n _{1%} ^c
Latest age that participant masturbated using male images	-.232	.013	<.001	.198	10.5
Latest age that participant masturbated using female images	.138	.009	<.001	.153	80.4
Latest age that participant engaged in sex of any kind with a female	.038	.007	<.001	.021	51.4
Latest age that participant engaged in sex of any kind with a male	-.057	.014	<.001	.014	13.6
Constant	6.781	.141	<.001		
<i>Model number 7M: Male–male sexual orientation scale, AdjR² = .603, N = 1,242</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	B	SE	p	Effect size ^b	n _{1%} ^c
Latest age that participant masturbated using male images	.224	.013	<.001	.204	10.5
Latest age that participant engaged in sex of any kind with a male	.161	.011	<.001	.145	13.6
Latest age that participant masturbated using female images	-.068	.007	<.001	.069	80.4
Number of times that participant masturbated using male images	.003	.000	<.001	.029	10.5
Constant	1.065	.122	<.001		
<i>Model number 8M: Percent male–male sexual orientation scale, AdjR² = .593, N = 1,237</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	B	SE	p	Effect size ^b	n _{1%} ^c
Latest age that participant masturbated using male images	2.172	.119	<.001	.214	10.5
Latest age that participant engaged in sex of any kind with a male	1.326	.105	<.001	.114	13.7
Latest age that participant masturbated using female images	-.764	.068	<.001	.093	80.7
Number of times that participant masturbated using male images	.024	.004	<.001	.023	10.5
Constant	12.008	1.068	<.001		
<i>Model number 9M: Behavioral sexual orientation scale, AdjR² = .548, N^d = 1,014</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	B	SE	p	Effect size ^b	n _{1%} ^c
Latest age that participant masturbated using male images	11.139	.141	<.001	.167	10.6
Latest age that participant engaged in sex of any kind with a male	2.012	.119	<.001	.088	15.1
Latest age that participant masturbated using female images	-.753	.084	<.001	.074	82.6
Number of times that participant masturbated using male images	.027	.005	<.001	.027	10.6
Constant	11.139	1.337	<.001		
<i>Model number 10M: Self-identified sexual orientation, Nagelkerke R² = .575, N^e = 1,004 (logistic regression model)</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	B	SE	p	Odds-ratio	n _{1%} ^c
Latest age that participant masturbated using male images	.191	.020	<.001	1.211	10.5
Latest age that participant engaged in sex of any kind with a male	.147	.023	<.001	1.159	13.5
Latest age that participant masturbated using female images	-.087	.020	<.001	.917	51.5
Youngest age that participant engaged in sex of any kind with a female	-.053	.025	.034	.948	35.9
Constant	-2.362	.263	<.001		
<i>Model number 11M: Latest age of sex with a male partner – latest age of sex with a female partner as a function of the adult male–male sexual orientation score, AdjR² = .466, N^f = 78 (regression model)</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	B	SE	p	Effect size ^b	n _{1%} ^c
Male–male sexual orientation scale	2.796	.339	<.001	.472	–

(Continued)

Table 5. (Continued)

Constant	-17.417	2.519			
<i>Model number 12M: Latest age of sex with a male partner – latest age of sex with a female partner as a function of masturbating using images of adult males before 18 years of age, AdjR² = .278, N^f = 78 (regression model)</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> _{1%} ^c
MMI Masturbating using male images	18.026	3.257	<.001	.287	50.0
Constant	-9.154	2.303			
<i>Model number 13M: Latest age of masturbating using adult male images – latest age of masturbating using adult female images as a function of masturbating using images of adult males before 18 years of age, AdjR² = .104, N^f = 83 (regression model)</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> _{1%} ^c
Male–male sexual orientation scale	-1.112	.931	.003	.104	–
Constant	.501	.164			
Models number 6F–number 11F⁹ for female participants					
<i>Model number 6F: Female–female sexual orientation scale, AdjR² = .320, N = 2,201</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> _{1%} ^c
Latest age that participant engaged in sex of any kind with a female	.123	.007	<.001	.114	20.9
Latest age that participant masturbated using female images	.138	.008	<.001	.116	13.7
Number of times that participant engaged in sex of any kind with a female	.004	.001	<.001	.021	20.9
Ever masturbated using male images	-.434	.114	<.001	.007	19.9
Constant	.522	.045	<.001		
<i>Model number 7F: Female–male sexual orientation scale, AdjR² = .106, N = 2,201</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> _{1%} ^c
Earliest age that participant masturbated using images of males	.119	.010	<.001	.065	19.9
Latest age that participant engaged in sex of any kind with a male	.052	.006	<.001	.035	55.7
Earliest age that participant masturbated using images of females	-.070	.012	<.001	.016	13.7
Number of partners for sex with a female	-.146	.027	<.001	.014	20.9
Constant	6.278	.073	<.001		
<i>Model number 8F: Percent Female–male sexual orientation scale, AdjR² = .286, N = 2,181</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> _{1%} ^c
Latest age that participant engaged in sex of any kind with a female	-1.216	.074	<.001	.110	21.0
Latest age that participant masturbated using female images	-1.271	.082	<.001	.099	13.8
Number of times that participant engaged in sex of any kind with a female	-.032	.005	<.001	.016	21.0
Ever masturbated using male images	5.375	1.156	<.001	.010	20.1
Constant	94.098	.454	<.001		
<i>Model number 9F: Behavioral sexual orientation scale, AdjR² = .122, N^d = 1,882</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> _{1%} ^c
Number of times that participant engaged in sex of any kind with a female	-.045	.005	<.001	.039	22.7%
Number of female partners with whom the participant engaged in sex of any kind	-1.667	.269	<.001	.020	22.7%
Youngest age that the participant engaged in sex of any kind with a female partner	-1.118	.202	<.001	.016	22.7%
Ever sex with females	10.941	2.475	<.001	.010	22.7%

(Continued)

Table 5. (Continued)

Constant	97.702	.427	<.001		
<i>Model number 10F: Self-identified sexual orientation, Nagelkerke R² = .238, N^e = 1,771 (logistic regression model, N₁ = 185)</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Odds-ratio	<i>n</i> _{1%} ^c
Latest age that participant engaged in sex of any kind with a female	.091	.015	<.001	1.096	20.7
Latest age that participant masturbated using female images	.072	.011	<.001	1.075	31.9
Number of times that participant engaged in sex of any kind with a female	.002	.001	.041	1.002	20.7
Number of female partners with whom the participant engaged in sex of any kind	.101	.041	.014	1.106	20.7
Constant	-3.018	.122	<.001		
<i>Model number 11F: Female-female sexual orientation scale, AdjR² = .294, N = 1,994 (Multiple linear regression model)</i>					
Variables describing behaviors before 18 years of age used as predictors ^a	<i>B</i>	<i>SE</i>	<i>p</i>	Effect size ^b	<i>n</i> _{1%} ^c
Ever masturbated using female images	3.284	.239	<.001	.087	13.7
Ever sex with females	2.229	.198	<.001	.060	20.9
Ever masturbated using female images × ever masturbated using male images	-1.375	.283	<.001	.012	10.5
Ever masturbated using male images × ever sex with females	-.677	.213	<.001	.005	7.7
Ever sex with females × ever sex with males	-.577	.203	<.001	.004	15.5
Age at first orgasm	-.025	.011	.023	.003	100.0
Constant	.927	.189	<.001		

Note: “-” denotes not applicable because the independent variable is a scale.

^aPredictors are listed from top to bottom in order of decreasing predictive power as determined by the order of stepwise addition to the model.

^bEffect size as measured by the partial *Eta*².

^c*n*% is the percent of participants who engaged in the behavior (or in both behaviors for cross products).

^e*N* was reduced for the behavioral sexual orientation score because it could not be calculated for participants who had not been sexually active with partners as adults.

^e*N* was reduced for the self-identified sexual orientation because the self-identified sexual orientation item was added to the survey program after the first 238 male participants and the first 430 female participants had completed their participation.

^f*N* was reduced because the dependent variable could only be calculated for participants who engaged in both behaviors.

^gModel number 12F and Model number 13F do not appear in this paper because they were unnecessary for the analysis of the data from the female participants. Subsequent model numbers pick up with Model number 14F to preserve the parallels between the model numbers between the two sexes.

following hypothesis. Participants who did not engage in the behavior or who stopped the behavior at an early age would have scores disparate from those who engaged in the behavior through 17 years of age. Furthermore, those who stopped *engaging* in the behavior before reaching 17 years of age would have scores reflecting the fact that they had experienced less conditioning or some extinction. We used recoding to form a total of five groups to increase the *ns* for each group. The five groups were those who had never engaged in the behavior, those who last engaged in behavior at 1–10, 11–13, 14–16 years of age, and those who had persisted in the behavior up through 17 years of age. We examined the results of both the MSOS and the FSOS because they were completely applicable to all of the participants in the study. Furthermore, the MSOS and the FSOS provided a pair of scales measuring the adult male–male and the adult male–female orientations (Tables 6 and 7, respectively). Put succinctly, the results supported our hypothesis.

6.1.8. Genetic versus learned?

Our data also provided information sufficient to examine three different lines of research that have been purported to show evidence for a genetic basis rather than a learning basis for the origins of sexual preferences and orientations. The first line of evidence was earlier puberty in gay than in heterosexual individuals. The second line of evidence was the purported increased likelihood of gay men having an older brother. The third line of evidence was concordance of the sexual orientation of

Table 6. Effects of latest age for partner sex or masturbating using images on the adult MSOS in males as measured by one-way ANOVA

Latest age (Years)	Sex of any kind with partners				Masturbation using image of adult			
	Male partners		Female partners		Males		Females	
	n_i	$M \pm SD$	n_i	$M \pm SD$	n_i	$M \pm SD$	n_i	$M \pm SD$
Never ^a	1,073	.4 ± 1.6***	604	1.2 ± 3.0**	1,112	.3 ± 1.3***	244	2.4 ± 4.2***
1-10	31	1.8 ± 3.4***	24	2.8 ± 4.3***	–	–	3	.0 ± .0ns
11-13	31	2.2 ± 3.6***	16	3.2 ± 4.9***	3	.0 ± .0***	9	5.2 ± 5.2 ***
14-16	42	2.2 ± 3.8***	35	2.6 ± 4.5***	4	3.8 ± 4.9*	51	1.0 ± 2.8ns
17 ^b	65	8.3 ± 2.7	563	.4 ± 1.5	123	6.5 ± 4.5	935	.5 ± 1.8

Notes: The means are for the MSOS. Only the comparisons between the 17 year of age group and the other groups were made. We used rank-transformed data for the comparisons to correct for heterogeneity in the variances between groups, and we corrected for multiple comparisons using Dunnet's tables for multiple comparisons to a single control. ns indicates not significant and "–" indicates empty set.

^aNever engaged in the behavior before reaching 18 years of age.

^bControl group for Dunnet's comparisons.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 7. Effects of latest age for partner sex or masturbating using images on the adult FSOS in males as measured by one-way ANOVA

Latest age (Years)	Sex of any kind with partners				Masturbation using image of adult			
	Male partners		Female partners		Males		Females	
	n_i	$M \pm SD$	n_i	$M \pm SD$	n_i	$M \pm SD$	n_i	$M \pm SD$
Never ^a	1,073	8.8 ± 2.2***	604	7.8 ± 3.2***	1,112	8.9 ± 2.1***	244	6.1 ± 3.8***
1-10	31	8.6 ± 2.9***	24	7.5 ± 3.9ns	–	–	3	9.3 ± 1.5ns
11-13	31	7.5 ± 4.1***	16	7.4 ± 4.4ns	3	7.0 ± 4.6ns	9	3.3 ± 3.8***
14-16	42	8.9 ± 3.2***	35	7.4 ± 3.6*	4	4.5 ± 4.1ns	51	8.2 ± 2.8*
17 ^b	65	3.0 ± 3.8	563	9.3 ± 1.7	123	4.0 ± 4.0	935	9.1 ± 1.9

The means are for the FSOS. Only the comparisons between the 17 year of age group and the other groups were made. We used rank-transformed data for the comparisons to correct for heterogeneity in the variances between groups, and we corrected for multiple comparisons using Dunnet's tables for multiple comparisons to a single control. ns indicates not significant and "–" indicates empty set.

^aNever engaged in the behavior before reaching 18 years of age.

^bControl group for Dunnet's comparisons.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

same-sex twins. Our findings regarding these three lines of research will be provided in three subsequent paragraphs.

6.1.9. Early puberty in gay or bisexual men

To test the hypothesis that "Puberty occurs earlier in gay or bisexual men than in heterosexual men," we examined data on the age at which the participants had their first orgasm while fully awake. In men, the first orgasm often occurs shortly after onset of the testosterone rise associated with puberty. The first orgasm (accompanying the first ejaculation in sexually maturing men), therefore, serves as

a measure of puberty in men. In our study, 1,224 of the 1,242 participants reported having experienced at least one orgasm. A histogram showed a normal distribution of the age at first orgasm. The participants were allowed to endorse one of five choices about their stage of physical development at the time that they experienced their first orgasm. The distribution of the 1,224 responses from those who provided an age for their first orgasm was as follows: "I had not begun to develop pubic hair or adult genitalia," 9.7%; "I was in the early stages of developing pubic hair and adult genitalia," 28.6%; "I had well established pubic hair and nearly adult genitalia, but I was still not fully mature sexually," 23.4%; "I was completely mature physically with mature pubic hair and adult genital development," 36.0%. And, "This question is not applicable to me since I have never yet had my first orgasm," 2.2%. The participants were also allowed to endorse one of five choices about the situation in which they experienced their first orgasm while fully awake. The distribution of the 1,224 responses from those who provided an age for their first orgasm was as follows. "During masturbation and/or fantasy when I was alone," 84.9%. "While I was with a partner in a situation that I considered to be voluntary at the time," 12.1%, "While I was engaged in a physical activity (such as bike riding, climbing a rope, etc.)," 1.2%. "While I was with a sexual perpetrator in a situation in which I was definitely not participating in voluntarily or when I was being beaten, spanked, whipped or otherwise hurt," .5%; and "This question is not applicable since I have never had an orgasm when I was fully awake," 1.3%. The age of the first orgasm in those 1,224 participants was 13.0 ± 2.4 (mean \pm SD). The median age of the first orgasm was 13 years. Fourteen percent had their first orgasm before 13 years of age. Seventy-five percent had their first orgasm in the interval including ages 13 and 19 years of age. Eleven percent had their first orgasm after reaching 20 years of age. The first orgasm of the subset of 120 who had sex of any kind with a male partner of any age before reaching 18 years of age was at an age that was significantly younger than that of the 1,004 who had not had such an experience (11.6 ± 2.3 vs. 13.1 ± 2.4 respectively, $p < .001$). The median ages of the two groups were 12 and 13 years of age, respectively. The first orgasm of the subset of 103 who self-identified as gay or bisexual was also significantly younger than that of the 884 who self-identified as heterosexual (12.3 ± 2.9 vs. 13.1 ± 2.4 , $p = .003$) The median ages were 12 and 13 years of age, respectively. Furthermore, the age at first orgasm was significantly *negatively* correlated with the MSOS ($r = -.103$, $p < .001$), the PM-SOS ($r = -.091$, $p = .002$), the behavioral sexual orientation scale ($r = -.093$, $p = .003$), and the binary self-identified sexual orientation ($r = -.094$, $p = .003$). The age at first orgasm was not significantly correlated with the FSOS ($r = -.019$, ns). The remaining 18 participants were left out of these analyses because they denied having ever had an orgasm. Forcing the age at first orgasm into the regression as a predictor in addition to those included in Model number 2M through Model number 5M showed that age at first orgasm was not a significant predictor after adjusting for the other predictors in the model. This result implied that the significant correlations between age at first orgasm, the MSOS, the BSOS, the PM-SOS, and the self-identified sexual orientation were all completely explained by the behaviors with partners described by the sexual behavior predictors in the model.

6.1.10. Men with older brothers

To test the hypothesis that men with older brothers are more likely to become gay or bisexual adults, we ran a series of analyses that looked for correlations between a set of variables related to the distribution of siblings in the nuclear family and four different measures of male-male sexual orientation. Thirty-eight percent of the 1,242 participants had an older brother. Neither having an older brother (coded 0/1 as a dummy variable), nor the total number of older siblings (older brothers and sisters), the number of older sisters, the number of older brothers, the total number of brothers, the total number of sisters, nor the total number of siblings was significantly correlated with the MSOS, the BSOS, the PM-SOS or the self-identified sexual orientation. These findings provided no support for the idea that either having an older brother or the position in the birth order is a predictor for developing either a gay or a bisexual orientation as an adult.

6.1.11. Brother-brother sibling incest

There were 25 participants who reported that they had experienced brother-brother incest before reaching 18 years of age, but we only had data on 19 of those participants for the self-identified sexual orientation because the self-identified sexual orientation item was added to the survey

program after the first 238 male participants had completed their participation. The 25 who experienced brother–brother incest had significantly higher scores on the MSOS than the other participants (3.96 ± 4.7 vs. $.86 \pm 2.6$, $N = 1,242$, $p < .001$). The 25 who experienced brother–brother incest had significantly higher scores on the PM-SOS (8.1 ± 24.0 vs. 34.7 ± 42.1 , $N = 1,237$, $p < .001$). The 25 who experienced brother–brother incest had significantly higher scores on the MSOS (28.2 ± 39.7 vs. 7.0 ± 24.2 , $N = 1014$, $p < .001$). (We used the Mann–Whitney U test each of the above three tests). And, the 19 who experienced brother–brother incest for whom data were available were significantly more likely to self-identify as gay or bisexual than the other participants (36.8% vs. 9.7%), $\chi^2[1, 1,004] = 12.068$, $p = .001$). However, forcing the 0/1 dummy variable for brother–brother incest into Model number 2M, or Model number 3M, or Model number 4M, or Model number 5M showed that brother–brother incest was no longer a statistically significant predictor after adjusting for the effects of the other predictors in the models. These results were consistent with the idea that the effect of incest with the brother had been fully explained by the variables encoding for actual sexual behaviors with male partners in general or masturbating using images of adult males. The effect of sexual behavior with a brother had neither a greater nor a lesser effect than actual or covert behaviors with same-sex partners in general.

6.1.12. Shifts in latest sexual behavior of men with male and female partners

There were 78 cases in which the participants reported sex of any kind with both male and female partners after reaching 18 years of age. In order to determine whether there was a shift toward male or female partners and to look for variables that might predict the direction of the shift, we calculated the age difference between the latest age they had reported sex of any kind with a male partner minus the age that they reported sex of any kind with a female partner. A zero value indicated sex with both male and female partners had last occurred within the same year of age. Negative values indicated that the last partner–sex had occurred with a female. A positive value greater than a zero value indicated that the last partner–sex had occurred with a male partner. A one-sample *t*-test showed that the mean difference was $-.14 \pm 16.9$ (mean \pm SD) and that there was no significant trend in either direction ($p = ns$). Regression analysis (Model number 11M, Table 5) showed that the MSOS was a more powerful predictor of the direction of movement than the FSOS, which was not a statistically significant predictor once the MSOS predictor had been added to the model. The regression equation showed that the predicted difference in latest ages = $-17.417 + 2.796$ (male sexual orientation score) + ξ , where ξ indicates the random error. Solving the regression equation for zero showed that the solution was a MSOS score of 6.23. This result meant that participants with a male–male sexual orientation score above 6.23 tended to move toward sex with males. Those with a MSOS score below 6.23 tended to move toward sex with females. When we used the difference in latest ages as the dependent variable and variables numbered 7–16 in Table 3 as potential independent variables, regression analysis showed that having masturbated using images of males before reaching 18 years of age was a more powerful predictor of the direction of movement than any of the other nine variables evaluated (Model number 12M, Table 5). None of the other nine variables was a statistically significant predictor once the first variable was in the model.

6.1.13. Shifts in adult latest masturbatory behavior of men using images

There were 83 cases in which the participants reported masturbating with both adult male and adult female images after reaching 18 years of age. To determine whether there was a shift toward using male or female images and to look for variables which might predict the direction of the shift, we calculated the age difference between the latest ages they had reported masturbating using a male image minus the latest age they reported masturbating using a female image. A zero value indicated that masturbating with both male and female images had last occurred within the same year of age. Negative values indicated that the last masturbation had occurred using female image. A positive value greater than zero indicated that the last masturbation had occurred using a male image. A one-sample *t*-test on the mean difference of 1.1 ± 5.8 showed that there was no significant trend in either direction ($p = ns$). Regression analysis (Model number 13M, Table 5) showed that the MSOS was a more powerful predictor of the direction of movement than the FSOS (which was not a statistically significant predictor once the male sexual orientations scale was in the model). The regression

equation showed that the predicted difference in latest ages = $-1.112 + .501 (\text{MSOS}) + \xi$. Solving the regression equation for zero showed that the solution for the MSOS was 2.22. That result meant that participants with a MSOS above 2.22 tended to move toward masturbating using images of males. In contrast, it meant that those with a MSOS below 2.22 tended to move toward masturbating using images of females. Correlation analysis showed that none of the 10 variables numbered 8–17 in Table 3 were significantly correlated with the age difference calculated as latest ages that participants had reported masturbating using a male image minus the latest age that they reported masturbating using a female image.

6.1.14. Crushes in male participants

Of the 1,114 male participants who were able to provide data on crushes, 70 acknowledged having had crushes mostly or exclusively on males before puberty. Seventy-two acknowledged having had crushes mostly or exclusively on males after puberty (Table 8). Sixty-one endorsed both selections. Nine who had such crushes before puberty did not report them after puberty. Eleven who had not acknowledged having them before puberty reported having crushes exclusively or mostly on men after puberty. Of the 1,042 who did *not* report having crushes exclusively or mostly on males after puberty, 9.9% reported having had sex of any kind with males and 5.7% reported having masturbated using images of males before reaching 18 years of age (Table 8). On the other hand, of the 72 who reported having crushes mostly on males after puberty, 66.7% reported having had sex of any kind with males, and 80.6% reported having masturbated using images of males before reaching 18 years of age (Table 8). These observations were consistent with the idea that early crushes were a powerful motivator for engaging in both kinds of same-sex behaviors.

As shown in Table 8, the 72 participants who acknowledged having had crushes mainly on males after puberty (but before 18 years of age) were far more likely to have engaged in sex of any kind with males and also to have masturbated using images of males by 18 years of age. Nevertheless, the number of participants who actually had sex with males before reaching the age of 18 contributed by the group

Table 8. Same-sex behaviors in 1,114 male participants who did not or did have crushes mostly on males after puberty

	Crushes mostly on males after puberty?				Row totals	
	No, <i>n</i> = 1,042		Yes, <i>n</i> = 72		<i>n</i> = 1,114	
	<i>n</i>	% ^a	<i>n</i>	% ^a	<i>n</i>	% ^a
A: Sex of any kind with males before 18 years of age ^b						
Behavior did <i>not</i> occur before 18 years of age	939	90.1	24	33.3	963	86.4
Behavior occurred before 18 years of age	103	9.9	48	66.7	151	13.6
B: Masturbated using images of males before 18 years of age ^b						
Behavior did <i>not</i> occur before 18 years of age	983	94.3	14	19.4	997	89.5
Behavior occurred before 18 years of age	59	5.7	58	80.6	117	10.5
A or B ^b						
Behavior did <i>not</i> occur before 18 years of age	909	87.2	7	9.7	916	82.2
Behavior occurred before 18 years of age	133	12.8	65	90.3	198	17.8
C: Self-identified sexual orientation selection ^c						
Heterosexual	880	94.1	4	5.8	884	88.0
Gay or bisexual	38	4.1	65	94.2	103	10.3
No sexual orientation selected by participant	17	1.8	0	.0	17	1.7

^aColumn percent within the 2 × 2 or 2 × 3 table for the behavior.

^b*n* = 1,114.

^c*n* = 1,004.

without same-sex crushes was more than two times higher than the number contributed by the group *with* same-sex crushes because of the large number of participants *without* crushes mainly on males (1,042 vs. 72). Similarly, the actual number of participants who masturbated using images of males before reaching the age of 18 contributed by the group *without* same-sex crushes was approximately equal to the number contributed by the group of participants who acknowledged having crushes mostly on males.

We tested three “crush on males” and three “crush on females” 0/1 dummy variables as predictors of the five adult sexual orientation variables using correlation analysis. The three tested predictors were: crushes mostly on males before puberty, crushes mostly on males after puberty, and having endorsed having crushes on males as a child (item A) or mostly on males (recoded items C or D). We also tested the three corresponding variables substituting the word “females” for males. Having crushes mostly on males after puberty coded as a 0/1 dummy variable was the most powerful “crush on males” predictor of scores on the five adult sexual orientation variables. Endorsing having had crushes on females as a child (item A) or mostly on females (recoded items C or D) coded as a 0/1 dummy variable was the most powerful “crush on females” predictor of scores on the five adult sexual orientation variables.

In order to measure the relative predictive power of the above two crush variables and the four primary early sexual behavior variables (sex of any kind with—or masturbating using images of—males or females), we utilized a stepwise approach to construct the first five multiple regression or multiple logistic regression models presented in Table 9. We entered the variables into the model in order of decreasing predictive power on entry. As shown in Table 9, having crushes predominantly on males after puberty (but before reaching 18 years of age) was selected as the first variable added to each of the five models on the basis of predictive power. The effect size (as measured by the partial η^2) showed that it was the most powerful predictor in Models number 15M, number 16M, and number 17M. Furthermore, the having crushes predominantly on males after puberty variable had the highest odds-ratio of all the predictors in the logistic regression (Model number 18M). These findings for the predictive power of experiencing mostly crushes on males after puberty were consistent with the idea that experiencing those crushes had a powerful effect on the participant’s adult sexual orientation *above and beyond* the effects of conditioning from the reported actual and covert same-sex behaviors that occurred prior to 18 years of age. Not unexpectedly, in the sole exception (Model number 14 M, for predicting the FSOS), adjustment for the other predictors in the model showed that masturbating using female images and masturbating using male images both had larger effect sizes in the final model than did having crushes on males after puberty.

6.1.15. Predictors for males having crushes

To identify possible predictors for having crushes on either males or females before the participants reached 18 years of age, we used the same two crush predictors that we previously found to be the most powerful predictors for the adult sexual orientations of the participants as dependent variables in the three logistic regression analyses in Table 10. We also examined Items 3–10 in Appendix A. These were forced choice items describing the nuclear family of the participants. Items number 3 through number 5 and number 9 through number 10 were recoded so that each possible forced choice was coded as one and all the other choices were recoded to zero to create a series of 0/1 dummy variables representing each item. Items number 6 through number 8 were recoded to create ordinal variables. The last two choices in Item 6 were recoded as 0/1 dummy variables. Because the 0/1 dummy variables within each item were mutually exclusive forced choices (e.g. Appendix A, Item 4), they were negatively correlated and *inappropriate* to include in the same model, so only the most powerful predictor within each item was considered eligible for inclusion in a given model. At step-0 of the logistic regression, “There was often an obvious disagreement between my parents with my mother taking my part against my father,” “Father thought sex was healthy, and he provided me with healthy information,” and “Mother thought sex was dirty and filthy, but she never was able to discuss it with me” were the three most powerful predictors of having crushes mostly or exclusively on males after puberty. The potential predictors based on the other items were not statistically

Table 9. Predicting the adult sexual orientations of the male and female participants from variables describing early crushes and sexual behaviors

Models number 14 M–number 18M for male participants

Model number 14 M: Male–female sexual orientation scale, AdjR² = .576, N = 1,114

Behaviors before 18 years of age and crushes used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Crushes on males	-3.345	.402	<.001	.059	6.5
Masturbating using female images	1.671	.150	<.001	.100	80.5
Masturbating using male images	-2.324	.223	<.001	.089	10.5
Crushes on females	2.057	.369	<.001	.027	93.5
Sex with females	.485	.114	<.001	.016	51.7
Constant	5.361	.368	<.001		

Model number 15M: male–male sexual orientation scale, AdjR² = .784, N = 1,114

Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Crushes on males	5.313	.277	<.001	.249	6.5
Masturbating using male images	2.468	.277	<.001	.178	10.5
Sex with males	1.271	.125	<.001	.085	13.6
Crushes on females	-1.244	.252	<.001	.022	93.5
Masturbating using female images	-.321	.100	.001	.009	80.5
Constant	1.575	.252			

Model number 16M: Percent male–male sexual orientation scale, AdjR² = .791, N = 1,109

Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Crushes on males	50.420	2.641	<.001	.248	6.5
Masturbating using male images	22.933	1.470	<.001	.181	10.6
Sex with males	9.428	1.151	<.001	.057	13.6
Masturbating using female images	-4.872	0.925	<.001	.025	80.9
Crushes on females	-12.542	2.456	<.001	.023	93.8
Constant	17.476	2.477	<.001		

Model number 17M: Behavioral sexual orientation scale, AdjR² = .716, N = 906

Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Crushes on males	42.885	3.591	<.001	.137	7.0
Masturbating using male images	21.249	1.943	<.001	.117	10.6
Sex with males	8.566	1.423	<.001	.039	15.1
Crushes on females	-16.312	3.367	<.001	.025	93.5
Masturbating using female images	-3.943	1.273	.002	.011	83.2
Constant	19.587	3.428	<.001		

Model number 18M: Self-identified sexual orientation, Nagelkerke R² = .670, N^e = 1,004 (logistic regression model)

Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Odds-ratio	n ₁ % ^b
Crushes on males	3.449	.725	<.001	31.475	6.9
Masturbating using male images	2.310	.397	<.001	10.070	10.5
Sex with males	1.674	.3876	<.001	5.331	13.5
Crushes on females	-1.847	.700	.008	.158	
Constant	-2.153	.687	.002		

(Continued)

Table 9. (Continued)

Models number 14F–number 18F for female participants

Model number 14F: Female–female sexual orientation scale, AdjR² = .484, N = 1,965

Behaviors before 18 years of age and crushes used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Crushes on females	3.718	.185	<.001	.171	5.6
Masturbating using female images	1.783	.109	<.001	.121	13.9
Sex with females	1.144	.094	<.001	.071	20.9
Crushes on males after puberty	-1.236	.179	<.001	.024	94.4
Constant	1.609	.178	<.001		

Model number 15F: Female–male sexual orientation scale, AdjR² = .221, N = 1,965

Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Crushes on males after puberty	2.099	.241	<.001	.037	94.4
Masturbating using male images	1.562	.143	<.001	.057	20.7
Crushes on females	-2.134	.243	<.001	.038	5.6
Sex with males	.765	.097	<.001	.031	55.9
Masturbating using female images	-.783	.170	<.001	.011	13.9
Constant	4.326	.239	<.001		

Model number 16F: Percent male–male sexual orientation scale, AdjR² = .471, N = 1,947

Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Crushes on females	-34.500	1.855	<.001	.151	5.6
Masturbating using female images	-17.095	1.293	<.001	.083	14.0
Sex with females	-11.125	.939	<.001	.067	21.1
Crushes on males after puberty	16.612	1.833	<.001	.041	94.6
Masturbating using male images	2.699	1.070	.012	.003	20.9
Constant	78.854	1.827	<.001		

Model number 17F: Behavioral sexual orientation scale, AdjR² = .392, N^d = 1,673

Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Effect size ^b	n ₁ % ^c
Crushes on males after puberty	28.828	1.892	<.001	.122	94.9
Crushes on females	-25.676	1.772	<.001	.112	6.3
Sex with females	-2.808	.882	.001	.006	22.8
Masturbating using female images	2.427	1.030	.019	.003	14.8
Constant	70.278	1.901	<.001		

Model number 18F: Self-identified sexual orientation, Nagelkerke R² = .405, N^e = 1,771 (logistic regression model)

Behaviors before 18 years of age and their cross products used as predictors ^a	B	SE	p	Odds-ratio	n ₁ % ^b
Crushes on females	2.919	.309	<.001	18.517	5.6
Sex with females	1.189	.208	<.001	3.285	20.7
Masturbating using female images	1.297	.221	<.001	3.659	13.7
Crushes on males after puberty	-1.517	.341	<.001	.219	94.3
Constant	-1.867	.335	<.001		

^aPredictors are listed from top to bottom in order of decreasing predictive power as determined by the order of stepwise addition to the model.

^bEffect size as measured by the partial Eta².

^cn% is the percent of participants who engaged in the behavior (or in both behaviors for cross products).

^dN was reduced for the Behavioral sexual orientation score because it could not be calculated for participants who had not been sexually active with partners as adults.

^eN was reduced for the Self-identified sexual orientation because the self-identified sexual orientation item was added to the survey program after the first 238 male participants and the first 430 female participants had completed their participation in the study.

significant predictors. The latter two statements, above, were choices in different items. Their significant correlation ($-.159, p < .001, N = 1,242$) reflected the strong over-all tendency for the two parents' attitudes to be similar. Their significant correlation permitted each to also serve as a partial surrogate predictor for the other.

As shown in Model number 19M and Model number 21M in Table 10, participants who had endorsed "There was often an obvious disagreement between my parents with my mother taking my part against my father" as the best forced-choice description of the way that parents handled disagreements about how to deal with them as a child (Appendix A, Item 10) were 2.3 and 2.5 times more likely to have reported crushes exclusively or mostly on males, respectively. The second most powerful predictor in Model number 19M and the third most powerful predictor in Model number 21M was father's attitude ("Father thought sex was healthy, and he provided me with healthy information").

As shown in Appendix A Item 5, the other four alternative items that the participant might have selected described fathers who thought that sex was filthy and dirty, fathers who could not talk about sex even if they did think that it was healthy, or fathers who were so unavailable to the participant that the participant had no idea about their father's attitude about sex. The next most powerful predictor in Model number 19M and the second most powerful predictor in Model number 21M (of having crushes mostly or exclusively on males after puberty and before puberty, respectively) was the complete logical opposite "Mother thought sex was dirty and filthy, but she never was able to discuss it with me." It had a reversed the sign to that of the "Father thought sex was healthy, and he provided me with healthy information" regression coefficient in both Model number 19M and Model number 21M. Model number 20M (for predicting opposite sex crushes after puberty) utilized "If my parents had disagreements about how to deal with me as a child, they seemed to work them out where I could not hear, and I saw a united approach to me" (Appendix A, Item 10) as the most powerful predictor. It increased the likelihood of forming opposite-sex crushes by approximately 1.7 times. The second most powerful predictor in Model number 20M was "Mother thought sex was dirty and filthy, but she never was able to discuss it with me" (with the sign of the regression appropriately reversed from that of the same predictor in Model number 19 and Model number 21). It reduced the likelihood of forming opposite-sex crushes to about half the likelihood estimated for those not endorsing the statement. Thus, our data pointed to both the way that parents handled disagreements about how to deal with the children and parental attitudes about sex as predictors that influenced whether participant's early crushes would be mostly on females or mainly on males after puberty.

6.1.16. *Frequencies of scores on the PM-SOS in men*

In Table 11, we have presented the observed frequencies of scores on the PM-SOS. The data showed a dramatic, but expected, significant difference in the scores on the PM-SOS between those men self-identifying as gay or bisexual and those self-identifying as heterosexual.

6.2. *Female participants*

Of the 2,201 female participants, 459 reported "sex of any kind" with females of any age before themselves reaching 18 years of age (6 with adult females and 453 with females under 18 years of age). They started the behavior at a median of 10 (years of age). The 38 who had participated in incest with a sister reported having their first early sexual experience of any kind with a female starting at a mean age that was 3.9 years earlier than that of those who did not participate in sex with a sister ($p < .001$). And, they reported having their first early sexual experience of any kind with a male starting at a mean age that was 2.9 years earlier than that of those who did not participate in sex with a sister ($p = .003$, Table 2).

Of the 2,201 female participants, 1,225 reported "Sex of any kind" with males of any age before themselves reaching 18 years of age (105 with adult males and 1,120 with males under 18 years of age). The median age at which they started the behavior was 15 (years). The 26 who had participated in incest with a brother reported having their first early sexual experience of any kind with a male starting at a mean age that was 5.7 years earlier than that of those who did not participate in

Table 10. Predicting sex of early crush objects from nuclear-family variables in the male and female participants

Models number 19M–number 22M for Male Participants						
<i>Model number 19M: Predominantly same-sex crushes after puberty but before 18 years of age, Nagelkerke R² = .061, N^b = 1,114^b (logistic regression model)</i>						
Nuclear-family variables used as predictors	B	SE	p	Odds-ratio	n ₀ % ^a	n ₁ % ^b
“There was often an obvious disagreement between my parents with my mother taking my part against my father.” (Item 10, 1)	.847	.264	.001	2.333	17.4	34.7
“Father thought sex was healthy, and he provided me with healthy information.” (Item 5, 5)	−.895	.328	.006	.409	36.0	16.7
“Mother thought sex was dirty and filthy, but she never was able to discuss it with me.” (Item 4, 2)	.666	.315	.034	1.947	9.9	20.8
Constant	−2.758	.176	<.001			
<i>Model number 20M: Predominantly opposite-sex crushes after puberty but before 18 years of age, Nagelkerke R² = .027, N^b = 1,114^b (logistic regression model)</i>						
Nuclear-family variables used as predictors	B	SE	p	Odds-ratio	n ₀ % ^c	n ₁ % ^d
“If my parents had disagreements about how to deal with me as a child, they seemed to work them out where I could not hear, and I saw a united approach to me.” (Item 10, 5)	.553	.204	.007	1.739	45.4	59.5
“Mother thought sex was dirty and filthy, but she never was able to discuss it with me.” (Item 4, 2)	−.636	.276	.021	.530	17.6	9.8
Constant	2.026	.148	<.001			
<i>Model number 21M: Predominantly same-sex crushes before puberty, Nagelkerke R² = .056, N^b = 1,114^b (logistic regression model)</i>						
Nuclear-family variables used as predictors	B	SE	p	Odds-ratio	n ₀ % ^e	n ₁ % ^f
“There was often an obvious disagreement between my parents with my mother taking my part against my father.” (Item 10, 1)	.904	.265	.001	2.468	17.3	35.7
Mother thought sex was dirty and filthy, but she never was able to discuss it with me. (Item 4, 2)	.739	.317	.20	2.094	9.9	21.4
Father thought sex was healthy, and he provided me with healthy information. (Item 5, 5)	−.643	.312	.039	.526	35.7	20.0
Constant						
Models number 19F–number 23F for female participants						
<i>Model number 19F: Predominantly same-sex crushes before 18 years of age, Nagelkerke R² = .033, N = 1,965 (logistic regression model)</i>						
Nuclear-family variables used as predictors	B	SE	p	Odds-ratio	n ₀ % ^g	n ₁ % ^h
“If my parents had disagreements about how to deal with me as a child, they seemed to work them out where I could not hear, and I saw a united approach to me.” (Item 10, 5)	−.619	.209	.003	.539	53.2	35.5
Maternal affection (Item 7, ordinal variable rated 0–2)	−.407	.166	.014	0=1.00	0=3.2	0=6.4
				1=.666	1=21.3	1=30.0
				2=.444	2=75.5	2=63.6
“My parents’ relationship was reserved: I did not see fighting, criticism, or physical display of affection, but I believe that there was quiet love and respect underneath.” (Item 9, 3)	−.924	.467	.048	.397	10.6	4.5
Constant	−1.813	.280	<.001			
<i>Model number 20F: Predominantly same-sex crushes after puberty but before 18 years of age, Nagelkerke R² = .029, N = 1,965 (logistic regression model)</i>						
Nuclear-family variables used as predictors	B	SE	p	Odds-ratio	n ₀ % ⁱ	n ₁ % ^j
“I witnessed intercourse by sight or sound.” (Item 6, 5)	1.113	.452	.014	3.043	3.7	10.2
“I had so little contact with my mother that I have no idea what attitude she had.” (Item 4, 1)	.985	.420	.019	2.677	4.9	11.9
“There was often an obvious disagreement between my parents with my mother taking my part against my father.” (Item 10, 1)	.626	.296	.034	1.869	17.3	28.8

(Continued)

Table 10. (Continued)

Table 10. (Continued)						
Constant	-3.767	.169	<.001			
<i>Model number 21F: Predominantly opposite-sex crushes after puberty but before 18 years of age, Nagelkerke R² = .039, N = 1,965 (logistic regression model)</i>						
Nuclear-family variables used as predictors	B	SE	p	Odds-ratio	n₀%^k	n₁%^l
"I had so little contact with my mother that I have no idea what attitude she had." (Item 4, 1)	-1.221	.299	<.001	.295	14.5	4.6
"One of my parents died, but there was no remarriage or new partner in my home before I reached 18." (Item 3, 5)	-1.135	.415	.006	.321	7.3	2.0
My parents' relationship was reserved: I did not see fighting, criticism, or physical display of affection, but I believe that there was quiet love and respect underneath. (Item 9, 3)	.972	.467	.037	2.644	4.5	10.6
Constant	2.908	.110	<.001			
<i>Model number 22F: Predominantly opposite-sex crushes after puberty but before 18 years of age, Nagelkerke R² = .030, N = 1,965 (logistic regression model)</i>						
Nuclear-family variables used as predictors	B	SE	p	Odds-ratio	n₀%^k	n₁%^l
"I had so little contact with my mother that I have no idea what attitude she had." (Item 4, 1)	-1.306	.294	<.001	.271	14.5	4.6
My parents' relationship was reserved: I did not see fighting, criticism, or physical display of affection, but I believe that there was quiet love and respect underneath. (Item 9, 3)	.979	.466	.036	2.662	4.5	10.6
Constant	2.869	.108	<.001			
<i>Model number 23F: Predominantly Same-sex crushes before puberty, Nagelkerke R² = .032, N = 1,965 (logistic regression model)</i>						
Nuclear-family variables used as predictors	B	SE	p	Odds-ratio	n₀%^m	n₁%ⁿ
Maternal affection (Item 7, ordinal variable rated 0–2)	-5.66	.231	.014	0:1.00	0:3.3	0:4.2
				1:5.56	1:21.3	1:39.6
				2:309	2:75.3	2:56.3
"I witnessed intercourse by sight or sound." (Item 6, 5)	1.162	.491	.018	3.196	3.7	10.4
I was raised by my grandparent or grandparents (item 3, 9)	1.614	.777	.038	5.024	.8	4.2
Constant	-2.874	.606	<.001			

Notes: The column entries (1–8) are column percents. n_0 gives the number of "zero" values in the logistic regression. n_1 gives the number of "one" values in the logistic regression dependent variable. The n_0 and n_1 column percents provide the percent in each column of respondents who endorsed the item (coded "1") for 0/1 dummy predictors or the percentage for each value for the ordinal predictors included in a model (e.g. the paternal nudity scale). For the male participants the total n 's for the column percents were as follows: ^a $n_0 = 1,042$, ^b $n_1 = 72$, ^c $n_0 = 108$, ^d $n_1 = 1006$, ^e $n_0 = 70$, ^f $n_1 = 1,044$. For the female participants the total n 's for the column percents were as follows: ^g $n_0 = 1,855$, ^h $n_1 = 110$, ⁱ $n_0 = 1,906$, ^j $n_1 = 59$, ^k $n_0 = 110$, ^l $n_1 = 1,855$, ^m $n_0 = 1,917$, ⁿ $n_1 = 48$.

sex with a brother ($p < .001$, data not shown). There were 341 female participants who had participated in sex of any kind with both male and female partners before reaching 18 years of age. Sex of any kind with female partners had preceded sex of any kind with male partners by 1.5 ± 4.6 years ($M \pm SD$, $p < .001$ by paired t -test).

Of the 2,201 female participants, 301 reported having masturbated using images of females before 18 years of age. They began the behavior at a median of 15 years of age. Four hundred and thirty-nine reported having masturbated using images of males before 18 years of age. They began the behavior at a median of 15 years of age (Table 2). There were 232 participants who had engaged in masturbating using both male and female images before reaching 18 years of age. A paired t -test showed that there was no statistically significant difference in the earliest age that they had begun masturbating using images of the two sexes. There were 156 participants who had participated in sex of any kind with female partners and who had also masturbated using female images. A paired t -test showed that sex of any kind with female partners had preceded masturbating using female images by 3.4 ± 4.4 years ($p < .001$). There were 296 participants who had participated in sex of any

Table 11. Percentages and cumulative percentages of scores of the male participants on the PM-SOS tabulated by self-identified adult sexual identity

Range	Self-identified as heterosexual		Self-identified as gay or bisexual		No self-identity selected		All participants with data	
	%	Cumulative percent	%	Cumulative percent	%	Cumulative percent	%	Cumulative percent
0	90.9	90.9	8.7	8.7	93.8	93.8	81.9	81.9
.1–10	5.7	96.6	1.0	9.7	.0	93.8	5.5	87.4
10.1–20	.2	98.6	5.8	15.5	.0	93.8	3.0	90.4
20.1–30	.3	99.0	1.0	15.5	6.3	100.0	.7	91.1
30.1–40	.3	99.3	3.9	20.4	.0	100.0	.6	91.7
40.1–50	.2	99.5	3.9	24.3	.0	100.0	.5	92.2
50.1–60	.0	99.5	2.9	27.2	.0	100.0	.2	92.4
60.1–70	.0	99.5	1.9	29.1	.0	100.0	.2	92.6
70.1–80	.0	99.5	3.9	33.0	.0	100.0	.5	93.1
8.1–90	.3	99.9	19.4	52.5	.0	100.0	2.3	95.4
90.1–100	.1	100.0	47.6	100.0	.0	100.0	4.6	100.0
N for	881		103		16		1,237 ^c	
Median	0		90		0		0	
Mean ± SD	1.5 ± 7.3 ^b		73.4 ± 33.7 ^a		1.4 ± 5.6 ^b		8.6 ± 24.8	

Note: The data are from the 1,000 participants who provided data about their self-identified sexual orientation and who had non-zero scores on both the MSOS and the FSOS.

^aThe mean was significantly different from that of the self-identified heterosexual group, or.

^bSignificantly different from the mean of the self-identified gay or bisexual group (both $p < .001$) after Tukey correction for multiple comparisons and rank-transformation of the data to correct for the heterogeneity of variance present in the untransformed data.

^cThe N for all participants with data (1,237) is higher than the sum of the three group ns because the other group ns were reduced by the smaller N of the self-identified sexual orientation used for defining the other three columns.

kind with male partners and who had also masturbated using male images. A paired t-test showed that sex of any kind with male partners had preceded masturbating using male images by 1.5 ± 3.5 years ($p < .001$).

6.2.1. Pearson correlation analysis of the data from the female participants

The Pearson correlation analysis (Table 12) showed that there were many significant correlations between the five measures of adult sexual orientation, the four primary predictor variables describing sexual behaviors with partners, and masturbating using images. There were many significant correlations with the first-degree cross products among the four primary predictor variables (Table 12). Also note that only two of the 35 correlations among the 5 measures of adult sexual orientations and the 7 potential predictors related to the number of male or female siblings (variable numbers 18–24) were statistically significant in the data from the female participants. Furthermore, note that the statistical significance of those low correlation coefficients (only .046 and .047) was most likely random type-one errors since a false positive probability of .05 would predict 1.75 false positives among 35 correlation coefficients. The lack of strong correlations between the sibling variables and the five measures of adult sexual orientation provided strong evidence against there being any causal relationship between birth order and adult sexual orientation in females. On the other hand, the age at first orgasm, a measure of the age at which puberty occurred, was significantly correlated with the FSOS, the PM-SOS, the BSOS, and the self-identified sexual orientation. These latter findings were consistent with a possible etiological relationship between age at first puberty and adult sexual orientation.

Table 12. Correlations among the variables in the female participants

Variable	1 ^a	2 ^a	3 ^b	4 ^c	5 ^d	6 ^e	7 ^f
Female sexual orientation scale ^a	1	-.373***	-.967***	-.605***	.702***	-.318***	-.132*
Male sexual orientation scale ^a	-.373***	1	.470***	.489***	-.341***	.402***	.166**
Male-male sexual orientation as percent of total male-male and male-female scale scores ^b	-.967***	.470***	1	.652***	-.6957***	.373***	.148*
Behavioral sexual orientation scale ³	-.605***	.489***	.652***	1	-.512 ^h ***	.415***	.041 ⁱ ns
Self-identified sexual orientation ^d	.702***	-.341***	-.695 ^g ***	-.512 ^h ***	1	-.304 ^j ***	-.003 ^k ns
Latest sex with a male—latest with a female ^e	-.318***	.402***	.373***	.415***	-.304 ^j ***	1	.044 ^l ns
Latest masturbation using male images—latest using female images ^f	-.132*	.166**	.148*	.041 ⁱ ns	-.003 ^k ns	.044 ^l ns	1
Masturbation while viewing images of adult women before reaching 18 ^g	.435***	.006 ^{ns}	-.398***	.085***	.278***	-.078 ^{ns}	.079 ^{ns}
Masturbation while viewing images of adult men before reaching 18 ^g	.200***	.219***	-.165***	-.017 ^{ns}	.133***	.019 ^{ns}	.024 ^{ns}
Sex of any kind with a female before reaching 18 ^g	.419***	-.009 ^{ns}	-.403***	.313***	.000 ^{ns}	.014 ^{ns}	.417***
Sex of any kind with a male before reaching 18 ^g	.098***	.128***	.073***	.027 ^{ns}	.063**	-.043 ^{ns}	-.076 ^{ns}
Cross product: variables ^a 10 × 11	.322***	.034 ^{ns}	-.290***	-.092***	.248***	-.025 ^{ns}	.000 ^{ns}
Cross product: variables ^a 8 × 9	.309***	.089***	-.271***	-.042 ^{ns}	.213***	-.012 ^{ns}	.081 ^{ns}
Cross product: variables ^a 8 × 10	.408***	-.057**	-.371***	-.127***	.316***	-.024 ^{ns}	.053 ^{ns}
Cross product: variables ^a 8 × 11	.350***	.026 ^{ns}	-.311***	-.076***	.238***	-.040 ^{ns}	-.037 ^{ns}
Cross product: variables ^a 9 × 10	.259***	.066**	-.225***	-.061**	.193***	.066 ^{ns}	-.002 ^{ns}
Cross product: variables ^a 9 × 11	.184***	.165***	-.150***	-.027 ^{ns}	.131***	.018 ^{ns}	-.060 ^{ns}
Total number of older brothers and sisters ^a	-.008 ^{ns}	.035 ^{ns}	.002 ^{ns}	.012 ^{ns}	.010 ^{ns}	-.033 ^{ns}	.032 ^{ns}
Number of older sisters ^a	.002 ^{ns}	.038 ^{ns}	-.001 ^{ns}	.008 ^{ns}	.010 ^{ns}	-.021 ^{ns}	.019 ^{ns}
Number of older brothers ^a	-.015 ^{ns}	.017 ^{ns}	.005 ^{ns}	.012 ^{ns}	.005 ^{ns}	-.029 ^{ns}	.028 ^{ns}
Total number of brothers ^a	-.014 ^{ns}	.029 ^{ns}	.007 ^{ns}	.012 ^{ns}	.006 ^{ns}	.042 ^{ns}	.051 ^{ns}
Total number of sisters ^a	.023 ^{ns}	.041 ^{ns}	-.019 ^{ns}	-.025 ^{ns}	.010 ^{ns}	-.057 ^{ns}	.102 ^{ns}
Total siblings ^a	.006 ^{ns}	.046*	-.008 ^{ns}	-.009 ^{ns}	.011 ^{ns}	-.015 ^{ns}	.109 ^{ns}
At least one older sister coded 0/1 ^a	-.016 ^{ns}	.047*	.018 ^{ns}	.034 ^{ns}	.011 ^{ns}	.017 ^{ns}	-.035 ^{ns}
Age at first orgasm with “never” coded missing	-.186***	-.004 ^{ns}	.169***	.054*	-.134***	-.017 ^{ns}	-.051 ^{ns}

^aN = 2,201, ^bN = 2,181, ^cN = 1,882, ^dN = 1,771, ^eN = 226, ^fN = 275, ^gN = 1,754, ^hN = 1,498, ⁱN = 254, ^jN = 193, ^kN = 216, ^lN = 95. Unless indicated by a superscript number, the lesser of the N for columns and rows provides the N for the correlation coefficient placed in the cell in the intersection of each column and row. ns indicates not significant.

*p < .05.

**p < .01.

***p < .001.

6.2.2. Predictive effects of early partnered behaviors and early masturbation using images in women

Stepwise regression procedures limited to predictor variables' numbers 8–17 in Table 12 arrived at four multiple regression statistical models. The first model was for predicting the participants' adult female-female sexual orientation as measured by the FSOS (Model number 1F, Table 4). The second model was for predicting the participants' adult female-male sexual orientation as measured by the MSOS (Model number 2F, Table 4). The third model was for predicting the participants' adult sexual

Table 13. Effects of latest age for partner sex or masturbating using images on the adult FSOS in females as measured by one-way ANOVA

Latest age (Years)	Sex of any kind with partners				Masturbation using image of adult			
	Female partners		Male partners		Females		Males	
	n_i	$M \pm SD$	n_i	$M \pm SD$	n_i	$M \pm SD$	n_i	$M \pm SD$
Never ^a	1,742	.7 ± 1.6***	976	.9 ± 2.0***	1,900	.7 ± 1.8***	1,762	.9 ± 2.0***
1–10	122	2.2 ± 2.5***	44	2.0 ± 2.4*	1	.0 ^c	0	–
11–13	112	2.0 ± 2.3***	42	1.6 ± 2.3ns	3	2.0 ± 2.0ns	2	2.0 ± 2.8ns
14–16	89	2.3 ± 2.4***	71	1.7 ± 2.7ns	21	1.8 ± 1.9*	35	1.2 ± 2.0ns
17 ^b	136	4.5 ± 3.5	1068	1.2 ± 2.2	276	3.6 ± 2.8	402	2.0 ± 2.5

Notes: The means are for the FSOS. Only the comparisons between the 17 year of age group and the other groups were made. We used rank-transformed data for the comparisons to correct for heterogeneity in the variances between groups, and we corrected for multiple comparisons using Dunnet’s tables for multiple comparisons to a single control. ns indicates not significant and “–” indicates empty set.

^aNever engaged in the behavior before reaching 18 years of age.

^bControl group for Dunnet’s comparisons.

^cThis value was treated as missing data in the ANOVA to allow *post hoc* analysis of the remaining data.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 14. Effects of latest age for partner sex or masturbating using images on the adult MSOS in females as measured by one-way ANOVA

Latest age (Years)	Sex of any kind with partners				Masturbation using image of adult			
	Female partners		Male partners		Females		Males	
	n_i	$M \pm SD$	n_i	$M \pm SD$	n_i	$M \pm SD$	n_i	$M \pm SD$
Never ^a	1,742	6.9 ± 2.2***	976	6.4 ± 2.6***	1,900	6.9 ± 2.3ns	1,762	6.6 ± 2.3***
1–10	122	7.3 ± 2.2***	44	7.2 ± 2.1ns	1	7.0 ^c	0	–
11–13	112	7.6 ± 2.3***	42	6.9 ± 2.5ns	3	8.7 ± 1.5ns	2	6.5 ± .7ns
14–16	89	7.4 ± 2.1***	71	6.6 ± 2.5ns	21	6.9 ± 2.5ns	35	7.3 ± 2.2ns
17 ^b	136	5.4 ± 3.3	1068	7.3 ± 2.0	276	6.9 ± 2.7	402	8.0 ± 2.2

Notes: The means are for the MSOS. Only the comparisons between the 17 year of age group and the other groups were made. We used rank-transformed data for the comparisons to correct for heterogeneity in the variances between groups, and we corrected for multiple comparisons using Dunnet’s tables for multiple comparisons to a single control. ns indicates not significant and “–” indicates empty set.

^aNever engaged in the behavior before reaching 18 years of age.

^bControl group for Dunnet’s comparisons.

^cThis value was treated as missing data in the ANOVA to allow *post hoc* analysis of the remaining data.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

orientation as measured by the PM-SOS (Model number 3F, Table 4). The fourth model was for predicting the participants’ adult sexual orientation as measured by the Behavioral Sexual Orientation Scale (Model number 4F, Table 4). The predictors included in the four models were different because they were selected solely based on their predictive power for the four different dependent variables.

6.2.3. Model number 1F, the FSOS and Model number 5F, the self-identified sexual orientation in women

In both Model number 1F and Model number 5F, the positive signs for ever having masturbated using female images before reaching 18 years of age and ever having had sex of any kind with a female partner before reaching 18 years of age were consistent with conditioning from these early female–female behaviors leading to an adult female–female orientation. The negative signs of the cross products between female–female behaviors and female–male behaviors provided evidence of counterconditioning and reduction in the adult female–female orientation by early experiences with male partners.

6.2.4. Model number 2F through Model number 4F

The sign of each regression coefficient in Model number 2M through Model number 5M (four separate models) for a primary variable related exclusively to sexual behaviors with male partners or masturbating using images of males was positive. These observations were consistent with conditioning from these early female–male behaviors leading to an adult female–male orientation. The sign of each regression coefficient related to sexual behaviors with females or masturbating using female images and cross products with such a variable was negative. These findings providing evidence of counterconditioning and reduction in the adult female–male orientation by both covert and overt early experiences with female partners. There were two exceptions. First, the positive sign of predictor six in Model 2F in Table 4 can be best understood as an adjustment for predictor five. It reflected the counterconditioning effect of masturbating using male images in those who had also masturbated using female images. Predictor six in Model 2F also had the smallest effect size of the six statistically significant predictors on the adult female–female sexual orientations of the participants, as measured by the partial η^2 . Second, the negative sign of regression coefficient three in Model number 4F (the cross product between early masturbation using female images and early sexual behaviors with male partners) was consistent with counterconditioning by the early covert female–female behavior having reduced the effect of the early female–male behavior (which would otherwise have been expected to have a positive sign).

6.2.5. Evaluation of the four covert measures of adult sexual orientation as predictors of the self-identified sexual orientation in women

Based on the 1,498 cases with no missing data for any of the four measures, the order of decreasing predictive power for the self-identified sexual orientation was FSOS, PM-SOS, F-BSOS, and MSOS.

The findings in Model number 1F through Model number 5F provided unequivocal evidence supporting the idea that early actual sexual behaviors with female partners or masturbation using female images tended to condition an adult female–female sexual orientation. The findings in Model number 1F through Model number 5F also provided unequivocal evidence supporting the idea that the analogous early sexual behaviors with male partners tended to inhibit development of an adult female–female sexual orientation in that participant. Furthermore, these findings provided strong evidence (in the cross products involving sexual experiences with male partners or masturbating using images of males) of counterconditioning produced by these two behaviors. The small size of the constant in Model number 1F (.471) relative to that for Model number 2F was consistent with the idea that the heterosexual bias of the societies (in which our participants developed, Testa, Kinder, & Ironson, 1987) provided little impetus to develop a same-sex orientation when conditioning was not available from actual or covert sexual experiences with same-sex partners.

6.2.6. Predictive power of masturbating using human images and engaged in sex with partners in women

We used the Pearson correlation analysis to evaluate the correlations of each of the five measures of adult sexual orientation with a total of 16 potential predictors: the 0/1 dummy variable indicating whether or not the behavior occurred, the earliest (age), the latest (age), and the number of times that participants engaged in masturbating using male or female images and the earliest, the latest, and the number of times that participants engaged in sex of any kind with male or female partners

(data not shown). It was possible to make one generalization about the relative sizes of the correlation coefficients. The latest age that participants engaged in each behavior was more highly correlated with each of the five measures of adult sexual orientation than was the corresponding 0/1 dummy variable measuring whether or not the behavior had occurred. We used a stepwise approach to construct a separate statistical model for predicting each of the five measures of adult sexual orientation. We limited each model to the four most powerful predictors. Those four predictors are listed in Table 5 in order of addition to the model—which is also in order of decreasing effect size for Model number 6F, through Model number 9F, as measured by the partial η^2 . In Model number 6F, Model number 8F, and Model number 10F the two most powerful predictors were latest-age variables, showing that latest-age variables accounted the lion's share of the variance explained by each of these three statistical models. In Model number 6F, Model number 8F, and Model number 10F, the most powerful predictor was the latest age that participants engaged in sex of any kind with a female partner. In Model number 7F, the two most powerful predictors were the earliest and latest ages that participants had engaged in sex of any kind with male partners. In Model number 9F, the two most powerful predictors were number of times that participants engaged in sex of any kind with female partners and the number of female partners.

6.2.7. Examination of the data for evidence of critical period learning in women

The variable describing latest ages that participants had engaged in sex of any kind with female partners before reaching the age of 18 was more highly correlated with the five measures of adult sexual orientation than the respective 0/1 dummy variable (indicating whether the participants had or had not engaged in the behavior). This finding was consistent with the “latest age” variable for sex of any kind with female partners containing additional predictive information about the values of the five measures of adult sexual orientation. Based on the idea that critical period learning was an important factor and that the effect of each behavior was due to the combined actions of classical and operant conditioning, we tested the following hypothesis. Participants who did not engage in the behavior would have scores disparate from those who engaged in the behavior through 17 years of age and that those who stopped engaging in the behavior before reaching 17 years of age would have scores reflecting the fact that they had experienced less conditioning or some extinction. We used recoding to increase the ns for each group and to form a total of five groups corresponding to those who had never engaged in the behavior, those who last engaged in behavior at 1–10, 11–13, and 14–16 years of age, and those who had persisted in the behavior up through 17 years of age. We examined the results of both the FSOS and the MSOS because they were completely applicable to all of the participants in the study and because they provided a pair of scales measuring the adult female–female and the adult female–male orientations (Tables 13 and 14, respectively). Put succinctly, the results supported our hypothesis.

6.2.8. Genetic versus learned?

Our data also provided information sufficient to examine three different lines of research in the female participants that, in men, have been purported to show evidence for a genetic basis rather than a learning basis for the origins of sexual preferences and orientations. The first line of evidence was earlier puberty in gay than in heterosexual individuals. The second line of evidence was the purported increased likelihood of gay men having an older brother. The third line of evidence was concordance of the sexual orientation of same-sex twins. Our findings in women regarding these three lines of research will be provided in three subsequent paragraphs.

6.2.9. Early puberty in lesbian or bisexual women

To test the hypothesis that “puberty occurs earlier in lesbian or bisexual women than in heterosexual women,” we examined data on the age at which the participants had their first orgasm while fully awake. In women, the first orgasm often occurs shortly after onset of the testosterone rise associated with puberty. The first orgasm, therefore, serves as a measure of puberty in women similarly to the way that it does in men. In our study, 1,994 of the 2,201 participants reported having experienced at least one orgasm. The participants were allowed to endorse one of five choices about their stage of physical development at the time that they experienced their first orgasm while fully awake.

The distribution of the 1,994 responses from those who provided an age for their first orgasm was as follows: “I had not begun to develop pubic hair or adult genitalia,” 6.8%. “I was in the early stages of developing pubic hair and adult genitalia,” 13.6%. “I had well established pubic hair and nearly adult genitalia, but I was still not fully mature sexually,” 23.9%. “I was completely mature physically with mature pubic hair and adult genital development,” 53.4%. And, “This question is not applicable to me since I have never yet had my first orgasm,” 2.2%. (The last response was inconsistent with their having provided an age for their first orgasm). These results confirm that the first orgasm in women often occurs during or after pubic hair grows (one of the measures used in the Tanner-staging of puberty). The participants were also allowed to endorse one of five choices about the situation in which they experienced their first orgasm while fully awake. The distribution of the 1,994 responses from those who provided an age for their first orgasm was as follows: “During masturbation and/or fantasy when I was alone,” 41.1%. “While I was with a partner in a situation that I considered to be voluntary at the time,” 52.8%. “While I was engaged in a physical activity (such as bike riding, climbing a rope, etc.),” 3.2%. “While I was with a sexual perpetrator in a situation in which I was definitely not participating in voluntarily or when I was being beaten, spanked, whipped or otherwise hurt,” .5%. And, “This question is not applicable since I have never had an orgasm when I was fully awake,” 2.6%. The distribution of responses clearly showed that the vast majority of women’s first orgasms either occurred during masturbation or voluntary participation in partnered sex. The age of the first orgasm in those 1,994 participants was 16.0 ± 4.0 (mean \pm SD) years of age. The median age of the first orgasm was 16 years of age. A histogram showed a normal distribution of the age at first orgasm. Of these 1,994 women, 7.6% had their first orgasm before 12 years of age. Eighty-three percent had their first orgasm in the interval including 12 through 20 years of age. And, 6.7% had their first orgasm after reaching 21 years of age. The first orgasm of the subset of 448 who had sex of any kind with a female partner of any age before reaching 18 years of age was at an age that was significantly younger than that of the 1,546 who had not had such an experience (14.6 ± 4.6 vs. 16.4 ± 3.7 , $p < .001$ by Mann–Whitney U). The median ages of the two groups were 15 and 17 years of age, respectively. The first orgasm of the subset of 175 who self-identified as lesbian or bisexual was also significantly younger than that of the 1,419 who self-identified as heterosexual (14.5 ± 4.9 vs. 16.1 ± 3.6 , $p < .001$ by Mann–Whitney U). The median ages of the two groups were 15 and 16 years of age, respectively. Furthermore, the age at first orgasm was significantly *negatively* correlated with the FSOS ($r = -.186$, $p < .001$) and the binary self-identified sexual orientation ($r = -.134$, $p < .001$). The age at first orgasm was significantly positively correlated with the PM-SOS ($r = .169$, $p < .001$) and the behavioral sexual orientation scale ($r = .054$, $p = .023$). The age at first orgasm was *not* significantly correlated with the MSOS ($r = -.004$, ns). The remaining 207 female participants were left out of these analyses because they denied having ever had an orgasm. Forcing the age at first orgasm into the regression analyses as a predictor in addition to those included in Model number 1F and Model number 3F through Model number 6F showed that age at first orgasm was *not* a significant predictor after adjusting for the other predictors in the model for Model number 3F, Model number 4F, Model number 5F, or Model number 6F. This result implied that the significant correlations between age at first orgasm, the BSOS, the PM-SOS, and the self-identified sexual orientation were all mathematically fully explained by the behaviors with partners described by the sexual behavior predictors in the models. Although the regression coefficient for age at first orgasm remained statistically significant when the variable was forced into Model number 1F (Table 4) to produce Model number 11F (Table 5), it had the lowest effect size of all six predictors in Model number 11F, as measured by the partial η^2 of .003. The partial η^2 of .003 was far lower than the r^2 result of .036 obtained by squaring the simple Pearson correlation of $-.186$ (Table 12). Furthermore, as mentioned above, forcing age at first orgasm into Model number 6F (which had the same dependent variable as Model number 1F) showed that it was not a significant predictor given the other predictors already in Model number 6F. These two results suggested that the effect of early sexual experiences with female partners (the theoretical mechanism explaining the predictive effect of age at first orgasm) was not fully explained by the other predictors in Model number 1F. In contrast, the effect of early sexual experiences with female partners was more fully explained by the other predictors in Model number 6F which included both the latest age and the number of times that participants had engaged in sex with female partners before reaching 18 years of age.

Table 15. Same-sex behaviors in 1,965 female participants who did not or did have crushes mostly on females after puberty

	Crushes mostly on females after puberty?				Row totals	
	No, n = 1,621		Yes, n = 59		n = 1,965	
	n	%	n	%	n	%
A: Sex of any kind with females before 18 years of age ^b						
Behavior did <i>not</i> occur before 18 years of age	1,621	85.0	36	61.0	1,657	84.3
Behavior <i>occurred</i> before 18 years of age	285	15.0 ^a	23	39.0 ^a	308	15.7 ^a
B: Masturbated using images of females before 18 years of age ^b						
Behavior did <i>not</i> occur before 18 years of age	1,706	89.5	45	76.3	1,751	89.1
Behavior <i>occurred</i> before 18 years of age	200	10.5	14	23.7	214	10.9
A or B ^b						
Behavior did <i>not</i> occur before 18 years of age	1,498	78.4	32	54.2	1,530	77.9
Behavior <i>occurred</i> before 18 years of age	408	21.4	27	45.8	435	22.1
C: Self-identified sexual orientation selection ^c						
Heterosexual	1,564	91.0	1	1.9	1,586	88.4
Gay or bisexual	133	7.7	52	98.1	185	10.4
No sexual orientation selected by participant	21	1.2	0	.0	21	1.2

^aColumn percent within the 2 × 2 or 2 × 3 table for the behavior.

^bn = 1,965.

^cn = 1,771.

6.2.10. Birth order, having sisters, and having brothers in women

As mentioned before, the lack of strong correlations between the sibling variables and the five measures of adult sexual orientation provided strong evidence against there being any causal relationship between birth order and adult sexual orientation in females.

6.2.11. Sister–sister sibling incest

There were 38 participants who reported that they had been victims of SSI before reaching 18 years of age. However, we only had data on 31 of those victims for the self-identified sexual orientation because the self-identified sexual orientation item was added to the survey program after the first 430 female participants had completed their participation. The 38 victims of SSI had significantly *higher* scores (using the Mann–Whitney *U* test) on the FSOS than the other participants (3.2 ± 3.5 vs. 1.1 ± 2.1 , $N = 2,201$, $p < .001$). The 38 victims of SSI had significantly *lower* scores on the PM-SOS (71.3 ± 30.1 vs. 88.9 ± 20.8 , $N = 2,181$, $p < .001$). And, the 38 victims of SSI had significantly *lower* scores on the BSOS (91.5 ± 23.7 vs. 96.0 ± 17.2 , $N = 1,882$, $p < .001$). Furthermore, the 31 victims of SSI for whom data were available were significantly more likely to self-identify as lesbian or bisexual than the other participants (29.0% vs. 10.1%), $Eta^2[1, 1,771] = 9.717$, $p = .003$). However, forcing the 0/1 dummy variable for SSI into Model 1F, or Model 3F, or Model 4F, or Model 5F showed that SSI was no longer a statistically significant predictor after adjusting for the effects of the other predictors in the models. These latter results were consistent with the idea that the effect of incest with the sister had been mathematically fully explained by the variables encoding for actual sexual behaviors with female partners in general or masturbating using images of adult females. Furthermore, these latter results were also consistent with the idea that the effect of sexual behavior with a sister had neither a greater nor a lesser effect than actual or covert same-sex sexual behaviors in general.

6.2.12. Shifts in latest sexual behavior of women with partners

There were 266 cases in which the participants reported sex of any kind with both male and female partners after reaching 18 years of age. To determine whether there was a shift toward male or female

Table 16. Percentages and cumulative percentages of female participant's scores on the PM-SOS tabulated by self-identified sexual orientation

Range	Self-identified as heterosexual		Self-identified as gay or bisexual		No self-identity selected		All participants with data	
	%	Cumulative percent	%	Cumulative percent	%	Cumulative percent	%	Cumulative percent
0	.0	.0	12.4	12.4	6.3	6.3	1.3	1.3
.01–10.0	.0	.0	4.9	17.3	.0	6.3	.5	1.8
10.01–20.0	.0	.0	11.9	29.2	.0	6.3	1.1	2.9
20.01–30.0	.2	.2	8.1	37.3	6.3	12.5	1.0	3.9
30.01–40.0	.5	.6	10.3	47.6	.0	12.5	1.3	5.2
40.01–50.0	.6	1.3	11.4	58.9	.0	12.5	2.1	7.3
50.01–60.0	1.6	2.9	8.1	67.0	.0	12.5	2.5	9.8
60.01–70.0	4.1	7.0	8.1	75.1	.0	12.5	4.4	14.2
70.01–80.0	6.4	13.3	5.9	81.1	.0	12.5	6.6	20.8
80.01–90.0	12.8	26.1	10.8	91.9	12.5	25.0	12.7	33.5
90.01–100.0	73.9	100.0	8.1	100.0	75.0	100.0	66.5	100.0
Total N for column	1,553		185		16		2,181 ^d	
Median	100		42.9		100		100	
Mean ± SD	93.8 ± 11.9 ^b		45.1 ± 31.6 ^{a,c}		87.3 ± 30.0 ^b		88.6 ± 21.5	

Notes: The data are from the 1,754 female participants who provided data about their self-identified sexual orientation and who had non-zero scores on both the MSOS and the FSOS.

^aThe mean was significantly different from that of the self-identified heterosexual group.

^bSignificantly different from the mean of the self-identified gay or bisexual group.

^cSignificantly different from the mean of the no self-identity selected group (all $p < .001$) after Tukey correction for multiple comparisons and rank-transformation of the data to correct for the heterogeneity of variance present in the untransformed data.

^dThe N for all participants with data (2,181) is higher than the sum of the three groups (1,754) because the other groups were reduced by the smaller N of the self-identified sexual orientation used for defining the other three columns.

partners and to look for variables that might predict the direction of the shift, we calculated the age difference between the latest age that they had reported sex of any kind with a male partner minus the age that they reported sex of any kind with a female partner after reaching 18 years of age. A zero value indicated that sex with both male and female partners had last occurred within the same year of age. A negative value indicated that the last partner sex had occurred with a female. A positive value greater than zero indicated that the last partner sex had occurred with a male partner. A one-sample *t*-test showed that the mean difference was 2.15 ± 6.46 years (mean ± SD, $t = 5.4$, $p < .001$). This result meant that there was a significant trend toward favoring male partners among the 266 women with sexual experience with both male and female partners as adults. Correlation and regression analysis showed none of the variables numbered 7–16 in Table 12 was a significant predictor of the shifts in adulthood toward favoring either male or female partners.

6.2.13. Shifts in adult latest masturbatory behavior of women

There were 275 cases in which the participants reported masturbating with both adult male and adult female images after reaching 18 years of age. To determine whether there was a shift toward male or female images and to look for variables that might predict the direction of the shift, we calculated the age difference between the latest ages that they had reported masturbating using a male image minus the latest age that they reported masturbating using a female image. A zero value indicated that masturbating with both male and female images had last occurred within the same year of age. A negative value indicated that the last masturbation had occurred using a female image. A positive value greater than zero indicated that the last masturbation had occurred using a

male image. The mean difference was $.17 \pm 1.93$ years. A one-sample *t*-test ($t = 1.4, p = ns$) showed that there was no significant trend in either direction. Correlation and regression analysis showed that none of the variables numbered 7–16 in Table 12 was a significant predictor of shifts in adulthood toward using male or female images during masturbation.

6.2.14. Crushes in female participants

Of the 1,965 female participants who were able to provide data on crushes, 48 (2.4%) acknowledged having had crushes mostly or exclusively on females before puberty. Fifty-nine (3.0%) acknowledged having had crushes mostly or exclusively on females after puberty (Table 15). Forty-one (2.1%) endorsed both selections. Seven who had such crushes before puberty did not report them after puberty. And, 18 who had not acknowledged having them before puberty reporting having crushes exclusively or mostly on females after puberty. Of the 1,906 who did not report having crushes exclusively or mostly on females after puberty, 15.0% reported having had sex of any kind with females. Approximately 11% reported having masturbated using images of females before reaching 18 years of age (Table 15). On the other hand, of the 59 who reported having crushes mostly on females after puberty, 39.0% reported having had sex of any kind with females. And, 23.7% reported having masturbated using images of females before reaching 18 years of age (Table 15). The latter observations were consistent with the idea that early same-sex crushes were a powerful motivator for engaging in both kinds of same-sex behaviors.

As shown in Table 15, the 59 female participants who acknowledged having had crushes mainly on females after puberty but before 18 years of age were more likely to have engaged in sex of any kind with females by 18 years of age. They were also more likely to have masturbated using images of females by 18 years of age. Nevertheless, because of the large number of participants without crushes on females (1,621 vs. 59), the actual number of participants who actually had sex of any kind with females before reaching the age of 18 contributed by the group without same-sex crushes was more than twelve times higher than the number contributed by the group of participants who acknowledged having crushes mostly on females after puberty. Furthermore, the actual number who masturbated using images of females before reaching the age of 18 contributed by the group without same-sex crushes was more than fourteen times higher than the number contributed by the group of participants who acknowledged having crushes mostly on females after puberty.

As predictors of the five adult sexual orientation variables, we tested three “crush on females” 0/1 dummy variables using correlation analysis. The three variables were crushes mostly on females before puberty, crushes mostly on females after puberty, and having endorsed having crushes on females as a child (item A) or mostly on females (recoded items C or D) coded as a 0/1 dummy variable. This latter combination “crush on females” variable was the most powerful predictor for three of the five scales (the MSOS, the PMSOS, and the self-identified sexual orientation scale). We also tested the three corresponding variables substituting the word “males” for females. Having crushes mostly on males after puberty coded as a 0/1 dummy variable was the most powerful “crush on males” predictor of scores on all five adult sexual orientation variables.

In order to measure the relative predictive power of the above two crush variables and the four primary early sexual behavior variables (sex of any kind with—or masturbating using images of—males or females) in women, we utilized a stepwise approach to construct the first five multiple regression or multiple logistic regression models for females presented in Table 9. In each model, the variables were entered in order of decreasing predictive power. In each of the five models for females, one or the other of the crush predictors was the most powerful initial predictor. As shown in Table 9, having crushes predominantly on females before reaching 18 years of age was selected as the first variable added to three of the five models for females on the basis of predictive power (Models number 14F, number 16F, and number 18F). The effect size (as measured by the partial η^2) showed that it was the most powerful predictor in both Model number 14F and Model number 16F. In Model number 15F (a logistic regression model), having had crushes primarily on females before 18 years of age was the most powerful predictor in the model. The odds-ratio showed that having had crushes primarily

on females before 18 years of age increased the likelihood that a participant would self-identify as lesbian or bisexual by approximately 18.5 times. Furthermore, having had crushes predominantly on females before 18 years of age had the highest odds-ratio of all the predictors in the logistic regression model. These findings in women for the predictive power of experiencing crushes on females before 18 years of age were consistent with the idea that experiencing those crushes had a powerful effect on the participant's adult sexual orientation *above and beyond* the effects of conditioning from the reported actual and covert same-sex behaviors that occurred prior to 18 years of age. In Model number 15F (for predicting the MSOS), adjustment for the other predictors in the model showed that masturbating using male images had a larger effect size in the final model than did having crushes on males after puberty or having crushes on females. In Model number 17F (for predicting the score on the BSOS scale), crushes on males after puberty and crushes on females were the two most powerful predictors in women (in order of decreasing predictive power).

6.2.15. Predictors for females having crushes

To identify possible predictors for having crushes, we used the same two crush predictors that we previously found to be the most powerful predictors for the adult sexual orientations of the participants as dependent variables in the four logistic regression analyses in Table 10. We also identified the predictors for opposite-sex crushes after puberty and predictors for same-sex crushes before puberty. We examined exactly the same set of initial predictors used for the analogous logistic regressions in the data from the male participants. We also used exactly the same criteria for predictor eligibility for inclusion in the final models. The four models resulting from the logistic regression analyses are presented in Table 10 along with data on the counts for the "one" and "zero" values in the dependent variables and the percentages of respondents in each column who had endorsed the predictor. We first screened the possible predictors for statistical significance at step-0 of the logistic regression. Only those predictors that were statistically significant were eligible for inclusion in the multiple logistic regression models. We used a stepwise approach to building the logistic regression models for females in Table 10. At each step, we added the nuclear family variable that was the most powerful remaining predictor for having predominantly same-sex crushes before 18 years of age (Model number 19F), predominantly same-sex crushes after puberty but before 18 years of age (Model number 20F), predominantly opposite-sex crushes after puberty but before 18 years of age (Model number 21F), and predominantly same-sex crushes before puberty (Model number 22F).

Parents having a united approach on how to deal with the participant as a child, high levels of displayed maternal affection for the participant as a child, and the child's parents having had a relationship free from fighting or criticism and evidencing quiet love and affection for one another were all statistically significant predictors that reduced the likelihood that the participant would experience predominantly same-sex crushes before 18 years of age (Model number 19F). Having witnessed parental intercourse by sight or sound as a child or adolescent, having so little contact with her mother that the participant had no idea what her mother's attitude was about sex, and having witnessed the participant's mother take the participant's part against her father in parental disagreements were all statistically significant predictors that increased the likelihood that the participant would experience predominantly same-sex crushes after puberty but before 18 years of age (Model number 20F). Having so little contact with her mother that the participant had no idea what her mother's attitude was about sex, having a parent die without a remarriage before the participant reached 18 years of age, and the child's parents having had a relationship free from fighting or criticism and evidencing quiet love and affection for one another were all statistically significant predictors for opposite-sex crushes after puberty but before 18 years of age (Model number 21F). In Model number 21F, the first two predictors reduced the likelihood that the participant would experience predominantly opposite-sex crushes after puberty but before 18 years of age. In Model number 21F, the third predictor increased that likelihood (Model number 21F). As expected, whenever the same predictors appeared in two of the first three models, the signs (direction of predicted effects) were reversed in keeping with the reversed sexes of the crush objects serving as the dependent variables (e.g. predictor number 3 appears in Model number 19F with a negative sign and also as predictor number 3 in Model number 21F with a positive sign. Predictor number 2 appears in Model number 20F with a

positive sign and also as predictor number 1 in Model number 21F with a negative sign). We included Model number 23F to identify predictors for same-sex crushes *before* puberty. High levels of displayed maternal affection for the participant as a child reduced the likelihood of same-sex crushes *before* puberty. Having witnessed parental intercourse by sight or sound as a child or adolescent and having been raised by grandparents both increased the likelihood of having same-sex crushes *before* puberty (Model number 23F).

Thus, our data pointed to parental relationship issues within the nuclear family, the amount of maternal affection the participant had received, maternal absence either as measured by little contact (Model number 21F) or having been raised by grandparents (Model number 23F), and witnessing parental coitus as predictors that influenced whether female participant's early crushes would be mainly on females or mainly on males. Extensive cross-tabulation of the other choices for Item number 3 (data not shown) established that it was the loss of a father by death before the age of 18 without a replacement father-figure that accounted for the statistical effect of predictor number 2 in Model number 21F (a reduction in the likelihood of an opposite-sex crush). To provide a model without predictor number 2, we have provided Model number 22F while preserving the predictor numbering from Model number 21F to allow easy comparison of the two models. Note that there was very little change in the signs or numerical values of the two predictors between Model number 21 and Model number 22 and that none of the remaining predictors were statistically significant once these two predictors had been entered into the model.

6.2.16. Frequencies of scores on the PM-SOS in female participants

In Table 16, we have presented the observed frequencies of scores on the PM-SOS in those women self-identifying as heterosexual, those self-identifying as lesbian or bisexual, those who did not select a self-identified sexual orientation, and in all 2,181 female participants. The data showed a dramatic, but expected, significant difference in the scores on the PM-SOS between those self-identifying as lesbian or bisexual and those self-identifying as heterosexual. Although 73.9% of those self-identifying as heterosexual had scores over 90 and 86.7% had scores over 80 on the PM-SOS, 13.3% had scores of 80 or less and 1.3% had scores of 50 or less. Scores of 50 or less on the PM-SOS showed that their scores on the FSOS were actually as high as or higher than their scores on the MSOS in 1.3% of those self-identifying as heterosexual. This result clearly showed that 1.3% of those self-identifying as heterosexual had demonstrated a score consistent with bisexuality, with some even favoring female partners.

As expected, the frequency distribution for those 185 women self-identifying as lesbian or bisexual showed more variability than the frequency distribution for those self-identifying as heterosexual. Of those 185 women, 12.4% had scores of zero and 58.9% had scores of 50 or less. About 74.6% of those self-identifying as lesbian or bisexual exhibited evidence of being bisexual to one degree or another (based on their scores on PM-SOS falling in the interval above 10 and as high as 90). This percentage was increased to 82.7% when the 8.1% who turned in scores above 90 on the PM-SOS were included. There was a small frequency peak in scores in the interval above 30 and as high as 60. The 16 participants in Table 11 who did not select a self-identified sexual orientation turned in scores that were not significantly different from those who self-selected the heterosexual identity. This fact justified combining these 16 participants with those self-identifying as heterosexual in the logistic regressions leading to Models number 5F and number 10F.

6.3. Contrasts between male and female participants

In the present study, the analysis of the data from the female participants was designed to be parallel to that of the data from the 1,242 male participants. A paired *t*-test of the adjusted r^2 or Nagelkerke r^2 values that paired the similar models (male-female) was statistically significant with a mean difference of $.387 \pm .076$ [$t(4) = 11.4, p < .001$]. This result showed that the adjusted r^2 values for the female participants were systematically lower than those of the male participants for each of the five similar models in Table 4. A second paired *t*-test of the adjusted r^2 or Nagelkerke r^2 for Models number 6 through number 10 of Table 5 was statistically significant with a mean difference of

.338 ± .054 [$t(4) = 13.9, p < .001$]. This result showed that the adjusted r^2 values for the female participants were also systematically lower for each of the second five models. A third paired t -test of the adjusted r^2 or Nagelkerke r^2 for Models number 14 through number 18 of Table 9 was statistically significant with a mean difference of .312 ± .033 [$t(4) = 21.1, p < .001$]. This result showed that the adjusted r^2 values for the female participants were also systematically lower for each of the third five models.

7. Discussion

This paper was the first to examine the origins of adult sexual preferences in men and women while also adjusting for the effects of sibling incest and the first to demonstrate a predictive relationship between factors within the nuclear family and same-sex crushes in men and women. The statistical analysis, the tables, the results section, and discussion of the data from the two sexes were designed to be completely parallel, so that we could compare and contrast the results for the two sexes. In each sex, we used four different covert measures of adult sexual preference as well as the self-identified sexual orientation. In the two sexes, the MSOS, FSOS, PM-SOS, and BSOS were all covert measures of sexual orientation because all were based either on items apparently randomly scattered among hundreds of other apparently unrelated items presented either as multiple choice or as agree–disagree (the MSOS, FSOS and PM-SOS) or based on behaviors with adult sexual partners apparently scattered randomly among hundreds of items that obtained detailed information about sexual behaviors (the BSOS). In each sex, three of the covert measures (the MSOS, the FSOS, and the PM-SOS) allowed us to measure orientations toward males and toward females even in those participants who had not actually engaged in sex with a partner of either sex as an adult.

7.1. The measures of adult sexual orientation

The FSOS and MSOS scales used in this paper by Stroebel et al. (2013) and by Beard et al. (2013) were designed to provide orthogonal measures of sexual orientation (Beard et al., 2013; Bickham et al., 2007; O’Keefe et al., 2014; Robinett, 2012; Storms, 1980; Stroebel et al., 2013; Whalen et al., 1990). In other words, the orientations toward sex with same-sex partners and opposite-sex partners were analyzed as independent variables that could be represented graphically on orthogonal coordinates. Both scales were based on a wide range of sexual behaviors (Beard et al., 2013; Stroebel et al., 2013) that conceptually conformed to the view of sexual orientation as a multivariable dynamic process (Klein, 1990). The third and fourth covert measures, the PM-SOS and the F-BSOS, each provided a measure of adult sexual orientation modeled as a continuous variable, analogous to measures used by Kinsey et al. (1948, 1953, 1955), Van Wyk and Geist (1984), Bickham et al. (2007), Beard et al. (2013), and Stroebel et al. (2013). We also used a fifth, face-valid, measure of adult sexual orientation, the binary self-identified sexual orientation.

7.2. The evidence from the study

Although the five measures of adult sexual orientation were different, in each sex the results regarding the effects of early sexual behaviors on adult sexual orientation of the participants were remarkably similar. In each sex, our detailed statistical analyses provided evidence consistent with the theory that adult sexual orientation of the participants was determined by conditioning as hypothesized by Beard et al. (2013) and O’Keefe et al. (2014). Furthermore, in each sex additional statistical analyses identified the latest age before reaching 18 years of age that participants had engaged in same-sex actual or covert (masturbatory) behaviors as some of the most powerful predictors of their adult sexual orientation. This provided further evidence for the role of conditioning in establishing their adult sexual orientations.

7.2.1. Sex of early crush objects

The findings in both sexes regarding the effects of nuclear family variables on the sex of the participants’ early crushes can be interpreted as consistent with Bowlby’s attachment theory based on Bowlby’s inclusion of data on experimental rearing factors that led to same-sex preferences in ducks (Schutz, 1965; cited by Bowlby, 1969, p. 163). In both sexes, when the internalized working model of the opposite-sex parent (Bowlby, 1988) did not model a good heterosexual romantic partner, the

child and adolescent tended to form same-sex crushes. On the other hand, when the internalized working model of the opposite-sex parent modeled a good heterosexual romantic partner, the child and adolescent tended to form opposite-sex crushes.

In the males, the most powerful nuclear family predictor of developing same-sex crushes was endorsing the statement: "There was often an obvious disagreement between my parents with my mother taking my part against my father." In bonobos, the dominant animal in the group is always a female and her son is always the dominant male because she instinctively joins him in any fight with another bonobo (De Waal & Lanting, 1997). In humans, the dynamic of the mother joining the son against the father in any disagreement with his father replays the dominant female bonobo's joining her son in any fights involving other male bonobos. In humans, this type of triangulation by his wife and son (Charles, 2001; Dallos & Vetere, 2012) is perceived by the father as very hurtful and demeaning because it allows his son to achieve dominance over him and it displays his wife's dominance in front of his son. Simultaneously, it demonstrates to the son that the wife (his mother) chooses such opportunities to hurt her husband. The son quickly learns to take advantage of this dynamic at every opportunity, guaranteeing that it occurs frequently within the family. This triangulation-dynamic's prediction of development of same-sex crushes in the son was consistent with the son's internalized working model of his mother modeling a bad heterosexual romantic partner. In other studies, triangulation involving the parents and a child has also been shown to be harmful to the triangulated offspring through other mechanisms (e.g. Buehler, Franck, & Cook, 2009; Franck & Buehler, 2007; Pinheiro et al., 2006). Other predictors of same-sex crushes included the father's attitude that sex was healthy and the mother's attitude that sex was filthy and disgusting. These observations suggest that the (early) choice of romantic partner was in some way being influenced by a mechanism involving the participant's mother, possibly either as a model (Bandura, 1986) or as an internalized or working model (Bowlby, 1969) of a potential future romantic attachment figure.

In females, parental disagreements and loss of the participant's father through death without replacement before the age of 18 (factors which cast the father in the role of an unsatisfactory sex partner or could have led to the absence of an internalized working model of the opposite-sex parent) predicted that a female participant's childhood or adolescent crushes would be primarily on females. Witnessing parental intercourse (which could have been misinterpreted by young girls as parents fighting or fathers mistreating mothers) also predicted that a female participant's childhood or adolescent crushes would be primarily on females. Low levels of maternal affection for the participant and lack of contact with the participant's mother (factors which reflected diminished or absent maternal affection) also predicted that a female participant's childhood or adolescent crushes would be primarily on females. This observation suggested that seeking to replace absent or reduced maternal affection with affection from an alternative mother-figure was a factor that predicted early same-sex crushes. Thus, in females (as in males) variables describing the nuclear family had influenced the sex of participant's crush objects.

7.2.2. Early Puberty in participants with same-sex orientations

Bisexual or gay men tended to have had an earlier onset of puberty than the heterosexual men. Bisexual or lesbian women tended to have had an earlier onset of puberty than the heterosexual women. In both sexes, the effect of early puberty seemed to be completely explained by an earlier onset of a strong sex drive (caused by early puberty) and their having turned to the only sex partners readily available at that earlier age, same-sex partners, as predicted by Storms (1981) theory.

7.2.3. Sibling incest

We were able to show that early incestuous experiences with brothers clearly affected the adult sexual orientations of the incest participants in men even though there were only 25 such cases in our sample. We were able to show that early incestuous experiences with sisters clearly affected the adult sexual orientations of the incest participants in women even though there were only 38 such cases in our sample. There was no evidence that the effect of incest was significantly different from

similar experiences with unrelated sexual partners except that incestuous experiences tended to be earlier and there also tended to be more access to siblings (Beard et al., 2013; Stroebel et al., 2013).

7.2.4. *No effect of birth order in men or women*

We were not able to show any effect of either birth order or having an older-brother in men even though there were 474 cases with older brothers, suggesting that such effects, if they exist at all, were too small to detect in our sample of 1,242 men. We were not able to show any effect of either birth order or having an older-sister in women even though there were 829 cases with older sisters, suggesting that such effects, if they exist at all, were too small to detect in our sample of 2,201 women. Bearman and Bruckner (2002) also found no evidence for an effect of older siblings (whether sisters or brothers) on the sexual orientation of either male or female participants in their study of 5,512 respondents.

7.2.5. *Direction of orientation change in men*

We were able to show that the direction of behavior change in men could be predicted by the MSOS. The direction of behavior change as measured by the interval in years between the last sexual behavior with male and female partners could also be predicted by whether or not the participant had masturbated using male images before reaching 18 years of age. The findings regarding direction of adult behavior change were consistent with other research showing that most of the change in sexual orientation displayed by adult men was seen in those who were bisexual (Dickson et al., 2013).

7.2.6. *Direction of orientation change in women*

We were able to show trended significantly toward favoring male partners in 266 cases, a finding consistent with the results of Dickson et al. (2013) who showed that changes in sexual orientation were more common among those initially attracted to both sexes. The trend favoring sex with male partners as the women aged was consistent with the idea that women were more likely than men to respond to societal pressures (Baumeister, 2000) which tended to favor heterosexual over same-sex relationships during the study interval in the area of the USA from which the participants were recruited (Testa et al., 1987; i.e. those who had bisexual interests but were overtly or covertly punished for same-sex behaviors would be more likely to engage in opposite sex behaviors). We found no significant trend in either direction in the sex of the image used while masturbating in the 275 cases in which the female participants reported masturbating using images of both sexes.

7.3. *Requirements for establishing causal relationships*

Although data from correlative studies cannot, alone, provide proof of causality, it is well established that showing that putative causes tend to be antecedent to the putative effect (Hill, 1965; Offord & Kraemer, 2000; Susser, 1991) combined with evidence of a strong association and evidence from the biological sciences that identify the mechanisms through which the putative causes produce the putative effect provides evidence of causality (Hill, 1965; Susser, 1991). In our study, the crushes and behaviors that we have asserted were determinants of adult sexual orientation were clearly antecedent to the adult sexual orientation. Associations between endorsing being gay or bisexual as an adult and early same sex crushes, masturbating using images of males, and sex of any kind with male partners before reaching 18 years of age were *strong* (Table 6, Model 18M). Participants who engaged in the behaviors were 31 times, 10 times, and 5 times as likely, respectively, to endorse being gay or bisexual as those who had no history of such behaviors. The mechanisms of romantic attachment (Henry & Holmes, 1998; Rusby, 2010; Simpson & Rholes, 1998), classical conditioning (see Hoffmann, 2012; Pfaus et al., 2012 for reviews), operant conditioning (see Hoffmann, 2012; Pfaus et al., 2012 for reviews), critical period learning (Desmarais et al., 2012; Fox & Rutter, 2010; Fox et al., 2010; Griffee et al., 2014a; Griffee et al., 2014b; Uylings, 2006), and sexual imprinting (Aronsson et al., 2011; Bereczkei et al., 2004; Enquist et al., 2011; Nojo et al., 2012; for a review of sexual imprinting in animals see Irwin & Price, 1999) have all been extensively studied in both animals and humans. Taken together, these three converging lines of evidence are sufficient to establish a very-likely causal relationship between the early crushes and early sexual behaviors and subsequent adult sexual orientations, but they do not rule out the existence of still other causes or mechanisms (e.g. weak genetic effects

predisposing in some unknown way to development of same-sex attractions, Sanders et al., 2015). Similar arguments support the idea that there is a causal relationship between the factors in the nuclear family and the occurrence of same-sex crushes in childhood and adolescence because the impact of such factors was predicted by Bowlby's attachment theory which, in its broader applicability to relationships with adult romantic partners, has been validated by other investigators (e.g. Carlson et al., 2004; Henry & Holmes, 1998; Roisman et al., 2005; Roisman et al., 2001; Rusby, 2010; Simpson & Rholes, 1998).

Returning to our data on adult self-identified sexual orientation, for examples, 80.6% of those who endorsed being gay or bisexual as adults provided a history of either masturbating using male images or engaging in sex of any kind with a male partner before reaching 18 years of age. Adding having experienced post-pubertal crushes exclusively or predominantly on males increased the figure to 85.4%. When we included masturbating using images of males and engaging in sex of any kind with males *before or after* reaching 18 years of age, 91.3% vs. 13.2% of those not self-identifying as gay or bisexual had engaged in at least one of the three behaviors, leaving 8.7% of the adult self-identified sexual gay or bisexual orientations unexplained. It is therefore likely that other behaviors such as masturbating using same-sex text, movies, or fantasies (none of which were accounted for in the present statistical analysis) could explain the other 8.7% without having to hypothesize a very different sort of causal chain.

7.4. Reversibility of causality and possible third-factor explanations

The standard explanation for how the adult sexual orientation could have influenced (in reverse) early sexual experiences and early masturbation using images is that the adult sexual orientation could have influenced participant's perceptions or memories of these factors. However, based on the extensive research on the validity of retrospective reports (that showed fairly good reliability of reports on whether or not events happened and few false positives, Hardt & Rutter, 2004), we believe that the events we described above in such alternative explanations would be extremely unlikely to occur. We have explored the following alternative hypothesis to explain our results. Since the results were based on a "correlative study," could it be that the correlations between the behaviors that occurred before the participants reached 18 years of age and the measures of adult sexual orientation were either explained by the adult sexual orientation causing the behaviors or that both were caused by a third factor (e.g. a gene or some other sort of biological factor)? In order to test this alternative hypothesis, it was appropriate to test whether such an approach could be shown to produce (logically) absurd conclusions (*reductio ad absurdum*). First, since time lines and the possibility of causality only flow in one direction, latter events cannot be logically said to have caused antecedent events. Because the predictors were all events that occurred prior to measurement of the adult sexual orientation variables, the first of the two options must be rejected. Second, since same-sex parent child incest (PCI) has been shown to increase the likelihood that the PCI victim would have an adult gay or bisexual orientation (Goodwin & DiVasto, 1979, 1989; Meiselman, 1979; Rosencrans, 1997; Simari & Baskin, 1984), the third factor hypothesis would erroneously predict that the gay or bisexual child had seduced the parent. Otherwise, both the parent and the child would have had to be genetically gay, which has been shown to be an unlikely event (Anderssen et al., 2002). In contradiction to the erroneous prediction, the fact is that it is the parent who is responsible for sexually seducing the child. Third, there would have to be a series of gay-genes coding for various degrees of being gay mixed with varying degrees of heterosexuality to explain the diversity along the gay-heterosexual spectrum, whether that spectrum is modeled statistically by a single continuous variable or by two orthogonal coexisting orientations. However, the DNA-based evidence for linkage between same-sex sexual orientation and regions on two chromosomes was obtained using a binary (homosexual/heterosexual) model, and the linkages found were weak and consistent with a multifactorial causation that included environmental factors (Sanders et al., 2015). Fourthly, in the present as well as other studies (e.g. Bell et al., 1981) the early history of gay and bisexual men shows a very high incidence of sex with both male and female partners, not an exclusive preference for male partners, as would be predicted by a gene coding for exclusive preference for same-sex partners (Sanders et al., 2015). Finally, in agreement with the findings of Dickson et al. (2013), we have

provided evidence that the adult behaviors of the male participants who engaged in behaviors with both male and female partners as adults tended to drift either toward the heterosexual or the gay end of the spectrum. The direction of the drift depended on whether their MSOS score was lower or higher, respectively, than a statistically estimable value of the MSOS score. This phenomenon was consistent with small but continued change of adult sexual orientation induced by continued conditioning from covert and overt behaviors that occurred during adulthood. Similarly, we showed that for women with adult experience with partners of both sexes, behaviors with partners tended to drift toward heterosexual behaviors with partners (in the direction favored by societal pressures prevailing in the society in which they resided).

7.5. A unitary hypothesis and comparison of women's results to those of men

In general, the results (comparing and contrasting the results of the women to those of the men) were completely consistent with the unitary hypothesis that human adult sexual orientations are the result of the combined, concerted, and synergistic actions of early classical conditioning, operant conditioning, critical period learning, sexual imprinting (Beard et al., 2013; O'Keefe et al., 2014) and sex-specific crushes, *in both sexes*. The similarity in the results from the two sexes allowed the results and discussion of the men and the women to be remarkably parallel. Our study showed, for the first time, that lesbian or bisexual women (like gay or bisexual men) had significantly earlier onset of puberty than heterosexual controls. Our findings in both sexes were predicted by the theories of Storms (1981). In their "study 1" of age at puberty in 91 lesbian and 74 heterosexual women using a different measure for onset of puberty, Tenhula and Bailey (1998) *did* report that the lesbian women had a .4 year earlier onset of puberty as measured by menarche, but the p -value of .08 was declared not statistically significant. In retrospect, the study of Tenhula and Bailey (1998) tends to confirm our study rather than contradicting it. Two factors seem to explain why we succeeded in finding a statistical significant difference in data from women while the difference (in the same direction) by Tenhula and Bailey (1998) failed to reach statistical significance. First, our use of age of first orgasm as the measure of puberty in women was a far more direct measure of the developing sexual interest caused by increasing androgen levels related to early puberty that Storms (1981) predicted would lead to more same-sex behaviors than menarche which would be expected to correlate better with estrogen levels. Second, the total N for our study was much larger than that of "study 1" (Tenhula & Bailey, 1998). The fact that the results in the female participants so closely paralleled those of our sample of male participants when similar techniques were applied to both sexes (an approach suggested by Mustanski et al., 2002) confirmed the results in both sexes by showing their similarity, and it also showed that in many ways, the origins of adult sexual orientations of females are more analogous to those of males than previously thought. However, paired t -tests showed that the adjusted r^2 results of women were systematically and significantly lower than those of men for the three similarly numbered sets of five models contained in Tables 4, 5, and 9. This result showed that the percentage of the variation in the adult sexual orientations of the participants explained by conditioning from early sexual behaviors and early crushes was significantly lower in women than in men.

In both sexes, the majority of cases of childhood and adolescent same-sex behaviors with partners occurred in those who did *not* have same-sex crushes after puberty, even though the rate of such behaviors was increased in those with same-sex crushes. This effect was more pronounced in women than in men because of relatively low percentage of women who reported same-sex crushes. Furthermore, there was a significantly higher rate of early same-sex behaviors with partners in women than in men (20.9% of 2,201 female participants vs. 13.6% of 1,242 male participants, $\chi^2[1] = 27.48, p < .001$).

We believe that at least three differences between women and men identified in our study are related to some of the reported differences in the malleability of the self-identified sexual orientations in women and men (Baumeister, 2000; Diamond, 2012; Dickson et al., 2013; Peplau et al., 1999). The first two differences may play a role in the greater malleability in women, while the third may be mainly a result the greater malleability of the self-identified sexual orientations in women. First, as shown

above by comparing the women in the present study to the men in our study, a higher percent of women than of men had experiences with early same sex behaviors, providing them with a coexisting same-gender orientation (Bickham et al., 2007) that would enable functioning in same-sex relationships. Second, the sex drive (or interest in sex) of women is lower than that of men (Baumeister et al., 2001; Griffee et al., 2014a; Griffee et al., 2014b using data based on the same participants in the present study). Having a lower sex drive than their male partner would make it more likely that females would often be in the position of responding to sexual initiation by a potential partner rather than being the initiator in heterosexual relationships. Third, the adjusted r^2 values of the regressions examining the data from females were systematically lower than the parallel regressions examining the data from males. This showed that the percentage of the variance in adult sexual orientation that can be explained by conditioning from masturbation using images, experiences with early sex partners, or early sex-specific crushes was lower in women than in men. This adjusted r^2 difference was very likely the result rather than a cause of the greater malleability of the self-identified sexual orientations in women (Baumeister, 2000; Diamond, 2012; Dickson et al., 2013; Peplau et al., 1999).

8. Limitations to the study

This was an epidemiological, self-selected, cohort study based on a convenience sample, not an experimental study. Since the participants were *not* identified as children and then randomized into groups to be subjected to experimenting with same-sex or opposite-sex partners before 18 years of age or to masturbating using male or female images under the direct supervision of an investigator, it can be said that our present study was correlative in nature. However, it would not be ethical to implement the prospective, randomized design described above, (Friedrich, 2005, p. 44). So, retrospective designs relying on random differences between individuals in past early behaviors are the only available way to study the behavioral origins of adult sexual orientations.

Describing the study as correlative implies that the correlation between early events and later events, we found *could* have been caused by selective memory or other reporting defects to which retrospective studies are vulnerable (e.g. selectively remembering an early behavior because participants engaged in a later behavior or creating a false early memory to justify participants' later behavior). However, as we have mentioned above, based on the extensive research on retrospective data that showed fairly good reliability of reports on whether or not events happened and few false positives (Hardt & Rutter, 2004), we believe that the events we described above in such alternative explanations would be extremely unlikely to occur. Furthermore, because we did not obtain a random sample of a defined general population, our results cannot be used to estimate the *incidence* of behaviors in the general population. However, as was shown by this study, the incidences of the various types of adult sexual orientation are far less useful than the understanding of the origins of these adult sexual orientations, because the incidence should vary if the incidences of early same-sex and opposite-sex crushes and same-sex and opposite-sex sexual behaviors change. Moreover, because many of the participants were from state-supported schools and relatively well educated, questions can be raised about whether conclusions based on the study sample would apply to more poorly educated or extremely wealthy individuals.

Despite these limitations, convenience samples have been, and continue to be, useful to answer other kinds of sexological questions, such as those addressed in the present paper (Brecher & Brecher, 1986). Furthermore, studies that have attempted to obtain random samples to obtain data on CSA and other types of sexual behavior have run into sampling problems (Brecher & Brecher, 1986; Pilkington & Kremer, 1995).

Our findings provide important information about the impact of early crushes, experimenting with partners, and masturbating using images on the adult sexual orientations of both men and women. Our findings also provide important information about the impact of some nuclear family factors on the sex of childhood and adolescent crushes.

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Appendix A

Items from computer-assisted self-interview (CASI) program S-SAPE1@S-SAPE, LLC. Reproduced by permission of S-SAPE, LLC, 2002, P.O. Box 11081, Charleston, WV 25339. Permission to reuse must be obtained from the rights holder.

Sexual behavior screen

The screen displayed each *behavior* item (one at a time), detailing not only the behavior but also that it was voluntary or coerced. Each item specified the age of the respondent at the time, the age-differential category, and sex of the partner. The questions were presented in a multi-tiered hierarchically structured format.

Items for behaviors during sex with partners

Items (1) and (2) below represent second-tier screening questions that only allowed access to third-tier questions if they were answered affirmatively. Item numbers (1) and (2) are presented below as examples that described CSA by an adult male. When paired with each of four partner age differentials and both male and female sexes, they form a total of 16 items that describe sexual behaviors that occurred before participants in the study reached 18 years of age. With insertion of 18–99 for “Your age range:” and both male and female sexes, Item (1) and Item (2) each describe sexual behaviors of participants as adult males with other adults of both sexes.

Item 1

“Your age range: 1-17 years; Behavior: Sexual experimentation of any kind with a male age 18 or older and more than 4 years older than yourself. Give your best guess for numbers—don’t get hung up on being precise!”

Item 2

“Your age range: 1-17 years; Behavior: Coerced sexual situations of any kind with a male age 18 or older and more than 4 years older than yourself. Give your best guess for numbers—don’t get hung up on being precise!”

The four age-differential categories were presented in the following order: (a) The partner’s age was within 4 years of the respondent’s age, (b) The partner was more than 4 years older than the respondent but under the age of 18, (c) The partner was more than 4 years older than the respondent and over the age of 18 (as shown in items 1 and 2), and (d) The partner was more than 4 years younger than the respondent.

Sexual behavior subitems

The following subitems variables were the actual prompts used in the sexual behavior screen to obtain the data used in this research.

- (a) “Did you ever engage in this behavior in this age range? (No/Yes coded 0/1)
- (b) “Number of partners:”
- (c) “On about how many occasions did you engage in this behavior?”
- (d) and (e) “What were the earliest and latest ages in the “(applicable age range)” age interval that you engaged in this behavior?”
- (f) “Was mother involved” or “Was father involved” These questions were only asked when the partner described in the item was more than four years older and over age 18 and of the female sex (for mother) or the male sex (for father), respectively. (No/Yes coded 0/1)
- (g) “Was sister involved?” (for female partners) or “Was brother involved?” (for male partners) was asked for all partner-age categories. (No/Yes coded 0/1)

Item 3

“Select the choice which best describes your family of rearing whether by biological parents or adoptive parents.” (1) My parents remained married (including common-law) and together until I reached 18. (2) My parents divorced or separated, and there was no remarriage or new partner in my home before I reached 18. (3) My parents divorced or separated, and there was a remarriage or a new partner in my home before I reached 18. (4) My parents never married (excludes common-law marriages) before I reached 18 and did not live together. (5) One of my parents died, but there was no remarriage or new partner in my home before I reached 18. (6) One of my parents died, and there was a remarriage or a new partner in my home before I reached 18. (7) I was raised almost exclusively in an orphanage. (8) I was raised in a series of foster homes. (9) I was raised by my grandparent or grandparents. (10) I was adopted later, and I don’t remember my biological parents.

Item 4

“Select the choice which best fits your mother’s (or mother figure’s) attitude about sex.” (1) I had so little contact with my mother that I have no idea what attitude she had. (2) Mother thought sex was dirty and filthy, but she never was able to discuss it with me. (3) Mother thought sex was dirty and filthy, and she did her best to teach her view to me. (4) Mother thought sex was healthy, but she never was able to discuss it with me. (5) Mother thought sex was healthy, and she provided me with healthy information.

Item 5

“Select the choice which best fits your father’s (or father figure’s) attitude about sex.” (1) I had so little contact with my father that I have no idea what attitude he had. (2) Father thought sex was dirty and filthy, but he never was able to discuss it with me. (3) Father thought sex was dirty and filthy, and he did his best to teach his view to me. (4) Father thought sex was healthy, but he never was able to discuss it with me. (5) Father thought sex was healthy, and he provided me with healthy information.

Item 6

“Select the phrase that best describes your parent’s demonstration of affection for one another in your presence.” (1) My parents never kissed or hugged in my presence. (2) My parents sometimes kissed or hugged in my presence. (3) My parents often hugged or kissed in my presence. (4) My parents often hugged or kissed and did some genital petting in my presence. (5) My parents often hugged or kissed in my presence and I witnessed intercourse by sight or sound.

Item 7

“Select the phrase which most closely describes the way that your mother demonstrated affection for you.” (1) My mother never kissed or hugged me. (2) My mother seldom kissed or hugged me. (3) My mother often kissed or hugged me.

Item 8

“Select the phrase which most closely describes the way that your father demonstrated affection for you.” (1) My father never kissed or hugged me. (2) My father seldom kissed or hugged me. (3) My father often kissed or hugged me.

Item 9

“The best way to describe my parents’ relationship while I was growing up is: (1) My parents’ relationship was not good: there was verbal fighting, anger, criticism, distance, and little or no love or affection. (2) My parents’ relationship was very mixed: there were periods of love and affection interspersed with verbal fighting, anger, criticism, or distance. (3) My parents’ relationship was reserved: I did not see fighting, criticism, or physical display of affection, but I believe that there was quiet love and respect underneath. (4) My parents’ relationship included a lot of physical fighting and/or brutality. (5) My parent’ relationship was very good with lots of love, support, and physical affection and few times when there was fighting, anger, criticism or distance.”

Item 10

The best way to describe the way that my parents handled disagreements about how to deal with me as a child was: (1) There was often an obvious disagreement between my parents with my mother taking my part against my father. (2) There was often an obvious disagreement between my parents with my father taking my part against my mother. (3) I was mostly raised in a single-parent family by my mother. (4) I was mostly raised in a single-parent family by my father. (5) If my parents had disagreements about how to deal with me as a child, they seemed to work them out where I could not hear, and I saw a united approach to me.



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