



Interest, Personality, and Sexual Traits That Distinguish Heterosexual, Bisexual, and Homosexual Individuals: Are There Two Dimensions That Underlie Variations in Sexual Orientation?

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Abstract

A diverse U.S. sample comprising 1437 men and 1474 women was assessed on sexual orientation, masculinity–femininity of occupational preferences (MF-Occ), self-ascribed masculinity–femininity (Self-MF), Big Five personality traits, sex drive, and sociosexuality (positive attitudes toward uncommitted sex). Discriminant analyses explored which traits best distinguished self-identified heterosexual, bisexual, and homosexual individuals within each sex. These analyses correctly classified the sexual orientation of 55% of men and 60% of women, which was substantially better than a chance rate (33%) of assigning participants to one of three groups. For men, MF-Occ and Self-MF distinguished heterosexual, bisexual, and gay men, with heterosexual men most gender typical, gay men most gender atypical, and bisexual men intermediate. Independently, higher sex drive, sociosexuality, and neuroticism and lower conscientiousness distinguished bisexual men from other groups. For women, gender-related interests and Self-MF distinguished lesbians from other groups, with lesbians most gender atypical. Independently, higher sociosexuality, sex drive, and Self-MF distinguished non-heterosexual from heterosexual women. These findings suggest that variations in self-reported sexual orientation may be conceptualized in terms of two broad underlying individual difference dimensions, which differ somewhat for men and women: one linked to gender typicality versus gender atypicality and the other linked to sex drive, sociosexuality, and various personality traits.

Keywords Sexual orientation · Sex drive · Sociosexuality · Gender-related interests · Masculinity–femininity

Introduction

People who identify as heterosexual, bisexual, or gay/lesbian differ most obviously in their degrees of sexual and romantic attraction to men and women. However, they differ in other ways as well. Research has shown, for example, that same-sex individuals who differ in sexual orientation also show large mean differences in their gender-related interests (Lippa, 2005), their levels of childhood gender conformity and nonconformity (Bailey & Zucker, 1995), and their gender-related nonverbal behaviors (Rieger, Linsenmeier, Gygax, Garcia, & Bailey, 2010), with heterosexual individuals tending to be most gender typical and gay/lesbian individuals most gender atypical. Heterosexual, bisexual, and gay/lesbian individuals also differ on

some personality and cognitive traits and on some sexual traits not directly linked to sexual orientation, such as sex drive and sociosexuality (Collaer, Reimers, & Manning, 2007; Lippa, 2006, 2007; Peters, Manning, & Reimers, 2007; Schmitt, 2007), and they often show mean differences in their reported levels of behavioral and mental problems (Hatzenbuehler, Hilt, & Nolen-Hoeksema, 2010; Herek & Garnets, 2007; Meyer, 2003).

The research to be presented here addressed a fundamental question related to these kinds of psychological differences between sexual orientation groups: Can heterosexual, bisexual, and gay/lesbian individuals within each sex be distinguished, with a significant degree of accuracy, based on psychological traits other than those that most directly define sexual orientation? More specifically, using the statistical technique of discriminant analysis, the current research explored how well gender-related interests, self-ascribed masculinity–femininity, Big Five personality traits, and two sexual traits (sex drive and sociosexuality) that are not directly related to defining attributes of sexual orientation predict whether individuals identify as heterosexual, bisexual, or gay/lesbian.

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In addition, the current research addressed a second and related question: If interest, personality, and sexual traits such as sex drive and sociosexuality do in fact distinguish same-sex heterosexual, bisexual, and gay/lesbian individuals with a significant degree of accuracy, then what are the underlying individual difference dimensions that account for this predictive power? Lay conceptions as well as many scholarly conceptions of sexual orientation—such as that implicit in Kinsey's seminal seven-point scale of sexual orientation (Kinsey, Pomeroy, & Martin, 1948)—often view variations in sexual orientation as following a one-dimensional continuum, with heterosexuality at one pole, homosexuality at the other, and gradations of bisexuality in between. The current research poses two empirical questions related to this assumption: Does this kind of one-dimensional spectrum fully account for variations in sexual orientation, and is this one-dimensional spectrum reflected in broader individual differences that are linked to sexual orientation?

In contrast to one-dimensional models, other models have proposed two dimensions that underlie variations in sexual orientation, the most obvious being attraction to men and attraction to women (e.g., see Storms, 1980). Unlike the one-dimensional Kinsey-type spectrum, such two-dimensional models allow for the independent variation of same-sex and other-sex attractions. In practice, when applied to actual data, such two-dimensional models often more-or-less reduce to a one-dimensional spectrum, insofar as same-sex and other-sex attractions are often negatively correlated (albeit more strongly for men than for women; see Lippa, 2006, 2007).

When conceptualized in terms of broad individual difference dimensions that are not directly related to same-sex and other-sex attractions, the dimensional underpinnings of sexual orientation are less clear-cut. One hint about the underlying dimensionality of sexual orientation, when conceived in terms of broad individual difference dimensions, comes from a substantial body of research showing that many of the ways in which same-sex heterosexual, bisexual, and homosexual individuals differ are linked to various kinds of gender-related behaviors and traits, with heterosexual men and women showing, on average, the most gender-typical traits and behaviors, gay men and lesbians showing the most gender-atypical traits and behaviors, and bisexual men and women showing traits and behaviors that are often intermediate in gender typicality (relevant research will be reviewed later).

There is reason to question, however, whether a single dimension of gender typicality versus gender atypicality is sufficient to account for all variations in sexual orientation. Documented differences between bisexual individuals, on the one hand, and same-sex heterosexual and homosexual individuals, on the other hand, are sometimes difficult to reconcile with such a one-dimensional model. Although bisexual men and women do in fact tend to occupy a middle position

between same-sex heterosexual and homosexual individuals on the spectrum defined by gender-related traits and behaviors (see literature review that follows), at the same time they stand out from both same-sex heterosexual and homosexual individuals on other traits and behaviors—e.g., bisexual men and women sometimes show elevated rates of mental illness and behavior problems compared to both heterosexual and homosexual individuals of the same sex (e.g., see Dodge & Sandfort, 2007), and bisexual men and women differ from other sexual orientation groups on some personality traits (e.g., they report higher neuroticism and lower conscientiousness than other groups) and on some sexual traits (e.g., they report higher sex drive and sociosexuality than other groups) that are not central to the definition of sexual orientation. Thus, one-dimensional conceptions of sexual orientation that focus on gender typicality versus gender atypicality may be insufficient to account completely for variations in sexual orientation, particularly if they strive to incorporate bisexual individuals into their models.

Traits and Behaviors That Distinguish Heterosexual, Bisexual, and Homosexual Individuals Within Each Sex

The following two sections describe first how heterosexual and gay/lesbian individuals differ on psychological traits and second how bisexual individuals compare to heterosexual and homosexual individuals.

Differences Between Heterosexual and Homosexual Individuals on Psychological Traits

As noted earlier, gay men are often somewhat behaviorally “feminized” compared to heterosexual men, whereas lesbians are somewhat “masculinized” compared to heterosexual women. One of the largest documented psychological differences between same-sex heterosexual and homosexual individuals is in their gender-related interests, with gay/lesbian individuals reporting substantially less gender-typical interests than same-sex heterosexuals (Lippa 2005, 2008b). Differences between gay and heterosexual men are often more modest but still significant for personality traits such as expressiveness, agreeableness, neuroticism, conscientiousness, openness to experience (gay men tend to be higher than heterosexual men on all the previous traits; see Greaves, Barlow, Huang, Stronge, & Sibley, 2017; Lippa, 2005, 2008b; Schmitt, 2007), and on Self-MF (gay men's conscious self-concept is moderately more feminine and less masculine than heterosexual men's; Lippa, 2005, 2008b). Similarly, lesbian and heterosexual women often show small to moderate differences in instrumentality and openness (lesbians higher) and neuroticism (lesbians lower). All the homosexual–heterosexual personality differences just listed tend to mirror sex differences—with heterosexual

individuals more gender typical and gay and lesbian individuals more gender atypical—except for differences on openness to experience (sexual minorities tend to score higher on openness than same-sex heterosexual individuals; e.g., see Lippa 2005, 2008b; Schmitt, 2007).

On average, gay men show large differences from heterosexual men on a broad array of nonverbal behaviors, with gay men tending to be more female typical than heterosexual men. Similarly, lesbians are considerably more masculine and less feminine in their nonverbal behaviors than heterosexual women are, on average (Rieger et al., 2010). On some sex-linked cognitive ability measures (such as mental rotation performance, which tends to be higher in men than women; and verbal fluency, which tends to be higher in women than men), gay men are also shifted in a female-typical direction compared to heterosexual men, and lesbians are shifted in a male-typical direction compared to heterosexual women—differences that are small to moderate in magnitude (Collaer et al., 2007; Peters et al., 2007).

A substantial body of research shows that same-sex heterosexual and homosexual individuals show large differences in their levels of childhood gender conformity versus nonconformity, as assessed by both retrospective self-reports and contemporaneous behavioral measures such as behaviors recorded in childhood videos (Bailey & Zucker, 1995; Lippa, 2008a; Rieger, Linsenmeier, Gygax, & Bailey, 2008). A recent large-scale prospective study found that children's levels of gender-conforming/nonconforming behaviors at around ages 4 and 5 significantly predicted their sexual orientation at age 15 (Li, Kung, & Hines, 2017).

Finally, gay men and lesbians show higher prevalence rates for many kinds of mental disorders and behavioral problems (e.g., higher rates of depression, suicidality, anxiety, food and substance abuse disorders) than same-sex heterosexuals do (Hatzenbuehler et al., 2010; Herek & Garnets, 2007; Meyer, 2003).

Differences Between Bisexual Men and Women and Other Same-Sex Sexual Orientation Groups

Research suggests that bisexual individuals differ from both same-sex heterosexual and homosexual individuals in a number of ways. Results from the BBC Internet Survey (Lippa, 2008b) and a meta-analysis of eight studies conducted in the U.S. (Lippa, 2005), for example, found that bisexual men tended to be intermediate between heterosexual and gay men and that bisexual women tended to be intermediate between heterosexual and lesbian women on measures of self-ascribed and occupational masculinity–femininity.

Bisexual individuals sometimes differ from both same-sex heterosexual and homosexual individuals on personality traits like neuroticism and disagreeable assertiveness (with bisexual individuals higher than other groups) and

conscientiousness (bisexual individuals lower than other groups; see Lippa, 2008b). Semenyina, Belu, Vasey, and Honey (2017) reported that moderately bisexual women were higher than more exclusively heterosexual or homosexual women on the “dark triad” of narcissism, Machiavellianism, and psychopathy. Other studies have suggested that bisexual women score lower on honesty/humility and conscientiousness than other sexual orientation groups do (Bogaert, Ashton, & Lee, 2018; Greaves et al., 2017).

Although research that compares bisexual individuals to same-sex heterosexual and homosexual individuals on nonverbal behaviors is sparse, at least one study found that bisexual women were intermediate between heterosexual and lesbian women on observer-rated masculinity–femininity (Rieger, Savin-Williams, Chivers, & Bailey, 2016). This study also found that bisexual women were intermediate between heterosexual and lesbian women on self-reported masculinity–femininity.

A large-sample study that assessed sex-linked cognitive abilities reported that bisexual men scored intermediate between heterosexual and gay men on a mental rotation test, and bisexual women tended to be intermediate between heterosexual and lesbian women (Peters et al., 2007). Similarly, in a study that looked at relatively small samples of heterosexual, bisexual, and gay men, Cohen (2002) reported that bisexual men were intermediate between heterosexual and gay men on mental rotation ability and measures of self-reported childhood masculinity and femininity.

McConaghy and Silove (1991) and Phillips and Over (1992) presented early evidence suggesting a graded relationship between same-sex attraction and degree of childhood gender nonconformity, and a recent large-scale prospective study by Li et al. (2017) found that when sexual orientation was assessed as a continuous variable ranging from heterosexuality to homosexuality, a greater tendency toward homosexuality was associated in a continuous fashion with greater childhood gender nonconformity. These findings suggest that bisexual individuals are, on average, intermediate in their levels of childhood gender nonconformity compared to same-sex heterosexual and homosexual individuals.

A number of studies have examined possible links between bisexuality and behavioral and mental problems. Based on a review of five then-published studies that compared bisexual individuals to both heterosexual and homosexual individuals, Dodge and Sandfort (2007) concluded that the evidence suggested “higher rates of depression, anxiety, suicidality, substance use, and other health problems among bisexual individuals when compared to homosexual and heterosexual individuals (p. 43).” Such findings have tended to be confirmed by more recent research as well (e.g., Bolton & Sareen, 2011; Bostwick, Boyd, Hughes, & McCabe, 2010; Fredriksen-Goldsen, Shiu, Bryan, Goldsen, & Kim, 2017; Li, Pollitt, & Russell, 2016; Persson & Pfaus, 2015; Wardecker, Matsick, Graham-Engeland, & Almeida, 2019). Vrangalova

and Savin-Williams (2014) summarized evidence showing that “mostly heterosexuals”—men and women who report small amounts of same-sex attraction and sexuality but who nonetheless label themselves as “heterosexual”—reported moderately higher levels of behavior problems and mental disorders than same-sex heterosexual individuals, and just slightly lower levels than bisexual individuals more generally. Thus, even a slight tendency toward bisexuality appears to confer higher risk of many kinds of behavior problems. Analyzing data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), Beaver et al. (2016) reported that bisexual individuals constituted the most delinquent of the sexual orientation groups for both males and females.

Finally, a number of studies have found that bisexual individuals tend to be higher than heterosexual and homosexual individuals on a number of sexual traits and behaviors not directly related to sexual orientation, with bisexual individuals reporting higher levels of sex drive, sociosexuality, sexual curiosity and sexual excitement seeking, and larger numbers of lifetime sexual partners than same-sex heterosexual and homosexual individuals, especially among women (Fethers, Marks, Mindel, & Estcourt, 2000; Lippa, 2006, 2007; Rieger et al., 2013; Schmitt, 2007; Stief, Rieger, & Savin-Williams, 2014).

The differences just summarized between bisexual individuals and members of other sexual orientation groups in terms of mental health and sexual traits could be characterized as reflecting higher levels of certain kinds of impulses and impulsiveness in bisexual individuals (e.g., higher sexual drive and a tendency toward acting out behaviors), accompanied by lower levels of impulse control (e.g., lower conscientiousness, higher levels of “dark triad” traits).

Explanations for Differences Between Sexual Orientation Groups

Much biologically oriented theory and research has focused on variations in prenatal hormone levels—particularly variations in androgen levels—as a factor that influences both behavioral sex differences and variations in sexual orientation (Ellis & Ames, 1987; Hill, Dawood, & Puts, 2013; Hines, 2011; Rosario & Schrimshaw, 2014). Research testing hormonal theories of human sexual orientation has yielded complex and sometimes inconsistent results (Breedlove, 2017). Nonetheless, many theorists continue to propose that variations in prenatal hormone levels (and also, genetic variations in tissue sensitivity to hormones and other hormone-related factors) play a significant role in the development of sexual orientation, in both humans and animals (Baum & Bakker, 2017; LeVay, 2017; McFadden, 2017).

Most hormonal theories of sexual orientation have focused on the prenatal action of hormones, while much less attention

has been directed at postnatal effects. It is possible that postnatal as well as prenatal hormones play a role in the development and expression of sexual orientation, and such effects may help explain some of the ways in which bisexual individuals differ from both same-sex heterosexual and homosexual individuals. As summarized earlier, bisexual individuals often report higher levels of sex drive and sociosexuality and show personality differences (e.g., higher neuroticism and “dark triad” traits, and lower conscientiousness) compared to same-sex heterosexual and homosexual individuals. Bisexual individuals also show higher prevalence rates for many kinds of behavioral and mental problems. One hypothesis that might tie together these diverse findings is that bisexual individuals, on average, experience higher postnatal and adult levels of some sex hormones—particularly androgens—than same-sex heterosexual and homosexual individuals.

Research has linked variations in adult levels of sex hormones—again, particularly androgens—to traits such as sex drive, sociosexuality, aggressiveness, risk taking, and impulse control, although the evidence for such associations is complex and sometimes inconsistent (Archer, Graham-Kevan, & Davies, 2005; Cappelletti & Wallen, 2016; Dabbs, 2000; Motta-Mena & Puts, 2017; Puts et al., 2015; Terburg & van Honk, 2013; Yildirim & Derksen, 2012). One tentative set of hypotheses, then, is that bisexual individuals, like heterosexual and homosexual individuals, are subject to prenatal hormonal effects (and possibly other early biological influences such as maternal immunological processes—e.g., see Blanchard, 2001; Bogaert & Skorska, 2011), which influence their levels of gender typicality versus gender atypicality. These prenatal effects tend to make bisexual individuals less gender typical than same-sex heterosexual individuals but more gender typical than same-sex homosexual individuals (and, presumably, both somewhat “masculinized” and “feminized” in terms of their sexual attractions). In addition, bisexual individuals may, as adults, experience higher levels of circulating levels of testosterone (and perhaps other hormones) than other groups, and this may serve to “energize” sexual interest in both their more-preferred sex and their less-preferred sex, and it may also serve to activate a cluster of correlated traits, such as higher sex drive and sociosexuality, some personality traits (such as neuroticism and “dark triad” traits, and reduced conscientiousness), and behavioral tendencies toward impulsivity, sensation seeking, and externalizing behaviors.

Social–environmental theories may also help explain behavioral differences between heterosexual, bisexual, and homosexual individuals (for a more complete account, see Lippa, 2005). Some differences between sexual orientation groups may result from the effects of social stereotypes, which to some extent accurately reflect the on-average psychological differences across sexual orientation groups summarized in previous sections. For example, common

stereotypes hold that gay men are, on average, more feminine than heterosexual men, that lesbian women are, on average, more masculine than heterosexual women in a number of ways, and that bisexual men and women are more highly sexed and promiscuous and less faithful and trustworthy than same-sex heterosexual individuals (see Burke & LaFrance, 2016a, 2016b). To the extent that such stereotypes create self-fulfilling social expectations, then stereotypes about sexual orientation groups might contribute to actual differences between these groups. At the same time, it is important to note that causal links between stereotypes and social reality are bidirectional and that actual group differences can lead to the development of social beliefs about group differences, as well as the reverse (Jussim, 2012).

Differences in psychological adjustment and maladjustment across sexual orientation groups have often been attributed to the influence of “minority stress” and various kinds of prejudice directed against sexual minorities (Dodge & Sandfort, 2007; Herek & Garnets, 2007; Meyer, 2003). Some theorists have proposed that bisexual individuals may receive a “double dose” of prejudice—from both the gay and heterosexual communities—and that bisexual individuals may be subject to uniquely negative stereotypes (e.g., of being “confused about their sexuality,” “dishonest,” and “promiscuous and unfaithful”), which gay and lesbians individuals are not always subject to (Dodge & Sandfort, 2007). Such factors may help explain elevated rates of mental and behavioral problems among bisexual men and women. However, to the extent that bisexual individuals participate in heterosexual relationships and present themselves as heterosexual in many social settings, they should also experience a kind of “heterosexual privilege” that many gay and lesbian individuals do not experience (see Herek, 2009; Lewis, Derlega, Brown, Rose, & Henson, 2009). Presumably, this should serve to buffer bisexual individuals from some of the prejudice directed at gay and lesbian individuals—a possibility that is inconsistent with the empirical results reviewed earlier.

An Overview of the Current Study

The current study assessed large and diverse samples of U.S. adult men and women on individual difference variables that past research has shown to have links to sexual orientation: self-ascribed masculinity–femininity, gender-related occupational preferences, Big Five personality traits, and two sexual traits (sex drive and sociosexuality). Participants were also assessed on their attraction to men and to women and were asked to identify as heterosexual, bisexual, or gay/lesbian. The central goal of the current research was to explore, using the statistical technique of discriminant analysis, how well masculinity–femininity of self-concept, gender-related interests, personality traits, and sex drive and sociosexuality—in combination—predicted participants’ self-reported sexual

orientation. In addition, the power of these measures to predict participants’ sexual orientation was compared with the predictive power of participants’ self-reported attraction to men and self-reported attraction to women. Finally, the current research attempted to identify underlying broad individual difference dimensions that covary with variations in self-reported sexual orientation.

Method

Participants

Data were collected from November 11, 2014, to March 22, 2015, by Qualtrics Panels, a professional service that administers Qualtrics surveys to pre-specified samples of participants. Qualtrics Panels collected data from 1437 men and 1474 women—a sample that was representative of the overall U.S. adult population (defined as 18 years of age or older) in terms of sex, age, and ethnicity. Specifically, the targeted sample was 49% male and 51% female; 75% White, 10% Latino/Hispanic, 10% Black, and 5% Asian/Asian Pacific; and 13% of participants who were to be 18 to 25 years old, 35% 26 to 45 years old, 35% 45 to 64 years old, and 17% 65 years old or older. These breakdowns were based on 2014 U.S. Census data.

Measures

An online Qualtrics survey was administered to participants, which included demographic questions and which assessed attitudinal factors, personality traits, sexual attitudes, and occupational preferences. Sexual identity was assessed by a question that asked—“Think about how you identify yourself. Would you say that you are:...” Response options were: “Heterosexual (Straight),” “Homosexual (Gay/lesbian),” “Bisexual,” “Asexual,” or “Other.” Participants reported their age in years by typing their age into a text box.

The independent variables (in terms of discriminant analyses) assessed in the current research were masculinity–femininity of occupation preferences (MF-Occ), self-ascribed masculinity–femininity (Self-MF), Big Five personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience), sex drive, sociosexuality, self-reported attraction to men, and self-reported attraction to women.

MF-Occ was assessed by asking participants to rate on a five-point scale of disagreement–agreement how much they would like to work in ten occupations: “car mechanic,” “social worker,” “builder,” “florist,” “carpenter,” “costume designer,” “electrical engineer,” “dance teacher,” “inventor,” and “school teacher”—items had been used previously in the BBC Internet Study (Lippa, 2008b). MF-Occ was computed

as the mean of “male-typical” items (odd items) and reversed “female-typical” items (even items). Previous research has shown that the reliability of such scales is best computed using ipsatized items, which are computed by subtracting from individual item scores the participant’s mean score for all ten items. Ipsatizing items controls for “elevation response set” (see Lippa, 2008b, 2010b). Scale reliabilities reported here were computed using ipsatized items.

Self-MF was assessed by asking participants to rate on a five-point scale of disagreement–agreement how much they see themselves as someone who is “masculine,” or “feminine,” and someone who “acts, appears, and comes across to others as masculine,” or as “feminine.” Self-MF was computed as the mean of the two “masculine” items and the two reversed “feminine” items.

Big Five personality traits were assessed by short scales, partly based on those created by Gosling, Rentfrow, and Swann (2003), which contained items that asked participant to rate on a five-point scale how much they saw themselves as possessing various personality traits. Extraversion items were: “extraverted and enthusiastic,” “assertive and independent,” “reserved and quiet” (reversed), and “dominant and a leader.” Agreeableness items were: “sensitive to others and compassionate,” “sympathetic and warm,” and “supportive and takes care of friends and family members.” Conscientiousness items were: “dependable and self-disciplined” and “disorganized and careless” (reversed). Neuroticism items were: “critical and quarrelsome,” “anxious and easily upset,” and “calm and emotionally stable” (reversed). Finally, openness items were: “complex and open to new experiences,” “values artistic and intellectual experiences,” and “ingenious and a deep thinker.”

Self-reported sex drive and sociosexuality were assessed by short scales asking participants to rate on a seven-point scale how much they agreed with various attitudinal statements. The three sex drive items were: “I have a strong sex drive,” “I frequently think about sex,” and “It doesn’t take much to get me sexually excited.” The five sociosexuality items were: “Sex without love is okay,” “I can imagine myself being comfortable and enjoying casual sex with different partners,” “I would have to be closely attached to someone (both emotionally and psychologically) before I could feel comfortable and fully enjoy having sex with him or her” (reversed), “I want emotional commitment in my sexual relationships” (reversed), and “I must be in love with someone before I can be physically intimate with that person” (reversed).

Finally, two scales directly assessed self-reported attraction to men and to women. Each scale consisted of three items, with words indicating either attraction to men or attraction to women: “I am sexually attracted to men (women).” “I think the male (female) body is sexy to look at.” “I am romantically attracted to men (women).” Participants rated on a seven-point scale how much they agreed with these statements.

Table 1 shows scale reliabilities, which were generally moderate to high.

Results

Sexual Orientation and Age Frequencies

The initial sample analyzed included 1437 men (49.4%) and 1474 women (50.6%). Among men, 1303 (90.7%) reported being heterosexual, 47 (3.3%) bisexual, 78 (5.4%) gay, and 9 (.6%) asexual. Among women, 1364 (92.5%) reported being heterosexual, 70 (4.7%) bisexual, 28 (1.9%) lesbian, and 12 (.8%) asexual. Self-identified asexual individuals were not included in the analyses that follow. In regard to age, 627 participants (21.5%) were 18–29 years, 583 (20.0%) were 30–39 years, 401 (13.8%) were 40–49 years, 556 (19.1%) were 50–59 years, and 744 (25.6%) were 60 years or older.

Association of Age with Independent and Dependent Measures

To explore whether age was related to sex or sexual orientation, a 2-by-3 (sex by sexual orientation) ANOVA was performed with participants’ age serving as the dependent variable. This analysis showed a marginally significant main effect for participant sex, $F(1, 2884) = 3.40, p = .07$, a significant main effect for sexual orientation, $F(2, 2884) = 22.53, p < .001$, but no significant two-way interaction. Mean ages and SDs (in parentheses) for heterosexual, bisexual, and gay men were 46.61 (16.41), 38.85 (14.59), and 47.62 (16.38)

Table 1 Reliabilities (coefficient α) of measures for all participants, men, and women

Measure	All participants	Men	Women
MF-Occ (10)	.81	.74	.65
Self-MF (4)	.92	.69	.76
Extraversion (4)	.71	.68	.73
Agreeableness (3)	.77	.73	.78
Conscientiousness (2)	.44	.45	.45
Neuroticism (3)	.62	.62	.64
Openness (3)	.61	.60	.61
Sex drive (3)	.85	.82	.84
Sociosexuality (5)	.84	.83	.80
Attraction to men (3)	.94	.88	.77
Attraction to women (3)	.92	.89	.78

The number of items in each scale is listed in parentheses next to the scale’s label. MF-Occ is masculinity–femininity of occupational preferences, and Self-MF is self-ascribed masculinity–femininity, both keyed with higher scores more masculine or male typical

years, respectively, and mean ages and SDs for heterosexual, bisexual, and lesbian women were 45.82 (16.60), 32.44 (13.33), and 45.96 (16.82) years, respectively. Women were slightly younger than men on average, and, within each sex, bisexual participants were younger than heterosexual and homosexual participants. Post hoc comparisons with Bonferroni corrections showed that the age comparisons between bisexual participants and participants in other groups were all significant.

Table 2 shows, separately for men and women, correlations between age and the key independent variables used in discriminant analyses. In general, these correlations showed expected patterns. Consistent with previous research (e.g., see Donnellan & Lucas, 2008; Soto, John, Gosling, & Potter, 2011), some Big Five personality traits—particularly conscientiousness and neuroticism—covaried with age, with conscientiousness and agreeableness showing positive correlations and neuroticism and openness showing negative correlations with age. Sex drive was negatively correlated with age, but more strongly so for women than for men. Sociosexuality showed a weak negative correlation with age for women, but no correlation with age for men. Self-MF was positively correlated with age for men and negatively correlated with age for women, indicating that age correlated with a more masculine self-concept in men, but with a more feminine self-concept in women. MF-Occ was weakly correlated with age for both men and women, indicating a weak tendency toward more masculine occupational preferences in older participants. Finally, for men, attraction to men, but not to women, showed a weak

negatively correlation with age, whereas for women attraction to both sexes was negatively correlated with age.

Because age was associated with sexual orientation in the current sample—with a particular tendency for bisexual participants to be younger than heterosexual and homosexual participants—and because a number of predictor variables intended for use in discriminant analyses to classify participants as heterosexual, bisexual, or gay/lesbian were also associated with age, age was partialled out of these predictor variables. Specifically, linear regressions were conducted that correlated age with predictor variables, and residualized scores for these variables were computed with age partialled out. These age-corrected scores were then used as predictor variables in the discriminant analyses reported in later sections.

Descriptive Statistics for Predictor Variables and Their Intercorrelations

Table 3 shows means and SDs for predictor variables for eight participant groups: all men, all women, heterosexual men, bisexual men, gay men, heterosexual women, bisexual women, and lesbian women. The patterns revealed by these means are more easily discerned in Table 4, which shows effect sizes for the following group contrasts: all men versus all women, heterosexual men versus bisexual men, heterosexual men versus gay men, bisexual men versus gay men, heterosexual women versus bisexual women, heterosexual women versus lesbian women, and bisexual women versus lesbian women. Effects sizes are presented for both raw and age-corrected measures. The group differences revealed in Table 4 were generally consistent with those documented by previous research (e.g., see Lippa, 2005, 2009, 2010a, 2010b).

Table 5 shows intercorrelations of key predictor variables, computed separately for men and women. Although variables showed some degree of intercorrelation, in general collinearity among variables was low, with no correlation exceeding .42 in magnitude.

Discriminant Analyses

The results in Table 4 show differences across sexual orientation groups in a variable-by-variable fashion. To take into account collinearity among predictor variables and to explore the dimensionality of individual differences that were associated with sexual orientation, the multivariate technique of discriminant analysis was employed. Specifically, discriminant analyses were conducted that explored how well men and women could be classified into three groups—heterosexual, bisexual, or gay/lesbian—based on various sets of predictor variables.

Discriminant analyses compute linear combinations of predictor variables (discriminant functions) that optimally predict

Table 2 Correlations of MF-Occ, Self-MF, Big Five personality traits, sex drive, and sociosexuality with age, separately for men and women

Measure	Men	Women
MF-Occ	.11***	.07**
Self-MF	.28***	-.29***
Extraversion	-.03	.02
Agreeableness	.16***	.12***
Conscientiousness	.31*** ^b	.20*** ^b
Neuroticism	-.31***	-.35***
Openness	-.16***	-.15***
Sex drive	-.16*** ^c	-.32*** ^c
Sociosexuality	-.03 ^a	-.11*** ^a
Attraction to men	-.11***	-.15***
Attraction to women	-.01 ^c	-.23*** ^c

MF-Occ is masculinity–femininity of occupational preferences, and Self-MF is self-ascribed masculinity–femininity, both keyed with higher scores more masculine or male typical. Correlations marked *** are significant at $p < .001$. Paired correlations with superscripts letter show significant sex differences based on two-tailed z -tests: ^a $p < .05$, ^b $p < .01$, ^c $p < .001$

Table 3 Means and SDs for MF-Occ, Self-MF, Big Five personality traits, sex drive, and sociosexuality for all men and all women and for heterosexual, bisexual, and homosexual individuals within each sex

Measure	All men	All women	Heterosexual men	Bisexual men	Gay men	Heterosexual women	Bisexual women	Lesbian women
MF-Occ ^a	3.51 (.55)	2.66 (.52)	3.55 (.54)	3.29 (.50)	3.06 (.60)	2.65 (.51)	2.63 (.57)	3.06 (.60)
Self-MF ^a	4.14 (.77)	1.71 (.75)	4.18 (.74)	3.82 (.86)	3.88 (1.00)	1.67 (.72)	2.14 (.85)	2.30 (1.07)
Extraversion ^a	3.28 (.80)	3.12 (.89)	3.30 (.79)	3.28 (.69)	3.03 (.90)	3.14 (.89)	2.86 (.94)	3.17 (.96)
Agreeableness ^a	4.09 (.69)	4.33 (.68)	4.09 (.68)	4.03 (.75)	4.22 (.73)	4.44 (.67)	4.25 (.84)	4.37 (.69)
Conscientiousness ^a	4.14 (.82)	4.19 (.78)	4.15 (.81)	3.91 (.96)	4.19 (.76)	4.21 (.77)	3.86 (.81)	4.09 (.89)
Neuroticism ^a	2.31 (.85)	2.37 (.88)	2.30 (.85)	2.65 (.86)	2.25 (.88)	2.34 (.87)	2.79 (.79)	2.38 (1.05)
Openness ^a	3.87 (.70)	3.80 (.73)	3.85 (.70)	4.06 (.64)	4.02 (.70)	3.78 (.73)	3.98 (.59)	3.96 (.68)
Sex drive ^b	5.30 (1.32)	4.06 (1.58)	5.32 (1.30)	5.63 (1.46)	4.82 (1.44)	4.00 (1.57)	5.18 (1.51)	4.38 (1.47)
Sociosexuality ^b	3.83 (1.51)	2.66 (1.34)	3.81 (1.52)	4.48 (1.36)	3.89 (1.36)	2.61 (1.32)	3.61 (1.44)	2.91 (1.35)
Attraction to men ^b	2.13 (1.70)	6.10 (1.17)	1.77 (1.22)	4.79 (1.57)	6.44 (1.20)	6.19 (1.04)	6.02 (1.06)	2.54 (1.69)
Attraction to women ^b	6.37 (1.30)	2.68 (1.52)	6.64 (.79)	6.03 (1.04)	2.42 (1.51)	2.43 (1.23)	5.82 (1.24)	6.35 (1.06)

Values for standard deviations are in parentheses. MF-Occ is masculinity–femininity of occupational preferences, and Self-MF is self-ascribed masculinity–femininity, both keyed with higher scores more masculine or male typical

^aMeasures with five-point item scales that ranged from 1 to 5; ^bMeasures with seven-point item scales that ranged from 1 to 7

participants' group membership. When predicting membership in three groups, discriminant analyses compute two discriminant functions—the first optimally predicts group membership, and the second—which is orthogonal to the first—optimally predicts group membership after the predictive power of the first function is accounted for (see Tabachnick & Fidell, 2013).

Discriminant analyses using nine simultaneous predictor variables. Two discriminant analyses were conducted, one for men and the other for women, using nine predictor variables (MF-Occ, Self-MF, the Big Five personality traits, sex drive, and sociosexuality) to predict membership in three groups (heterosexual, bisexual, and gay/lesbian individuals).

In the analysis for men, Wilks' lambda was .92 ($p < .001$) for the first function, with the corresponding first eigenvalue accounting for 86.7% of explained variance. Wilks' lambda was .99 ($p = .05$) for the second function, with the corresponding second eigenvalue accounting for 13.3% of explained variance. For women, Wilks' lambda was .93 ($p < .001$) for the first function, with the corresponding first eigenvalue accounting for 78.1% of explained variance, and Wilks' lambda was .98 ($p < .01$) for the second function, with the corresponding second eigenvalue accounting for 21.9% of explained variance.

The structure (loading) matrices for men and women (i.e., the matrix of correlations between predictors and discriminant functions) are shown in Tables 6 and 7, respectively. For men, the values of discriminant function 1 at group centroids (mean positions in the two-dimensional participant space defined by the two discriminant functions) were .08 for heterosexual men, $-.47$ for bisexual men, and -1.04 for gay men. Thus, the first discriminant function defined a sexual orientation continuum,

with heterosexual men highest, bisexual men intermediate, and gay men lowest on the function. As indicated by the loadings in Table 6, predictor variables that loaded most highly on function 1 for men were MF-Occ and Self-MF, with heterosexual men most male typical and gay men least male typical on these measures. Values of discriminant function 2 at group centroids were $-.01$ for heterosexual men, $.53$ for bisexual men, and $-.16$ for gay men. Thus, function 2 distinguished bisexual men from other groups. As indicated by the loadings in Table 6, predictor variables that loaded most highly on function 2 for men were sociosexuality, sex drive, and neuroticism, with bisexual men tending to be higher on all these variables than heterosexual or gay men.

To examine the success of the discriminant analysis in classifying men as heterosexual, bisexual, or gay, prior probabilities of group membership were set at 33.3% for each group. If prior probabilities had been set instead to the proportions of each group in the sample, then the optimal predictions of the discriminant analyses would have been to predict virtually all participants to be heterosexual, given that the base rate proportion of heterosexual men in the male sample was 91.2% and the base rate of heterosexual women in the female sample was 93.3%. Indeed, when discriminant analyses were run that set prior probabilities equal to the proportions of each sexual orientation group in the sample—which generated the same discriminate functions—virtually all men (99.6%) and all women (99.4%) were classified as heterosexual, yielding correct classifications for 91.2% of men and 93.5% of women—percentages that were almost identical to the percent of heterosexual men and women in their respective total samples. Setting prior

Table 4 Effect sizes (*d*) for sex differences and within-sex sexual orientation differences in MF-Occ, Self-MF, Big Five personality traits, sex drive, and sociosexuality

Measure	Sex difference (all men vs. all women)	Heterosexual versus gay men	Heterosexual versus bisexual men	Bisexual versus gay men	Heterosexual women versus lesbians	Heterosexual versus bisexual women	Bisexual versus lesbian women
MF-Occ	1.58***	.87***	.51**	.42*	-.72***	.03	-.72***
		.87***	.46**	.47*	-.72***	.03	-.67**
Self-MF	3.20***	.34**	.44**	-.06	-.68***	-.59***	-.16
		.36***	.34*	.05	-.71***	-.37**	-.34
Extraversion	.19***	.32**	.02	.31	-.02	.31**	-.32
		.31**	.03	.29	-.02	.30*	-.31
Agreeableness	-.35***	-.19†	.08	-.26	-.06	.10	-.15
		.18	.01	-.18	-.05	.02	-.07
Conscientiousness	-.07†	-.06	.26†	-.32	.15	.45***	-.28
		-.04	.13	-.17	.16	.30*	-.13
Neuroticism	-.07†	-.06	-.41**	.46*	-.04	-.53***	.43*
		.05	-.28†	.34†	-.05	-.25*	.18
Openness	.09*	-.24*	-.32*	.07	-.25	-.29*	.02
		-.24*	-.24*	-.01	-.26	-.16	.12
Sex drive	.85***	.36**	-.23	.56**	-.31	-.77***	.46*
		.36**	-.16	.49**	-.28†	-.53***	.28
Sociosexuality	.82***	-.06	-.47**	.43*	-.26	-.73***	.48*
		-.07	-.45**	.40*	-.23	-.64***	.40†
Attraction to men	-2.72***	-3.86***	-2.14***	-1.18***	2.60***	.16	2.47***
		-3.83***	-2.08***	-1.23***	2.62***	.29	2.38***
Attraction to women	2.61***	3.50***	.66***	2.78***	-3.41***	-2.75***	-.45†
		3.50***	.66***	2.78***	-3.29***	-2.56***	-.67**

Positive *d* values indicate the first group is higher than the second, and negative values indicate the reverse. MF-Occ is masculinity–femininity of occupational preferences, and Self-MF is self-ascribed masculinity–femininity. Effect sizes listed first are for raw scores, and effect sizes listed second are for residual scores with age partialled out. Significance levels are for two-tailed *t*-tests

† *p* < .1, * *p* < .05, ** *p* < .01, *** *p* < .001

Table 5 Intercorrelations of age-corrected MF-Occ, Self-MF, Big Five personality traits, sex drive, and sociosexuality for men (above diagonal) and for women (below diagonal)

Measure	MF-Occ	Self-MF	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness	Sex drive	Sociosexuality
MF-Occ	–	.36***	.05	-.04	.18***	-.16***	.01	.13***	.02
Self-MF	.34***	–	.23***	.19***	.18***	-.16***	.19***	.20***	.03
Extraversion	-.03	-.02	–	.22***	.23***	-.12***	.31***	.28***	.06*
Agreeableness	-.23***	-.34***	.09***	–	.24***	-.24***	.42***	.18***	-.17***
Conscientiousness	-.06*	-.29***	.17***	.29***	–	-.41***	.22***	.11***	-.04
Neuroticism	.04	.21***	-.19***	-.21***	-.33***	–	-.18***	-.02	.00
Openness	.01	-.10***	.31***	.34***	.13***	-.21***	–	.24***	.00
Sex drive	-.05	-.05	.29***	.16***	.04	-.07**	.26***	–	.18***
Sociosexuality	.10***	.20***	.12***	-.21***	-.16***	.06*	.00	.15***	–

MF-Occ is masculinity–femininity of occupational preferences, and Self-MF is self-ascribed masculinity–femininity, both keyed with higher scores more masculine or male typical. Tests for significant correlations are two-tailed

* *p* < .05, ** *p* < .01, *** *p* < .001

Table 6 Structure matrix generated by discriminant analysis predicting men's sexual orientation from MF-Occ, Self-MF, Big Five personality traits, sex drive, and sociosexuality

Predictor variables	Function 1	Function 2
MF-Occ	.82 ^a	.01
Self-MF	.40 ^a	-.24
Extraversion	.27 ^a	.21
Openness	-.25 ^a	.19
Sociosexuality	-.15	.64 ^a
Sex drive	.26	.57 ^a
Neuroticism	-.02	.49 ^a
Conscientiousness	.00	-.26 ^a
Agreeableness	-.14	-.16 ^a

MF-Occ is masculinity–femininity of occupational preferences, and Self-MF is self-ascribed masculinity–femininity

^aThe largest absolute correlation between each variable and the two discriminant functions. Predictor variables are ordered in terms of the degree of correlation they show with the discriminant function they load on most highly

Table 7 Structure matrix generated by discriminant analysis predicting women's sexual orientation from MF-Occ, self-MF, Big Five personality traits, sex drive, and sociosexuality

Predictor variables	Function 1	Function 2
Sociosexuality	.58 ^a	-.26
Sex drive	.48 ^a	-.13
Conscientiousness	-.28 ^a	.06
Neuroticism	.21 ^a	-.12
Openness	.17 ^a	.14
MF-Occ	.19	.73 ^a
Self-MF	.53	.55 ^a
Extraversion	-.24	.24 ^a
Agreeableness	-.01	.07 ^a

MF-Occ is masculinity–femininity of occupational preferences, and Self-MF is self-ascribed masculinity–femininity

^aThe largest absolute correlation between each variable and the two discriminant functions. Predictor variables are ordered in terms of the degree of correlation they show with the discriminant function they load on most highly

probabilities instead to 33.3% for each group achieved greater variability in the predicted sexual orientation of participants in each of the three sexual orientation groups, at the cost of lower overall accuracy of predictions.

With equal (33.3%) prior probabilities of group membership, the discriminant analysis predicted 54.9% of heterosexual men to be heterosexual, 25.2% to be bisexual, and 19.9% to be gay. Correspondingly, 46.8% of bisexual men were predicted to be bisexual, 31.9% were predicted to be heterosexual, and 21.3% were predicted to be gay. Finally, 64.9% of gay men were predicted to be gay, 22.1% were predicted

to be heterosexual, and 13.0% were predicted to be bisexual. Overall, 55.2% of the original cases were correctly classified, which was substantially better than a 33.3% chance level of prediction for membership in three groups. Using the more relaxed prediction standard of “non-heterosexual versus heterosexual,” 68.1% of bisexual men and 77.9% of gay men were correctly classified as being non-heterosexual by the discriminant analysis.

For women, the two discriminant functions classified groups somewhat differently than was the case for men. The values of discriminant function 1 for women at group centroids were -.07 for heterosexual women, .97 for bisexual women, and .72 for lesbians. Thus, the first discriminant function distinguished heterosexual from non-heterosexual women. As shown in Table 7, the predictor variables that loaded most highly on function 1 for women were sociosexuality, Self-MF, and sex drive, with heterosexual women lower than non-heterosexual women on all of these measures. Values of discriminant function 2 at group centroids for women were .00 for heterosexual women, -.25 for bisexual women, and .85 for lesbians. Thus, function 2 distinguished lesbians from other groups. As indicated in Table 7, predictor variables that loaded most highly on function 2 were MF-Occ and Self-MF, with lesbians more male typical on both measures than other groups.

To examine the success of the discriminant analysis in classifying women as heterosexual, bisexual, or gay, prior probabilities of group membership were again set at 33.3% for each group. The discriminant analysis predicted 60.4% of heterosexual women to be heterosexual, 21.4% to be bisexual, and 18.2% to be lesbian. Correspondingly, 55.7% of bisexual women were predicted to be bisexual, 15.7% were predicted to be heterosexual, and 28.6% were predicted to be lesbian. Finally, 51.9% of lesbians were predicted to be lesbian, 33.3% were predicted to be heterosexual, and 14.8% were predicted to be bisexual. Overall, 60.0% of original cases were correctly classified, which was substantially better than a 33.3% chance level of prediction for membership in three groups. Using the more relaxed prediction standard of “non-heterosexual versus heterosexual,” 84.3% of bisexual women and 66.7% of lesbians were correctly classified as being non-heterosexual by the discriminant analysis.

Discriminant Analyses Using Step-Wise Selection of Predictor Variables

To explore whether the simultaneous use of nine predictor variables in the just-described discriminant analyses resulted in some degree of “overfitting,” the same analyses were conducted using step-wise selection of predictor variables instead of simultaneous entry of all nine predictors. For the step-wise analysis on men, two predictor variables emerged

as significant—MF-Occ and sociosexuality—which, respectively, loaded highly on discriminant functions 1 and 2.

Other results were similar to the results from the earlier discriminant analysis. In the step-wise selection discriminant analysis for men, the accurate prediction of sexual orientation was slightly reduced. Overall, 51.6% of original cases were correctly classified, which was only slightly lower than the 55.2% correct classification rate generated by the discriminant analysis that used all nine predictor variables.

For the corresponding step-wise analysis on women, five predictor variables emerged as significant—MF-Occ, sex drive, sociosexuality, extraversion, and Self-MF. Sex drive, sociosexuality, and Self-MF loaded highly on discriminant function 1, and MF-Occ and Self-MF loaded highly on discriminant function 2. Other results were similar to the results from the discriminant analysis that used all nine predictor variables. As was true for men, in the step-wise discriminant analysis for women the accurate prediction of sexual orientation was slightly reduced. Overall, 56.6% of original cases were correctly classified, which was only slightly lower than the 60.0% correct classification rate in the analysis that used all nine predictor variables.

Discriminant Analyses Using Self-Reported Attraction to Men and to Women as Predictor Variables

As noted at the start, people who identify as heterosexual, bisexual, and gay/lesbian differ most obviously in their sexual and romantic attraction to men and women. To examine this assertion in the context of the kinds of analyses conducted here, discriminant analyses were run separately for men and women that used two predictor variables—self-reported attraction to men and self-reported attraction to women—to predict membership in three groups (heterosexual, bisexual, and gay/lesbian). In the discriminant analysis for men, two significant discriminant functions again emerged. Discriminant function 1 (which had a .91 structure loading for attraction to women and a $-.75$ structure loading for attraction to men) defined a bipolar continuum of sexual orientation, with heterosexual men showing the highest group centroid mean (.34), gay men the lowest (-4.94), and bisexual men an intermediate value (-1.28). Discriminant function 2 (which had a loading of .41 for attraction to women and .66 for attraction to men—that is, positive loadings for both attraction to men and attraction to women) distinguished bisexual men from other groups, with bisexual men showing the highest group centroid mean (1.82) and with both heterosexual men ($-.05$) and gay men ($-.34$) showing lower group centroid means. Thus, as would be intuitively expected, bipolar sexual attraction to men versus women distinguished the three sexual orientation groups in a graduated way, whereas attraction to both men and women distinguished bisexual men from the two other groups.

As might be expected, prediction of sexual identity was quite good from self-reported attraction to the two sexes. Again, using equal (33.3%) prior probabilities of group membership, the current discriminant analysis predicted 90.2% of heterosexual men to be heterosexual, 7.3% to be bisexual, and 2.5% to be gay. Correspondingly, 76.6% of bisexual men were predicted to be bisexual, 19.1% were predicted to be heterosexual, and 4.3% were predicted to be gay. Finally, 80.8% of gay men were predicted to be gay, 2.6% were predicted to be heterosexual, and 16.7% were predicted to be bisexual. Overall, 89.2% of original cases were correctly classified, which was substantially better than a 33.3% chance level of prediction for membership in three groups and also considerably better than the 55.2% correct classification rate generated by the discriminant analysis that used the initial nine predictor variables. Using the more relaxed prediction standard of “non-heterosexual versus heterosexual,” 80.9% of bisexual men and 97.5% of gay men were correctly classified as being non-heterosexual.

For the corresponding discriminant analysis on women, two significant discriminant functions again emerged. Discriminant function 1 (which had a .91 structure loading for attraction to women and a $-.45$ structure loading for attraction to men) defined a bipolar continuum of sexual orientation, with lesbian women showing the highest group centroid mean (4.10), heterosexual women the lowest ($-.20$), and bisexual women an intermediate value (2.34). Discriminant function 2 (which had a loading of .43 for attraction to women and .89 for attraction to men—again, positive loadings for both attraction to men and women) distinguished bisexual women from other groups, with bisexual showing the highest group centroid mean (1.09), heterosexual women showing a lower value ($-.02$), and lesbian women showing the lowest group centroid mean (-1.66). However, unlike the corresponding second discriminant function for men, which strongly distinguished bisexual men from the other two groups, the second discriminant function for women seemed to define a kind of continuum, with self-identified bisexual women reporting the most bisexual pattern of same-sex and other-sex attractions, heterosexual women reporting a less bisexual pattern of attraction, and lesbian women reporting the least bisexual (and most category-specific) pattern of attraction to the two sexes.

As was true for men, prediction of women’s sexual orientation was quite good from self-reported attraction to men and attraction to women. Overall, 88.1% of original cases were correctly classified, which was substantially better than a 33.3% chance level of prediction for membership in three groups and also considerably better than the 55.2% correct classification rate generated by the discriminant analysis that used the initial nine predictor variables. Using the more relaxed prediction standard of “non-heterosexual versus heterosexual,” 92.8% of bisexual women and 96.3% of lesbian

women were correctly classified as being non-heterosexual, based on their self-reported degrees of attraction to men and to women.

Discussion

In general, the sex differences and sexual orientation differences documented in previous studies were replicated in the current study. When nine individual difference variables—MF-Occ, Self-MF, Big Five personality traits, sex drive, and sociosexuality—were used as predictors in discriminant analyses that classified participants as heterosexual, bisexual, or gay/lesbian individuals (assuming equal prior probabilities of group membership), approximately 55% of men and 60% of women were correctly classified, which was substantially better than the expected classification rate of 33% when randomly assigning individuals to one of three groups. When self-reported attraction to men and self-reported attraction to women served as predictor variables in discriminant analyses, accurate classification increased to 89% for men and to 88% for women. It is worth noting that the classification accuracy of all discriminant analyses reported here was handicapped by their assumption of equal prior probabilities of group membership. If analyses had been conducted on samples that included roughly equal numbers of heterosexual, bisexual, and gay/lesbian individuals, accuracy levels would likely have been higher.

The discriminant analyses that used nine individual difference variables to predict sexual orientation were not only reasonably successful at classifying participants as heterosexual, bisexual, or gay/lesbian, but they also identified two broad latent factors that seemed to underlie variations in sexual orientation. For men, the first underlying dimension was defined by MF-Occ and Self-MF, and it reflected a dimension of gender typicality versus gender atypicality, which was linked to men's sexual orientation in a graded way with heterosexual men most gender typical, gay men least gender typical, and bisexual men intermediate. The second underlying dimension was most strongly defined by sociosexuality, sex drive, and neuroticism, and it primarily distinguished bisexual men (who tended to be higher on these traits) from heterosexual and gay men (who tended to be lower).

The corresponding analysis conducted on women also yielded two discriminant functions. However, the underlying latent factors that distinguished heterosexual, bisexual, and lesbian women were somewhat different than the corresponding factors identified for men. For women, the first dimension was most strongly defined by high sociosexuality and sex drive and low conscientiousness, and it primarily distinguished heterosexual women (who were lower on this factor) from non-heterosexual women (who were higher). The second underlying dimension was most strongly defined

by MF-Occ and Self-MF, and it reflected a dimension of gender typicality versus gender atypicality (thus corresponding to discriminant function 1 in the analysis on men). This second dimension primarily distinguished lesbians (more gender atypical) from bisexual and heterosexual women (more gender typical).

Thus, the discriminant analysis results presented here provided evidence for a two-factor model of variations in sexual orientation, at least when such variations are viewed in the context of broad individual difference measures. For both men and women, one of the two identified factors tapped gender typicality versus gender atypicality, as assessed by MF-Occ and Self-MF, whereas the other factor tapped sociosexuality, sex drive, and various personality traits (this factor might be tentatively labeled as a “sexual impulse and impulse control” dimension). It should be noted that both factors were sex-linked, in the sense that sociosexuality and sex drive (which loaded mostly highly on one factor) showed strong sex differences, and MF-Occ and Self-MF (which loaded most highly on the other factor) also showed strong sex differences (Table 4). At the same time, sex differences in MF-Occ and Self-MF were considerably larger (respective $d_s = 1.58$ and 3.20) than were sex differences in sociosexuality and sex drive (respective $d_s = .82$ and $.85$). In the “Introduction” section, one theoretical possibility is that these two factors, which were linked to both sex and sexual orientation in the current study, have different causal underpinnings, with the gender typicality versus gender atypicality factor more influenced by prenatal (possibly hormonal) factors and the “sexual impulse and impulse control” factor more influenced by postnatal (again possibly hormonal) factors.

The discriminant analyses that predicted men's and women's sexual orientations from their self-reported attraction to men and to women also pointed to some interesting sex differences. For men, results were clear-cut and intuitively expected: (1) A bipolar factor of “attraction to men versus attraction to women” defined a graded continuum whereby heterosexual men were most attracted to women and least attracted to men, gay men were most attracted to men and least attracted to women, and bisexual men were in between, and (2) a “bisexual attraction” factor of “attraction to both men and women” defined a dimension that distinguished bisexual men from other groups.

Corresponding results were somewhat different for women. As was true for men, the discriminant analysis for women yielded a bipolar “attraction to men versus attraction to women” that defined a graded continuum where heterosexual women were most attracted to men and least attracted to women, lesbian women were most attracted to women and least attracted to men, and bisexual women were in between. However, in contrast to the corresponding results for men, the “bisexual attraction” factor for women, which assessed “attraction to both men and women,” also showed a graded

relation to women's sexual orientation. Bisexual women were highest on this factor, lesbian women were lowest, and heterosexual women were intermediate. This finding is consistent with recent research showing that heterosexual women are sometimes intermediate between lesbian and bisexual women in their degree of category specificity in relation to target sex (e.g., see Lippa, 2017).

The current study had strengths and limitations that are worth noting. A key strength was that sample sizes were relatively large, samples were diverse in terms of age and ethnicity, and participants were sampled from the entire U.S. adult population, in contrast to many past studies. A limitation of the current study, however, was that it did not assess a true random probability sample. One direction for future research would be to attempt to replicate the current results in a true random sample—ideally, a national probability sample.

Another strength of the current study was that it used a variety of broad individual difference measures, including measures assessing masculinity–femininity of self-concept, gender-related interests, broad personality traits, and the sexual traits of sex drive and sociosexuality. A corresponding weakness was that the measures employed in the current study were assessed via short self-report scales, future research would benefit from using longer scales, with higher reliabilities and with more differentiated subscales. It seems reasonable to expect that the use of more reliable and diverse individual difference measures would result in even more accurate classification of participants' sexual orientations.

The current study included just two measures of gender typicality versus gender atypicality: MF-Occ and Self-MF. Gender-related interests (assessed by MF-Occ) have consistently shown large differences across sexual orientation groups, as documented in the literature review at the start of this paper. However, the ten-item scale of gender-related occupational preferences used in the current research was relatively short, and future research might benefit from the use of longer, more reliable, and more differentiated interest measures. In addition, because Self-MF was, in essence, a self-concept measure, it might have been more susceptible to some kinds of bias than other measures. For example, it seems likely that an individual's sexual identity could influence his or her self-ascribed masculinity–femininity, as well as the reverse (see Lippa, 2005). One recommendation for future research would be to include additional measures of gender typicality versus gender atypicality, such as measures of childhood gender conformity/nonconformity. Also, future research should include measures of psychological adjustment and maladjustment.

Another methodological issue and possible limitation is that the current research used a categorical measure of sexual identity (heterosexual, bisexual, or gay/lesbian). Dividing participants into sexual orientation categories was necessary to analyze data using the statistical technique of discriminant

analysis. However, the use of discriminant analysis in future research does not preclude the use of more fine-grained sexual identity categories (e.g., see Vrangalova & Savin-Williams, 2014). Also, future research might attempt to define sexual orientation in terms of sexual desire or arousal rather than in terms of self-reported sexual identity, for it seems likely that sexual identity is more malleable than sexual desire or arousal. At the same time, it is worth noting that self-reported sexual orientation was strongly related to self-reported attraction to men and women in the current study (Table 4), and previous analyses using the current data have shown that self-reported sexual orientation was also strongly related, in expected ways, to participants' viewing times to images of male and female swimsuit models (Lippa, 2017).

The variables assessed in the current study that were most clearly related to the conventional definition of sexual orientation—self-reported attraction to men and attraction to women—did quite a good job of predicting participants' self-reported sexual orientations (89% of men and 88% of women were correctly classified). However, they did not do a perfect job. Why wasn't the accuracy of sexual orientation classification based on these variables closer to 100 percent? Possible answers include: (1) Accurate classification was reduced by the unrealistic assumption of equal (33%) prior group probabilities implemented in discriminant analyses. (2) A small number of participants responded dishonestly to the self-reported sexual orientation item. (3) Some participants may have been motivated to report their sexual orientations in ways seemingly inconsistent with their self-reported sexual attractions—e.g., a conservative Christian man married to a woman may have labeled himself as being “heterosexual” despite the fact that he knew himself to be more sexually attracted to men than to women. (4) Some participants may have labeled themselves based on ideological considerations—e.g., some feminist women may have labeled themselves as “bisexual” because of their ideological identification with other women, despite being considerably more attracted to men than to women. (5) Some participants may have seen themselves as “borderline” cases, but nonetheless forced themselves to make the categorical self-assignment required by the survey.

Discriminant analyses may also have misclassified some participants who reported transitional sexual identities (e.g., see Diamond, 2008; Diamond, Dickenson, & Blair, 2017). Recall that the current study treated age as a confounding variable in discriminant analyses because: (1) bisexual men and women tended to be younger than heterosexual and homosexual men and women (see Lewis et al., 2009 for corroboration of this finding in previous research) and (2) age was correlated with many of the predictor variables used in discriminant analyses. Because of these associations between age and key variables, the effects of age were partialled out of predictor variables. In the “Results” section, additional discriminant analyses that used raw predictor variables produced similar

results to the analyses reported here that used age-corrected predictor variables.

The issue of age and sexual identity is worthy of further research attention. Because the current data were cross sectional in nature, it was not possible to choose between two possibilities that might help explain why bisexual individuals tended to be younger than members of other sexual identity groups: (1) Contemporary young people are more likely to identify as bisexual than young people in previous generations or (2) the identity of “bisexual” is a transitional identity for some young people, who will later in life come to identify as either “heterosexual” or “gay/lesbian” (e.g., see Diamond, 2008; Diamond et al., 2017). Given speculations presented earlier in this paper—that bisexuality may be related to elevated testosterone levels and to associated traits such as high sex drive, sociosexuality, and neuroticism, and low conscientiousness and impulse control—it seems reasonable to expect higher rates of bisexual behavior and bisexual self-identification in young people, because testosterone (and perhaps other hormone) levels and traits related to testosterone levels tend to be higher in young people. Thus, age may not be so much a “confounding variable” as it is a variable that is linked to bisexual behaviors and identities via mediating biological and psychological processes (e.g., see Savin-Williams & Vrangalova, 2013).

For now, two main conclusions can be drawn from the current results: (1) It is possible to predict men’s and women’s self-reported sexual orientations with a significant degree of accuracy from broad individual difference measures and (2) there appear to be two broad individual difference dimensions linked to variations in sexual orientation—one related to gender typicality versus gender atypicality and the other related to sex drive, sociosexuality, and various personality traits.

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Compliance with Ethical Standards

Human and Animal Participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent It was obtained from all individual participants included in the study.

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