Psychosocial mediators of the relations between sexual orientation and depressive symptoms in a longitudinal sample of young people

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ABSTRACT

OBJECTIVE: This longitudinal study investigated psychosocial mediators in the association between minority sexual orientation (e.g., identifying as lesbian, gay, or bisexual) and depressive symptoms in young people. **METHOD:** Data from the Avon Longitudinal Study of Parents and Children (ALSPAC) UK birth cohort were analyzed. Sexual orientation was assessed at 15 years and depressive symptoms were assessed at 18 years. Mediators were assessed at 17 years: unhelpful assumptions (i.e., dysfunctional attitudes about the self and others), hypothesized to be vulnerability factors in cognitive theories of depression; self-esteem; and family relationships measured with four items. Multiple mediation analysis of 14,814 individuals utilized structural equation models estimated via full information maximum likelihood, with family relationships entered as a latent variable. Sex at birth was examined as a moderator. **RESULTS:** Sexual minority youth had higher risk for depressive symptoms at 18 years than heterosexual youth. They also had poorer relationships with their family and more unhelpful assumptions, with weaker evidence for lower self-esteem, especially those who were male sex at birth. Poorer family relationships and unhelpful assumptions mediated the relation between sexual minority status and depressive symptoms, with weaker evidence for self-esteem as a mediator. There was no evidence to suggest that sex at birth moderated these relations. **CONCLUSIONS:** Poorer family relationships, more unhelpful self-beliefs, and possibly lower self-esteem may contribute to sexual orientation disparities in depressive symptoms, indicating possible areas for prevention and intervention.

Keywords: sexual minority; depression; mediation; ALSPAC; LGB; adolescents

SECOND ABSTRACT: This study indicates that more difficult family relationships, negative assumptions, and possibly self-esteem may contribute to the increased rates of depressive symptoms in sexual minority youth compared to heterosexual young people.

Research has consistently demonstrated higher rates of depressive symptomatology for sexual minority adults (e.g., King et al., 2008) and youth (e.g., Marshal et al., 2011) compared to their heterosexual counterparts. Minority stress theory (Meyer, 2003) suggests that, being a member of a minority group exposes individuals to discrimination, stigma, and prejudice, creating a stressful social environment which contributes to the presence of mental health problems. Indeed, studies show that sexual minority individuals can experience multiple stressors early in their lives, including peer victimization, physical assault, abuse, and lack of support or even rejection from family and friends (e.g., Balsam, Rothblum, & Beauchaine, 2005; Corliss, Cochran, & Mays, 2002). Hatzenbuehler (2009) proposed a psychological mediation framework that elaborated on minority stress theory by suggesting that sexual minority individuals' increased exposure to stressors may have a negative impact on different intra- and interpersonal psychological processes that may then increase vulnerability to mental health problems. Therefore, under this framework, the focus shifts to the intermediate cognitive, regulatory, and social mechanisms through which sexual minority individuals experience increased risk for mental health problems, including depression.

Family Relationships

One possible contributory factor is family relationships. Previous studies using mediation methodologies provide some evidence that family factors may help explain depression disparities between sexual minorities and heterosexual individuals. For example, a longitudinal study by la Roi, Kretschmer, Dijkstra, Veenstra, and Oldehinker (2016) found that parental rejection mediated the relation between sexual minority identity and depressive symptomatology, although this was only found for adolescent girls and not for boys. Similarly, perceived closeness with parents, parental involvement, and family support mediated the relation between same-sex attraction and depressive symptoms in a longitudinal sample of adolescents (Pearson & Wilkinson, 2013). This mediational association was again

more profound in girls. More evidence of the importance of family relationships as a mediator was provided by a longitudinal study of adolescents that demonstrated that self-reports of family satisfaction at 17 years mediated the relation between sexual orientation reported at 17 years and depressive symptoms in later adolescence and early adulthood (Luk, Gilman, Haynie, & Simons-Morton, 2018). Similarly, Rosario et al. (2014) demonstrated that less secure attachments attenuated the relation between sexual orientation and depressive symptoms in a longitudinal sample of young adults. Such findings are consistent with evidence from cross-sectional studies of young adults (Needham & Austin, 2010; Ueno, 2010).

Cognitive Vulnerabilities

According to the psychological mediation model (Hatzenbuehler, 2009), sexual minority individuals are more susceptible to developing cognitive vulnerability factors for depression due to their stigma experiences. Beck and colleagues' (1979) work on depression suggests that key cognitive vulnerability factors for depression include certain types of cognitive structures or underlying beliefs. Such beliefs contain unhelpful attitudes towards themselves, others, and the future (e.g., "I should be always happy"; "If I make a mistake then I'm a failure.") These depressogenic attitudes typically involve negative beliefs about the self or others that are excessive and rigid. Beck suggests that when they are activated, such underlying attitudes result in more "negative automatic thoughts" that contribute to depressed mood. Research has demonstrated their predictive role in the onset and maintenance of depression (e.g., Alloy et al., 2006).

There has been limited research exploring whether there are disparities between different sexual orientations in cognitive vulnerabilities and whether such disparities may help explain the increased rates of depression in sexual minority individuals. Kirsch, Conley, and Riley (2015) found the sexual minority individuals had higher scores on a composite

measure of cognitive vulnerabilities, that included unhelpful assumptions, suppression, and avoidant coping. Hart et al. (2017) found that unhelpful attitudes and negative automatic thoughts mediated the relation between adverse childhood experiences and depression outcomes in gay and bisexual men. Their results suggested that the role of these general cognitive factors as mediators was stronger than internalized homophobia, a sexual minority-specific vulnerability.

Self-Esteem

Another psychological process hypothesized by Hatzenbuehler (2009) to be related to sexual orientation disparities in mental illness is self-esteem. Self-esteem has been shown to be a risk factor for the development of depression in prospective general population studies (Sowislo & Orth, 2013) and there is evidence that sexual minority adolescents and young adults have lower self-esteem than heterosexuals (e.g., Jager & Davis-Kean, 2011). Cross-sectional mediation studies have suggested that self-esteem may mediate the association between sexual orientation and depression. Martin-Storey and Crosnoe (2012) for example, found that poorer self-concept (a construct very closely related to self-esteem; Baumeister, 1997) was a significant mediator of the association between sexual orientation and depression. Similarly, Ueno (2010) showed evidence that controlling for self-esteem, along with mastery and a sense of mattering, attenuated the association between same-sex contact and depressive symptoms. To our knowledge, no prospective studies have examined self-esteem as a mediator in a between-group study.

Limitations of Previous Studies

A mediation hypothesis implies a causal chain of events in which the independent variable causes change in the mediator, which in turn causes change in the dependent variable. Therefore, longitudinal studies in which the independent variable, mediator, and dependent variable are measured at three consecutive timepoints allow time for causal effects

to manifest themselves and ensure that presumed causes precede effects. Consequently, they are considered to be more appropriate in the context of mediation compared to cross-sectional studies. Existing studies examining mediators of the disparities in depression between sexual minority and heterosexual individuals are largely based on cross-sectional data which do not fully support causal inferences about mediators (Cole & Maxwell, 2003; Goldsmith et al., 2017). Even the studies in the literature that had longitudinal designs either measured sexual minority status and mediators at time 1 and depression at time 2, or sexual minority status at time 1 and mediators and depression at time 2. Moreover, many studies used retrospective accounts to assess mediators (e.g., family relationships) which can suffer from recall biases.

Another limitation of previous studies is that they have often failed to examine the possible moderating effect of sex when investigating mediational pathways. It is well-documented that women report higher depression (e.g., Salk, Petersen, Abramson, & Hyde, 2016) and lower self-esteem (e.g., Bleidorn et al., 2016) than men and that such differences are present as early as in adolescence. Both biologically-based and psychologically-based explanations for the emergence of greater rates of depression in women after puberty have been proposed, such as genetic factors, ovarian and adrenal hormonal changes at puberty, gender intensification and adherence to traditional gender roles, greater female exposure to negative life experiences of rape and child sexual abuse, female body dissatisfaction, greater cognitive vulnerability in women, female reliance on relationships, and greater ruminative coping (Hyde, Mezulis, & Abramson, 2008). Moreover, there is some evidence that potential mediating factors between minority sexual orientation and increased depression may be different for boys than for girls (e.g., la Roi et al., 2016). Given the potential differences in the mediators, outcome, and mediation relations among males and females, sex differences should be investigated in mediational studies in this area.

The Current Study

A better understanding of the intermediate factors contributing to increased depression symptom rates in sexual minority individuals would be instrumental in designing and refining effective prevention, early intervention, and therapeutic programs for sexual minority youth. Research with general population samples has demonstrated the effectiveness of cognitive-behavioral interventions (CBT) in modifying unhelpful rules about the self or others (Sankar et al., 2015) and self-esteem (Taylor & Montgomery, 2007), whilst family therapy and community approaches are often used to help improve family relationships. Establishing the importance of these factors for sexual minority youth could lead to improved evidence-based and targeted intervention approaches for sexual minority youth.

The present study used existing data from the UK Avon Longitudinal Study of Parents and Children (ALSPAC) birth cohort to investigate disparities in depression between sexual minority young people and heterosexual participants while examining psychosocial factors that mediate them. To do so, temporally ordered data were used with sexual minority status measured at age 15, mediators measured at age 17, and depressive symptoms measured at age 18. Structural equation modelling (SEM) was used to assess the extent to which sexual minority status was related to increased depressive symptoms via family relationships, unhelpful assumptions, and self-esteem. The moderating effect of sex (male/female) at birth on these pathways was also tested. Gender identity had not been assessed in this birth cohort study therefore the terms male sex at birth (MSAB) and female sex at birth (FSAB) are used to refer to sex as reported by mothers at birth.

Method

Participants

The sample comprised participants from ALSPAC, an observational cohort prospective study (Boyd et al., 2013; Fraser et al., 2013). The study invited all pregnant women who were expected to give birth between April 1, 1991 and December 31, 1992 in Avon, UK, to enroll,

resulting in a cohort of 14,541 pregnancies. Of these pregnancies, there was a total of 14,676 fetuses, resulting in 14,062 live births and 13,988 children alive at age one. The sample was increased by an additional 713 children during a second and third enrollment phase when the children were seven years old by sending invites to eligible families that had not previously responded. The total sample size following Phases II and III of enrollment was therefore 15,247 pregnancies, resulting in 15,458 fetuses. Of this sample, 14,775 were live births and 14,701 were alive at age one. Compared with the 1991 UK Census data, the ALSPAC sample is slightly more affluent and more likely to be white. Data collection included self-report questionnaires by the young person or their carer and direct assessment at clinics. The study website contains details of all the data that is available through a fully searchable data dictionary and variable search tool (http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/). Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees. Ethical approval for the analysis of secondary data for this study was obtained from [removed for blinding].

Measures

Sexual orientation.

At age 15 (in 2006-2007), adolescents were asked to choose the "description that best fits how you think about yourself" with seven response options provided regarding sexual orientation. A total of 5154 participants responded to this item. Responses were: "100% heterosexual" (n = 4470), "mostly heterosexual" (n = 441), "bisexual" (n = 86), "mostly homosexual" (n = 27), "100% homosexual" (n = 20), "not sure" (n = 93), or "not attracted to either sex" (n = 17). Participants who responded either "not sure" or "not attracted to either sex" were excluded from the analyses. Due to small subgroup sizes, and in line with previous studies using the ALSPAC cohort (Jones, Robinson, Oginni, Rahman, & Rimes, 2017; Oginni, Robinson, Jones, Rahman, & Rimes, 2018; Pesola, Shelton, & van de Bree, 2014)

"mostly heterosexual," "bisexual," and "mostly homosexual" responses were combined to define the sexual minority group (n = 574) whilst the "100% heterosexual" responses defined the heterosexual group (n = 4470).

Depression.

Depressive symptoms were measured using the Short Mood and Feelings Questionnaire (SMFQ; Angold et al., 1995) administered to young people at the clinic at 13 (in 2004-2005) and 18 years (in 2009-2010). The self-report measure consists of 13 statements, each of which can be rated as "not true," "sometimes true," or "true." The total scores range from 0 to 26, with higher scores indicating higher depressive symptoms. The SMFQ was demonstrated to have high validity (Turner, Joinson, Peters, Wiles, & Lewis, 2014). Internal consistency in the current study was very good ($\alpha = 0.91$).

Family relationships.

Family relationships were assessed with a latent factor that was measured by the following four items that participants completed at age 17 years (in 2008-2009): (1) "How close do you feel to your parents"; (2) "How close do you feel to your siblings?"; (3) "How easy do you find it to discuss your problems with anyone in your family?"; and (4) "How well have you been getting along with your family in the past few months?". Responses were rated on Likert scales ranging from 1 (*very close to at least one*) to 4 (*not close at all to any*) for items 1 and 2, from 1 (*very easy*) to 5 (*very difficult*) for item 3, and from 1 (*very close*) to 5 (*not close at all*) for item 4.

Unhelpful assumptions.

Unhelpful assumptions were assessed at 17 years with an abbreviated nine-item version of the Dysfunctional Attitudes Scale derived from a factor analysis (Andrews, Lewinsohn, Hops, & Roberts, 1993). The Dysfunctional Attitudes Scale (DAS; Weissman, 1979) is a self-report scale assessing rigid, negative, and perfectionist attitudes and unhelpful

contingencies for self-evaluation that were proposed by Beck, Rush, Shaw, & Emery (1979) to be vulnerability factors for depression. An example item in this version of the questionnaire is “My life is wasted unless I am a success.” Respondents rated their agreement to each of the nine statements on a five-point Likert scale. Scores ranged from 9 to 45, and in the ALSPAC dataset scoring was conducted so that lower scores reflected more unhelpful assumptions. Both the original DAS and the abbreviated version used here have been reported to have good reliability and validity (Andrews et al., 1993; de Graad, Roelofs, & Huibers, 2009). Internal consistency in the present sample was good ($\alpha = 0.80$).

Self-esteem.

Self-esteem was measured with the Bachman revision (1970) of the Rosenberg Self-Esteem Scale (1965) at 17 years (RSE-B). The measure consists of 10 statements, which can be rated on a scale from 1 (*almost always true*) to 5 (*never true*). The total scores range from 0 to 40, and higher scores indicate higher self-esteem. Good construct validity has been reported for the measure (Bachman & O’Malley, 1977) and internal consistency was very good in the present sample ($\alpha = 0.89$).

Potential confounders.

The original model was adjusted for a number of confounding variables and an earlier measure of the outcome variable:

Earlier depressive symptoms. Following recent recommendations (Dunn, Emsley, Liu, Landau, 2013; Landau, Emsley, & Dunn, 2018; Pickles et al., 2015), baseline measures of the outcome variable were adjusted for in the model using the SMFQ measure assessed at 13 years.

***Socioeconomic status*.** Maternal occupation and maternal education were used as socioeconomic status indicators. Maternal occupation information was collected from mothers at 18 weeks of pregnancy and was dichotomized into “non-manual” and “manual”

work (Dale & Marsh, 1993). Maternal education information was collected from mothers at 32 weeks of pregnancy and was categorized into "below O-level," "O-level," and "above O-level" (O-levels are school tests previously taken at age 16 in the UK).

Race. Participants' ethnic group was derived from mothers' reports of their ethnic group and that of the children's fathers' ethnic group, taken during pregnancy, as adolescents were not asked about their self-identified race or ethnicity. Race was coded dichotomously in the ALSPAC data (white / non-white). Child race was coded as non-white if either mother or partner race was reported as anything other than white.

Sex at birth. Sex of the child was reported by the mother or healthcare provider at birth. For the main SEM analyses sex at birth was entered as a confounding variable, whilst it was used as a moderator in supplementary analyses to examine α paths, b paths, and indirect effects separately by sex at birth and to test for possible sex at birth differences in the indirect effects. Data on gender identity was not available and therefore could not be used in the analysis.

Statistical Analyses

Preliminary analyses were conducted in SPSS using Pearson's chi-squared tests and t-tests to compare heterosexual participants and sexual minority participants on all variables. Intercorrelations were assessed using Pearson's correlation coefficients. The descriptive statistics, correlations, chi-squares, and t-tests are based on complete cases. Main analyses were conducted using MPlus Version 8 (Muthén & Muthén, 2017).

Missing data.

Large longitudinal studies like ALSPAC generally suffer from significant attrition and hence missing follow-up data. Listwise deletion analyses of such data would result in diminished statistical power and may give biased results if data are not missing completely at random (MacKinnon, 2008). In the ALSPAC data it is known that factors such as household

income and being male predict missingness (Boyd et al., 2013). For the present study, Full Information Maximum Likelihood (FIML) was used as it is often used to deal with missing data in large datasets (Enders & Bandalos, 2001) and has been used in other ALSPAC studies (Li, Kung, & Hines, 2017). FIML assumes the data are missing at random (MAR) (Enders & Bandalos, 2001; Rubin, 1976). FIML was implemented here by conditioning on the covariates, including confounders.

Multiple Imputation (Rezvan, Lee, & Simpson) was also implemented as an alternative method. This was not presented as the main analysis because percentile bootstrap confidence intervals and multiple group analysis by sex at birth were not available for multiple imputation in MPlus. Information on the missing data model and results based on analyses ran after MI can be found in Supplemental Materials.

Cases that had missing data on all the model variables were excluded (n = 521). The final sample used for both types of missing data analyses was n = 14,814.

SEM Analyses.

The SEM framework allows for fitting multiple regression equations simultaneously. The mediation hypotheses in this study were assessed using SEM with the three mediators (family relationships, unhelpful assumptions, and self-esteem) examined in parallel. Family was entered as a latent variable. The model was used to test the hypothesis that on average sexual minority adolescents exhibit poorer relationships with their family, higher unhelpful assumptions, and lower self-esteem (*a* paths) which may lead to depressed symptoms (*b* paths).

The strength of the effects of sexual orientation via each of the mediators on depressed symptoms was estimated by calculating the specific indirect effect of interest. The indirect effects were calculated using SEM path tracing rules, which is sometimes referred to specifically in the mediation context as the product of coefficients method (*a* path × *b* path)

(MacKinnon, 2001, 2008; Wright, 1921). The total indirect effect was calculated as the sum of the three specific indirect effects. Note that the *b* paths in the model are each adjusted for the other mediators, as would occur in any regression model. As recommended, 95% percentile bootstrap confidence intervals were estimated for indirect effects (Fritz, Taylor, & MacKinnon, 2012), using 1,000 repetitions.

Model fit was assessed using the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and the Standardized Root Mean Square Residual (SRMSR) as recommended for SEM (Hooper, Coughlan, & Mullen, 2008).

To investigate whether there was differential mediation between MSAB and FSAB participants, a multiple-group analysis of the mediated model was also conducted. This assesses evidence for sex at birth - specific direct, indirect, and total effects. The differences between the indirect effects of the two groups were compared in model constraint statements in MPlus, to examine the presence of moderated mediation. The multiple group analysis for sex at birth was conducted using FIML with bootstrapped confidence intervals.

Results

Descriptive Statistics and Preliminary Results

The demographic characteristics of heterosexual and sexual minority groups are listed in *Table 1* and their scores on the rest of the variables in the hypothesized model are presented in *Table 2*, with the results of chi-square or t-test comparisons. Intercorrelations between variables can be found in Supplemental Materials. As can be seen in *Table 2*, sexual minority young people reported poorer family relationships, more unhelpful beliefs, lower self-esteem, and higher depression symptoms at both 13 and 18 years compared to heterosexuals.

SEM Analyses

The confirmatory factor analysis showed that the measurement model fit the data adequately [CFI = .987; RMSEA = 0.076, (90% CI: 0.058, 0.095), SRMR = .017]. In this model, the factor loadings for the four observed family relationships items were statistically significant at $p < .001$ (Item 1 = 0.736, Item 2 = 0.464, Item 3 = 0.676, Item 4 = 0.726). As the results of the model indicated that the observed items were adequate indicators of their corresponding latent construct, structural models were fitted.

The fit indices for the hypothesized model were mostly adequate [CFI = 0.87, RMSEA = 0.041, (90% CI: 0.039, 0.043), SRMR = 0.06]. According to Hu and Bentler's (1999) recommended cut-off guidelines, the RMSEA (recommended cut-off < .06) and the SRMR indexes (recommended cut-off < .08) suggested good fit whilst the CFI index (recommended cut-off > .95) cast some doubt on the adequacy of the model.

The unstandardized estimates, bootstrapped standard errors, p-values, and CIs of all the *a* paths, *b* paths, indirect, and total effects are summarized in *Table 3* and *Figure 1*. Sexual minority status was associated with depressive symptoms (β = 1.07, 95% CI: 0.26, 1.86). Sexual minority status was associated with poorer family relationships (β = 0.17, 95% CI: 0.08, 0.25) and unhelpful assumptions (β = -0.89, 95% CI: -1.61, -0.18), but for self-esteem evidence for an association was weak (β = -0.70, 95% CI: -1.49, 0.05); (*a* paths). Poorer family relationships (β = 0.81, 95% CI: 0.34, 1.36), unhelpful assumptions (β = -0.11, 95% CI: -0.16, -0.07), and lower self-esteem (β = -0.28, 95% CI: -0.32, -0.24) at 17 years were all associated with more depressive symptoms at 18 years (*b* paths). Evidence was found for specific indirect paths from sexual minority status to depressive symptoms via poorer family relationships (β = 0.13, 95% CI: 0.04, 0.26) and more unhelpful assumptions (β = 0.10, 95% CI: 0.02, 0.17). Suggestive evidence for an indirect path via lower self-esteem was also found (β = 0.20, 95% CI: -0.01, 0.42). Combined, there was evidence for a total indirect path from sexual minority status to depressive symptoms via all the mediators in the

model (β = 0.43, 95% CI: 0.12, 0.75).

Estimates by Sex at Birth

Evidence of an association between sexual minority status and poorer family relationships was found for both MSAB (β = 0.17, 95% CI: 0.05, 0.30) and FSAB participants (β = 0.17, 95% CI: 0.05, 0.28). Sexual minority status was associated with unhelpful assumptions in MSAB participants (β = -1.35, 95% CI: -2.32, -0.33) but there was no such evidence for FSAB participants (β = -0.72, 95% CI: -1.56, 0.18). Although there was weak evidence for an association between sexual minority status and self-esteem for MSAB participants (β = -1.35, 95% CI: -2.50, 0.01), there was no evidence of such an association for FSAB (β = -0.46, 95% CI: -1.38, 0.50).

Whilst strong evidence of an association between family relationships and depressive symptoms was found for FSAB participants (β = 0.99, 95% CI: 0.37, 1.65), no such evidence was found for MSAB participants (β = 0.33, 95% CI: -0.29, 1.14). Unhelpful assumptions were found to be related with depressive symptoms for MSAB (β = -0.08, 95% CI: -0.15, -0.02) and FSAB participants (β = -0.12, 95% CI: -0.17, -0.06). Strong evidence for an association of self-esteem with depressive symptoms was found for both MSAB (β = -0.19, 95% CI: -0.25, -0.14) and FSAB participants (β = -0.32, 95% CI: -0.38, -0.27).

Evidence was found for a total effect of sexual minority status on depressive symptoms for MSAB participants (β = 1.44, 95% CI: 0.26, 2.53), whilst this was not strongly supported for FSAB participants (β = 0.89, -0.11, 1.84). There was some evidence to suggest an indirect effect of sexual minority status on depressive symptoms via family for FSAB participants (β = 0.16, 95% CI: 0.04, 0.35), whilst such evidence was weak for MSAB participants (β = 0.06, 95% CI: -0.05, 0.26). Evidence for an indirect effect of sexual minority status on depressive symptoms via unhelpful assumptions was moderate for both MSAB participants (β = 0.11, 95% CI: 0.01, 0.26) and weak for FSAB participants (β = 0.09, 95%

CI: -0.02, 0.19). Finally, whilst there was suggestive evidence that self-esteem mediated the relation between sexual minority status in MSAB participants (β = 0.26, 95% CI: 0.00, 0.56), there was no such evidence of mediation in FSAB participants (β = 0.15, 95% CI: -0.16, 0.45). Detailed results on separate analyses by sex at birth can be found in Supplemental Materials.

Sex at Birth Differences

No evidence was found for differences between MSAB and FSAB participants regarding the specific indirect paths from sexual minority status to depressive symptoms via self-esteem (β = -0.11, 95% CI: -0.55, 0.31), unhelpful assumptions (β = -0.03, 95% CI: -0.22, 0.15), or family relationships (β = 0.11, 95% CI: -0.14, 0.31). Similarly, the total indirect effect was not found to differ significantly between MSAB and FSAB participants (β = -0.03, 95% CI: -0.65, 0.55). Finally, there was no evidence of difference in the direct (β = -0.52, 95% CI: -1.99, 1.01) or the total effects (β = -0.55, 95% CI: -2.17, 1.06) either. These results suggest no evidence of sex at birth as a moderator. Detailed results on moderation by sex at birth can be found in Supplemental Materials.

Discussion

The present study tested family relationships, unhelpful assumptions, and self-esteem as mediators of the relation between minority sexual orientation and depressive symptoms. As expected, youth who reported sexual minority status at 15 years reported higher depressive symptom scores than heterosexual youth at 18 years. This difference was present as early as age 13. The SEM results suggested that family relationships and unhelpful assumptions at 17 years mediated the association between sexual minority status and depressive symptoms. The results for self-esteem were inconclusive; suggestive evidence for self-esteem as a mediator was provided by the FIML analysis presented, whilst stronger evidence was found using multiple imputation (Supplemental Materials).

This is the first published study of which we are aware that used temporally-ordered prospective data at three timepoints to conduct mediation analysis, which is recommended as it provides stronger evidence for possible causal relations (Maxwell & Cole, 2007). It is the also first published study that we could identity that tests unhelpful assumptions as a mediator, and the first UK study to investigate family relationships and self-esteem as mediators. The inclusion of sociodemographic confounding variables as well as the baseline confounder of the outcome variable is an important strength of this study as the importance of the adjusting for confounding variables has been extensively discussed in literature (Goldsmith, Chalder, White, Sharpe, & Pickles, 2016; MacKinnon, 2008; Pickles et al., 2015).

In general, the findings of this study are in line with the psychological mediation framework (Hatzenbuehler, 2009) that suggests that general psychological processes known to confer risk for mental health problems in the general population are elevated in sexual minority individuals compared to their heterosexual counterparts and are causally related to later depressive disparities. In accordance to Hatzenbuehler's model, both unhelpful attitudes and self-esteem can be thought as cognitive psychological processes, while perceptions of family relationships can be conceptualised as a social/interpersonal mediator. The current study demonstrated how these proximal mediators mediate the relation between minority status and depressive symptomatology. Minority stress theories (Meyer, 2003; Hatzenbuehler, 2009) propose that these psychological vulnerability factors are increased in sexual minority individuals due to stigma-related stressors, but this was not directly tested in the present study. Hatzenbuehler's (2009) mediation model suggests that minority status leads to stigma-related stressors that then lead to individual psychological processes which in turn lead to increased risk for mental health problems. Future studies can therefore attempt to test this full mediation model, by using for instance serial mediation pathways to demonstrate

how sexual minority status leads to increased exposure to prejudice events which may lead to increased levels of these psychological mediation processes and with these processes then contributing to the increased rates of depression symptomatology.

The finding that poorer family relationships may contribute to the depression disparities between sexual minority and heterosexual young people is in line with evidence supporting the role of parental rejection, family satisfaction, and parental closeness and support as intermediate mechanisms found in three longitudinal studies in samples of Dutch and American adolescents (la Roi et al., 2016; Luk et al., 2018; Pearson & Wilkinson, 2013). The present study is the first study of which we are aware that has provided support for this mechanism in a UK youth sample using a full longitudinal mediation design. Evidence from general population research indicates that poorer family relationships in adolescence are associated with not only depression but a range of other outcomes and can have long-lasting effects (e.g., Laursen & Collins, 2009; Sander & McCarty, 2006). Family relationships should therefore be a factor to look at when considering designing prevention and intervention programs for sexual minority youth.

This is the first study that we could identify showing that unhelpful assumptions mediate the relation between minority sexual orientation and increased depressive symptoms. These results are consistent with Beck and colleagues' (1979) cognitive model of depression which proposes that rigid, negative, conditional assumptions about the self, constitute a vulnerability factor for depression. Beck proposes that such beliefs develop due to negative life experiences but may lie dormant until activated by subsequent life stressors. This diathesis-stress model has been supported by studies in the general population (e.g., Abela & D'Alessandro, 2002), and useful future research could investigate the types of life experiences that contribute to the development and activation of these unhelpful assumptions in sexual minority youth. For example, sexual minority youth show elevated rates of

childhood abuse (Friedman et al., 2011) as well as victimization and stigma relating to their sexual orientation or associated precursors such as childhood gender nonconformity (Roberts et al., 2013; Toomey, Ryan, Diaz, Card, & Russell, 2010). These experiences may contribute to the development of unhelpful beliefs which may then become activated by other life stressors.

Cross-sectional studies have provided evidence for self-esteem as a mediator in the relation between sexual minority status and depression (Martin-Storey & Crosnoe, 2012; Ueno, 2010). This is the first longitudinal study examining self-esteem as a mediator in a between-group sample of young people. In line with previous research (Sowislo & Orth, 2013), self-esteem was associated with subsequent depression, however results were inconclusive regarding the link between sexual orientation and self-esteem, with weak evidence provided for MSAB participants and no link supported for FSAB participants. In the alternative whole sample analysis presented in Supplemental Materials however, both these links were supported. Consequently, there is suggestive evidence of self-esteem as a mediator. As self-esteem rates differed between sexual minority and heterosexual youth in preliminary analyses (see *Table 2*), it seems that controlling for earlier levels of depression and demographic characteristics attenuated the relation between sexual orientation and self-esteem. Indeed, depressive symptoms are more strongly associated with self-esteem than with family relationships or unhelpful assumptions, so it is not surprising that adjusting for prior depression may have had more impact on this association. It is worth noting the potential conceptual overlap between depression and self-esteem as theoretical and measurement constructs, with low self-esteem also being a symptom of depression. We therefore suggest despite the weak evidence in our study that future research should continue to investigate positive self-esteem as a possible resilience factor for depression in sexual minority youth, as

well as the possibility that sexual minority boys in particular are at increased risk for low self-esteem.

There was no evidence to support sex at birth as a moderating factor of any of the pathways. Uncertainty around parameter estimates was considerable however and confidence intervals for differences between indirect effects in MSAB and FSAB participants were relatively large. Consequently, whilst no evidence was provided that effects differ between MSAB and FSAB participants, it was still the case that evidence was found for some associations in one sex at birth whilst there was too much uncertainty to provide evidence for associations (or lack thereof) in the other. Whilst sexual minority status was related with poorer family relationships for both MSAB and FSAB participants, poorer family relationships were associated with depressive symptoms in FSAB participants, whereas this relation was not shown in MSAB participants. Therefore, family relationships emerged as a mediator for FSAB participants but not for MSAB participants. This is consistent with findings of other longitudinal research with Dutch and American adolescents, suggesting that family-related variables such as parental rejection or parental closeness, support, and involvement appear to be stronger mediators of the relation between sexual orientation and depressive symptoms for girls than for boys (la Roi et al., 2016; Pearson & Wilkinson, 2013). This is the opposite pattern that was found for self-esteem, where evidence suggested that self-esteem was a weak mediator for MSAB participants, but was not a mediator for FSAB participants, as self-esteem was related with sexual minority status only for MSAB. It has been reported that attitudes are often more negative toward sexual minority men than women (Kite & Whitley, 1996) and that sexual minority men may experience sexual-orientation related victimization more than sexual minority women (e.g., Almeida, Johnson, Corliss, Molnar, & Azrael, 2009). However, sexual minority young women report more sexual victimization than sexual minority men (Rothman, Exner, & Baughman, 2011). It could be

argued that the impact of minority stressors relating to sexual orientation on self-esteem may be less apparent in the young women because self-esteem is generally lower in women than men (Bleidorn et al., 2016), presumably due to sexism and gender-based victimization. Indeed, self-esteem was lower in FSAB participants in the present study (data available upon request).

Clinical Implications

The findings have important implications in terms of primary and secondary prevention. Firstly, these UK findings support many other studies (e.g., King et al., 2008) indicating that sexual minority youth should be recognized as an at-risk population for depression. Depression disparities were already present at 13 years indicating that prevention efforts need to begin at a young age.

Secondly, knowledge of psychosocial processes that act as vulnerability factors provides specific targets for preventative and therapeutic efforts. The current findings suggest that psychological interventions for sexual minority youth should attend to unhelpful rules for living and conditional beliefs about self-worth. Addressing these beliefs is a core component of CBT for depression. Future research should investigate whether sexual minority youth in the UK are accessing evidence-based treatments such as CBT in line with their increased need. Unfortunately, access to mental health services for children and young people in the UK is currently poor (Care Quality Commission, 2019). Pilot studies have investigated a computerized CBT program specifically adapted for sexual minority teenagers with depression (Lucassen, Merry, Hatcher, & Frampton, 2015), group CBT for sexual minority youth (Craig & Austin, 2016), and LGB affirmative CBT for gay and bisexual men (Pachankis, Hatzenbuehler, Rendina, Safren, & Parsons, 2015). Such interventions address minority stress processes not investigated in the current study but show promising results and require further research.

Recently, research and practice has been focused on resilience as a protective factor for sexual minority individuals (Mustanski, Newcomb, & Garofalo, 2011). Although resilience is a poorly understood process, self-esteem has been shown to be an important aspect of it (Anderson, 1998). There is some evidence that CBT specifically focused on self-esteem may be effective in the general population (Waite, McManus, & Shafran, 2012) although this has not been tested in sexual minority youth. The presence of community and school-based programs that facilitate positive identity development (e.g., Asakura, 2010) as well as interventions that focus on building sexual minority young people's self-esteem (e.g., Craig, McInroy, Austin, Smith, & Engle, 2012) are also likely to be protective for this population.

Furthermore, the finding that poorer family relationships may have contributed to the greater depressive symptoms in sexual minority youth highlights the need for research evaluating the impact of interventions that facilitate awareness, normalization, and education to parents and families. Research on interventions that focus on the family relationships of sexual minority youth is scarce (Diamond et al., 2012; Willoughby & Doty, 2010). Although recommendations for family interventions exist (Woodward & Willoughby, 2013), they are not based on a solid evidence base. Young people who come out to their families (or who are "outed" without their consent) may also need support coping with any adverse reactions including the possibility that they will be made homeless. Young people who experience concealment stigma (Pachankis, 2007) and do not come out due to fears of negative family reactions require a different kind of support, that takes into account that they may be correct in their anticipated family rejection.

Limitations

Like most longitudinal cohort studies, ALSPAC suffers from significant attrition which may lead to biased estimates. Two different methods were used to deal with missing

data, both of which are known to reduce statistical bias when data can be assumed to be missing at random, as well as to increase power. These two methods led to similar results.

One of the strengths of this study is that it used a mediational design with three time-points. However, it should be noted that it is very difficult to infer causal relationships based solely on one observational study, and results obtained from SEM will be biased if causal structures are misspecified or there are unobserved confounders. Hence, analyses such as the ones presented here do not provide conclusive evidence of some causal structure. Instead, they examine whether a causal theory is consistent with observational data, and pre-supposing that this causal structure is correct, perform inference for the parameters of the causal model. Further, as previously discussed, mediation studies with a longitudinal design are methodologically superior to cross-sectional mediation studies in that they acknowledge that mediation processes unfold over time. However, in the present study assumptions are necessarily being made about the timing of the effects of sexual minority status on the mediators, and of the mediators on depressive symptoms. Ideally, when the hypothesized timings of the effects are unknown as they are in this model, multiple measures should be collected at different timepoints so that the nature of how the causal process unfolds could be better modelled. This was not possible in this study as more measures were not administered to the ALSPAC participants and they were therefore not available to us for analysis.

In the present study, a self-report measure assessing the number of depressive symptoms was used rather than a diagnostic tool for major depression. Future studies should investigate whether similar results are found when using clinical structured assessment of major depression as an outcome variable. Moreover, the family relationships variable was not assessed by a validated questionnaire thus this construct requires further research with alternative measures. In addition, sexual orientation was measured at a single time-point using a simple measure of sexual orientation; participants were not asked about sexual

attraction or sexual behavior. Sexual orientation was only assessed at one time point (15 years) and we were not able to account for the stability of sexual orientation across time. Particularly at this developmental stage, sexual identity is likely to shift over time for some individuals.

Different sexual minority subgroups were grouped together due their small sizes. This has been a common approach used in sexual minority research; however, it represents an important limitation as it fails to capture differences in the experiences among different sexual minority subgroups. Research indicates that some groups such as bisexual people may be at more risk than others (Ross et al., 2018). There is also evidence that suggests that "mostly heterosexual" youth can be considered a separate group (Savin-Williams & Vrangalova, 2013) that may also be vulnerable compared to heterosexuals (Corliss et al., 2009). Participants who responded "not sure" or "not attracted to either sex" were excluded and these individuals require research in their own right. In addition, it is very likely that self-reported sexual orientation would have changed for some young people in the timespan of the study. It is important for future research to investigate mechanisms contributing to depression disparities in sexual minority subgroups and in those who report changing identities.

Data on gender identity was not collected for the ALSPAC birth cohort and therefore could not be included in the analysis. However, it is highly likely that the sample includes transgender, gender fluid, or other gender expansive young people. Future longitudinal studies should include measures of gender identity.

Although we used a few potential confounding variables in our analysis, these were not without limitations. A crude measure of race was used (dichotomized as white/non-white) that fails to capture different non-white racial and ethnic identities. Similarly, SES was measured on data of the mother's education and occupation, which do not take into account the background of the father or other factors that contribute to the SES make-up of the young

people in the sample. Future studies should use more inclusive and nuanced demographic variables and also investigate a broader range of confounding variables, (e.g., victimization experiences).

There may be limits to the generalizability of the findings: firstly, the sample exclusively consisted of participants from Avon, UK, a relatively affluent and mostly white community, and therefore it is unclear whether the present findings translate to other populations and cultures. Moreover, societal attitudes about sexual orientation are rapidly and continuously changing and it is therefore possible that, with measures administered between 2006 and 2010, the results of this study are already limited in their generalizability to present day youth.

Conclusions

The study is unique in using a longitudinal design in which the sexual minority status, proposed mediators, and depressive outcomes are measured at different timepoints. Results provide evidence for the importance of family relationships and unhelpful assumptions in explaining disparities in depressive symptoms between heterosexual and sexual minority youth, and there is weaker support that self-esteem may also help explain the disparities. The results do not provide conclusive evidence for sex at birth differences in these mediational pathways. Future studies should further investigate such differences, along with differences across sexual minority subgroups.

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Table 1.

Frequencies, percentages, and chi-square tests of demographic variables.

Variable	**Categories**	**Heterosexual**	**Sexual Minority**	**Total**	**Pearson χ^2**
		n (%)	*n* (%)	*n* (%)	
Sex ***	Male	2157 (48.3%)	205 (35.7%)	7591 (51.2%)	χ^2 (2) = 97.27
	Female	2310 (51.7%)	268 (64.1%)	7153 (48.3%)	$p < .001$
	Missing			70 (0.5%)	
Race **	White	3914 (87.6%)	491 (85.5%)	11,439 (77.2%)	χ^2 (2) = 13.29
	Non-white	166 (3.7%)	25 (4.4%)	610 (4.1%)	$p = .001$
	Missing			2765 (18.7%)	
Maternal Education ***	Below O-level	776 (17.4%)	93 (16.2%)	3733 (25.2%)	χ^2 (2) = 136.48
	O-level	1449 (32.4%)	174 (30.3%)	4300 (29%)	$p < .001$
	Above O-level	1907 (42.7%)	261 (45.5%)	4356 (29.4)	
	Missing			2425 (16.4%)	
Maternal Occupation***	Manual	725 (16.2%)	105 (18.3%)	2855 (19.3%)	χ^2 (4) = 603.51
	Non-manual	3012 (67.4%)	370 (64.5%)	8182 (55.2%)	$p < .001$
	Missing			3777 (25.2%)	

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

Table 2.

Means, standard deviations (SD), and t-test differences based on summary scores for respondents with complete information on each variable.

Variable	**Heterosexual**	**Sexual Minority**	**Total**	**T-test results**
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	(*df*) *t*-statistic, *p*-value (*n*)
Family relationships				
Close to parents ***	1.69 (0.90)	1.98 (1.16)	1.71 (0.94)	t (3220) = -3.80, $p < .001$ (n = 3222)
Close to siblings **	2.08 (1.30)	2.33 (1.27)	2.11 (1.28)	t (3220) = -3.03, $p = .002$ (n = 3222)
Discuss problems with family***	2.66 (1.33)	3.10 (1.23)	2.71 (1.34)	t (3219) = -4.50, $p < .001$ (n = 3221)
Get along with family ***	2.23 (1.11)	2.57 (1.20)	2.25 (1.14)	t (3214) = -4.27, $p < .001$ (n = 3216)
Unhelpful assumptions ***	31.80 (6.13)	30.18 (6.41)	31.52 (6.23)	t (3509) = 4.21, $p < .001$ (n = 3511)
Self-esteem ***	28.37 (6.38)	26.18 (6.95)	27.85 (6.66)	t (3377) = 4.56, $p < .001$ (n = 3379)
Depression at 13 years[a] ***	4.64 (4.20)	7.31 (5.44)	4.94 (4.49)	t (4478) = -10.56, $p < .001$ (n = 4480)
Depression at 18 years ***	6.59 (5.85)	8.84 (6.63)	7.19 (6.23)	t (2373) = -4.86, $p < .001$ (n = 2375)

[a] Confounding variable

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

Table 3.

Results of mediation for FIML with bootstrapped CIs (n = 14,814).

Coefficient	**Estimate**	**SE**	***p* value**	**CIs (95%)**
a path				
Family	0.17	0.02	< 0.001	0.08 / 0.25
Unhelpful assumptions[a]	-0.89	0.02	0.013	-1.61 / -0.18
Self-esteem	-0.70	0.02	0.084	-1.49 / 0.05
b path				
Family	0.81	0.03	0.001	0.34 / 1.36
Unhelpful assumptions[a]	-0.11	0.02	< 0.001	-0.16 / -0.07
Self-esteem	-0.28	0.02	< 0.001	-0.32 / -0.24
Indirect effect				
Total	0.43	0.16	0.008	0.12 / 0.75
Specific				
Family	0.13	0.06	0.020	0.04 / 0.26
Unhelpful assumptions[a]	0.10	0.04	0.026	0.02 / 0.17
Self-esteem	0.20	0.11	0.083	-0.01 / 0.42
Direct effect (*c'* path)	0.64	0.39	0.100	-0.12 / 1.42
Total effect (*c* path)	1.07	0.41	0.009	0.26 / 1.86

[a] Higher scores indicate lower unhelpful assumptions.

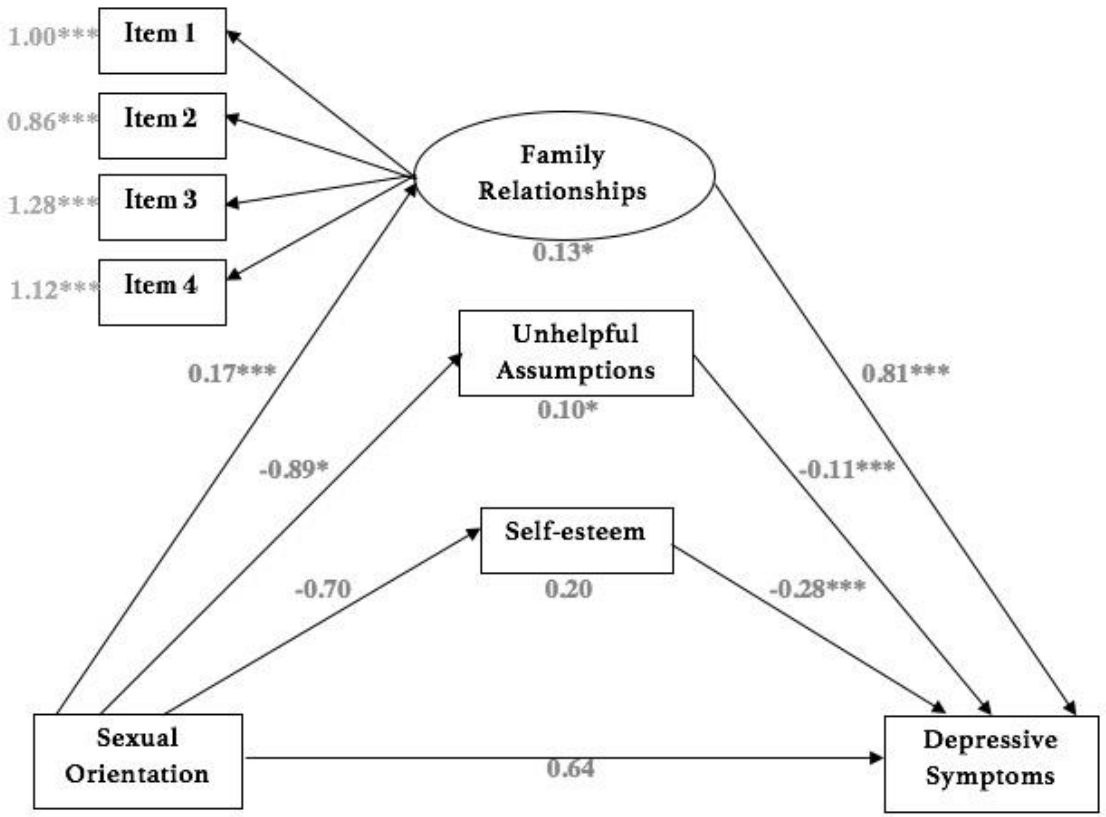

Figure 1. Mediation diagram. Estimates of factor loadings, specific indirect effects (under each mediator variable), and direct effect are shown.

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

SUPPLEMENTAL MATERIALS A – MULTIPLE IMPUTATION MODEL

Class	Variables	Measure	Age
Main variables	Sexual minority status	Self-description	15y
	Self-esteem	Bachman revision of Rosenberg scale	17y
	Family relationships	4 items, Latent variable	17y
	Unhelpful assumptions	DAS-SF	17y
	Depression	SMFQ	18y
Covariates	Sex at birth	Binary (male / female)	At birth
	Ethnicity	Binary (white / non-white)	32wk gestation
	Socio-economic status	Maternal education	32wk gestation
Baseline covariate	Depression	SMFQ	13y
Additional auxiliary variables	Self-esteem	Harter's self-perception scale, global score	8y
	Self-esteem	Butler's self-image profile for children	13y
	Depression	SMFQ	10.5y
	Depression	SMFQ	16y
	Gender non-conformity	Children's activities inventory (CAI)	8.5y

SUPPLEMENTAL MATERIALS B - INTERCORRELATIONS

Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. F1: Close to parents		.344*	.487*	.534*	-.128*	-.223*	.095*	-.176*
2. F2: Close to siblings			.314*	.275*	-.077*	-.140*	.100*	.155*
3. F3: Discuss problems with family				.571*	-.200*	-.297*	.147*	.197*
4. F4: Get along with family					.170*	-.310*	.153*	.260*
5. Unhelpful assumptions						.359*	-.200*	-.293*
6. Self-esteem							-.261*	-.462*
7. Depression at 13								.320*
8. Depression at 18								

*Correlation is significant at $p < .001$.

SUPPLEMENTAL MATERIALS C -

SEM RESULTS AFTER MULTIPLE IMPUTATION

Coefficient	**Estimate**	**SE**	***p* value**	**CIs (95%)**
a path				
Family	0.21	0.06	< 0.001	0.10 / 0.30
Unhelpful assumptions[a]	-0.93	0.36	0.009	-1.62 / -0.23
Self-esteem	-0.80	0.33	0.014	-1.44 / -0.17
b path				
Family	0.56	0.19	0.004	0.18 / 0.94
Unhelpful assumptions[a]	-0.11	0.02	< 0.001	-0.15 / -0.07
Self-esteem	-0.26	0.02	< 0.001	-0.29 / -0.22
Indirect effect				
Total	0.43	0.12	< 0.001	0.19 / 0.66
Specific				
Family	0.12	0.05	0.015	0.02 / 0.22
Unhelpful assumptions[a]	0.10	0.05	0.021	0.02 / 0.19
Self-esteem	0.21	0.09	0.019	0.03 / 0.38
Direct effect (*c'* path)	0.65	0.32	0.041	0.03 / 1.28
Total effect (*c* path)	1.08	0.35	0.002	0.40 / 1.77

[a] Higher scores indicate lower unhelpful assumptions.

Note: 1,000 bootstrap samples were drawn for each imputed dataset and used to obtain standard errors (SEs) of the estimates. The estimates and their SEs were combined using Rubin's rules. Confidence intervals were then constructed based on asymptotic normal theory, in contrast to the quantile method used in the presented analysis with FIML which is recommended in the literature (Fritz, Taylor, & MacKinnon, 2012). This methodology is recommended in recent literature (Schomaker & Heumann, 2018) as an alternative.

SUPPLEMENTAL MATERIALS D - SEM ESTIMATES BY SEX AT BIRTH (WITH FIML)

	MALE SEX AT BIRTH				FEMALE SEX AT BIRTH			
Coefficient	**Estimate**	**SE**	***p* value**	**CIs (95%)**	**Estimate**	**SE**	***p* value**	**CIs (95%)**
a path								
Family	0.17	0.07	0.009	0.05 / 0.30	0.17	0.06	0.005	0.05 / 0.28
Unhelpful assumptions [a]	-1.35	0.52	0.009	-2.32 / -0.33	-0.72	0.45	0.115	-1.56 / 0.18
Self-esteem	-1.35	0.70	0.053	-2.50 / 0.01	-0.46	0.48	0.332	-1.38 / 0.50
b path								
Family	0.33	0.38	0.382	-0.29 / 1.14	0.99	0.33	0.003	0.37 / 1.65
Unhelpful assumptions [a]	-0.08	0.04	0.019	-0.15 / -0.02	-0.12	0.03	< 0.001	-0.17 / -0.06
Self-esteem	-0.19	0.03	0.000	-0.25 / -0.14	-0.32	0.03	< 0.001	-0.38 / -0.27
Indirect effect								
Total indirect	0.43	0.19	0.025	0.08 / 0.83	0.40	0.23	0.079	-0.05 / 0.86
Specific indirect								
Family	0.06	0.08	0.467	-0.05 / 0.26	0.16	0.08	0.037	0.04 / 0.35
Unhelpful assumptions [a]	0.11	0.07	0.108	0.01 / 0.26	0.09	0.06	0.139	-0.02 / 0.19
Self-esteem	0.26	0.14	0.063	0.00 / 0.56	0.15	0.16	0.335	-0.16 / 0.45
Direct effect (*c'* path)	1.01	0.57	0.075	-0.12 / 2.06	0.49	0.48	0.302	-0.40 / 1.36
Total effect (*c* path)	1.44	0.58	0.014	0.26 / 2.53	0.89	0.50	0.078	-0.11 / 1.84

[a] Higher scores indicate lower unhelpful assumptions.

SUPPLEMENTAL MATERIALS E

MODERATION RESULTS. ESTIMATES OF SEX AT BIRTH DIFFERENCES IN EFFECTS BETWEEN MALE SEX AT BIRTH AND FEMALE SEX AT BIRTH PARTICIPANTS

Coefficient	**Estimate**	**SE**	***p* value**	**CIs (95%)**
Total indirect	-0.03	0.30	0.919	-0.65 / 0.55
Specific indirect				
Self-esteem	-0.11	0.21	0.599	-0.55 / 0.31
Unhelpful assumptions [a]	-0.03	0.09	0.767	-0.22 / 0.15
Family relationships	0.11	0.11	0.308	-0.14 / 0.31
Direct effect	-0.52	0.76	0.494	-1.99 / 1.01
Total effect	-0.55	0.80	0.49	-2.17 / 1.06

[a] Higher scores indicate lower unhelpful assumptions.