



# Testing a Model of Sexual Minority Orientation in Individuals with Typical Development, the Broad Autism Phenotype, and Autism Spectrum Disorder

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## Abstract

Individuals with Autism Spectrum Disorder (ASD) and the Broad Autism Phenotype (BAP) are more likely than individuals with typical development (TD) to report a sexual minority orientation (e.g., Bejerot and Eriksson, *PLoS ONE* 9:1–9, 2014; DeWinter et al., *Journal of Autism and Developmental Disorders* 47:2927–2934, 2017; Qualls et al., *Journal of Autism and Developmental Disorders* 48:3974–3983, 2018). This study operationalized and tested the fit of an existing model of sexual orientation to examine which factors are associated with increased sexual minority orientation (Worthington et al., *The Counseling Psychologist* 30:496–531, 2002) in individuals with TD, BAP, and ASD. The model was found to have adequate fit,  $\chi^2(130) = 374.04$ ,  $p < 0.001$ ; RMSEA = 0.07; CFI = 0.95; SRMR = 0.08. Heterosexism was found to be the only predictor of sexual minority orientation and a significant predictor in the BAP and ASD groups, with increased daily heterosexist experiences predicting greater sexual minority orientation in these groups.

**Keywords** Broad Autism Phenotype · Sexual orientation · Sexual minorities

## Introduction

Sexual minority orientation has become increasingly more common in the United States. The term “sexual minority orientation” refers to an individual’s same-sex directed preferences in sexual attraction and sexual behavior, as well as the adoption of a sexual minority identity, where they see themselves as a sexual minority and may adopt a label that describes their sexual minority identity (Diamond, 2006;

McCarn & Fassinger, 1996; Roberts et al., 2010). This is especially true in specific sub-groups. Among individuals with Autism Spectrum Disorder (ASD), an estimated 42–69% identify as same-sex attracted or a sexual minority (Byers et al., 2012; George & Stokes, 2018b). Evidence of this relationship has also been found in individuals with the Broad Autism Phenotype (BAP), where an increased number of traits related to ASD, as measured by the Broad Autism Phenotype Questionnaire (BAPQ), was shown to be positively correlated with increased same-sex attraction, behavior, fantasies, and sexual minority identity present in these individuals (Qualls et al., 2018).

Despite the increase in sexual minority orientation, there is no model currently for what factors affect the development of this identity. Several milestone models of sexual orientation development exist (Cass, 1979, 1984; D’Augelli, 1994; Diamond, 2007; McCarn & Fassinger, 1996; Trolden, 1988) but none of them adequately integrate the multiple pathways found in the literature that combine to influence sexual minority orientation. Additionally, the literature on sexual orientation largely explores individuals with typical development (TD) and does not identify individuals with the BAP or ASD as subgroups who might have a developmental difference in this area. This study examines the psychosocial

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factors that purportedly influence the development of a sexual minority orientation in individuals with TD, the BAP, and ASD, and tests the fit of a factor-based development model (Worthington et al., 2002) in a sample of individuals from each group.

### ASD, BAP, and Sexual Minority Orientation

Individuals with ASD are more likely to identify as sexual minorities. Surveys of adults with and without ASD found that both women and men with ASD reported higher levels of same-sex attraction and orientation, as well as asexuality, than individuals with TD (Bejerot & Eriksson, 2014; DeWinter et al., 2017; Gilmour et al., 2012). A meta-analysis including studies of individuals with ASD labeled as “high-functioning” found between 15 and 35% of these individuals reported a sexual minority identity (Pecora et al., 2016). A recent review of 11 articles on sexuality and ASD found that individuals with ASD had a greater diversity of sexual orientation, as well as increased asexuality and gender nonconforming feelings (Turner et al., 2017). Another study found that women with ASD were also more likely to be in a same-sex relationship than women with TD, and all participants with ASD reported more same-sex attraction, more varied sexual identities, and more asexuality than individuals with TD (DeWinter et al., 2017). Finally, the most recent study on this topic found the highest percentage of ASD individuals reporting a sexual minority identity—69.7% of an international online sample of 310 adults with ASD, compared to 30.3% of 261 adults with TD (George & Stokes, 2018b).

There is currently little research investigating why individuals with ASD are more likely than individuals with TD to report same-sex attraction and claim a sexual minority identity. A recent paper by George and Stokes (2018a) found that the relationship between autistic traits and sexual orientation was partially mediated by traits of gender dysphoria. However, the authors cautioned that this is only one possible pathway between ASD and sexual minority orientation (George & Stokes, 2018a). Other authors hypothesized that individuals with ASD may be around suitable people of the same-sex more often than those of the opposite-sex, and have less awareness of social norms (Bejerot & Eriksson, 2014; Gilmour et al., 2012). Meeting individuals of the opposite sex requires a certain level of social ability, which some individuals with ASD may lack (George & Stokes, 2018b). The study by Gilmour and colleagues found that sexual interests and behaviors were highly correlated in participants with ASD, suggesting that the increased prevalence of sexual minority orientation in ASD is not simply a result of fewer romantic opportunities with the opposite sex (Gilmour et al., 2012).

Individuals who have characteristics of ASD, but not the full disorder, are said to display the Broad Autism

Phenotype, or the BAP. Individuals with the BAP experience difficulties similar to those experienced by individuals with ASD, though they are generally less severe and cause less impairment in everyday life (Baron-Cohen & Hammer, 1997; Best et al., 2008; Jobe & White, 2007; Kunihiro et al., 2006; Palmer et al., 2014; Piven & Palmer, 1997). Individuals with higher levels of BAP traits also resemble individuals with ASD in that they, too, report higher levels of same-sex attraction (Qualls et al., 2018). A continuous examination of BAP traits found that these traits increased linearly with an increased reporting of same-sex sexual attraction, behavior, fantasies, and sexual minority identity.

### Sexual Minority Orientation and Models of Development

Sexual attraction, sexual behavior, and sexual identity are three components widely-agreed upon to make up sexual orientation (Diamond, 2003; Dillon et al., 2011; Klein et al., 1985; Worthington et al., 2002). Several models of sexual minority identity development have been proposed; however, currently, no factor models of sexual minority identity development exist. Worthington and colleagues (2002) proposed a factor model of heterosexual identity development that incorporates a majority of the factors identified in the literature as contributing to sexual minority identity development. This model was later applied by Dillon, Worthington, and colleagues (Dillon et al., 2011) to sexual identity development universally. In this model, the authors identified biological influences; microsocial context (i.e., family and peers); culture; religious orientation; gender norms and socialization; and systematic homonegativity, sexual prejudice, and privilege as influences in sexual orientation development. As most of the research with biological influences involves genetic research, this factor is not reviewed in this manuscript.

### Microsocial Context

Microsocial context refers to the social interactions to which a person is exposed on a day-to-day basis (Worthington et al., 2002). In the original article, the authors considered this to include “family, peers, coworkers, neighbors, and others” (Worthington et al., 2002, p. 503). A review of the literature showed that empirical studies examining the effect of family on sexual minority orientation were most common and consistently showed an effect; therefore, this study operationalized microsocial context as the effect that family has on sexual minority orientation.

One of the most important factors of family in relation to developing a sexual minority orientation is the degree to which family member’s expressed views on sexual minority individuals affects the development of sexual minority

orientation. Stacey and Biblarz (2001) found that having sexual minority parents increased the likelihood for the young adult child to have considered or to have had a same-sex relationship and to have more friends that identify as sexual minorities, but not necessarily to identify as a sexual minority themselves.

### Religion

Individuals who identify as sexual minorities are less likely to identify as religious than the general United States population, especially in the case of female sexual minorities, particularly bisexual women (Herek et al., 2010; Sherkat, 2002). Despite this tendency, religion may still have an identity-shaping influence in sexual minority individuals. Felson (2011) found that people from Jewish and secular backgrounds were more likely than those from other religious backgrounds to report same-sex attraction, identity, and behavior, and that this was especially strong for women from a Jewish background. Barnes and Meyer (2012) found that attendance at a non-identity-affirming church was associated with significantly higher internalized homophobia compared to that of individuals who attended an affirming church or who never attended church. These authors also found sexual minority individuals to be less religious, which they hypothesized could be due to a causal relationship between religious affiliation and internalized homophobia (Barnes & Meyer, 2012).

### Culture

Several studies identify cultural influences to the development of a sexual minority orientation. Peplau and Garnets (2000) reviewed the contemporary literature on sexual orientation development and stated that sociocultural influences such as society's view on gender and sexuality, women's economic and social status, which sexual identities are recognized by the culture, and attitudes of acceptance of sexual minorities play a part in the development of a sexual minority orientation, with multiple and individual developmental pathways for sexual orientation among female individuals (Peplau & Garnets, 2000).

### Gender Norms

The perception of gender roles in society can have an effect on the development of a sexual minority orientation. Worthington et al. (2002) stated that the gender role development in men is influenced by society's emphasis on a "default" heterosexual identity and men enacting homophobia to avoid being perceived as gay. Baumeister and Twenge (2002) asserted that female gender roles are also situated in a heteronormative context: women are taught to view their

sexuality and sexual behavior as being for the benefit of men. However, Worthington et al. (2002) stated that women who are able to identify and confront the patriarchal norms of society, can develop a feminine identity that is more based on their own personal standards. This in turn encourages a cooperative, rather than a competitive view of relationships with other women (Worthington et al., 2002), which may in time develop into romantic or sexual relationships with other women (Diamond, 2007).

### Heterosexism

Systematic homonegativity, prejudice, and stigma can be simplified into the term "heterosexism." Heterosexism is defined as "a cultural ideology embodied in institutional practices that work to the disadvantage of sexual minority groups even in the absence of individual prejudice or discrimination" (Herek, 2007, p. 907). A study by Dworkin and Yi (2003) examined statistics published by the New York City Gay and Lesbian Anti-Violence Project over a two-year period and found an increase in attempted assaults with weapons, harassment, and intimidation. More recent numbers from the FBI for 2016 showed that hate crimes against sexual minority individuals continue to increase (Dashow, 2017). Blumenfeld (1992) hypothesized that this sexual prejudice and violence has the consequence of forcing heteronormativity on people who might otherwise identify as sexual minorities.

### The Current Study

The current study aimed to create and test a model of sexual minority orientation in individuals with TD, the BAP, and ASD based on factors identified in the literature and hypothesized by Worthington et al. (2002). Studying how various psychosocial factors work together to influence sexual minority orientation, and how this process may differ between individuals with TD, the BAP, and ASD will allow those working with individuals who identify as a sexual minority to help these individuals better explore their identity development. In this study, we hypothesized that the fit of the factor model would vary between the groups of individuals with TD, the BAP, and ASD, and that sociocultural factors would have less influence on sexual minority orientation for individuals with the BAP and ASD.

## Methods

### Participants and Recruitment

The survey was started by 756 individuals, of whom 476 met eligibility for having their data included in the analysis (see

Preliminary Results section). Of the eligible participants, 169 were in the TD group, 189 in the BAP group, and 125 in the ASD group. Gender, ethnicity and other demographic variables are reported in Table 1. Participants were eligible for the study if they were young adults between the ages of 18 and 30 who identified as a sexual minority. This age range was selected to allow for comparison to other studies of sexuality in young adults with Autism (e.g., Hartmann et al., 2019; Mehzabin & Stokes, 2011). Participants were excluded if they reported having an intellectual or cognitive disability, or a psychotic disorder. Participants were recruited through the Autism Spectrum Disorder Program at Eastern Virginia Medical School, Faculty, and community providers both locally and nationally. Participants were also recruited nationally through study flyers posted to Facebook, Facebook advertisements, activist organizations, and online study recruitment websites.

## Measures

### Demographics

The demographics questionnaire consisted of questions concerning participant's age, birth gender, gender identity, race, religion, family income, parent's education, respondent's education, other psychiatric diagnoses, questions about sexual behaviors and relationships, formal ASD diagnosis, and family member ASD diagnosis.

### Autism Spectrum Quotient-10

The Autism Spectrum Quotient-10 (AQ-10; Allison et al., 2012) is a short-form version of the Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001). This measure indicates whether adults of average intelligence have symptoms of ASD. Higher scores indicate more autism spectrum traits, and a score of 6 has been found by previous research to sensitively identify individuals with ASD from individuals without ASD in comparison to the full scale AQ (Allison et al., 2012; Booth et al., 2013). The AQ-10 was used instead of the full AQ to shorten the survey to encourage more complete participant responses. Cronbach's alpha for this study was 0.89. The AQ-10 was used in conjunction with self-report diagnosis to include participants in the ASD group.

### Broad Autism Phenotype Questionnaire

The Broad Autism Phenotype Questionnaire (BAPQ; Hurley et al., 2007) is a 36-item self-report measure designed to assess characteristics of the BAP in adults of typical intelligence. Higher scores indicate greater likelihood of expressing the BAP. A cut-off score of 3.15 has been established as a good indicator of an individual having a

**Table 1** Demographics of study sample

	TD (%)	BAP (%)	ASD (%)	Total (%)
<b>Gender</b>				
Cisgender female	69 (15)	66 (14)	25 (5)	160 (34)
Cisgender male	53 (11)	43 (9)	11 (2)	107 (23)
Transgender female	1 (0.2)	4 (0.8)	3 (0.6)	8 (2)
Transgender male	7 (2)	27 (6)	23 (5)	57 (12)
Genderfluid/Gender-queer	14 (3)	26 (6)	34 (7)	74 (16)
Agender	6 (1)	8 (2)	12 (3)	26 (6)
Other	12 (3)	15 (3)	17 (4)	44 (9)
<b>Sexual Orientation</b>				
Lesbian	15 (3)	22 (5)	18 (4)	55 (12)
Gay	44 (9)	32 (7)	5 (2)	81 (18)
Bisexual	63 (13)	65 (14)	31 (7)	159 (34)
Pansexual	23 (5)	28 (6)	18 (4)	69 (15)
Asexual	8 (2)	23 (5)	21 (4)	52 (11)
Other non-hetero orientation	8 (2)	19 (4)	29 (6)	56 (12)
<b>Race and Ethnicity<sup>a</sup></b>				
White	138 (30)	165 (35)	110 (24)	364 (89)
Black or African American	5 (1)	13 (3)	6 (1)	24 (6)
Hispanic/Latino	15 (4)	12 (3)	5 (1)	32 (8)
American Indian/Alaskan	2 (0.5)	3 (0.7)	6 (1.4)	11 (3)
Asian	15 (4)	6 (1)	4 (1)	25 (6)
Multi-racial	9 (2)	9 (2)	6 (1)	24 (6)
Other	2 (0.5)	1 (0.2)	3 (0.7)	6 (1)
<b>Participant Education</b>				
Less than high school	8 (2)	11 (2)	7 (2)	26 (6)
High school graduate	23 (5)	38 (8)	32 (6.7)	93 (20)
Some college	43 (9)	75 (16)	37 (8)	155 (33)
2-year degree	7 (2)	13 (3)	9 (2)	29 (6)
4-year degree	55 (12)	40 (8)	31 (7)	126 (27)
Professional degree	4 (1)	0 (0)	0 (0)	4 (1)
Master's degree	20 (4)	11 (2)	9 (2)	40 (8)
Doctorate	2 (0.4)	1 (0.2)	0 (0)	3 (1)
<b>Participant Recruitment Source</b>				
Old Dominion University	4 (1)	6 (1)	0 (0)	10 (2)
Flyer	3 (1)	1 (0.2)	0 (0)	4 (1)
Psychology research website	26 (6)	21 (4)	1 (0.2)	48 (10)
Social media via friend	5 (1)	11 (2)	16 (3)	32 (7)
Facebook/Instagram Advertisement	94 (20)	129 (27)	106 (22)	329 (69)
Other	30 (6)	21 (4)	2 (0.4)	53 (11)
<b>Religion</b>				
Christian	37 (8)	43 (9)	17 (4)	97 (20)
Muslim	1 (0.2)	0 (0)	0 (0)	1 (0.2)
Jewish	5 (1)	5 (1)	7 (2)	17 (4)

**Table 1** (continued)

	TD (%)	BAP (%)	ASD (%)	Total (%)
Buddhist	2 (0.4)	2 (0.4)	3 (1)	7 (2)
Spiritual but not religious	36 (8)	29 (6)	32 (7)	97 (20)
Neither spiritual nor religious	37 (8)	54 (11)	24 (5)	115 (24)
Nothing in particular	37 (8)	32 (7)	22 (5)	91 (19)
Other	7 (2)	24 (5)	19 (4)	50 (11)
<b>Participant Income</b>				
Less than \$10,000	63 (15)	92 (22)	69 (16)	224 (53)
\$10,000–\$19,999	26 (6)	36 (9)	16 (4)	78 (18)
\$20,000–\$29,999	21 (5)	17 (4)	14 (3)	52 (12)
\$30,000–\$39,999	12 (3)	13 (3)	2 (1)	28 (7)
\$40,000–\$49,999	10 (2)	5 (1)	2 (1)	17 (4)
\$50,000 and above	10 (2)	4 (1)	12 (3)	26 (6)

Totals may not match between categories due to missing data. Percentages represent each category compared to the total and may not add up to 100% due to rounding

<sup>a</sup>Participants were able to pick multiple categories that applied to their racial and ethnic background

high number of BAP traits (Hurley et al., 2007), and was used in this study to include individuals in the BAP group. Cronbach's alpha for this measure in this study was 0.86.

### Klein Sexual Orientation Grid

The Klein Sexual Orientation Grid (KSOG; Klein et al., 1985) is a 21-item self-report instrument of an individual's past, present, and ideal sexual orientation. On the KSOG, participants rate themselves in seven areas, including "Sexual Attraction," "Sexual Behaviors," and "Sexual Fantasies." The adapted version of the measure created by Floyd and Stein (2002) was used to quantify sexual orientation for this study (see Qualls et al., 2018, for how this version has been previously used in individuals with the BAP). The scale was updated to use "LGBQ+" instead of "homosexual" or "Gay-Lesbian," and an explanation of the term "LGBQ+" was provided at the beginning of the scale. An option for *Asexual/No one* was added, since asexuality is also a sexual minority identity (DeWinter et al., 2017). For questions that ask about other or same sex, an option for non-binary individuals or those attracted to non-binary individuals was also added. Since non-binary identities are more uncommon than same-sex attraction, other-sex attraction, and asexuality (DeWinter et al., 2017), non-binary was ranked as the highest point of the scale. Higher scores indicate more sexual minority orientation. Cronbach's alpha for this measure was 0.91.

### Sexual Prejudice Scale

The Sexual Prejudice Scale (SPS; Chonody, 2013) was developed to measure bias against gay men and lesbian women. For this study, the scale author gave permission for 12 questions from the affective-valuation subscale of both the gay and the lesbian questionnaires to be adapted to measure the attitudes and beliefs prevalent in participants' social context and culture. Participants were prompted to think about the attitudes of their family and their culture towards gay and lesbian individuals during the participant's childhood. Higher scores indicated higher prejudice against sexual minority individuals in an individual's microsocial context and culture (Chonody, 2013). For this study, the SPS-Family scale had a Cronbach's alpha of 0.98 and the SPS-Culture scale had a Cronbach's alpha of 0.95.

### Religious Orientation Scale—Intrinsic (ROS-I)

The Intrinsic and Extrinsic Scales of Religious Orientation (Allport & Ross, 1967; Gorsuch & McPherson, 1989) were created to measure both how religious a person is and if their religiosity is intrinsically or extrinsically motivated. The Intrinsic scale was used for this study as it is the best measure of a person's intrinsically-motivated religiosity and therefore best represents their personal religious beliefs. Cronbach's alpha for this study was 0.76 for the scale as written and 0.83 with items 2 and 8 removed (see [Primary Analyses](#) section below for why these items were removed). Higher scores mean more intrinsically-motivated religiosity (Gorsuch & McPherson, 1989).

### Belief in Gender Norms

The Attitudes Toward Women Scale (Spence et al., 1973) and the Male Role Norms Inventory (Levant et al., 2013) have been used together to measure belief in traditional gender roles held by men and women in relation to individuals' beliefs about sexual minority individuals (Whitley, 2001).

### Attitudes Toward Women Scale

The Attitudes Toward Women Scale (AWS; Spence & Helmreich, 1978; Spence et al., 1973) scale is a 15-question measure designed to examine the degree to which participants agree with traditional female gender norms. For this study, the Cronbach's alpha score was 0.86. Higher scores represent more agreement with traditional female gender norms.

### Male Role Norms Inventory—Short Form

The Male Role Norms Inventory-Short Form (MRNI-SF; Levant et al., 2013) is a 21-item instrument developed to



measure the degree to which participants agree with traditional male gender norms. The overall alpha for this study was 0.90. Higher scores represent more agreement with traditional male gender norms (Levant et al., 2013).

Scores for the AWS-15 and the MRN-SF were averaged separately and then added together to form a Belief in Gender Norms (BGN) composite score. Cronbach's alpha for the composite score was 0.92.

### The Daily Heterosexist Experiences Questionnaire

The Daily Heterosexist Experiences Questionnaire (DHEQ; Balsam et al., 2013) was developed to measure aspects of minority stress experienced by individuals who identify as sexual minorities. Sub-scales related to gender expression, parenting, and HIV/AIDS were removed as these experiences were not experienced by most individuals in this target sample. The subscales for vigilance ( $\alpha=0.79$ ), discrimination/harassment ( $\alpha=0.83$ ), vicarious trauma ( $\alpha=0.82$ ), family of origin ( $\alpha=0.82$ ), victimization ( $\alpha=0.72$ ), and isolation ( $\alpha=0.66$ ) were used in this study. Higher scores indicated the experience of more heterosexism.

### Procedure

This study was approved by the Internal Review Board of Eastern Virginia Medical School. Interested persons were asked to anonymously complete a survey of personality traits, experiences, and sexuality, provided consent, and anonymously completed the survey online. Attention check questions were inserted throughout the survey, the questionnaires appeared in the same order online as is presented in the [Methods](#) section, and the order was the same for every participant. The participants were divided into groups based on reporting an ASD diagnosis and their scores on the AQ and BAPQ. Group membership was determined as follows: TD = score below BAPQ and AQ cut-off, BAP = score above BAPQ cutoff, ASD = self-report diagnosis combined with a score above the AQ cutoff. Any cases that were above the AQ cutoff, but not the BAPQ cutoff were discarded ( $n=5$ ). Participants who met study criteria, passed attention checks, and answered at least 75% of questions for each measure were entered into a raffle to win 1 of 10 \$50 gift cards. Additionally, participants were provided with referral information for the university counseling center or an outside mental health line should any study participant feel psychological distress during or following the completion of these questionnaires.

## Analyses

### Preliminary Analyses

The gender identity and race variables were dummy coded before being analyzed. For gender identity, "female" was chosen as the reference group and "male" and "other gender identity" were chosen as the comparison groups. For race, "White" was chosen as the reference group and "Black," "Hispanic," "Indigenous," "Asian," "Multiracial," and "Other" were chosen as comparison groups.

Data was screened for completeness, outliers, normality, skewness, kurtosis, and multicollinearity. Zero order correlations were run with the predictors before they were entered into the model to avoid biasing path coefficients. To correct for the missing values, Multiple Imputation was performed by taking the series mean for the SAQ, DHEQ, MRNI, AWS, ROS-I, SPS-Culture, SPS-Family, and the KSOG. Scores were imputed for cases that had at least 75% of the data for each scale (Manly & Wells, 2015). Cases that had less than 75% of the data for each scale were dropped from the analyses.

### Primary Analyses

SEM was used to determine the relationship between the observed and latent variables and to test the fit of the proposed model in each of the three groups. Observed variables in the model were the SPS—Micro-social Context, SPS-Culture, ROS-I, BGN, and DHEQ. The latent variable was sexual minority orientation, which was a single-indicator variable. Prior to running the full SEM model, confirmatory factor analysis (CFA) was used to assess the factor structure of all the variables in the model across groups, and this structure was found to be acceptable.

Parameters were estimated using the full information maximum likelihood (FIML) estimation method. This method used all the data for any parameter to choose estimates that maximize the likelihood that the data came from this population. For testing the fit of the overall model, chi-square tests, comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) served as model fit statistics.

## Results

### Preliminary Results

Before performing any analyses, cases that did not fit the inclusion criteria were removed. Cases were removed if they did not fit age ( $n=11$ ) or sexuality ( $n=64$ ) criteria, failed an attention check ( $n=10$ ), or did not provide at least 75% data

for each measure to allow for imputation ( $n = 181$ ). Participants without an ASD diagnosis who met ASD but not BAP criteria were excluded so as to not bias the analyses ( $n = 12$ ). In total, 278 cases were excluded.

Although missingness was found in 5% of the cases, none of the missingness of the main variables were correlated. Multiple imputation using the series mean was performed for these variables. The variable of Belief in Gender Norms was significantly skewed and kurtotic and was also found to have significant outliers. To correct for this, the log10 of the variable was taken. Lastly, none of the analyzed variables were found to have significant multivariate outliers or multicollinearity.

The demographic and predictor variables were examined for between-group differences. An ANOVA revealed the groups differed on level of education,  $F(2, 415) = 7.82$ ,  $p < 0.001$ , partial  $\eta^2 = 0.04$ , with participants with ASD, 95% CI (-1.05, -0.20), and the BAP, 95% CI (-0.96, -0.17) being less educated than participants with TD. Between group differences were also revealed for heterosexist experiences,  $F(2, 415) = 12.07$ ,  $p < 0.001$ , partial  $\eta^2 = 0.06$ , with participants with ASD experiencing significantly more heterosexism than participants with BAP, 95% CI (3.34, 17.03), and participants with TD, 95% CI (7.43, 21.58). Significant differences were also found between groups on SPS-Culture,  $F(2, 415) = 9.56$ ,  $p < 0.001$ , partial  $\eta^2 = 0.04$ , with participants with ASD reporting more sexual prejudice in their culture compared to participants with the BAP, 95% CI (3.35, 14.94), and participants with TD, 95% CI (4.21, 16.20). Finally, the groups also differed on religion,  $F(2, 472) = 7.51$ ,  $p = 0.001$ , partial  $\eta^2 = 0.03$ , with participants with ASD, 95% CI (-4.65, -1.10), and the BAP, 95% CI (-3.29, -0.09) being more religious than participants with TD.

There was also a between-group difference in the dependent variable, sexual orientation, between groups,  $F(2, 415) = 13.44$ ,  $p < 0.001$ , partial  $\eta^2 = 0.06$ , with individuals with ASD, reporting significantly greater sexual minority orientation (e.g., more same-sex, asexual, and non-binary-directed sexual attraction, fantasies, behavior, and identity) than participants with the BAP, 95% CI (0.14, 1.03), and participants with TD 95% CI (0.55, 1.49). Participants with the BAP also reported significantly greater sexual minority orientation than participants with TD, 95% CI (0.01, 0.86).

## Primary Analyses

Indicators for the variables SPS-Family, SPS-Culture, and ROS-I were defined by parcels. The dimensionality for each of these factors was verified using exploratory factor analysis (EFA). SPS-Family and SPS-Culture were both unidimensional and therefore appropriate for parceling.

The ROS-I had two dimensions, one consisting of six items and one consisting of two items. The two items, item 2, "It doesn't much matter what I believe so long as I am good," and item 8 "Although I believe in my religion, many other things are more important in life," were excluded as they appeared to relate more to a personal morality or spirituality, and not a personal religion as the measure was attempting to capture. Indicator parcels were created by matching the items based on factor loadings, pairing the highest with the lowest items to create three indicators for each factor. Indicators for SPS-Family and SPS-Culture consisted of four items each, while indicators for the ROS-I consisted of two items each.

The following model was entered into Mplus, Version 7 (Muthén & Muthén, 2008) to be analyzed using SEM (see Fig. 1). The initial fit statistics to the model were  $\chi^2(124) = 545.86$ ,  $p < 0.001$ ; RMSEA = 0.09, 90% CI (0.08, 0.09); CFI = 0.94; SRMR = 0.09. However, only one of the observed variables, heterosexist experiences had a significant path on the predictive variable, sexual minority orientation. Nevertheless, all of the predictor variables were correlated so that they were connected to the model to some degree (see Fig. 2). The model was then run in a multigroup comparison between all three groups with all of the parameters free to vary among groups. For factors with a measurement model, the first parcel was constrained at 1 across all groups. Model fit in this group was better than that of the overall model,  $\chi^2(373) = 656.11$ ,  $p < 0.001$ ; RMSEA = 0.07, 90% CI (0.06, 0.08); CFI = 0.96; SRMR = 0.07. Chi-square difference testing showed a significant difference between models,  $\Delta\chi^2(22) = 84.31$ ,  $p < 0.001$ .

For the TD group, the path of sexual orientation on heterosexist experiences was still significant; however, correlations linking Gender Norms and Religion disappeared from the model. Culture and microsocial context were still correlated with each other and with heterosexist experiences (see Fig. 3). For the BAP group, the relationship between sexual minority orientation and heterosexist experiences was no longer significant, and heterosexist experiences was not correlated with any other variables. There were still intercorrelations between the variables of Gender Norms, Religion, Culture, and Microsocial Context (see Fig. 4). For the ASD group, there were also no connections between sexual orientation and any of the predictor variables, and Religion was no longer correlated with any other variables in the model. Gender Norms was correlated with Culture, Culture was correlated with Microsocial Context, and Microsocial Context was correlated with Heterosexist Experiences. The correlation between Heterosexist Experiences and Culture approached, but did not meet, significance at the  $p = 0.05$  level (see Fig. 5).

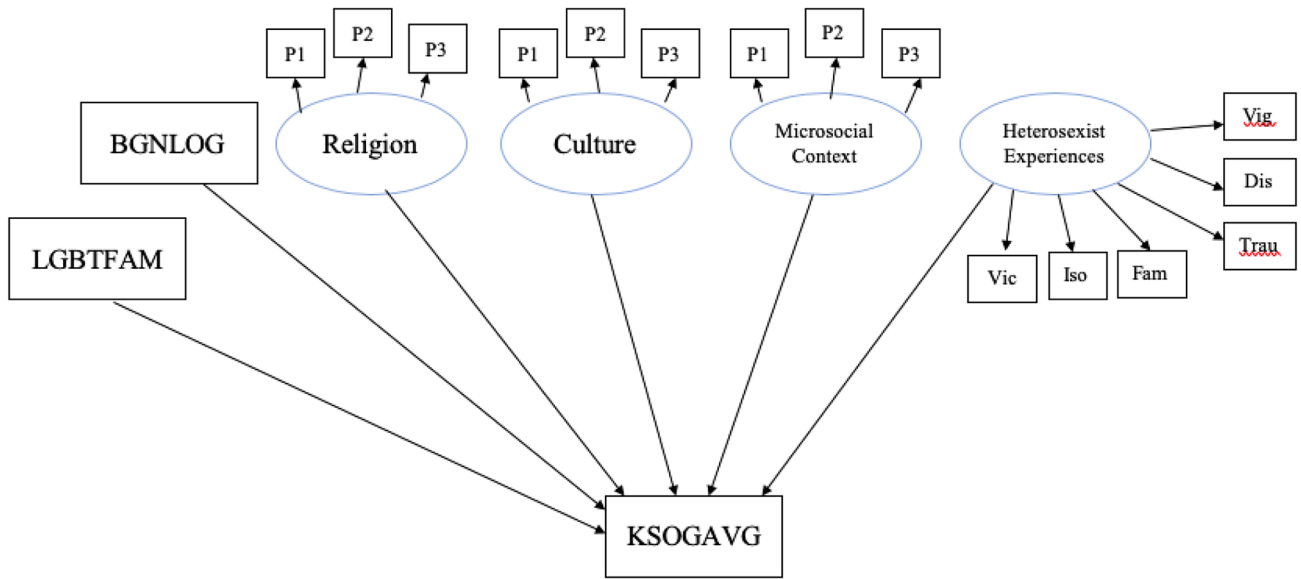


Fig. 1 Hypothesized structural equation model

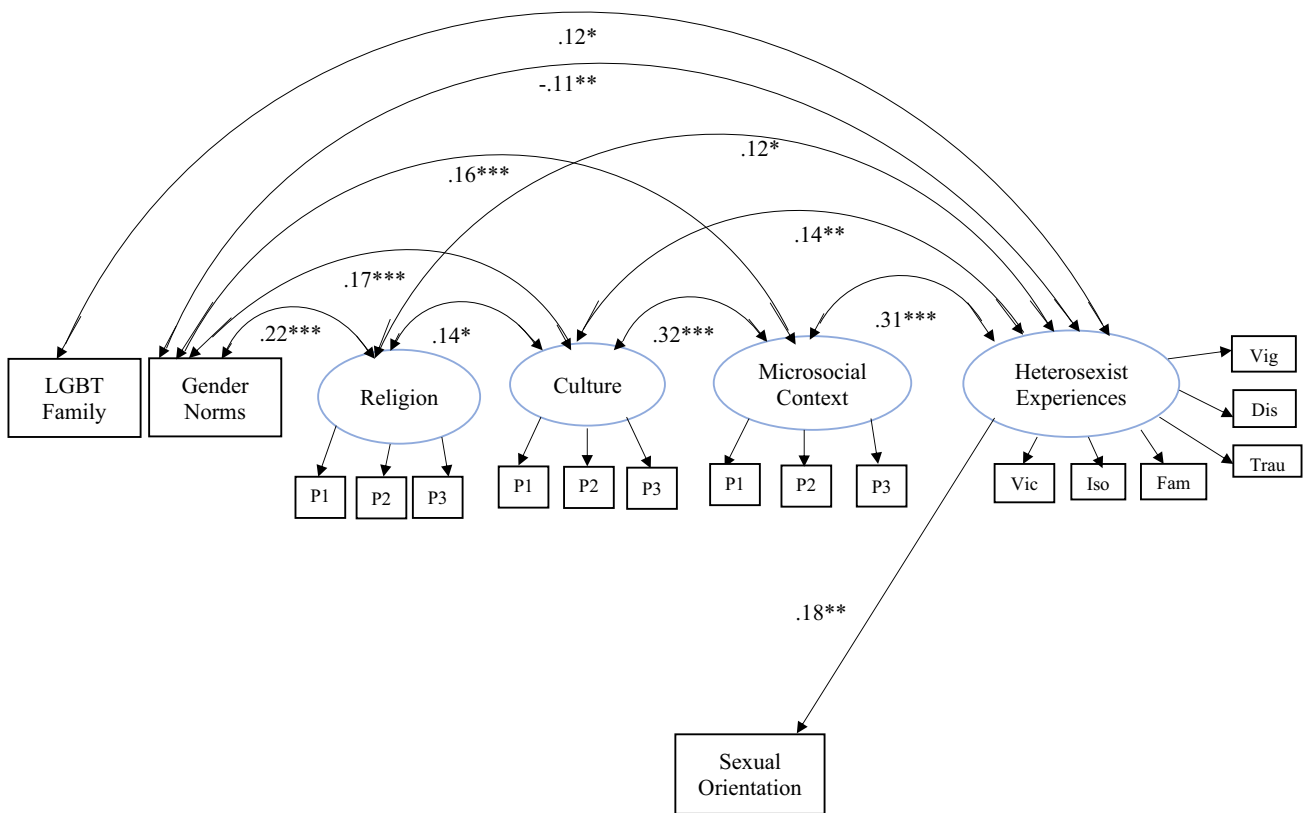


Fig. 2 Structural Equation Model for All Participants



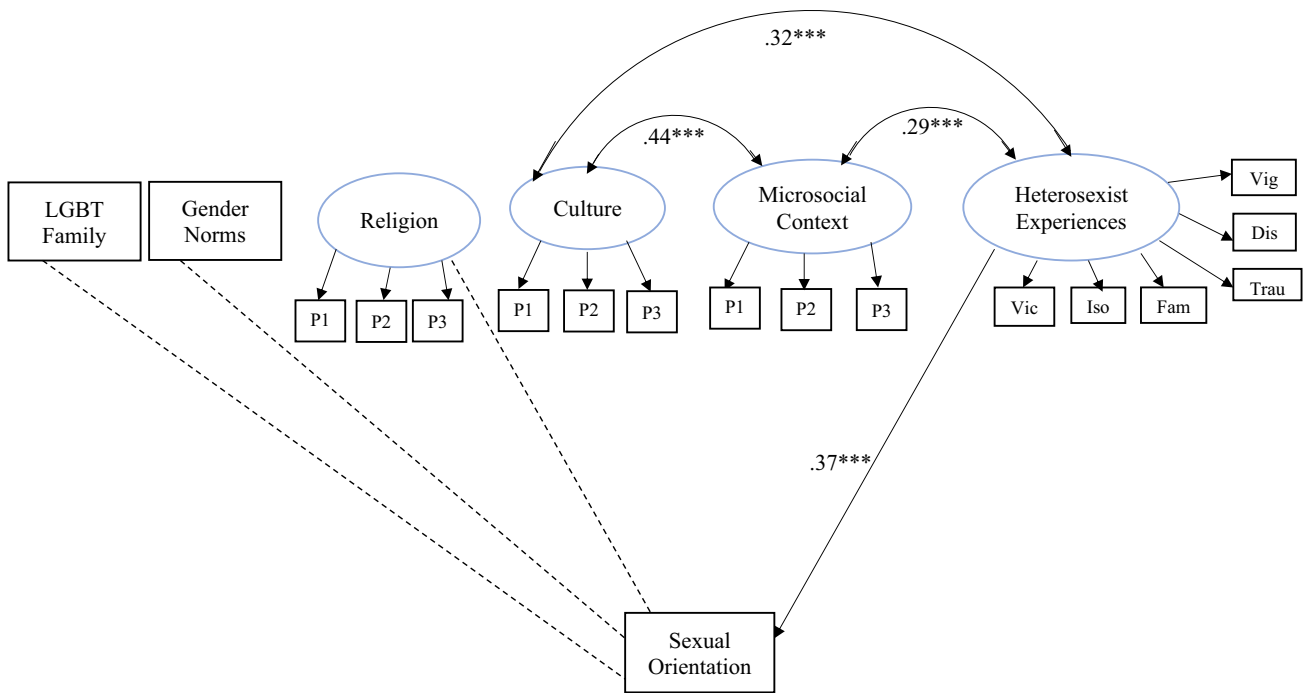


Fig. 3 Structural Equation Model for TD Group

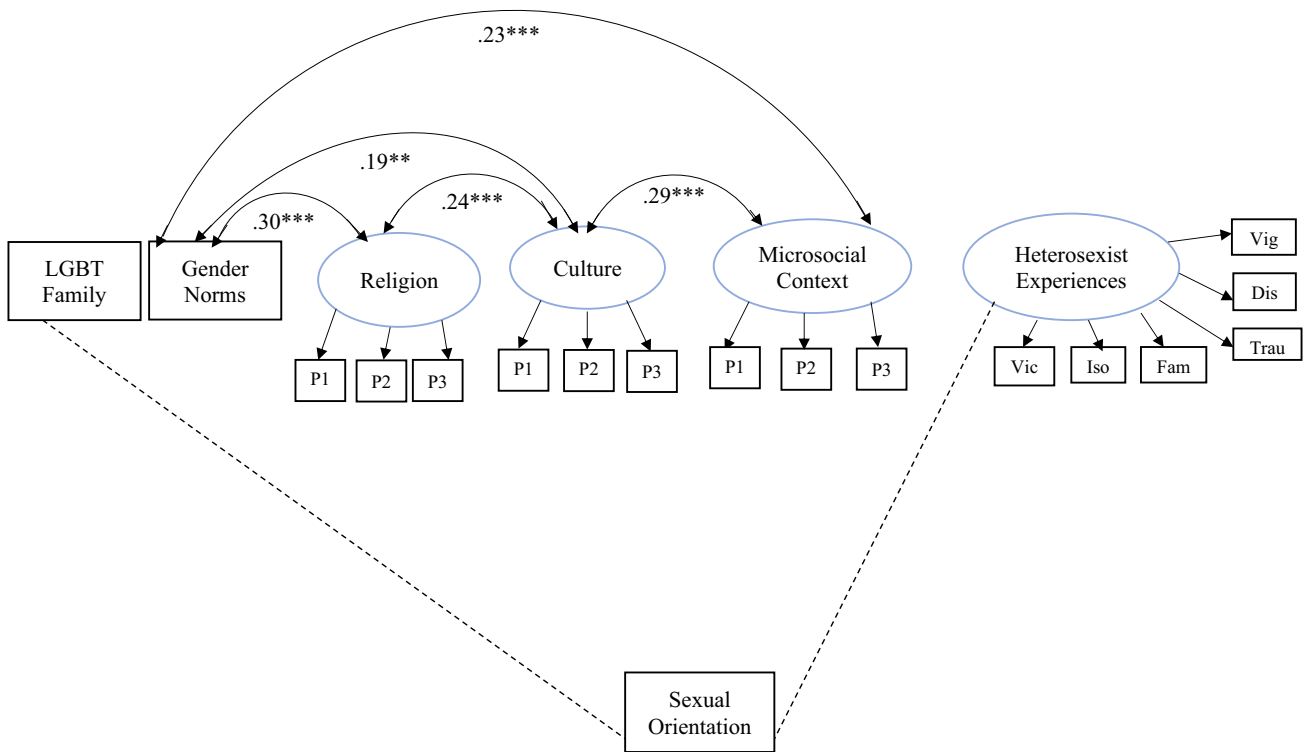


Fig. 4 Structural Equation Model for BAP Group

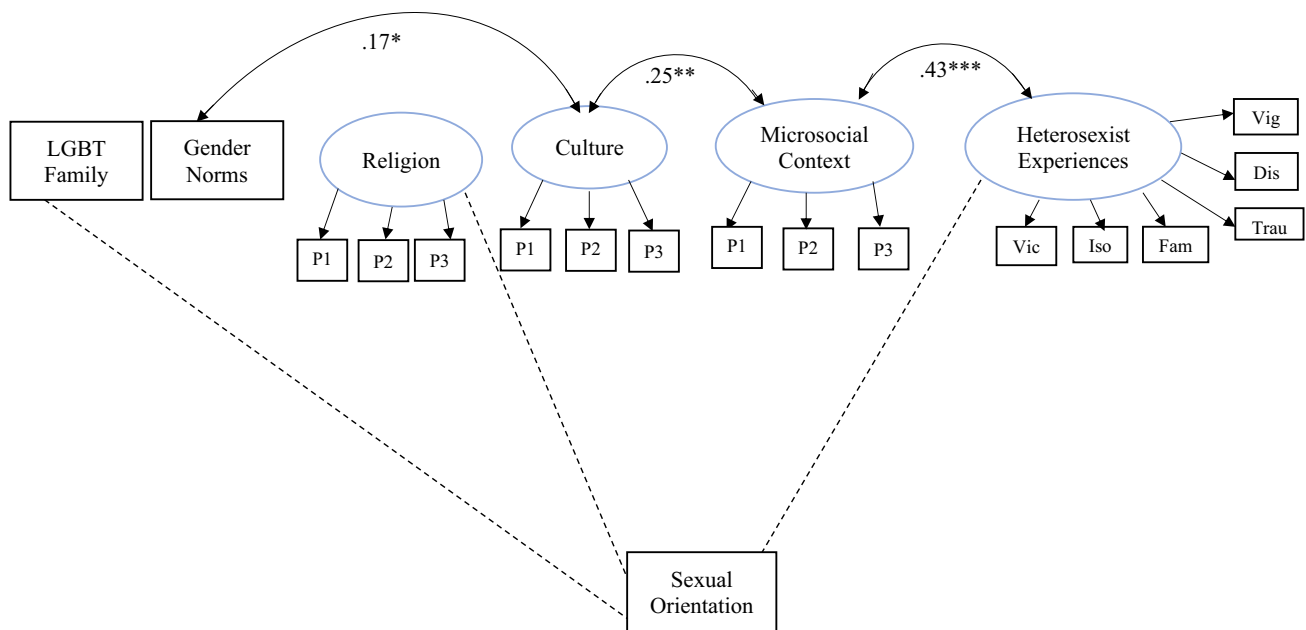


Fig. 5 Structural Equation Model for ASD Group

## Discussion

### Primary Findings

The goal for this study was to operationalize the model of sexual minority orientation development put forth by Worthington et al. (2002) and to test the fit of this model in individuals with TD, the BAP, and ASD. This study found that only one of the factors hypothesized to affect sexual minority orientation, heterosexist experiences, predicted sexual minority orientation in the overall model, with more heterosexist experiences predicting greater sexual minority orientation. Furthermore, when the sample was divided into the three groups, this effect was only present in the TD group. Although the other predictors did not significantly predict sexual minority orientation, they were intercorrelated in the overall model, and several factors remained correlated when the model was tested in individual groups.

There were significant differences in model fit for the group of individuals with TD, the BAP, and ASD as evidenced by the multigroup model having better fit than the overall model. However, the model for the BAP and ASD groups did not have any of the hypothesized factors (belief in gender norms, sexual prejudice in family and culture, religion, daily heterosexist experiences) predicting sexual minority orientation; therefore, the model could be said to best fit in the group with TD. The lack of a relationship between many of the hypothesized predictors and sexual minority orientation is likely related to the high intercorrelations between the predictor variables. Although these

factors represent distinct theoretical constructs, they relate to each other on a conceptual level and are operationalized similarly. It is possible that one or more the hypothesized predictors, such as religion, culture, or microsocial context, could still predict sexual minority orientation indirectly through the relationship with daily heterosexist experiences in individuals with TD.

### Relationship Between Predicting Factors

The path of heterosexist experiences on sexual minority orientation was significant in both the overall model and in the TD group. The variable of heterosexist experiences was also significantly positively correlated with all other predicting variables in the overall model except for gender norms, with which it was significantly negatively correlated. This means that participants who reported more daily heterosexist experiences also reported more sexual prejudice in their culture and family, being more religious, and believing less in traditional gender norms. Although the relationships between heterosexist experiences and religion, and belief in traditional gender norms were found in the overall model, these were not found in any of the individual group models, possibly due to small effect sizes and the reduced power concomitant with examining groups individually.

This study found a positive correlation between sexual minority orientation and heterosexist experiences in individuals with TD, meaning that as sexual minority orientation increases (e.g., individuals report greater same-sex attraction, asexuality, or non-binary attraction), daily heterosexist

experiences also increases. However, this relationship did not exist for individuals with the BAP and ASD. It is possible that TD individuals with more minoritized sexual orientations, such as being asexual or attracted to non-binary individuals, have more heterosexist experiences and are more bothered by them, whereas individuals with the BAP and ASD may be less aware of these experiences due to the social nature of these experiences. This may further be explained by the decreased emphasis individuals with ASD place on social reputation (Izuma et al., 2011). It is possible that individuals with the BAP have a similar insensitivity to social reputation and are less aware of daily heterosexist experiences. It is also possible that the direction of the relationship is reversed and expressing a more non-heterosexual orientation could lead individuals with TD to experience increased daily heterosexism.

Sexual prejudice in both microsocial and cultural contexts were correlated with heterosexism in the overall model and the TD group. These variables represent distinct, but related constructs. Heterosexism represents prejudice against sexual minority individuals at various levels of the social structure, whereas sexual prejudice measures the attitudes of individuals (Chonody, 2013). Nevertheless, it is logical that these constructs are highly correlated. Additionally, it makes sense that sexual prejudice in family and culture are highly interrelated. Family is subsumed under the cultural context, and many individuals learn about and relate to their culture through their family (Worthington et al., 2002). These concepts were also measured using the same adapted Sexual Prejudices Scale (Chonody, 2013). Therefore, the interrelatedness of these concepts and the correlation in all three groups is likely a product of both how they were measured and how they exist in vivo.

Despite the relationship between the two concepts, the correlation between family and cultural sexual prejudice and daily heterosexist experiences was found in the TD group but not the BAP or ASD groups. Individuals in the TD group also reported the highest levels of sexual prejudice in their culture and the lowest levels of heterosexist experiences, although not significantly higher or lower than individuals with the BAP. In contrast, individuals with ASD reported significantly higher levels of heterosexist experiences than both groups and significantly lower levels of sexual prejudice in culture than both groups. However, the correlation between factors in this group only approached significance at the  $p=0.05$  level, perhaps due to smaller sample size in the ASD group. Another interpretation is that insensitivity to social reputation and decreased theory of mind, if these exist in the BAP as postulated, could provide a buffering factor against the perceived experience of heterosexism and sexual prejudice in certain contexts. It is possible that individuals with the BAP have enough sensitivity to social factors to recognize increased sexual prejudice in their culture, but

not enough sensitivity to detect the presence of heterosexist experiences directed towards themselves. No research has been done to date on insensitivity to social reputation in individuals with the BAP, and research on theory of mind deficits in this group is inconclusive, with some researchers reporting finding deficits (Best et al., 2008) and others reporting no deficits in this group (Kunihira et al., 2006).

Belief in traditional gender norms was strongly related to intrinsic religiosity, and sexual prejudice in both cultural and microsocial contexts in the overall model and in individuals with the BAP. This means that, for individuals with a moderate level of autistic traits, the greater their belief in traditional gender norms, the greater their religiosity and the greater the sexual prejudice in their cultural and family contexts. Although there were no significant differences in belief in traditional gender norms among the three groups, individuals with the BAP and ASD were significantly more religious than individuals with TD, and individuals with TD and the BAP experienced significantly more sexual prejudice in their culture. The relationship between gender norms and religion, as well as sexual prejudice and religion, has been demonstrated in several other contexts and studies (Bang et al., 2005; Mikołajczak & Pietrzak, 2014). Sexual minority individuals who report staying involved with organized religion, especially non-identity-affirming churches, tend to experience negative effects such as internalized homophobia, lower self-esteem, and more depressive symptoms (Barnes & Meyer, 2012). Sexual minority individuals who internalized religious principles to the point of incorporating more religion in their lives may have been raised in cultures and families where more sexual prejudice existed. Perhaps, as stated above, individuals with the BAP are sensitive enough to social contexts to be able to detect sexual prejudice in the culture, but not sensitive enough to detect heterosexism directed towards themselves in religious contexts, which allows them to stay in religious contexts and endorse being more religious.

## Demographic Differences

There were several demographic differences between participants with ASD and those with and without the BAP. Individuals with ASD were, along with those with the BAP, less educated than those without ASD or the BAP. Participants with ASD were more likely to be female than male, and more likely to identify as “other gender” compared to female. Participants with ASD and those with the BAP reported a more non-heterosexual sexual orientation than participants without the BAP or ASD.

These findings replicate those from other studies that have found individuals with ASD more likely to describe themselves as non-binary or gender non-conforming (DeWinter et al., 2017; George & Stokes, 2018a; Turner et al., 2017),

have a more non-heterosexual orientation (Bejerot & Eriksson, 2014; Byers et al., 2012; George & Stokes, 2018b; Gilmour et al., 2012; Pecora et al., 2016). This study also replicates previous findings that individuals with the BAP are also more likely to have a more non-heterosexual orientation (Qualls et al., 2018). The education differences found in this study also replicate those found in the literature, as individuals with ASD are often found to have lower educational attainment and more often be unemployed or underemployed than individuals with typical development (e.g., Henninger & Taylor, 2013; Taylor & Seltzer, 2011).

## Strengths and Limitations

There are several limitations to the conclusions that may be drawn from this study. Testing many factors from the Worthington et al. (2002) model in one study required a large number of measures and a long survey (1 h on average) which may have contributed to participant drop out and random responding at the end of the survey. Although data were screened to remove cases that contained random responding, it is still possible that fatigue may have affected how participants responded to measures at the end of the survey. Another limitation of the nature of the study is that all information was self-reported by participants and could not be independently verified by the researchers. This includes self-report of inclusion criteria, including a diagnosis of ASD. Although ASD diagnosis was verified by the AQ-10, it is possible that some individuals reporting a diagnosis of ASD may not have received a formal diagnosis. However, many adults with ASD are self-diagnosed as there are many barriers to formal diagnosis (Lewis, 2017) and the need for a formal diagnosis is questioned by many autistic self-advocates (Lewis, 2016). The results for individuals in this study who may or may not have a formal diagnosis of ASD but who identified as autistic may be different if compared to a group of individuals with ASD that only had a formal diagnosis.

Limitations from this study may also result from testing the Worthington et al. (2002) model, which was originally developed to examine heterosexual identity development, in a non-heterosexual population. Although this model was later expanded upon to include non-heterosexual orientations (Dillon et al., 2011), operationalizing and studying this model in a solely non-heterosexual sample might limit the variance between groups in each of these factors. Only examining this model in a sexual minority sample might further limit the variance in the KSOG, as it would cause the data to be skewed towards more same-sex attraction, behavior, fantasies and identities. Future research on this model in heterosexual individuals in addition to sexual minority individuals is necessary to compare how this model operates differently in each group.

Measurement of the factors from the Worthington et al. (2002) model required some existing measures to be modified to properly measure the factors. Although Cronbach's alpha and other tests indicated that these measures were psychometrically acceptable for the study, since they were not being used as written, it cannot be certain that they were measuring the variable as intended.

Limitations also arise from the cross-sectional design of this study. The measures largely only captured one point in time, and measures that looked at the factors retrospectively (i.e., the questions asking about past sexual orientation on the KSOG) were not examined for this study. Since the formation of a sexual minority orientation is a developmental process over time, the cross-sectional nature of the study limits any causal conclusions that may be drawn between each of the factors and sexual minority orientation. Additionally, the relationship between sexual minority orientation and the psychosocial factors of the Worthington et al. (2002) model is likely not unidirectional. Once an individual develops a sexual minority orientation, the expression of this orientation affects how social factors influence the individual. Looking at factors that influence sexual minority orientation from a cross-sectional and unilateral perspective can obscure the developmental and bi-directional nature of sexual minority orientation.

There were more other gender participants than male or female participants, which limits the generalizability of the results. As discussed above, gender differences have been found in several of the factors that were the focus of this study, namely belief in traditional gender norms and religiosity, and in a more limited way, heterosexist experiences and sexual awareness. Future studies should aim to recruit a more balanced sample of men, women, and those of other gender to be able to control for these differences. Finally, the sample was also purposely limited to young adults ages 18–30, so caution should be utilized when generalizing these results to other age groups.

In addition to these limitations, this study also had several strengths. The robust sample size allowed for an  $n:q$  ratio for the overall model that was above the recommended amount, which means that more confidence can be placed in conclusions drawn from the overall model. The sample, although largely female, nevertheless represented several gender identities. The factors from the Worthington et al. (2002) were clearly operationalized, tested together, and examined in three different groups. Additionally, this study benefitted from recruitment through the internet, Facebook and Instagram in particular, which was how 69% of respondents found the study. This allowed us to specifically target a hard-to-access population, as the internet has been found to be a good recruitment and communication method for both sexual minority individuals and people with ASD (Benford & Standen, 2009; Guillory et al., 2018; Kosinski

et al., 2015). Finally, this was one of the first studies to use a model of sexual orientation to test a hypothesis regarding the increased number of individuals with ASD that identify as sexual minorities.

### Clinical Implications and Future Directions

The findings of this study have several important clinical implications and indicate directions for future research. Providers of sexual and/or gender minority clients with ASD would do well to introduce topics of heterosexism with their clients and assist them in finding appropriate coping mechanisms for dealing with this discrimination, as well as finding safe spaces for expressing their sexuality and gender identities. Parents also need to be made aware of the increased likelihood of sexuality and gender minority identities in ASD and can be provided with resources to support their child if they do identify as a gender or sexual minority.

Individuals with ASD and the BAP need to be supported in finding ways to communicate with their family and peers about their sexual minority identity. Individuals with ASD communicate less with their peers about sexuality (Hartmann et al., 2019), and participants in the study by Hannah and Stagg (2016) indicated that difficulties communicating with others about their sexuality and sexual orientation left them feeling isolated. Connection with supportive others can be a protective factor against the burden of heterosexism and sexual prejudice in an individual's culture and family (Hong & Garbarino, 2012). The outcomes also suggest that it is important for religious individuals to find a church that is affirming of their sexual and gender minority expression, lest they experience increased internalized homophobia, depression, and anxiety (Barnes & Meyer, 2012).

Research questions that arise out of the study results include whether insensitivity to social reputation and difficulties with theory of mind exist in individuals with the BAP. As mentioned above, no research has been done on insensitivity to social reputation in this group, and research on theory of mind in this group has been done in samples that were not well defined. If these traits are characteristic of the BAP, further research examining their relationship to having less sexual awareness and how they buffer against heterosexism and sexual prejudice may help elucidate the relationship between daily heterosexist experiences and sexual minority orientation in this group.

Further tests of the Worthington et al. (2002) model might examine the developmental aspect of sexual minority orientation, including the bidirectional relationship between sexual minority orientation and social factors. If possible, a longitudinal study which measures the factors in the model, especially social factors such as sexual prejudice in family and culture, religion, belief in gender norms, and heterosexism, should be measured prior to a person's developing

a sexual minority orientation, and then again afterwards. Grounded qualitative research may also be useful in examining if these factors are relevant to sexual minority individuals in developing their orientation, especially in groups where sexual orientation is understudied, such as the BAP and ASD.

### Conclusion

This study is the first to examine how biopsychosocial factors affect sexual minority orientation in individuals with TD, BAP, and ASD. Additionally, individuals with ASD experience more heterosexism and sexual prejudice than individuals with BAP and TD, making this an important area of intervention and research that has not heretofore been addressed. We hope that this paper encourages more intervention and research to improve the lives of sexual minority individuals, especially those with ASD and the BAP.

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