



King's Research Portal

DOI:

[10.1007/s10508-022-02319-2](https://doi.org/10.1007/s10508-022-02319-2)

Document Version

Peer reviewed version

[Link to publication record in King's Research Portal](#)

Citation for published version (APA):

Xu, Y., Montgomery, S., & Rahman, Q. (2022). Neuroticism and sexual orientation-based victimization as mediators of sexual orientation disparities in mental health. *Archives of Sexual Behavior*, 51(7), 3405-3416. <https://doi.org/10.1007/s10508-022-02319-2>

Citing this paper

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

General rights

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

This version of the article has been accepted for publication, after peer review (when applicable) and is subject to Springer Nature's AM terms of use, but is not the Version of Record and does not reflect post-acceptance improvements, or any corrections. The Version of Record is available online at: [http://dx.doi.org/\[TBC\]](http://dx.doi.org/[TBC])

Neuroticism and sexual orientation-based victimization as mediators of sexual orientation disparities in mental health

Yin Xu¹, Scott Montgomery^{2,3,4}, and Qazi Rahman⁵

¹Department of Sociology & Psychology, School of Public Administration, Sichuan University, Chengdu, China

²Clinical Epidemiology and Biostatistics, School of Medical Sciences, Örebro University, Örebro, Sweden

³Department of Epidemiology and Public Health, University College London, London, UK.

⁴Clinical Epidemiology Division, Karolinska Institutet, Stockholm, Sweden

⁵Department of Psychology, Institute of Psychiatry, Psychology & Neuroscience, King's College London, London, UK.

Acknowledgements The authors are grateful to the Centre for Longitudinal Studies, UCL Social Research Institute, for the use of these data and to the UK Data Service for making them available.

Declarations

Funding This work was supported by The Fundamental Research Funds for the Central Universities.

Conflicts of Interest The authors declare that they have no conflict of interest.

Ethics Approval Ethical approval was not required for this study since only secondary data analyses were involved.

Informed Consent Informed consent was obtained from the parents

Data Availability Millennium Cohort Study data are available through the UK Data Service.

Corresponding Author:

Yin Xu (Orcid ID: 0000-0003-3718-4715), Department of Sociology & Psychology, School of Public Administration, Sichuan University, Chengdu 610065, Sichuan, China
E-mail address: yin.xu@scu.edu.cn

ABSTRACT

This study tested whether elevated risk of poorer mental health outcomes among nonheterosexual adolescents compared with heterosexual adolescents is plausibly explained by neuroticism and sexual orientation-based victimization. The Millennium Cohort Study, a large British prospective birth cohort, was used (4,566 heterosexual boys, 77 bisexual boys, 129 homosexual boys, 96 asexual boys, 4,444 heterosexual girls, 280 bisexual girls, 158 homosexual girls, and 182 asexual girls). We analyzed the following measures assessed at age 17 years: sexual orientation based on sexual attraction, neuroticism, sexual orientation-based victimization, self-harm attempts, and psychological well-being. Mediation analysis was undertaken separately by sex and yielded the following statistically significant findings: for both sexes, we found that bisexual and homosexual adolescents scored higher than heterosexual adolescents on neuroticism; for both sexes, bisexual and homosexual adolescents reported more negative psychological well-being scores and self-harm attempts compared with heterosexual adolescents, with total effects (standardized regression coefficients) ranging from 0.58 to 0.91; those associations were mediated through sexual orientation-based victimization and neuroticism scores, with the indirect effects (standardized regression coefficients) through sexual orientation-based victimization and neuroticism scores ranging from 0.09 to 0.26 and 0.16 to 0.55, respectively. Asexual adolescents did not differ significantly from their heterosexual counterparts in psychological well-being and self-harm attempts, with the total effects ranging from -0.02 to 0.21. Sexual orientation-based victimization and neuroticism may both contribute to the sexual orientation-related disparities in psychological well-being and self-harm attempts. However, neuroticism appears to be the more powerful factor.

Keywords: Neuroticism; victimization; mental health; sexual orientation; adolescents

Neuroticism and Sexual Orientation-Based Victimization as Mediators of Sexual Orientation Disparities in Mental Health

Non-heterosexual adolescents are at greater risk of common mental health disorders such as depression, anxiety, substance use, and attempted or completed suicide compared to heterosexual adolescents (Russell & Fish, 2016). The dominant theoretical framework used to explain the elevated rates of mental disorders among non-heterosexuals is minority stress theory. Minority stress theory specifies that societal discrimination or stigma against non-heterosexuals is the primary cause of these disparities. In essence, minority stress theory suggests that societal discrimination or stigma experienced by non-heterosexuals increase their risk of poorer mental and physical health directly or via group-specific (e.g., internalized stigma) and general psychological processes (e.g., cognitive and emotional processes, coping strategies) (Hatzenbuehler, 2009; Meyer et al., 2021).

Although prior research offers support to the central hypothesis of minority stress theory that social stigma contributes to poorer mental health among non-heterosexual people (Collier et al., 2013; Meyer et al., 2021), this model cannot fully explain sexual orientation disparities in mental health outcomes. For example, greater exposure to victimization in early life, including maltreatment, homelessness, and intimate partner violence, explained between 10.7% and 21.5% of the increased risks of suicidal ideation or attempts, depressive symptoms, tobacco use, and alcohol abuse among non-heterosexual youths compared with heterosexual youths (McLaughlin et al., 2012). In addition, given that most of prior research is correlational and based on self-report, the direction of causality may be difficult to determine since stigma may lead to a greater likelihood of mental health problems, but also that mental health problems lead to a greater likelihood of experiencing stigma (Bailey, 2020; Corrigan & Watson, 2002). There is the possibility of a complex causal structure between stigma, sexual

orientation, and mental health problems with various possible mediation and moderation pathways.

Psychosocial and Genetic Influences on Sexual Orientation Disparities in Mental Health

Other processes hypothesized to interleave between sexual orientation-based victimization and mental health outcomes such as developmental or psychosocial factors (e.g., family relationships, self-esteem, cognitive processes, gender nonconformity) do not entirely explain the association (Argyriou et al., 2021; Oginni et al., 2019). Prospective studies of the association between bullying experienced by non-heterosexual adolescents or gender nonconforming adolescents (gender nonconformity being a predictor of later non-heterosexuality; Xu et al., 2021) and later depression symptoms or anxiety disorders suggests bullying can explain at most half of the increased prevalence (Jones et al., 2017; Roberts et al., 2013).

Common genetic confounding is also indicated by genome-wide association and twin studies, which report small-to-modest genetic correlations between sexual orientation or same-sex behavior and depression (Ganna et al., 2019; Zietsch et al., 2012). However, studies based on genetic mediation models suggested that genetic influences on sexual orientation and mental health outcomes would be better interpreted as being transmitted through phenotypic causal pathways rather than as influences of common genetic factors (Oginni et al., 2020; Oginni et al., 2022). Nonetheless, co-twin control studies which adjust for unmeasured genetic and environmental factors shared by the siblings, suggest that non-shared environmental factors (which may include those relevant to the hypothesized minority stress) may indeed contribute to the elevated rates of mental health problems in non-heterosexual co-twins (Donahue et al., 2017; O'Reilly et al., 2021). Thus, other mechanisms or explanations, may help explain the sexual orientation disparities in mental health outcomes and should be considered (Bailey, 2020, 2021).

Neuroticism as a Potential Cause of Sexual Orientation Disparities in Mental Health

One alternative factor may involve the personality factor neuroticism. Neuroticism reflects individual differences in the tendency to experience negative affect, self-consciousness, impulsiveness, and emotional instability (McCrae & Costa Jr, 1991). A meta-analysis found that higher neuroticism is strongly associated with poorer mental health outcomes, including depression, anxiety disorders, and substance abuse (Kotov et al., 2010). Neuroticism was also found to be associated with nonheterosexuality especially in males (Allen & Robson, 2020; Lippa, 2005; Wang et al., 2014). Studies measuring sexual orientation via sexual attraction and neuroticism as tendency to experience negative affect and emotional instability have found that non-heterosexual men and women score significantly higher than their heterosexual counterparts on neuroticism (Wang et al., 2014; Zietsch et al., 2011). Higher neuroticism has been associated with less resilience (Lü et al., 2014), more problematic coping strategies (Connor-Smith & Flachsbart, 2007), and greater internalized homophobia (Puckett et al., 2016), which in turn, is associated with poorer mental health outcomes (Lü et al., 2014; Puckett et al., 2016). Thus, neuroticism may explain, at least partially, the sexual orientation disparities in mental health outcomes.

To our knowledge, only one study has formally tested the mediating effect of neuroticism on the association between sexual orientation and mental health outcomes (Puckett et al., 2016). This study found that higher neuroticism was associated with increased internalized homophobia, which in turn was associated with the increased risk of poorer mental health outcomes among men who had sex with men. However, only men who had sex with men were included which rules out the sex-based comparisons and sexual orientation may have been misclassified by relying on same-sex behavior alone. It also remains unknown whether the mediating effect of neuroticism was different among sexual minority subgroups (bisexual, homosexual, or asexual). The relationship between asexuality and mental health is

under-researched but those studies that exist have inconsistent results. Some found that asexual individuals were at increased risk of poorer mental health outcomes compared to heterosexual adolescents (Borgogna et al., 2019), others found that asexuality was associated with decreased or equivalent risk compared with heterosexual individuals (Lucassen et al., 2011; Perales & Campbell, 2019).

The Present Study

Here, we test whether bisexual, homosexual, and asexual adolescents were at greater risk of poorer mental health outcomes compared with heterosexual adolescents, and whether the increased risks were plausibly partially explained by neuroticism and sexual orientation-based victimization via mediation analyses. We hypothesized that bisexual, homosexual, and asexual boys and girls would be at greater risk of poorer mental health outcomes at age 17 compared to their heterosexual counterparts, and this increased risk can be plausibly partially explained by sexual orientation-based victimization and neuroticism at age 17. It should be noted, even for models where the temporal order of variables being convincingly established (both independent variables and mediators temporally precede outcomes, and independent variables temporally precede mediators), a truly causal relationship cannot be determined by the traditional mediation analysis (Fiedler et al., 2011).

METHOD

Participants

Participants were part of the Millennium Cohort Study (MCS), a large ongoing longitudinal birth cohort study of children born in the United Kingdom between September 2000 and January 2002 from 19,941 families, which has been described in detail elsewhere (Connelly & Platt, 2014). MCS data reported by children and parents across seven waves at age nine months, 3 years, 5 years, 7 years, 11 years, 14 years, and 17 years old were used in the current study. Among 19,941 families, the proportion of participants dropped from around

93% at wave 1 to around 53% at wave 7, mainly due to refusal. Informed parental consent was given at each wave. Adolescents who had a valid response of sexual orientation at age 17 and whose gender identity (reported by adolescents at age 17 via one question: “Which of the following describes how you think of yourself: 1 = *male*, 2 = *female*, and 3 = *in another way*”) was consistent with their biological sex at birth were included here, $N = 9,932$ (4,868 boys and 5,064 girls). Transgender-identifying adolescents were excluded from analyses due to small cell sizes and interaction between sexual orientation and gender identity for mental health outcomes (16 transgender heterosexual individuals, 11 transgender bisexual individuals, 22 transgender homosexual individuals, and three transgender asexual individuals). Ethical approval was not required for this analysis since only secondary data analyses were involved.

Measures

Sexual Orientation

Adolescents’ self-reported sexual orientation at age 17 was measured via one item: “I have felt sexually attracted” on a 7-point scale: 1 = *only to the opposite-sex and never to the same-sex*, 2 = *more often to the opposite-sex but at least once to a same-sex*, 3 = *about equally often to both sexes (bisexual)*, 4 = *more often to the same-sex but at least once to an opposite-sex*, 5 = *only to the same-sex and never to the opposite-sex*, 6 = *never felt sexually attracted to either sex (asexual)*, and 7 = *do not know*. Compared with sexual identity labels and sexual behavior, assessing sexual attraction is considered as a more valid and reliable way of quantifying sexual orientation among adolescents (Austin et al., 2007). Heterosexual adolescents include those who reported being *sexually attracted only/more often to the opposite-sex*, and homosexual adolescents includes those who reported being *sexually attracted only/more often to the same-sex*. Adolescents who chose “do not know” were not included due to a small number ($n = 11$). A total of 4,566 heterosexual boys, 77 bisexual boys,

129 homosexual boys, 96 asexual boys, 4,444 heterosexual girls, 280 bisexual girls, 158 homosexual girls, and 182 asexual girls were included.

Mental Health Outcomes

The mental health outcomes at 17 years old were chosen based on availability in the MCS and robust associations with sexual orientation reported by prior research (Russell & Fish, 2016). These included self-harm attempts, mental well-being (the Short Warwick-Edinburgh Mental Well-being Scale; Cronbach's $\alpha = .80$; McKay & Andretta, 2017), psychological distress (Kessler Scale with six items; Cronbach's $\alpha = .89$; Kessler et al., 2002), emotional and behavioral difficulties (the sum of all subscales except the prosocial behavior subscale from the Strength and Difficulties Questionnaire; Cronbach's $\alpha = .82$; Goodman, 2001), and self-esteem (shortened Rosenberg's Self-Esteem Scale; Rosenberg, 2015; Cronbach's $\alpha = .91$ in our sample). For self-harm attempts, adolescents reported whether they had hurt themselves on purpose in the last 12 months by cutting or stabbing themselves, burning themselves, bruising or pinching themselves, taking an overdose of tablets, pulling out their hair, or other ways. Self-harm attempts were coded as present if adolescents had hurt themselves on purpose in either of the six ways listed above. Self-reported suicide attempts (whether adolescents had hurt themselves on purpose in an attempt to end life in the last 12 months) were not included due to the small number of asexual who had these attempts. See Supplemental Text for details of the rest of the mental health outcomes.

Neuroticism

When adolescents were 17 years old, the neuroticism subscale from the short 15-item Big Five Inventory was used to assess neuroticism (Hahn et al., 2012). The short Big Five Inventory has acceptable reliability and validity (Cronbach's $\alpha = .66$ for the neuroticism subscale; Hahn et al., 2012). The neuroticism subscale consists of three items on a 7-point scale ranging from 1 = *does not apply to me at all* to 7 = *applies to me perfectly*. An example

of item is “I see myself as someone who gets nervous easily”. The total score of the three items was used in the analysis, with a higher score indicating higher neuroticism.

Sexual Orientation-based Victimization

When adolescents were 17 years old, they reported whether they had been the targets of victimization in the past 12 months via nine binary items (0 = *no* and 1 = *yes*, supplemental text). Two examples of items are “been physically violent towards you” and “insulted you, called you names, threatened or shouted at you in a public place, at school or anywhere else”. Cronbach’s $\alpha = .73$ for the scale in our sample. The total score of the nine items was used in the analysis, with a higher score indicating more victimization. Adolescents who reported “yes” to either of the nine items also reported what reasons they attributed their victimization experiences to from six options, including racism, sexism, sexual orientation, ageism, disability discrimination, and appearance. Adolescents were able to select more than one reason. For adolescents who attributed their victimization experiences to their sexual orientation, their total score of the nine items were treated as sexual orientation-based victimization. Adolescents who reported “no” to all nine items or adolescents who did not attribute their victimization experiences to their sexual orientation received a score of 0 on sexual orientation-based victimization.

Potential Confounding Factors

Based on known associations with both sexual orientation and mental health outcomes reported by prior research (Hughes et al., 2017; Xu et al., 2019) and availability in the MCS, birthweight (kilograms), parental age at birth, duration of breastfeeding (months), ethnicity (White, Mixed, Indian, Pakistani and Bangladeshi, Black, and other ethnic group), number of older siblings (a derived variable based on household members self-reports relationships to adolescents at age 9 months and includes biological and non-biological siblings), parent-child relationship quality (reported by adolescents’ parents using the Child Parent Relationship

Scale at age 3 years; Cronbach's $\alpha = .84$ and $.69$ for the maternal conflict and closeness subscales, respectively; Driscoll & Pianta, 2011), and parental absence (a derived variable based on the main carers and their partners self-reports relationships to adolescents across seven waves) were included as potential confounding factors. For ethnicity, those choosing other than White were combined into one group, Others. Details have been described elsewhere (Xu et al., 2020).

Statistical Analysis

Missing Data

All analyses were performed in Mplus 7.4. The mental health outcomes, sexual orientation-based victimization, and neuroticism had 0.18%-3.69% missing information (Table 1), which were handled using full-information maximum likelihood estimation in mediation analysis. Potential confounding factors had 0.02%-15.28% missing information (Supplemental Table 1 and 2), which was handled via mentioning variances of confounding factors with missing in the MODEL command, with their distributional assumptions being made using maximum likelihood estimation. Sensitivity analysis found no substantial difference in estimates between mediation analysis using complete-case and mediation analysis using maximum likelihood estimation to handle confounding factors with missing information (Supplemental Table 3 and 4).

Multigroup Confirmatory Factor Analysis

Mental well-being, psychological distress, emotional and behavioral difficulties, and self-esteem were correlated with each other, and so may measure the same construct, which was confirmed by exploratory factor analysis. Accordingly, one-factor confirmatory factor analysis was used to incorporate these measures into one latent factor, psychological well-being, with a higher score indicating more negative psychological well-being (Figure 1). Self-harm attempt was excluded from the confirmatory factor analysis since it may represent a

different mental health outcome from generic psychological well-being, and we were interested in the sexual orientation disparities in self-harm attempts. In order to examine whether the construct of psychological well-being was the same across different sexual orientation subgroups, we followed the guideline to test the measurement invariance of psychological well-being (Putnick & Bornstein, 2016). Full information maximum likelihood estimation with robust standard errors was used to handle potential multivariate normality violation and the missing data. Measurement invariance of psychological well-being is considered to be supported when constraints lead to a change in the comparative fit index ≤ 0.01 among model comparison (Putnick & Bornstein, 2016).

Mediation Analysis

In order to test whether sexual orientation-based victimization and neuroticism act as mediators of the relation between sexual orientation and mental health outcomes, the hypothesized model shown in Figure 1 was tested using structural equation modelling. Specifically, we examined whether non-heterosexual adolescents would report more negative psychological well-being and self-harm attempts compared with heterosexual adolescents. Furthermore, we examined whether non-heterosexual adolescents would score higher on neuroticism and report more sexual orientation-based victimization compared with heterosexual adolescents. Finally, assuming that both neuroticism and victimization are associated with more negative psychological well-being and self-harm attempts, we examined their relative contributions. Analyses were undertaken separately by sex.

Only partial invariance for psychological well-being across sexual orientation subgroups was supported (Supplemental Table 5). However, no substantial difference was found for sexual orientation differences in psychological well-being between scalar and partial invariance models (Supplemental Table 6). Accordingly, scalar invariance was assumed and used in the mediation analysis. Maximum likelihood estimation based on Monte Carlo

integration was used since mental health outcomes included in confirmatory factor analysis were all continuous and both continuous and binary outcomes with missing information were included in mediation analysis. This method fits the data using linear regression for psychological well-being, neuroticism, and sexual orientation-based victimization, and using probit regression for self-harm attempt where the coefficient represents the change in the z-score or probit index for a one-unit change in the corresponding predictor. Simulation studies showed that maximum likelihood estimation performed equally well as categorical least squares estimation when observed variables have more than five categories (Rhemtulla et al., 2012). Thus, sexual orientation-based victimization was treated as a continuous variable. Bootstrapping method (2000 bootstrap samples) was used to estimate the standard errors and 95% bias-corrected confidence interval were reported. Bootstrapping is robust to model misfit and nonnormality (Lai, 2018), and performs well in testing the significance of indirect effects. Given the disagreement among statisticians regarding the need for *p*-value adjustments (Althouse, 2016), the decrease in statistical power and increase in Type II errors associated with corrections such as Bonferroni correction (Nakagawa, 2004), we did not adjust for multiple comparisons. But as recommended, we reported effect sizes, 95% confidence intervals, and *p* values (Althouse, 2016; Nakagawa, 2004).

RESULTS

No model fit indexes were reported for the mediation analysis since they were not available with maximum likelihood estimation based on Monte Carlo integration for a combination of continuous and binary outcomes with missing information. But mediation analysis stratified by sex and mental health outcomes (the mean and variance-adjusted weighted least squares was used for self-harm attempt in order to get model fit statistics), which produced almost the same results, had acceptable model fit statistics.

The standardized path coefficients were shown in Figure 2 and Figure 3. Standardized total, direct, and indirect effects were presented in Tables 2 and 3. Asexual boys and girls did not differ statistically significantly from heterosexual adolescents in psychological well-being and self-harm attempts, with total effects ranging from -0.02 to 0.21. For both sexes, bisexual and homosexual adolescents reported significantly more negative psychological well-being and self-harm attempts compared with heterosexual adolescents, with total effects ranging from 0.58 to 0.91. Those associations (except for more negative psychological well-being reported by bisexual boys compared to heterosexual boys) became statistically non-significant for boys when sexual orientation-based victimization and neuroticism were included, while those associations were weakened but remained significant for girls, with direct effects ranging from 0.30 to 0.64. For both sexes, the increased risks of negative psychological well-being and self-harm attempts among homosexual and bisexual adolescents compared to heterosexual adolescents were significantly mediated through sexual orientation-based victimization and neuroticism, with indirect effects through sexual orientation-based victimization and neuroticism scores ranging from 0.09 to 0.26 and 0.16 to 0.55, respectively. The degree of mediation by sexual orientation-based victimization ranged from 12.09% to 44.83%, and the degree of mediation by neuroticism ranged from 17.58% to 85.94%.

DISCUSSION

For both sexes, bisexual and homosexual adolescents scored significantly higher than heterosexual adolescents on neuroticism, which is consistent with much previous work (Wang et al., 2014; Zietsch et al., 2011). Note the finding for girls contradicts the gender-shift or cross-sex shift hypothesis (is in the opposite direction predicted by this hypothesis), which suggests that non-heterosexuals tend to be similar to their opposite-sex counterparts on neuroticism (neuroticism is a feminine-type trait; Lippa, 2005). The finding for girls also differs from the statistically non-significant difference in neuroticism between homosexual

and heterosexual women reported in one recent meta-analysis (the pooled effect size for the sexual orientation disparities in neuroticism is small; Allen & Robson, 2020). It should be noted that studies included in that meta-analysis differed in the measurement of neuroticism and sexual orientation, which is consistent with the substantial heterogeneity across studies (Allen & Robson, 2020). Thus, the inconsistent results may be partially explained by the variations in methods across studies. The current study also precludes inferences of causality between neuroticism and sexual orientation given the cross-sectional nature of the data used. It is possible that the association between sexual orientation and neuroticism is explained by shared familial environmental and genetic factors (Ganna et al., 2019; Zietsch et al., 2012). Thus, future research using sibling-comparison approach may help us to determine whether this association is independent of shared familial confounding factors.

We found that neuroticism partially accounted for the increased risks of self-reported negative psychological well-being and self-harm attempts among homosexual and bisexual adolescents compared to heterosexual adolescents. The degree of mediation by neuroticism ranged from 17.58% to 85.94%, which is a small-to-large portion of the primary association between sexual orientation and mental health outcomes. Higher neuroticism has been associated with less resilience (Lü et al., 2014), more problematic coping strategies (Connor-Smith & Flachsbart, 2007), and greater internalized homophobia (Puckett et al., 2016), increasing the risks of poorer mental health outcomes (Lü et al., 2014; Puckett et al., 2016). Twin and genome-wide association studies also reported significant genetic correlations between sexual orientation and neuroticism (Ganna et al., 2019; Zietsch et al., 2011) and between neuroticism and mental health outcomes (Gale et al., 2016; Kendler & Myers, 2010). Thus, there may be shared genetic and familial environmental factors relevant to sexual orientation, neuroticism, and mental health outcomes. Future research using multilevel

mediation analysis may help determine whether the mediating effects reported in the current study is independent of unmeasured shared genetic and familial confounding.

Consistent with minority stress theory, we also found that sexual orientation-based victimization plausibly partially explained the increased risks of negative psychological well-being and self-harm attempts among homosexual and bisexual adolescents compared to heterosexual adolescents. The degree of mediation by sexual orientation-based victimization ranged from 12.09% to 44.83%, which is smaller compared to the proportion of increased mental health outcomes associated with non-heterosexuality plausibly explained by neuroticism. Sexual orientation-based victimization may increase risk of poorer mental health via general or group-specific psychosocial factors (Jones et al., 2017; Roberts et al., 2013; Timmins et al., 2020).

Neuroticism was found to be relatively stable but also susceptible to change from adolescence to adulthood (Soto & Tackett, 2015). For example, a meta-analysis found that the mean level of neuroticism decreased from age 10- 40 years but remained stable afterwards (Roberts et al., 2006). Prior research also found a reciprocal relationship between stressful life events and neuroticism among adolescents (Metts et al., 2021). Thus, sexual orientation-based victimization may be also associated with increased level of neuroticism (Metts et al., 2021; Middeldorp et al., 2008), in turn may lead to poorer mental health among non-heterosexual adolescents. However, the current study precludes inferences of causality between neuroticism and sexual orientation-based victimization given the cross-sectional nature of the data used.

The associations between sexual orientation and psychological well-being, and between sexual orientation and self-harm attempts were weakened after controlling for sexual orientation-based victimization and neuroticism, but were not reduced to zero. This indicates that other mechanisms may explain the sexual orientation disparities in mental health

outcomes. One alternative explanation is that shared genetic and familial environmental factors relevant to both sexual orientation and mental health outcomes can partially explain the sexual orientation disparities in mental health outcomes (Ganna et al., 2019; Zietsch et al., 2012).

Asexual adolescents did not differ from heterosexual adolescents in psychological well-being and self-harm attempt, which is consistent with some studies (Greaves et al., 2017; Perales & Campbell, 2019), but contradicts others (Borgogna et al., 2019; Lucassen et al., 2011). Prior studies differed in the measurement of asexuality, which may partially explain the inconsistent results. Asexual adolescents did not differ from heterosexual adolescents in sexual orientation-based discrimination and neuroticism in the current study. Most asexual adolescents may not have perceived “asexual” to be a sexual identity since only around 20% of asexual adolescents self-identified as “other” in the current study. Adolescents who reported to being asexual at age 17 may still be at early stage of sexual orientation development since most asexual adolescents report changing their sexual orientation from adolescence to young adulthood (Xu et al., 2021). Thus, the statistically non-significant difference in sexual orientation-based discrimination and neuroticism between asexual and heterosexual adolescents, and the measurement of sexual orientation at a young age may partially explain the statistically non-significant difference in mental health outcomes between asexual and heterosexual adolescents.

This study has several strengths including the use of a large birth cohort in UK with high statistical power, measuring sexual orientation via sexual attraction, and studying bisexual and asexual adolescents as separate sexual minority groups. However, there were several limitations. We could not adjust for unmeasured shared familial environmental and genetic factors relevant to sexual orientation, neuroticism, and mental health outcome. We also could not determine the causal relationships among sexual orientation, neuroticism, and sexual

orientation-based victimization since neuroticism and sexual orientation-based victimization were only available at age 17 in the MCS. Given the reciprocal relationship between stressful life events and neuroticism among adolescents found in prior research (Metts et al., 2021), it is possible that higher neuroticism would increase the self-report of sexual orientation-based victimization among non-heterosexuals. Future research using cross-lagged panel design may help us address this. Finally, sexual orientation-based victimization measured in the MCS was based on binary items. Thus, we cannot determine the frequency or intensity of sexual orientation-based victimization. The measurement of sexual orientation-based victimization in the MCS did not cover all relevant victimization events (e.g., indirect forms of victimization like social exclusion, and second-hand victimization experiences like knowledge of victimization experiences of friends or acquaintances, Gower et al., 2021), which may contribute to the lower rate of sexual orientation-based victimization. Only victimization in the last 12 months at age 17 was measured. Thus, we cannot determine whether sexual orientation-based victimization at early adolescence would affect the development of neuroticism. Future studies using more comprehensive measures are needed to address those issues.

In sum, we found that for both sexes, bisexual and homosexual adolescents were at greater risk of self-reported negative psychological well-being and self-harm attempts compared with heterosexual adolescents. Sexual orientation-based victimization and neuroticism may both contribute to the sexual orientation-related disparities in psychological well-being and self-harm attempts. However, neuroticism appears to be the more powerful factor.

REFERENCES

- Allen, M. S., & Robson, D. A. (2020). Personality and sexual orientation: New data and meta-analysis. *The Journal of Sex Research, 57*(8), 953-965.
<https://doi.org/10.1080/00224499.2020.1768204>
- Althouse, A. D. (2016). Adjust for multiple comparisons? It's not that simple. *The Annals of Thoracic Surgery, 101*(5), 1644-1645. <https://doi.org/10.1016/j.athoracsur.2015.11.024>
- Argyriou, A., Goldsmith, K. A., & Rimes, K. A. (2021). Mediators of the disparities in depression between sexual minority and heterosexual individuals: A systematic review. *Archives of Sexual Behavior, 50*(3), 925–959. <https://doi.org/10.1007/s10508-020-01862-0>
- Austin, S. B., Conron, K. J., Patel, A., & Freedner, N. (2007). Making sense of sexual orientation measures: Findings from a cognitive processing study with adolescents on health survey questions. *Journal of LGBT Health Research, 3*(1), 55-65.
https://doi.org/10.1300/j463v03n01_07
- Bailey, J. M. (2020). The minority stress model deserves reconsideration, not just extension. *Archives of Sexual Behavior, 49*(7), 2265–2268. <https://doi.org/10.1007/s10508-019-01606-9>
- Bailey, J. M. (2021). It is time to stress test the minority stress model. *Archives of Sexual Behavior, 50*(3), 739-740. <https://doi.org/10.1007/s10508-021-01912-1>
- Borgogna, N. C., McDermott, R. C., Aita, S. L., & Kridel, M. M. (2019). Anxiety and depression across gender and sexual minorities: Implications for transgender, gender nonconforming, pansexual, demisexual, asexual, queer, and questioning individuals. *Psychology of Sexual Orientation and Gender Diversity, 6*(1), 54-63.
<https://doi.org/10.1037/sgd0000306>

- Collier, K. L., Van Beusekom, G., Bos, H. M., & Sandfort, T. G. (2013). Sexual orientation and gender identity/expression related peer victimization in adolescence: A systematic review of associated psychosocial and health outcomes. *Journal of Sex research, 50*(3-4), 299-317. <https://doi.org/10.1080/00224499.2012.750639>
- Connelly, R., & Platt, L. (2014). Cohort profile: UK millennium Cohort study (MCS). *International Journal of Epidemiology, 43*(6), 1719-1725. <https://doi.org/10.1093/ije/dyu001>
- Connor-Smith, J. K., & Flachsbart, C. (2007). Relations between personality and coping: A meta-analysis. *Journal of Personality and Social Psychology, 93*(6), 1080-1107. <https://doi.org/10.1037/0022-3514.93.6.1080>
- Corrigan, P. W., & Watson, A. C. (2002). Understanding the impact of stigma on people with mental illness. *World Psychiatry, 1*(1), 16–20.
- Donahue, K., Långström, N., Lundström, S., Lichtenstein, P., & Forsman, M. (2017). Familial factors, victimization, and psychological health among sexual minority adolescents in Sweden. *American Journal of Public Health, 107*(2), 322-328. <https://doi.org/10.2105/AJPH.2016.303573>
- Driscoll, K., & Pianta, R. C. (2011). Mothers' and fathers' perceptions of conflict and closeness in parent-child relationships during early childhood. *Journal of Early Childhood and Infant Psychology, 7*, 1–24.
- Fiedler, K., Schott, M., & Meiser, T. (2011). What mediation analysis can (not) do. *Journal of Experimental Social Psychology, 47*, 1231-1236. <https://doi.org/10.1016/j.jesp.2011.05.007>
- Gale, C. R., Hagenaars, S. P., Davies, G., Hill, W. D., Liewald, D. C., Cullen, B., Penninx, B. W., International Consortium for Blood Pressure GWAS, CHARGE Consortium Aging and Longevity Group, Boomsma, D. I., Pell, J., McIntosh, A. M., Smith, D. J., Deary, I.

- J., & Harris, S. E. (2016). Pleiotropy between neuroticism and physical and mental health: findings from 108 038 men and women in UK Biobank. *Translational Psychiatry*, 6(4), e791. <https://doi.org/10.1038/tp.2016.56>
- Ganna, A., Verweij, K., Nivard, M. G., Maier, R., Wedow, R., Busch, A. S., Abdellaoui, A., Guo, S., Sathirapongsasuti, J. F., 23andMe Research Team, Lichtenstein, P., Lundström, S., Långström, N., Auton, A., Harris, K. M., Beecham, G. W., Martin, E. R., Sanders, A. R., Perry, J., Neale, B. M., ... Zietsch, B. P. (2019). Large-scale GWAS reveals insights into the genetic architecture of same-sex sexual behavior. *Science*, 365(6456), eaat7693. <https://doi.org/10.1126/science.aat7693>
- Goodman R. (2001). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40(11), 1337–1345. <https://doi.org/10.1097/00004583-200111000-00015>
- Greaves, L. M., Barlow, F. K., Huang, Y., Stronge, S., Fraser, G., & Sibley, C. G. (2017). Asexual identity in a New Zealand national sample: Demographics, well-being, and health. *Archives of Sexual Behavior*, 46(8), 2417-2427. <https://doi.org/10.1007/s10508-017-0977-6>
- Gower, A. L., Valdez, C., Watson, R. J., Eisenberg, M. E., Mehus, C. J., Saewyc, E. M., Corliss, H. L., Sullivan, R., & Porta, C. M. (2021). First- and second-hand experiences of enacted stigma among LGBTQ youth. *The Journal of School Nursing*, 37(3), 185–194. <https://doi.org/10.1177/1059840519863094>
- Hahn, E., Gottschling, J., & Spinath, F. M. (2012). Short measurements of personality—Validity and reliability of the GSOEP Big Five Inventory (BFI-S). *Journal of Research in Personality*, 46(3), 355-359. <https://doi.org/10.1016/j.jrp.2012.03.008>

- Hatzenbuehler, M. L. (2009). How does sexual minority stigma “get under the skin”? A psychological mediation framework. *Psychological Bulletin*, *135*(5), 707-730.
<https://doi.org/10.1037/a0016441>
- Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., ... & Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: A systematic review and meta-analysis. *The Lancet Public Health*, *2*(8), e356-e366.
[https://doi.org/10.1016/S2468-2667\(17\)30118-4](https://doi.org/10.1016/S2468-2667(17)30118-4)
- Jones, A., Robinson, E., Oginni, O., Rahman, Q., & Rimes, K. A. (2017). Anxiety disorders, gender nonconformity, bullying and self-esteem in sexual minority adolescents: Prospective birth cohort study. *Journal of Child Psychology and Psychiatry*, *58*(11), 1201–1209. <https://doi.org/10.1111/jcpp.12757>
- Kendler, K. S., & Myers, J. (2010). The genetic and environmental relationship between major depression and the five-factor model of personality. *Psychological Medicine*, *40*(5), 801-806. <https://doi.org/10.1017/S0033291709991140>
- Kessler, R.C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S.-L. T., Walters, E. E., & Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, *32*(6), 959–976. <https://doi.org/10.1017/s0033291702006074>
- Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking “big” personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, *136*(5), 768-821. <https://doi.org/10.1037/a0020327>
- Lai, K. (2018). Estimating standardized SEM parameters given nonnormal data and incorrect model: Methods and comparison. *Structural Equation Modeling: A Multidisciplinary Journal*, *25*(4), 600-620. <https://doi.org/10.1080/10705511.2017.1392248>

- Lippa, R. A. (2005). Sexual orientation and personality. *Annual Review of Sex Research*, *16*(1), 119–153.
- Lucassen, M. F., Merry, S. N., Robinson, E. M., Denny, S., Clark, T., Ameratunga, S., ... & Rossen, F. V. (2011). Sexual attraction, depression, self-harm, suicidality and help-seeking behaviour in New Zealand secondary school students. *Australian & New Zealand Journal of Psychiatry*, *45*(5), 376-383.
<https://doi.org/10.3109/00048674.2011.559635>
- Lü, W., Wang, Z., Liu, Y., & Zhang, H. (2014). Resilience as a mediator between extraversion, neuroticism and happiness, PA and NA. *Personality and Individual Differences*, *63*, 128-133. <https://doi.org/10.1016/j.paid.2014.01.015>
- McCrae, R. R., & Costa Jr, P. T. (1991). The NEO Personality Inventory: Using the five-factor model in counseling. *Journal of Counseling & Development*, *69*(4), 367-372.
<https://doi.org/10.1002/j.1556-6676.1991.tb01524.x>
- McLaughlin, K. A., Hatzenbuehler, M. L., Xuan, Z., & Conron, K. J. (2012). Disproportionate exposure to early-life adversity and sexual orientation disparities in psychiatric morbidity. *Child Abuse & Neglect*, *36*(9), 645–655.
<https://doi.org/10.1016/j.chiabu.2012.07.004>
- McKay, M. T., & Andretta, J. R. (2017). Evidence for the psychometric validity, internal consistency and measurement invariance of Warwick Edinburgh Mental Well-being Scale scores in Scottish and Irish adolescents. *Psychiatry Research*, *255*, 382–386.
<https://doi.org/10.1016/j.psychres.2017.06.071>
- Meyer, I. H., Pachankis, J. E., & Klein, D. N. (2021). Do genes explain sexual minority mental health disparities?. *Archives of Sexual Behavior*, *50*(3), 731-737.
<https://doi.org/10.1007/s10508-020-01909-2>

- Metts, A., Yarrington, J., Enders, C., Hammen, C., Mineka, S., Zinbarg, R., & Craske, M. G. (2021). Reciprocal effects of neuroticism and life stress in adolescence. *Journal of Affective Disorders*, *281*, 247-255. <https://doi.org/10.1016/j.jad.2020.12.016>
- Middeldorp, C. M., Cath, D. C., Beem, A. L., Willemsen, G., & Boomsma, D. I. (2008). Life events, anxious depression and personality: A prospective and genetic study. *Psychological Medicine*, *38*(11), 1557-1565. <https://doi.org/10.1017/S0033291708002985>
- Nakagawa, S. (2004). A farewell to Bonferroni: The problems of low statistical power and publication bias. *Behavioral Ecology*, *15*(6), 1044-1045. <https://doi.org/10.1093/beheco/arh107>
- Oginni, O. A., Jern, P., Rahman, Q., & Rijdsdijk, F. V. (2022). Do psychosocial factors mediate sexual minorities' risky sexual behaviour? A twin study. *Health Psychology*, *41*(1), 76–84. <https://doi.org/10.1037/hea0001129>
- Oginni, O. A., Jern, P., & Rijdsdijk, F. V. (2020). Mental health disparities mediating increased risky sexual behavior in sexual minorities: A twin approach. *Archives of Sexual Behavior*, *49*(7), 2497–2510. <https://doi.org/10.1007/s10508-020-01696-w>
- Oginni, O. A., Robinson, E. J., Jones, A., Rahman, Q., & Rimes, K. A. (2019). Mediators of increased self-harm and suicidal ideation in sexual minority youth: A longitudinal study. *Psychological Medicine*, *49*(15), 2524-2532. <https://doi.org/10.1017/S003329171800346X>
- O'Reilly, L. M., Pettersson, E., Donahue, K., Quinn, P. D., Klonsky, E. D., Lundström, S., Larsson, H., Lichtenstein, P., & D'Onofrio, B. M. (2021). Sexual orientation and adolescent suicide attempt and self-harm: A co-twin control study. *Journal of Child Psychology and Psychiatry*, *62*(7), 834–841. <https://doi.org/10.1111/jcpp.13325>

- Perales, F., & Campbell, A. (2019). Early roots of sexual-orientation health disparities: associations between sexual attraction, health and well-being in a national sample of Australian adolescents. *Journal of Epidemiology and Community Health*, 73(10), 954-962. <https://doi.org/10.1136/jech-2018-211588>
- Puckett, J. A., Newcomb, M. E., Garofalo, R., & Mustanski, B. (2016). The impact of victimization and neuroticism on mental health in young men who have sex with men: Internalized homophobia as an underlying mechanism. *Sexuality Research and Social Policy*, 13(3), 193-201. <https://doi.org/10.1007/s13178-016-0239-8>
- Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review*, 41, 71-90. <https://doi.org/10.1016/j.dr.2016.06.004>
- Rhemtulla, M., Brosseau-Liard, P. É., & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychological Methods*, 17(3), 354-373. <https://doi.org/10.1037/a0029315>
- Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: A meta-analysis of longitudinal studies. *Psychological Bulletin*, 132(1), 1-25. <https://doi.org/10.1037/0033-2909.132.1.1>
- Roberts, A. L., Rosario, M., Slopen, N., Calzo, J. P., & Austin, S. B. (2013). Childhood gender nonconformity, bullying victimization, and depressive symptoms across adolescence and early adulthood: An 11-year longitudinal study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 52(2), 143-152. <https://doi.org/10.1016/j.jaac.2012.11.006>
- Rosenberg, M. (2015). *Society and the adolescent self-image*. Princeton university press.

- Russell, S. T., & Fish, J. N. (2016). Mental health in lesbian, gay, bisexual, and transgender (LGBT) youth. *Annual Review of Clinical Psychology, 12*, 465-487.
<https://doi.org/10.1146/annurev-clinpsy-021815-093153>
- Soto, C. J., & Tackett, J. L. (2015). Personality traits in childhood and adolescence: Structure, development, and outcomes. *Current Directions in Psychological Science, 24*(5), 358-362. <https://doi.org/10.1177/0963721415589345>
- Timmins, L., Rimes, K. A., & Rahman, Q. (2020). Minority stressors, rumination, and psychological distress in lesbian, gay, and bisexual individuals. *Archives of Sexual Behavior, 49*(2), 661-680. <https://doi.org/10.1007/s10508-019-01502-2>
- Wang, J., Dey, M., Soldati, L., Weiss, M. G., Gmel, G., & Mohler-Kuo, M. (2014). Psychiatric disorders, suicidality, and personality among young men by sexual orientation. *European Psychiatry, 29*(8), 514–522.
<https://doi.org/10.1016/j.eurpsy.2014.05.001>
- Xu, Y., Norton, S., & Rahman, Q. (2019). Early life conditions and adolescent sexual orientation: A prospective birth cohort study. *Developmental Psychology, 55*(6), 1226-1243. <https://doi.org/10.1037/dev0000704>
- Xu, Y., Norton, S., & Rahman, Q. (2020). A longitudinal birth cohort study of early life conditions, psychosocial factors, and emerging adolescent sexual orientation. *Developmental Psychobiology, 62*(1), 5-20.
<https://doi.org/10.1002/dev.21894>
- Xu, Y., Norton, S., & Rahman, Q. (2021). Childhood gender nonconformity and the stability of self-reported sexual orientation from adolescence to young adulthood in a birth cohort. *Developmental Psychology, 57*(4), 557–569. <https://doi.org/10.1037/dev0001164>
- Zietsch, B. P., Verweij, K. J., Bailey, J. M., Wright, M. J., & Martin, N. G. (2011). Sexual orientation and psychiatric vulnerability: A twin study of neuroticism and

psychoticism. *Archives of Sexual Behavior*, 40(1), 133-142.

<https://doi.org/10.1007/s10508-009-9508-4>

Zietsch, B. P., Verweij, K. J., Heath, A. C., Madden, P. A., Martin, N. G., Nelson, E. C., &

Lynskey, M. T. (2012). Do shared etiological factors contribute to the relationship

between sexual orientation and depression?. *Psychological Medicine*, 42(3), 521–532.

<https://doi.org/10.1017/S0033291711001577>

Table 1

Descriptive Statistics for Mental Health Outcomes and Mediators Included in the Study Stratified by Sexual Orientation and Sex

Sex	Mental health outcomes and mediators	Sexual orientation				Missing, %
		Heterosexual	Bisexual	Homosexual	Asexual	
Boys	Psychological well-being					0.00
	<i>N</i>	4,566	77	129	96	
	<i>M (SD)</i>	-0.68 (3.19)	2.27 (4.04)	1.57 (4.07)	0.09 (3.40)	
	Self-harm attempt <i>N (%)</i>					2.16
	No	3,736 (83.58)	46 (61.33)	79 (63.71)	79 (84.04)	
	Yes	734 (16.42)	29 (38.67)	45 (36.29)	15 (15.96)	
	Sexual orientation-based victimization					0.80
	<i>N</i>	4,529	76	129	95	
	<i>M (SD)</i>	0.05 (0.44)	0.95 (1.71)	1.68 (2.11)	0.09 (0.92)	
	Neuroticism					0.37
<i>N</i>	4,550	77	127	96		
<i>M (SD)</i>	10.01 (4.34)	13.22 (5.00)	13.67 (4.46)	10.53 (4.99)		
Girls	Psychological well-being					0.00
	<i>N</i>	4,444	280	158	182	
	<i>M (SD)</i>	0.70 (3.59)	3.92 (3.76)	3.91 (4.36)	0.94 (3.65)	
	Self-harm attempt <i>N (%)</i>					3.69
	No	3,202 (74.87)	102 (37.64)	57 (38.00)	136 (75.98)	

Sex	Mental health outcomes and mediators	Sexual orientation				Missing, %
		Heterosexual	Bisexual	Homosexual	Asexual	
	Yes	1,075 (25.13)	169 (62.36)	93 (62.00)	43 (24.02)	
	Sexual orientation-based victimization					0.59
	<i>N</i>	4,423	279	156	176	
	<i>M (SD)</i>	0.16 (0.84)	0.91 (1.86)	1.40 (2.10)	0.07 (0.41)	
	Neuroticism					0.18
	<i>N</i>	4,436	279	158	182	
	<i>M (SD)</i>	13.30 (4.43)	15.47 (4.33)	15.46 (4.40)	13.18 (4.87)	

Note. The range for psychological well-being, sexual orientation-based victimization, and neuroticism is -8.27-16.73, 0-9, and 3-21, respectively.

Table 2*Standardized Total, Direct, and Indirect Effects from Mediation Analysis Among Boys*

Path	Indirect effect	<i>p</i> value ^a	Direct effect	<i>p</i> value ^b	Total effect	<i>p</i> value ^c
From bisexual to psychological well-being	0.61 [0.40, 0.79]	< .001	0.25 [0.03, 0.50]	.035	0.86 [0.57, 1.17]	< .001
Bisexual → victimization → psychological well-being	0.13 [0.08, 0.21]	< .001				
Bisexual → neuroticism → psychological well-being	0.47 [0.29, 0.64]	< .001				
From homosexual to psychological well-being	0.79 [0.62, 0.97]	< .001	-0.15 [-0.34, 0.04]	.119	0.64 [0.41, 0.87]	< .001
Homosexual → victimization → psychological well-being	0.24 [0.14, 0.35]	< .001				
Homosexual → neuroticism → psychological well-being	0.55 [0.42, 0.67]	< .001				
From asexual to psychological well-being	0.11 [-0.04, 0.28]	.196	0.10 [-0.08, 0.29]	.280	0.21 [-0.03, 0.47]	.101
Asexual → victimization → psychological well-being	0.01 [-0.01, 0.05]	.619				
Asexual → neuroticism → psychological well-being	0.10 [-0.05, 0.27]	.215				
From bisexual to self-harm attempt	0.35 [0.23, 0.47]	< .001	0.30 [-0.01, 0.57]	.050	0.65 [0.31, 0.94]	< .001
Bisexual → victimization → self-harm attempt	0.14 [0.07, 0.24]	.001				
Bisexual → neuroticism → self-harm attempt	0.21 [0.12, 0.29]	< .001				
From homosexual to self-harm attempt	0.50 [0.37, 0.63]	< .001	0.08 [-0.18, 0.33]	.537	0.58 [0.33, 0.83]	< .001
Homosexual → victimization → self-harm attempt	0.26 [0.16, 0.39]	< .001				

Path	Indirect effect	<i>p</i> value ^a	Direct effect	<i>p</i> value ^b	Total effect	<i>p</i> value ^c
Homosexual → neuroticism → self-harm attempt	0.24 [0.18, 0.30]	< .001				
From asexual to self-harm attempt	0.05 [-0.02, 0.14]	.194	-0.04 [-0.40, 0.26]	.793	0.01 [-0.34, 0.31]	.965
Asexual → victimization → self-harm attempt	0.01 [-0.01, 0.05]	.603				
Asexual → neuroticism → self-harm attempt	0.04 [-0.02, 0.12]	.219				

Note. The standardized path coefficients, their 95% bias-corrected confidence intervals, and their *p* values were reported. For sexual orientation, we created three dummy variables (one for being bisexual boys, one for being homosexual boys, and one for being asexual boys) using heterosexual boys as the reference groups.

^a*p* values for indirect effects.

^b*p* values for direct effects.

^c*p* values for total effects.

Table 3*Standardized Total, Direct, and Indirect Effects from Mediation Analysis Among Girls*

Path	Indirect effect	<i>p</i> value ^a	Direct effect	<i>p</i> value ^b	Total effect	<i>p</i> value ^c
From bisexual to psychological well-being	0.39 [0.30, 0.47]	< .001	0.39 [0.28, 0.49]	< .001	0.77 [0.64, 0.90]	< .001
Bisexual → victimization → psychological well-being	0.09 [0.06, 0.13]	< .001				
Bisexual → neuroticism → psychological well-being	0.30 [0.22, 0.37]	< .001				
From homosexual to psychological well-being	0.44 [0.32, 0.56]	< .001	0.30 [0.15, 0.47]	< .001	0.75 [0.55, 0.94]	< .001
Homosexual → victimization → psychological well-being	0.15 [0.11, 0.21]	< .001				
Homosexual → neuroticism → psychological well-being	0.29 [0.18, 0.38]	< .001				
From asexual to psychological well-being	0.01 [-0.10, 0.11]	.913	0.01 [-0.11, 0.13]	.849	0.02 [-0.15, 0.18]	.834
Asexual → victimization → psychological well-being	-0.01 [-0.02, 0.00]	.050				
Asexual → neuroticism → psychological well-being	0.02 [-0.09, 0.11]	.774				
From bisexual to self-harm attempt	0.27 [0.21, 0.34]	< .001	0.64 [0.50, 0.79]	< .001	0.91 [0.76, 1.06]	< .001
Bisexual → victimization → self-harm attempt	0.11 [0.08, 0.16]	< .001				
Bisexual → neuroticism → self-harm attempt	0.16 [0.12, 0.20]	< .001				
From homosexual to self-harm attempt	0.35 [0.26, 0.44]	< .001	0.56 [0.35, 0.75]	< .001	0.90 [0.68, 1.11]	< .001
Homosexual → victimization → self-harm attempt	0.19 [0.14, 0.26]	< .001				

Path	Indirect effect	<i>p</i> value ^a	Direct effect	<i>p</i> value ^b	Total effect	<i>p</i> value ^c
Homosexual → neuroticism → self-harm attempt	0.16 [0.10, 0.21]	< .001				
From asexual to self-harm attempt	-0.00 [-0.06, 0.05]	.911	-0.02 [-0.23, 0.16]	.831	-0.02 [-0.24, 0.16]	.816
Asexual → victimization → self-harm attempt	-0.01 [-0.02, 0.00]	.050				
Asexual → neuroticism → self-harm attempt	0.01 [-0.05, 0.06]	.774				

Note. The standardized path coefficients, their 95% bias-corrected confidence intervals, and their *p* values were reported. For sexual orientation, we created three dummy variables (one for being bisexual girls, one for being homosexual girls, and one for being asexual girls) using heterosexual girls as the reference groups.

^a*p* values for indirect effects.

^b*p* values for direct effects.

^c*p* values for total effects.

Figure captions

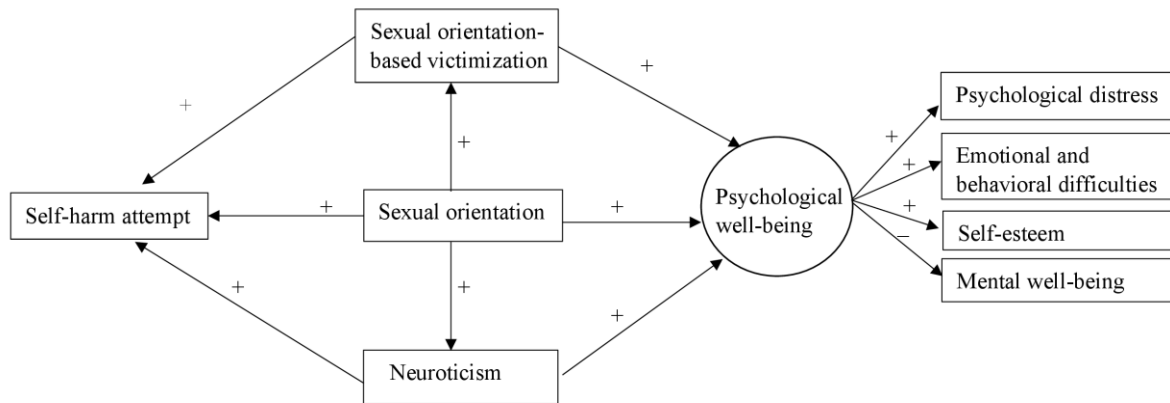


Figure 1

Model Tested in the Mediation Analysis

Note. For sexual orientation, we created three dummy variables (one for being bisexual, one for being homosexual, and one for being asexual) using heterosexual boys and girls as the reference groups for the male and female sexual orientation comparisons, respectively. For the paths from sexual orientation to neuroticism, sexual orientation-based victimization, self-harm attempt, and psychological well-being, birthweight, parental age at birth, duration of breastfeeding, ethnicity, number of older siblings, parent-child relationship quality, and parental absence were controlled for.

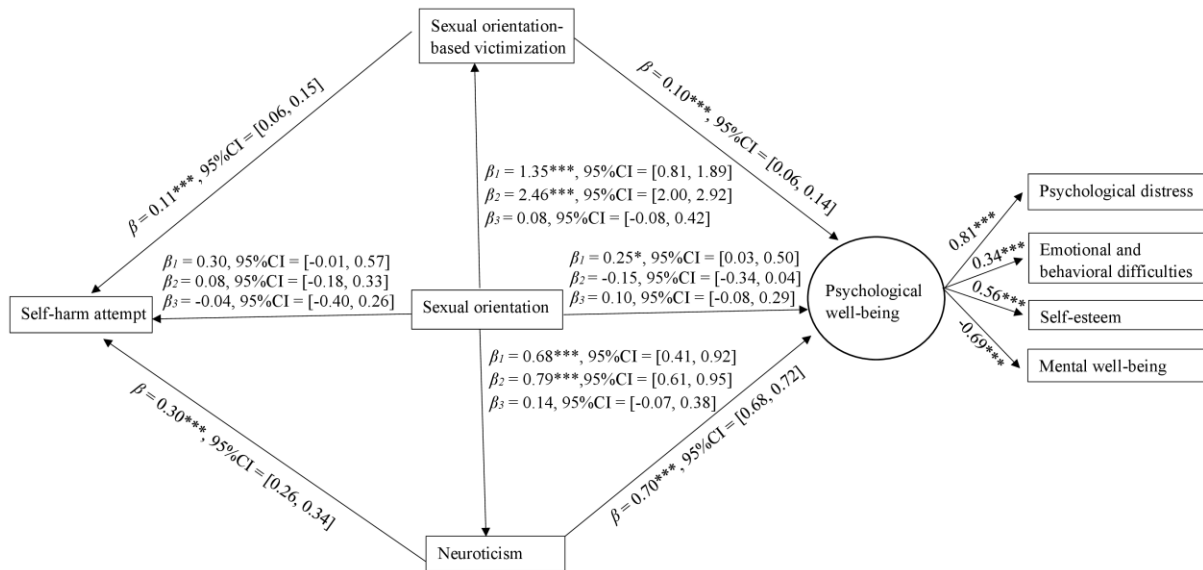


Figure 2

Standardized Path Estimates from the Mediation Analysis Among Boys

Note. For sexual orientation, we created three dummy variables (one for being bisexual boys, one for being homosexual boys, and one for being asexual boys) using heterosexual boys as the reference groups. The statistics represent the standardized path coefficients and their 95% bias-corrected confidence intervals. β_1 represents the differences between bisexual and heterosexual boys in neuroticism, sexual orientation-based victimization, self-harm attempt, and psychological well-being. β_2 represents the differences between homosexual and heterosexual boys in neuroticism, sexual orientation-based victimization, self-harm attempt, and psychological well-being. β_3 represents the difference between asexual and heterosexual boys in neuroticism, sexual orientation-based victimization, self-harm attempt, and psychological well-being. For the paths from sexual orientation to neuroticism, sexual orientation-based victimization, self-harm attempt, and psychological well-being, birthweight, parental age at birth, duration of breastfeeding, ethnicity, number of older siblings, parent-child relationship quality, and parental absence were controlled for.

* $p < .05$; *** $p < .001$.

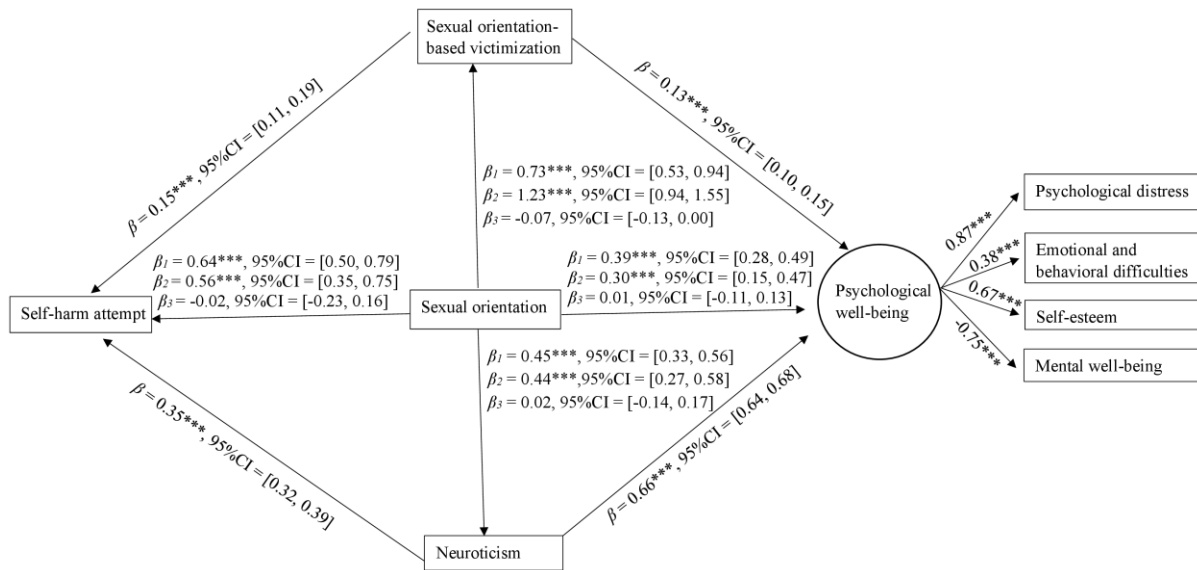


Figure 3

Standardized Path Estimates from the Mediation Analysis Among Girls

Note. For sexual orientation, we created three dummy variables (one for being bisexual girls,

one for being homosexual girls, and one for being asexual girls) using heterosexual girls as

the reference groups. The statistics represent the standardized path coefficients and their 95%

bias-corrected confidence intervals. β_1 represents the differences between bisexual and

heterosexual girls in neuroticism, sexual orientation-based victimization, self-harm attempt,

and psychological well-being. β_2 represents the differences between homosexual and

heterosexual girls in neuroticism, sexual orientation-based victimization, self-harm attempt,

and psychological well-being. β_3 represents the difference between asexual and heterosexual

girls in neuroticism, sexual orientation-based victimization, self-harm attempt, and

psychological well-being. For the paths from sexual orientation to neuroticism, sexual

orientation-based victimization, self-harm attempt, and psychological well-being, birthweight,

parental age at birth, duration of breastfeeding, ethnicity, number of older siblings, parent-

child relationship quality, and parental absence were controlled for.

*** $p < .001$.

Supplemental Text

Sexual Orientation-based Victimization

When adolescents were 17 years old, adolescents reported whether they had been the targets of victimization in the past 12 months via nine binary items (0 = *no* and 1 = *yes*). These included “insulted you, called you names, threatened or shouted at you in a public place, at school or anywhere else”, “spread gossip about you, ignored you or you’ve experienced other emotional abuse”, “been physically violent towards you”, “hit you with or used a weapon against you”, “stolen something from you”, “harassed or bothered you via mobile phone or email”, “sent pictures of you or rumors about your via phone, email social media or online”, “made an unwelcome sexual approach to you”, and “assaulted you sexually”. Adolescents who reported “yes” to either of the nine items also reported what reasons they attributed their victimization experiences to from six options, including racism, sexism, sexual orientation, ageism, disability discrimination, and appearance. Adolescents were able to select more than one reason. For adolescents who attributed their victimization experiences to their sexual orientation, their total score of the nine items were treated as sexual orientation-based victimization. Adolescents who reported “no” to all nine items or adolescents who did not attribute their victimization experiences to their sexual orientation received a score of 0 on sexual orientation-based victimization.

Mental Health Outcome

Mental Well-being

When adolescents were 17 years old, the Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) was used to measure their self-reported mental well-being in the past 2 weeks. The SWEMWBS is a validated self-report inventory with seven items (McKay & Andretta, 2017). The SWEMWBS has acceptable reliability and validity (McKay & Andretta, 2017). Each item was measured on a 5-point scale ranging from 1 = *none of the time* to 5 = *all of the time*. An example item is “I have been feeling useful”. The total score of the seven items was transformed into a metric score using the Rasch model and was used in the analysis, with a higher score indicating higher positive mental wellbeing.

Psychological Distress

When adolescents were 17 years old, Kessler Scale was used to measure their self-reported psychological distress in the past 30 days. The Kessler Scale is a validated self-report inventory with six items on a 5-point scale ranging from 1 = *all of the time* to 5 = *none of the time* (Kessler et al., 2002). K6 also has good reliability and validity (Mewton et al., 2016). An example item is “During the last 30 days, about how often did you feel hopeless?” The total

score of the six items was used in the analysis, with a higher score indicating greater psychological distress.

Emotional and Behavioral Difficulties

When adolescents were 17 years old, the Strength and Difficulties Questionnaire (SDQ) was used to measure their psychological adjustment in the past six months (Goodman, 2001), completed by the main carers (usually mothers). The SDQ is a validated self-report inventory with 25 items divided into 5 subscales (emotional symptoms, conduct problems, hyperactivity, peer relationship problems, and prosocial behavior). The SDQ has acceptable reliability and validity (Goodman, 2001). Each subscale consists of five items on a 3-point scale ranging from 0 = *not true* to 2 = *certainly true*. An example of item is “*Child’s name* is restless, overactive, cannot stay still for long”. The total difficulties score (the sum of all subscales except the prosocial behavior subscale since it is independent of the difficulties measured by the other subscales) was used in the analysis, with a higher score indicating greater emotional and behavioral difficulties. The total difficulties score was chosen over five separate subscales scores in our sample since it has been validated in studies (Achenbach et al., 2008). By contrast, subscale scores were suggested to be only justified when studying high-risk children (those with mental disorders or with higher scores on SDQ subscales) (Goodman et al., 2010).

Self-esteem

When adolescents were 17 years old, a shortened version of Rosenberg’s Self-Esteem Scale was used to assess self-esteem (Rosenberg, 2015). Five items included asking about having a number of good qualities, self-satisfaction, being a person of value, being able to do things similar to others, and feeling good about oneself. Adolescents reported how much they agreed with the above statements on a 4-point scale ranging from 1 = *strongly agree* to 4 = *strongly disagree*. Exploratory factor analysis yielded one factor (eigenvalue = 3.71) accounting for 74.16% of the variance in our sample. The total score of the five items was used in the analysis, with a higher score indicating lower self-esteem.

References

- Achenbach, T. M., Becker, A., Döpfner, M., Heiervang, E., Roessner, V., Steinhausen, H. C., & Rothenberger, A. (2008). Multicultural assessment of child and adolescent psychopathology with ASEBA and SDQ instruments: research findings, applications, and future directions. *Journal of Child Psychology and Psychiatry*, 49(3), 251–275.
- Goodman R. (2001). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child and Adolescent*

Psychiatry, 40(11), 1337–1345.

- Goodman, A., Lamping, D. L., & Ploubidis, G. B. (2010). When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the Strengths and Difficulties Questionnaire (SDQ): Data from British parents, teachers and children. *Journal of Abnormal Child Psychology*, 38(8), 1179-1191.
- Kessler, R.C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S.-L. T., Walters, E. E., & Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, 32(6), 959–976.
- McKay, M. T., & Andretta, J. R. (2017). Evidence for the psychometric validity, internal consistency and measurement invariance of Warwick Edinburgh Mental Well-being Scale scores in Scottish and Irish adolescents. *Psychiatry Research*, 255, 382–386.
- Mewton, L., Kessler, R. C., Slade, T., Hobbs, M. J., Brownhill, L., Birrell, L., Tonks, Z., Teesson, M., Newton, N., Chapman, C., Allsop, S., Hides, L., McBride, N., & Andrews, G. (2016). The psychometric properties of the Kessler Psychological Distress Scale (K6) in a general population sample of adolescents. *Psychological Assessment*, 28(10), 1232–1242.
- Rosenberg, M. (2015). *Society and the adolescent self-image*. Princeton university press.

Supplemental Table 1. Descriptive statistics for potential confounding factors included in the study stratified by sexual orientation among boys.

Confounding factors	Sexual orientation				Missing, %
	Heterosexual	Bisexual	Homosexual	Asexual	
Maternal age at birth (years)					0.29
<i>N</i>	4,556	76	128	94	
<i>M (SD)</i>	29.07 (5.78)	28.88 (6.52)	29.58 (5.22)	27.88 (5.64)	
Paternal age at birth (years)					11.30
<i>N</i>	4,044	71	116	87	
<i>M (SD)</i>	32.32 (6.08)	31.65 (6.67)	33.12 (6.17)	31.03 (7.03)	
Parent-child relationship					15.28
<i>N</i>	3,874	66	110	74	
<i>M (SD)</i>	63.21 (6.28)	63.02 (5.61)	63.05 (6.68)	60.98 (6.71)	
Number of old siblings					3.57
<i>N</i>	4,404	75	124	91	
<i>M (SD)</i>	0.90 (1.05)	0.73 (0.91)	1.03 (1.13)	0.97 (1.07)	
Birthweight (kilograms)					0.68
<i>N</i>	4,537	76	128	94	
<i>M (SD)</i>	3.41 (0.60)	3.28 (0.58)	3.38 (0.65)	3.35 (0.62)	
Duration of breastfeeding (months)					1.42
<i>N</i>	4,502	77	126	94	
<i>M (SD)</i>	2.98 (4.50)	2.47 (4.22)	2.13 (3.70)	2.00 (3.01)	
Parental absence <i>N</i> (%)					0.27
Either parent absence before adolescents were 7	1,083 (23.77)	20 (26.67)	30 (23.44)	23 (23.96)	
Either parent absence since adolescents were 7	779 (17.10)	17 (22.67)	29 (22.66)	19 (19.79)	
Both presence	2,694 (59.13)	38 (50.67)	69 (53.91)	54 (56.25)	
Ethnicity group <i>N</i> (%)					0.02
Others	875 (19.17)	7 (9.09)	13 (10.08)	31 (32.29)	
White	3,690 (80.83)	70 (90.91)	116 (89.92)	65 (67.71)	

Note. The range for parent-child relationship is 15-75.

Supplemental Table 2. Descriptive statistics for potential confounding factors included in the study stratified by sexual orientation among girls.

Confounding factors	Sexual orientation				Missing, %
	Heterosexual	Bisexual	Homosexual	Asexual	
Maternal age at birth (years)					0.20
<i>N</i>	4,436	280	158	180	
<i>M (SD)</i>	29.03 (5.78)	29.16 (5.83)	29.66 (6.03)	28.42 (5.81)	
Paternal age at birth (years)					12.20
<i>N</i>	3,913	239	133	161	
<i>M (SD)</i>	32.34 (6.13)	32.27 (6.35)	32.56 (5.88)	31.80 (6.38)	
Parent-child relationship					14.16
<i>N</i>	3,815	248	144	140	
<i>M (SD)</i>	63.97 (6.00)	63.46 (6.24)	63.14 (5.89)	63.09 (6.35)	
Number of old siblings					3.38
<i>N</i>	4,292	270	154	177	
<i>M (SD)</i>	0.91 (1.04)	0.84 (1.01)	0.79 (0.91)	0.97 (1.05)	
Birthweight (kilograms)					0.45
<i>N</i>	4,424	280	157	180	
<i>M (SD)</i>	3.30 (0.57)	3.33 (0.57)	3.24 (0.66)	3.11 (0.73)	
Duration of breastfeeding (months)					0.81
<i>N</i>	4,408	280	156	179	
<i>M (SD)</i>	2.94 (4.64)	3.41 (5.78)	2.87 (4.27)	2.98 (5.92)	
Parental absence <i>N</i> (%)					0.41
Either parent absence before adolescents were 7	1,087 (24.56)	88 (31.54)	43 (27.39)	42 (23.08)	
Either parent absence since adolescents were 7	708 (16.00)	48 (17.20)	26 (16.56)	36 (19.78)	
Both presence	2,630 (59.44)	143 (51.25)	88 (56.05)	104 (57.14)	
Ethnicity group <i>N</i> (%)					0.00
Others	853 (19.19)	32 (11.43)	18 (11.39)	68 (37.36)	
White	3,591 (80.81)	248 (88.57)	140 (88.61)	114 (62.64)	

Note. The range for parent-child relationship is 15-75.

Supplemental Table 3. Standardized total, direct, and indirect effects from mediation analysis using complete-case among boys

Path	Indirect effect	<i>p</i> value ^a	Direct effect	<i>p</i> value ^b	Total effect	<i>p</i> value ^c
From bisexual to psychological well-being	0.59 [0.36, 0.83]	< .001	0.30 [0.03, 0.55]	.030	0.88 [0.54, 1.24]	< .001
Bisexual → victimization → psychological well-being	0.12 [0.06, 0.21]	.002				
Bisexual → neuroticism → psychological well-being	0.47 [0.26, 0.70]	< .001				
From homosexual to psychological well-being	0.81 [0.62, 1.01]	< .001	-0.06 [-0.29, 0.17]	.619	0.75 [0.50, 1.02]	< .001
Homosexual → victimization → psychological well-being	0.23 [0.11, 0.36]	< .001				
Homosexual → neuroticism → psychological well-being	0.58 [0.45, 0.72]	< .001				
From asexual to psychological well-being	0.11 [-0.08, 0.29]	.269	0.12 [-0.09, 0.37]	.296	0.23 [-0.07, 0.53]	.148
Asexual → victimization → psychological well-being	0.01 [-0.01, 0.08]	.574				
Asexual → neuroticism → psychological well-being	0.09 [-0.09, 0.26]	.301				
From bisexual to self-harm attempt	0.35 [0.22, 0.51]	< .001	0.47 [0.13, 0.79]	.005	0.82 [0.46, 1.15]	< .001
Bisexual → victimization → self-harm attempt	0.15 [0.07, 0.26]	.002				
Bisexual → neuroticism → self-harm attempt	0.20 [0.11, 0.31]	< .001				
From homosexual to self-harm attempt	0.54 [0.40, 0.71]	< .001	0.16 [-0.15, 0.43]	.294	0.70 [0.41, 0.97]	< .001
Homosexual → victimization → self-harm attempt	0.29 [0.17, 0.45]	< .001				
Homosexual → neuroticism → self-harm attempt	0.25 [0.19, 0.33]	< .001				
From asexual to self-harm attempt	0.06 [-0.03, 0.15]	.257	-0.16 [-0.63, 0.19]	.451	-0.11 [-0.57, 0.25]	.612
Asexual → victimization → self-harm attempt	0.02 [-0.01, 0.08]	.543				
Asexual → neuroticism → self-harm attempt	0.04 [-0.04, 0.11]	.305				

Note. The standardized path coefficients, their 95% bias-corrected confidence intervals, and their *p* values were reported. For sexual orientation, we created three dummy variables (one for being bisexual boys, one for being homosexual boys, and one for being asexual boys) using heterosexual boys as the reference groups.

^a p values for indirect effects.

^b p values for direct effects.

^c p values for total effects.

Supplemental Table 4. Standardized total, direct, and indirect effects from mediation analysis using complete-case among girls

Path	Indirect effect	<i>p</i> value ^a	Direct effect	<i>p</i> value ^b	Total effect	<i>p</i> value ^c
From bisexual to psychological well-being	0.39 [0.29, 0.49]	< .001	0.44 [0.32, 0.57]	< .001	0.83 [0.68, 0.99]	< .001
Bisexual → victimization → psychological well-being	0.10 [0.06, 0.14]	< .001				
Bisexual → neuroticism → psychological well-being	0.29 [0.19, 0.38]	< .001				
From homosexual to psychological well-being	0.45 [0.32, 0.58]	< .001	0.39 [0.20, 0.57]	< .001	0.84 [0.61, 1.08]	< .001
Homosexual → victimization → psychological well-being	0.14 [0.09, 0.20]	< .001				
Homosexual → neuroticism → psychological well-being	0.32 [0.21, 0.42]	< .001				
From asexual to psychological well-being	0.07 [-0.04, 0.20]	.246	0.01 [-0.14, 0.16]	.869	0.08 [-0.11, 0.28]	.390
Asexual → victimization → psychological well-being	-0.01 [-0.02, 0.01]	.162				
Asexual → neuroticism → psychological well-being	0.08 [-0.03, 0.20]	.182				
From bisexual to self-harm attempt	0.27 [0.20, 0.35]	< .001	0.68 [0.51, 0.84]	< .001	0.95 [0.79, 1.12]	< .001
Bisexual → victimization → self-harm attempt	0.11 [0.07, 0.17]	< .001				
Bisexual → neuroticism → self-harm attempt	0.16 [0.11, 0.21]	< .001				
From homosexual to self-harm attempt	0.33 [0.24, 0.44]	< .001	0.69 [0.47, 0.93]	< .001	1.02 [0.80, 1.27]	< .001
Homosexual → victimization → self-harm attempt	0.16 [0.10, 0.24]	< .001				
Homosexual → neuroticism → self-harm attempt	0.17 [0.11, 0.24]	< .001				
From asexual to self-harm attempt	0.03 [-0.03, 0.10]	.337	-0.02 [-0.25, 0.18]	.841	0.01 [-0.23, 0.23]	.924
Asexual → victimization → self-harm attempt	-0.01 [-0.02, 0.01]	.175				
Asexual → neuroticism → self-harm attempt	0.04 [-0.02, 0.11]	.184				

Note. The standardized path coefficients, their 95% bias-corrected confidence intervals, and their *p* values were reported. For sexual orientation, we created three dummy variables (one for being bisexual girls, one for being homosexual girls, and one for being asexual girls) using heterosexual girls as the reference groups.

^a p values for indirect effects.

^b p values for direct effects.

^c p values for total effects.

Supplemental Table 5. Model fit statistics for measurement invariance of psychological well-being

Model	Model fit indices					Model comparison
	CFI	TLI	RMSEA, 90%CI	SRMR	$\chi^2(df), p$	
Configural invariance	1.000	1.001	0.000 (0.000, 0.021)	0.026	$\chi^2(8) = 6.74, p = .565$	Reference group
Metric invariance	0.995	0.993	0.024 (0.014, 0.033)	0.031	$\chi^2(17) = 40.45, p = .001$	$\chi^2(9) = 30.25, p < .001$ $\Delta\text{CFI} = .005; \Delta\text{RMSEA} = .024$
Scalar invariance	0.976	0.978	0.043 (0.036, 0.050)	0.038	$\chi^2(26) = 145.81, p < .001$	$\chi^2(18) = 134.86, p < .001$ $\Delta\text{CFI} = .024; \Delta\text{RMSEA} = .043$
Partial invariance	0.990	0.990	0.029 (0.022, 0.037)	0.032	$\chi^2(23) = 72.24, p < .001$	$\chi^2(15) = 63.12, p < .001$ $\Delta\text{CFI} = .010; \Delta\text{RMSEA} = .029$

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; CI = confidence interval; ΔCFI = change in comparative fit index; and ΔRMSEA = change in root mean square error of approximation. For partial invariance, factor loadings for mental well-being among heterosexual and bisexual adolescents were freely estimated, and intercept for psychological distress among bisexual adolescents was freely estimated.

Supplemental Table 6. Mean differences and 95% confidence intervals for psychological well-being stratified by model and sex.

Sex	Model	Bisexual	Homosexual	Asexual
Boys	Scalar invariance	2.89***[1.84, 3.94]	2.11***[1.33, 2.88]	0.70 [-0.22, 1.63]
	Partial invariance	2.84***[1.39, 4.28]	2.43***[1.55, 3.31]	0.69 [-0.31, 1.68]
Girls	Scalar invariance	3.22***[2.63, 3.81]	3.31***[2.49, 4.13]	0.19 [-0.58, 0.96]
	Partial invariance	3.03***[2.34, 3.72]	3.43***[2.54, 4.33]	0.14 [-0.64, 0.92]

Note. The group contrast on the psychological well-being from the multigroup confirmatory factor analysis of psychological well-being with scalar and partial invariance where heterosexual boys and girls were the reference groups for the male and female sexual orientation comparisons, respectively, were reported. For partial invariance, factor loadings for mental well-being among heterosexual and bisexual adolescents were freely estimated, and intercept for psychological distress among bisexual adolescents was freely estimated.