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Is Developmental Change in Gender-Typed Behavior Associated with Adult Sexual Orientation?

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Abstract

The goal of this paper was to examine gender-typed behavior longitudinally and to consider its relationship with sexual orientation in adulthood. Data were from 10,624 respondents who completed Waves 1 (adolescence), 3 (emerging adulthood), and 4 (early adulthood) of the National Longitudinal Study of Adolescent to Adult Health (Add Health). First, we described the distributions of gender-typed behavior by adult sexual orientation at each of the three developmental stages. Next, we performed multilevel mixed regression models to assess longitudinal variation in gender-typed behavior from adolescence to adulthood within sexual orientation groups. Results showed that gender-typed behavior varied both within and between sexual orientation groups, as well as over time. For males, the differences in gender-typed behavior among the sexual orientation groups were relatively consistent at each stage, while differences in gender-typed behavior among sexual orientation groups varied more at each stage among females. Longitudinal models exhibited curvilinear patterns, such that gender-typed behavior strengthened from adolescence to early adulthood but peaked in emerging adulthood. To our knowledge, this is the first study to use population representative data to study gender-typed behavior both prospectively and at multiple time points from adolescence to adulthood, and to consider how such behavior is related to adult sexual orientation. This research contributes to a growing body of prospective literature on the link between gendered behavior and sexual orientation and provides further justification for more age- and cohort-specific measures of gender-typed behavior in future research.

Keywords

gender-typed behavior; sexual orientation; longitudinal; Add Health

Health disparities in sexual minorities are well-documented, and are hypothesized to be largely driven by a variety of stressors linked to sexual orientation (e.g., discrimination, bullying; Meyer, 2003). However, the prevalence of stressors, and how they are experienced by individuals, is not uniform across various groups of sexual minorities (e.g., homosexual versus bisexual; Herek, 2009; Lewis, Derlega, Brown, Rose, & Henson, 2009). One

contributing factor to these differential experiences is thought to be gender nonconformity. There are social and personal costs to violating gender role expectations, particularly for men, and these costs contribute to stress (Herek, 1988). However, the degree of variation in gender nonconformity among sexual minorities has not been extensively examined, and virtually nothing is known about developmental changes in gender nonconformity from adolescence into adulthood, and whether change over time is different for heterosexual and sexual minority groups. Recent work has highlighted the importance of considering developmental change in gender conformity to better understand the causal mechanisms underlying health disparities between sexual minorities and heterosexuals (Li, Pollitt, & Russell, 2016).

To our knowledge, only four published studies have used population-based, prospective data to describe longitudinal associations between gendered behavior and later sexual orientation (Li & Hines, 2016; Li, Kung, & Hines, 2017; Li et al., 2016; Steensma, Van Der Ende, Verhulst, & Cohen-Kettenis, 2012; Udry & Chantala, 2006). Steensma et al. (2012) assessed the gendered behaviors of a sample of Dutch children using two items regarding general behavior and wishes to be the opposite sex from caregiver reports on the Child Behavior Checklist. When they followed up after 24 years to assess sexual orientation, the researchers found that self-reported homosexuality was between eight and 15 times higher among those who had exhibited gender-atypical behavior during childhood. As the first population-based, prospective study of the association between childhood gendered behavior and sexual orientation in adulthood, Steensma et al. (2012) provided important, foundational evidence for this association. However, their measure of gendered behavior was limited to two items, indicating a need for something more comprehensive. In another such study, Li and Hines (2016) found that caregiver-reported gender-typed behavior at age 3.5 using the Preschool Activities Inventory was not associated with same-sex romantic attraction at age 13 in a British population-based sample. Using the same sample, Li et al. (2017) did find that caregiver-reported gender-typed behavior during early childhood was associated with self-reported homosexual identity at age 15, particularly among males. Notably, the differences at ages 13 and 15 in these studies showed the importance of assessing sexual orientation at later ages when sexual orientation identity may be more stable. Finally, using data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), Udry and Chantala (2006) tested the association between an empirically derived measure of gender among 13–18-year old adolescents and sexual attraction, partnering behavior, and orientation identity six years later (19–24). Their results showed no differences for females, but among males, those who exhibited more feminine behavior during adolescence were more likely to report same-sex attraction, same-sex partnering behavior, and homosexual identity in emerging adulthood. Importantly, these and Li et al.'s (2017) results show how the relationship between gender and sexual orientation may become stronger at later developmental stages, thus indicating a need for more longitudinal analyses of this association using multiple time points.

Each of these studies made significant contributions to the literature by providing population-based evidence for the association between gendered behavior and later orientation. Unfortunately, three of these studies focused on gender-typed behavior only during childhood, and none of the studies considered how such behavior may change over

time. This is particularly important in the case of gender and sexuality development, since adolescence and emerging adulthood represent critical periods of physical maturation, cognitive growth, and sexual identity exploration (Boislard, Van De Bongardt, & Blais, 2016; Halpern & Kaestle, 2014). In fact, scholars have debated in what ways gender may be especially important during adolescence. One such body of research has focused on Hill and Lynch's (1983) *gender intensification hypothesis*, which suggests that increased pressure to perform in gender conforming or stereotypical ways during adolescence leads to further gender role stratification between males and females. Although this hypothesis was developed using evidence from several studies, more contemporary research has suggested that gender intensification may be more relevant to gender role attitudes than to gender role identity or behavior, and that it may also differ for males and females (Priess-Groben & Lindberg, 2016). Therefore, more research is needed to understand how gender-typed behavior may continue to change through the life course, and how such trajectories may further vary by biological sex and sexual orientation.

Current Study

Accordingly, the goal of this paper was to examine gender-typed behavior longitudinally and consider its relationship with sexual orientation in adulthood using data from the National Longitudinal Study of Adolescent to Adult Health (Add Health). After stratifying by biological sex, we first examined differences in gender-typed behavior among sexual orientation groups at three separate waves of data collection, representing three different developmental periods (adolescence, emerging adulthood, early adulthood). Next, we performed longitudinal analyses to study changes in gender-typed behavior over time among these sexual orientation groups. Based on the existing literature, we hypothesized that members of sexual minority populations, particularly those who identify as homosexual or mostly homosexual, would exhibit more gender nonconforming behaviors compared to their heterosexual or mostly heterosexual peers (Bailey & Zucker, 1995; Li & Hines, 2016; Li et al., 2017, 2016; Steensma et al., 2012; Udry & Chantala, 2006; Zucker, 2008). We also predicted that this association would be apparent at multiple time points and persist over time, spanning from adolescence to early adulthood. Finally, based on the gender intensification hypothesis, we predicted that gender-typed behavior would be strongest during adolescence and decrease in emerging and early adulthood (Hill & Lynch, 1983).

Methods

Sample

This paper uses data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a large, nationally representative sample of more than 20,745 in-school adolescents who were in the 7th–12th grades during the 1994–1995 school year (Wave 1 [W1]; Harris et al., 2009). Four waves of data have been collected with the original Add Health sample through their adult years, providing rich information regarding their health and well-being. Wave 2 (W2) was completed one year later in 1995–1996 ($n=14,738$, ages 12–18; response rate=88.2%), Wave 3 (W3) was completed after another six years in 2001–2002 ($n=15,197$, ages 18–26; response rate=77.4%), and Wave 4 (W4) was completed in

2008–2009 (n=15,701, ages 24–32; response rate=80.3%; Harris, Udry, & Bearman, 2013) The final analytic sample for this paper was restricted to respondents who had valid longitudinal sampling weights (n=12,288) and who had complete data on all variables of interest at Waves 1, 3, and 4, resulting in a final analytic sample of 10,624 respondents. Table 1 presents information regarding missing data for each variable in the analysis by each individual variable as well as by the number of variables upon which a respondent was missing data. Except for missingness on the AGB measure at any single wave,^a the patterns of missing data did not suggest a significant bias due to selective attrition.

Measures

Biological sex.—Biological sex was reported from school records at Wave 1.

Sexual orientation.—Sexual orientation was measured using an item from the Wave 4 interview that asked the respondent to “Please choose the description that best fits how you think about yourself.” Response choices included “100% heterosexual,” “Mostly heterosexual,” “Bisexual,” “Mostly homosexual,” and “100% homosexual.”

Gender-typed behavior.—“Adherence to gender-typical behavior” (AGB) is an empirical measure created by Fleming, Harris, and Halpern (2016) from data at all waves of Add Health. At each wave, a variety of self-reported behavioral items were identified that were highly correlated with biological sex. These items were then used to construct a measure in which individuals were assigned a predicted probability of being male at each wave (range: 0–1). A higher value at any given wave indicates more male-typical behavior (e.g., 0.99) while a lower value indicates more female-typical behavior (e.g., 0.01). This empirical method for constructing gender measures was originally proposed by Lippa et al. (1990) and has been shown to be useful in several past studies (Cleveland, Udry, & Chantala, 2001; Li et al., 2016; Udry & Chantala, 2004, 2006). In contrast to past measures of gender that focus on traits or ideologies, this measure uniquely captures gendered characteristics and behavior relative to same age peers at the time of assessment. Importantly, this method represents a more contemporary theoretical conceptualization of masculinity and femininity as something that individuals *do* rather than who they *are* (West & Zimmerman, 1987). Furthermore, this measurement technique allows for gendered behavior to be fluid and shaped by the changing social contexts and experiences of the population of interest rather than as an innate quality. Table 2 presents a set of the five sample items with the greatest contributions to AGB scores at each wave, as presented in Fleming et al.’s paper (2016). Additional details on the construction of this measure can be found in this original publication.

Analysis

After stratifying by biological sex, we first described the AGB distributions at each wave for each sexual orientation group sex using summary statistics. Next, we compared the means of

^aA large number of respondents were missing data for the AGB measure at a single wave, which is likely the result of missing responses to one or more of the many behavioral items used in its construction. However, based on the results of Fleming et al.’s (2016) reliability and validity tests using subsets of the data during measure construction, such attrition did not represent a significant bias in our analysis.

the sexual orientation groups to each other at each wave. To avoid reporting false positive results, we used the Holm-Bonferroni correction for multiple statistical tests (Holm, 1979). Finally, we performed unadjusted multilevel mixed regression models to assess longitudinal variation in AGB scores from adolescence to adulthood within sexual orientation groups.^b Our analyses use sampling weights and adjusted variance estimates for the Add Health complex survey design using Stata version 15 (StataCorp, 2017). All study procedures were approved by the Institutional Review Board for the Protection of Human Subjects at [blinded], and present analyses were deemed exempt due to our use of existing, de-identified data.

Results

Tables 3 and 4 include descriptive statistics of the sexual orientation groups for males and females, respectively. Among males, the majority identified as 100% heterosexual (93.3%), followed by 3.5% as mostly heterosexual, 1.8% as 100% homosexual, 0.8% as mostly homosexual, and 0.6% as bisexual. For females, a slightly smaller majority identified as 100% heterosexual (80.2%), followed by 16.1% identifying as mostly heterosexual, 1.9% as bisexual, 1.0% as 100% homosexual, and 0.8% as mostly homosexual.

AGB Mean Comparisons of Sexual Orientation Groups by Wave

Males.—Table 3 also presents the distribution statistics for males, including the mean, standard deviation, and range of AGB scores for each sexual orientation group at each wave. At each wave, mean AGB scores were highest (most male) for those who identified as 100% heterosexual, while AGB scores were lowest (least male) for 100% homosexual respondents at every wave except for Wave 3, when scores for mostly homosexuals were lower (0.597 vs. 0.541). The range of AGB scores for males spanned the entire distribution (0.004, 1.000), and each sexual orientation group included scores on both the lower (more feminine) and higher (more masculine) ends of this range. For a visual representation of the distributions for males, see Figure 1.

Statistically significant differences in mean AGB scores occurred and were quite consistent across sexual orientation groups at each wave. Mean AGB scores for 100% heterosexual males were significantly higher at every wave compared to mostly homosexual males (W1: 0.704 vs. 0.457; W3: 0.762 vs. 0.541; W4: 0.740 vs. 0.562; $p < .05$ for all) and compared to 100% homosexual males (W1: 0.704 vs. 0.442; W3: 0.762 vs. 0.597; W4: 0.740 vs. 0.476; $p < .05$ for all). 100% heterosexual males also had significantly higher AGB scores than bisexual males at Wave 3 only (0.762 vs. 0.622; $p < .05$). Finally, mostly heterosexual males had significantly higher mean AGB scores compared to mostly homosexual males at Waves 1 and 3 (W1: 0.672 vs. 0.457; W3: 0.735 vs. 0.541; $p < .05$ for both) and compared to 100% homosexual males at every wave (W1: 0.672 vs. 0.442; W3: 0.735 vs. 0.597; W4: 0.667 vs. 0.476; $p < .05$ for all). No other statistically significant differences in AGB scores emerged between sexual orientation groups for males.

^bWe initially included age at each wave as covariates in the regression models. However, these variables did not change the strength or direction of the reported associations, so we excluded them in the final model.

Females.—Table 4 presents the same AGB distribution statistics for females. Scores were lowest (most female) for mostly heterosexual females at Wave 1 and 100% heterosexuals at Waves 3 and 4. In contrast, AGB scores were highest (least female) for mostly heterosexual females at Waves 1 and 4 and 100% homosexual respondents at Wave 3. As with males, the range of AGB scores for females covered the entire distribution (0.000, 1.000), and each sexual orientation group included scores on both the lower (more feminine) and higher (more masculine) ends of this range. Histograms of the distributions for females are shown in Figure 2.

Compared to the results for males, statistically significant differences in mean AGB scores between sexual orientation groups for females varied by wave. More specifically, there were no statistically significant differences in means between sexual orientation groups at Wave 1. At Wave 3, mean scores for 100% homosexual females were significantly higher compared to all other groups, while no other differences emerged among the other groups (0.454 [100% homosexual] vs. 0.222 [100% heterosexual]; 0.248 [mostly heterosexual]; 0.229 [bisexual]; 0.277 [mostly heterosexual]; $p < .05$ for all). At Wave 4, 100% heterosexual females had significantly lower AGB scores than all other groups (0.247 [100% heterosexual] vs. 0.281 [mostly heterosexual]; 0.330 [bisexual]; 0.476 [mostly homosexual]; 0.467 [100% homosexual]; $p < .05$ for all). In addition, mean AGB scores for mostly heterosexual females were significantly lower at Wave 4 compared to both mostly homosexual and 100% homosexual females (0.281 [mostly heterosexual] vs. 0.476 [mostly homosexual]; 0.469 [100% homosexual]; $p < .05$ for both). There were no other statistically significant differences in AGB scores between sexual orientation groups for females.

Longitudinal Change in AGB Scores

Figure 3 shows the trajectories of mean AGB scores for each sexual orientation group by biological sex. Figure 3 also includes a table with the slopes (dy/dx) from multilevel mixed regression models, which quantify these AGB score changes between adolescence and emerging adulthood (W1-W3), emerging adulthood and adulthood (W3-W4), and overall between adolescence and adulthood (W1-W4) for each sexual orientation group by biological sex.

Males.—Among 100% heterosexual respondents, AGB scores increased significantly (more masculine) between Waves 1 and 3 (0.06 [0.04, 0.07], $p < .01$) and decreased significantly between Waves 3 and 4 (−0.02 [−0.03, −0.01], $p < 0.01$), but increased overall from Wave 1 to Wave 4 (0.04 [0.02, 0.05], $p < .01$). For 100% homosexual males, AGB scores increased significantly from Wave 1 to 3 (0.16 [0.05, 0.26], $p < .01$) and decreased significantly from Wave 3 to Wave 4 (−0.13 [−0.23, −0.03], $p < .05$), with no significant change overall across the study period. No such significant changes in AGB scores were apparent for the mostly heterosexual, bisexual, and mostly homosexual groups over time.

Females.—Compared to males, there were more significant changes in AGB scores over time among females. Scores for 100% heterosexual females decreased significantly (more feminine) from Waves 1 to 3 (−0.07 [−0.08, −0.06], $p < .01$) and increased significantly from Waves 3 to 4 (0.03 [0.01, 0.04] $p < .01$), resulting in a significant decrease across the entire

study period ($-0.05 [-0.06, -0.04]$, $p < .01$). Mostly heterosexual females also showed a significant decrease in AGB scores from Wave 1 to 3 ($-0.04 [-0.07, -0.02]$, $p < .01$) and a significant increase from Wave 3 to 4 ($0.03 [0.00, 0.06]$, $p < .05$), though the overall change was not significant. Similarly, AGB scores for bisexual females decreased from Waves 1 to 3 ($-0.08 [-0.16, -0.01]$, $p < .05$) and increased from Waves 3 to 4 ($0.09 [0.01, 0.17]$, $p < .05$), but did not change overall from Waves 1 to 4. For mostly homosexual respondents, AGB scores only increased significantly from Waves 3 to 4 ($0.20 [0.08, 0.32]$, $p < .01$). Finally, although the change for each time interval was not significant among 100% homosexual females, the overall increase in AGB scores for these respondents was significant ($0.12 [0.01, 0.23]$, $p < .05$).

Discussion

Our results suggest that gender-typed behavior varies both within and between sexual orientation groups, as well as over time. To our knowledge, this is the first study to use population representative data to study gender-typed behavior both prospectively and at multiple time points from adolescence to adulthood, and to consider how such behavior is related to adult sexual orientation. Understanding these variations in gender-typed behavior can help to inform future research and expand our understanding of the mechanisms by which the intersection of gender nonconformity and sexual orientation intersect over time to affect physical and mental health.

Our first hypothesis was that members of sexual minority populations would report more gender nonconforming behaviors compared to their heterosexual peers. This hypothesis was supported. When comparing the means, we found that 100% homosexual and mostly homosexual respondents were more likely to have AGB scores that were gender nonconforming for both sexes. Our second hypothesis was that this association would be apparent at multiple time points and persist from adolescence to early adulthood. This hypothesis was only partially supported. For males, differences in gender-typed behavior were apparent beginning in adolescence. More specifically, the 100% homosexual and mostly homosexual groups had significantly lower scores (more feminine) compared to both the 100% heterosexual and mostly heterosexual groups at every wave except for Wave 4, when only the 100% homosexual group was significantly different. The bisexual male group only differed at Wave 3 compared to the 100% heterosexual group, when their mean score was significantly lower (more feminine). In contrast, we found no differences in mean AGB scores among the sexual orientation groups for females during Wave 1. However, these scores began to diverge by Wave 3, where the 100% homosexual group had significantly higher (more masculine) mean scores compared to all other groups, and diverged further by Wave 4, when the mean for the 100% heterosexual group was significantly lower (more feminine) than all other groups and the mostly homosexual and 100% homosexual groups had significantly higher scores (more masculine) compared to mostly heterosexual peers.

Our final hypothesis was that gender-typed behavior would be strongest during adolescence and decrease in emerging and early adulthood based on the gender intensification hypothesis. This was not supported by our results. In our longitudinal analysis, we actually found that gender-typed behavior increased from adolescence to early adulthood, but that

this trajectory was not linear. In general, AGB scores became more gender-conforming for both males and females from Wave 1 to Wave 3. Gender-conforming behavior then decreased for most groups between Waves 3 and 4 to a level somewhere between those of Waves 1 and 3. However, these changes in AGB scores between waves were only statistically significant for 100% heterosexual males and females, 100% homosexual males, and mostly heterosexual and bisexual females. The exceptions to this pattern were the bisexual and mostly homosexual males, whose AGB scores increased at both intervals, and 100% homosexual females whose AGB scores also increased from Wave 1 to Wave 4.

These results did not completely support the gender intensification hypothesis, which suggests that adolescents are more likely to adhere to gender stereotypes during adolescence due to increased sensitivity and judgement by peers (Hill & Lynch, 1983). Interestingly, our results did suggest that, when looking at more diverse behaviors that are relevant to this cohort and following them for longer periods, gender intensification actually peaks in emerging adulthood (18–25 years), which has been characterized in the literature as a period of further identity and sexual exploration (Halpern & Kaestle, 2014). Such results are not surprising given the mixed evidence regarding the gender intensification hypothesis in more recent literature. For example, Priess, Lindberg, and Hyde (2009) measured gender using the Children's Sex Role Inventory (CSRI; Boldizar, 1991) at ages 11, 13, and 15, and found no evidence for gender intensification in adolescence. Such conflicting results may be explained by various factors. For instance, it is possible that the gender intensification process has shifted with the more recently documented social extension of adolescence (Twenge & Park, 2017). Similarly, it is likely that gender has not been well measured in more contemporary cohorts given changing social norms. This is evidenced by the fact that many researchers still rely on measures like the Bem Sex Role Inventory (BSRI), which is cohort-specific to the majority white, undergraduate population in the 1970s upon which it was derived (Bem, 1974). Therefore, our results further support the need for more cohort relevant gender measures like the AGB, which can help us to understand how gender-typed behavior and gender intensification may vary from adolescence to adulthood.

Another important observation from the distribution statistics was the heterogeneity of AGB scores for all sexual orientation groups and both biological sexes. For all groups, scores spanned the entire distribution, suggesting that self-reports of gender-conforming and nonconforming behaviors were common among all youth, regardless of sexual orientation. Past research and reviews using both retrospective and prospective data have shown that those who identify as homosexual or bisexual in adolescence or adulthood were more likely to have exhibited gender nonconforming behaviors during childhood (Bailey & Zucker, 1995; Zucker, 2008). Our results support this, as a greater proportion of sexual minority respondents reported gender-atypical behaviors. Additional research could further develop this literature by considering how sexual orientation identity and gendered behavior may covary over time using such cohort-specific measures.

However, these results do not suggest that gender-typed behavior predicts sexual orientation. Although the 100% heterosexual respondents were more likely to report gendered behaviors that were congruent with their biological sex, many respondents in this category also exhibited gender-atypical behavior. Importantly, since most the population identified as

100% heterosexual, we demonstrated that a large proportion of those who were gender nonconforming were also a part of the 100% heterosexual group based on these distributions. Therefore, our results show that gender-typed behaviors vary among all sexual orientation groups, and thus sexual orientation should not be inferred from behavior. Future research would thus benefit from complementary qualitative data to better understand the developmental changes in sexual orientation and gendered behavior, as well as the meanings ascribed to each over time.

A significant amount of past research has shown that gender nonconforming youth and sexual minorities experience a variety of negative psychosocial outcomes related to victimization (Li et al., 2016; Toomey, Ryan, Diaz, Card, & Russell, 2010). To ultimately reduce these health disparities, it is critical that we understand the role that gender nonconformity plays in whether individuals are exposed to particular stressors, and how different individuals experience and process those stressors. From a research and practice perspective, measuring gender using a dynamic measure like the AGB rather than static trait measures may provide more reliable and valid representations of the population of interest, which can in turn help to identify gender nonconforming youth who might benefit from targeted support. Furthermore, these results suggest that discussions of gender and power dynamics and sexual orientation in educational programs should aim to prevent gender discriminatory behaviors among all youth by stressing that variations in gendered behavior are normative (American Educational Research Association, 2013; Lobel, Nov-Krispin, Schiller, Lobel, & Feldman, 2004; The Society for Adolescent Health and Medicine, 2017).

Strengths and Limitations

Our research has several important strengths. First, we used a large, nationally representative, prospective sample of in-school adolescents who were in grades 7–12 during the 1994–1995 school year and who were re-contacted at multiple subsequent waves. This is an important strength because most past research has been retrospective, asking sexual minority respondents to reflect on childhood behaviors, which may lead to recall bias. In contrast, much of the existing prospective research has focused on children who were seen in gender identity clinics (Bailey & Zucker, 1995; Zucker, 2008). Although such results have been useful in shaping our understanding of the association between gendered behavior and sexual orientation, these studies are subject to selection bias because they tend to include only those who exhibit “extreme” gender nonconforming behaviors.

Another important strength is our use of the innovative AGB measure of gender-typed behavior. First, this empirically derived measure is multi-faceted and comprehensive, improving upon past research that has measured gender-typed behaviors using a few items from instruments such as the Child Behavior Checklist (Steensma et al., 2012). In addition, the AGB measure was created using a large, diverse, population representative sample, and was reassessed at each wave to ensure that it reflected the social norms and age- and developmentally appropriate behaviors of this more contemporary cohort. This is arguably a marked improvement over other commonly used gender measures such as the BSRI, which needs to be updated to reflect more current gender norms (Bem, 1974; Donnelly & Twenge, 2017). Therefore, our results lend further support for updated measures of gender-typed

behavior to ensure that future work defines gender in a way that reflects the experiences of the more contemporary cohorts that they study.

Finally, to our knowledge, our study is the first to consider gender-typed behavior at multiple time points from adolescence through early adulthood, and how these behaviors are associated with later sexual orientation. Past prospective studies either followed up only once after childhood in adolescence or adulthood, or followed up at multiple time points but did not continue past adolescence (Li & Hines, 2016; Li et al., 2017; Priess et al., 2009; Steensma et al., 2012; Udry & Chantala, 2006). These distinctions are important for multiple reasons. First, by following up at multiple time points, we can see how gender-typed behavior can change in non-linear ways over time. Indeed, the curvilinear trajectories that we saw in our longitudinal analyses would have been impossible to observe without multiple waves of data. Second, a considerable amount of research suggests that although fluid, sexual orientation identity tends to become more stable in early adulthood (Savin-Williams, Joyner, & Rieger, 2012; Savin-Williams & Ream, 2007). For this reason, studies that assessed sexual orientation in adolescence may not reflect more stable identities that respondents may report later in life (Priess et al., 2009). Our study thus provides an important contribution by assessing gender-typed behavior at regular intervals from adolescence to early adulthood, which captures both variations in gendered behaviors and important developmental periods in sexuality development.

Of course, our study also is subject to limitations. In particular, we only assessed sexual orientation using a single item measuring identity and attraction. Research has shown that although self-regard is one way to operationalize sexual orientation, other aspects of this definition, like sexual behavior and arousal, provide information about sexual minority status that may not be captured in self-reported identity measures (Laumann, Gagnon, Michael, & Michaels, 1994). Future research that considers longitudinal associations between gender-typed behavior and sexual orientation should therefore include other measures of sexual orientation to ensure the accurate representation of sexual minority populations. For example, expanding on Udry and Chantala's (2006) work by testing the longitudinal relationship between gender-typed behaviors and sexual attraction or partnering behaviors at multiple time points may provide further insight into associations between gender and sexual minority status over time.

Another major shortcoming of prospective, longitudinal studies is the issue of selective attrition over time. Such non-response can introduce bias, as those who did not respond to the survey at particular waves may have differed significantly from those who are represented in the data. However, past analyses of the Add Health data have shown little to no bias based on non-response (Brownstein et al., 2010).

Finally, while the AGB measure is innovative, it is specific to the cohort upon which it was created. This is an important limitation for two reasons. First, our results can only be generalized to this particular cohort, since the gender-typed behaviors of more contemporary cohorts may vary. Second, since the AGB was empirically derived using Add Health data, this specific measure cannot be used with other datasets; it would have to be newly constructed. However, our research provides important evidence for both the AGB measure

and the utility of the approach used by Fleming et al. and other researchers for identifying relevant gender traits and behaviors for future research on different cohorts (Cleveland et al., 2001; Fleming et al., 2016; Li et al., 2016; Lipka et al., 1990; Udry & Chantala, 2004, 2006). In this way, researchers can use this procedure to identify items that are specific to their cohorts of interest in order to further understand variations in the gender-typed behaviors of their study populations across cultures and developmental periods.

Conclusion

The results of our study show important variations in gender-typed behavior and sexual orientation in a large, prospective, population-representative sample from adolescence to early adulthood using an innovative, empirically derived measure of gender performance. Overall, our results not only make an important contribution to the literature focused on sexuality development over the life course, but also have important implications for understanding the intersection of gender nonconformity and sexual orientation, and its implications for health and well-being from adolescence into adulthood. Future research focused on gender and gender expression should continue to focus on more cohort-relevant measures, as this will be more powerful in shaping our understanding of the social structures and expectations that affect populations over time and developmental periods.

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Figure 1.
Females: Predicted probability of being male at each wave by sexual orientation

Figure 2.

Females: Predicted probability of being male at each wave by sexual orientation

<i>dy/dx (95% CI)</i>	<u>ΔW1-W3</u>	<u>ΔW3-W4</u>	<u>ΔW1-W4 (Overall)</u>
<u>Males</u>			
100% heterosexual	0.06 (0.04, 0.07)**	-0.02 (-0.03, -0.01)**	0.04 (0.02, 0.05)**
Mostly heterosexual	0.06 (0.00, 0.12)	-0.06 (-0.13, 0.01)	0.00 (-0.07, 0.07)
Bisexual	0.03 (-0.13, 0.19)	0.09 (-0.07, 0.24)	0.11 (-0.06, 0.29)
Mostly homosexual	0.08 (-0.04, 0.20)	0.02 (-0.16, 0.21)	0.11 (-0.05, 0.26)
100% homosexual	0.16 (0.05, 0.26)**	-0.13 (-0.23, -0.03)*	0.02 (-0.08, 0.13)
All males			0.02 (0.01, 0.02)**
<u>Females</u>			
100% heterosexual	-0.07 (-0.08, -0.06)**	0.03 (0.01, 0.04)**	-0.05 (-0.06, -0.04)**
Mostly heterosexual	-0.04 (-0.07, -0.02)**	0.03 (0.00, 0.06)*	-0.01 (-0.04, 0.02)
Bisexual	-0.08 (-0.16, -0.01)*	0.09 (0.01, 0.17)*	0.01 (-0.06, 0.08)
Mostly homosexual	-0.06 (-0.19, 0.07)	0.20 (0.08, 0.32)**	-0.01 (-0.04, 0.02)
100% homosexual	0.10 (-0.03, 0.24)	0.01 (-0.13, 0.15)	0.12 (0.01, 0.23)*
All females			-0.02 (-0.02, -0.01)**

Figure 3. Change in AGB scores from adolescence to early adulthood by sexual orientation and biological sex

Notes. dy/dx = slope; CI = confidence interval; Δ = change; W1 = Wave 1; W3 = Wave 3; W4 = Wave 4; ** $p < .01$; * $p < .05$

Table 1

Missing Data Patterns

	Number missing
<u>By Variable</u>	
Biological sex	0
Sexual orientation	92
AGB at Wave 1	447
AGB at Wave 3	678
AGB at Wave 4	669
<u>By Number of Variables Missing</u>	
1	1,478
2	159
3	18
4	9
5	0

Table 2

Sample Items with the Greatest Contributions to AGB Scores at Each Wave, as Described by Fleming et al. (2016)

Item	$\frac{(\bar{x}_{Male} - \bar{x}_{Female})}{s_{Male}}$	Wald χ^2 contribution to model
<u>Wave 1</u>		
1. Frequency of crying	1.13	320.95
2. Frequency of playing an active sport	.56	227.93
3. Got into a physical fight	.38	145.53
4. How do you think of yourself in terms of weight?	-0.43	118.76
5. How much do you feel that your friends care about you?	-0.29	91.10
<u>Wave 3</u>		
1. You were sad, during the past 7 days	-0.96	327.33
2. In the past 7 days, how many times doing work around the house	-0.53	157.24
3. What do you think of yourself in terms of weight?	-0.45	124.22
4. In past 7 days, how many times did you participate in gymnastics, weight lifting	0.45	119.33
5. I can do a good job stretching the truth when I talk to people	0.47	86.09
<u>Wave 4</u>		
1. Have you ever used chewing tobacco at least 20 times in your entire life?	0.47	204.74
2. Have you ever been arrested?	0.49	141.66
3. When you go outside on a sunny day for more than one hour, how likely are you to use sunscreen or sunblock?	0.50	128.80
4. I have a vivid imagination	-0.28	123.17
5. I don't talk a lot	-0.35	117.98

Notes. $\bar{X}$ = mean; s = standard deviation; χ^2 = chi square

Table 3**Males: Distribution Statistics**

Sexual Orientation at Wave 4		Wave 1	Wave 3	Wave 4
(n=4,789)		(12–18)	(18–26)	(24–32)
100% heterosexual (n = 4,458; 93.3%)	Mean	0.704 ^{d,e}	0.762 ^{c,d,e}	0.740 ^{d,e}
	Standard Deviation	0.236	0.265	0.261
	Minimum	0.003	0.003	0.009
	Maximum	1.000	1.000	1.000
Mostly heterosexual (n = 160; 3.5%)	Mean	0.672 ^{d,e}	0.735 ^{d,e}	0.667 ^e
	Standard Deviation	0.259	0.266	0.298
	Minimum	0.025	0.009	0.043
	Maximum	1.000	1.000	1.000
Bisexual (n = 25; 0.6%)	Mean	0.595	0.622 ^a	0.711
	Standard Deviation	0.325	0.230	0.316
	Minimum	0.066	0.132	0.074
	Maximum	1.000	0.999	0.997
Mostly homosexual (n = 48; 0.8%)	Mean	0.457 ^{a,b}	0.541 ^{a,b}	0.562 ^a
	Standard Deviation	0.277	0.315	0.325
	Minimum	0.041	0.011	0.013
	Maximum	0.958	0.995	0.998
100% homosexual (n = 98; 1.8%)	Mean	0.442 ^{a,b}	0.597 ^{a,b}	0.476 ^{a,b}
	Standard Deviation	0.245	0.294	0.288
	Minimum	0.016	0.002	0.028
	Maximum	0.987	0.997	0.998

Notes. Statistics are weighted to yield national probability estimates; Percentages may not sum to 100 due to rounding; Q1 = first quartile; Q3 = third quartile; Letters indicate significant differences in means at the 0.05 level with Bonferroni correction across sexual identity groups:

^a = 100% straight,

^b = Mostly straight,

^c = Bisexual,

^d = Mostly homosexual,

^e = 100% homosexual

Table 4

Females: Distribution Statistics

Sexual Orientation at Wave 4		Wave 1	Wave 3	Wave 4
(n=5,835)		(12–18)	(18–26)	(24–32)
100% heterosexual (n = 4,708; 80.2%)	Mean	0.296	0.222 ^e	0.247 ^{b,c,d,e}
	Standard Deviation	0.237	0.216	0.222
	Minimum	0.000	0.000	0.001
	Maximum	0.999	1.000	0.997
Mostly heterosexual (n = 909; 16.1%)	Mean	0.292	0.248 ^e	0.281 ^{a,d,e}
	Standard Deviation	0.255	0.242	0.252
	Minimum	0.000	0.001	0.003
	Maximum	0.978	0.976	0.997
Bisexual (n = 115; 1.9%)	Mean	0.319	0.229 ^e	0.330 ^a
	Standard Deviation	0.229	0.269	0.264
	Minimum	0.003	0.001	0.002
	Maximum	0.959	0.979	0.995
Mostly homosexual (n = 44; 0.8%)	Mean	0.350	0.277 ^e	0.476 ^{a,b}
	Standard Deviation	0.247	0.260	0.281
	Minimum	0.030	0.006	0.022
	Maximum	0.881	0.985	0.956
100% homosexual (n = 59; 1.0%)	Mean	0.343	0.454 ^{a,b,c,d}	0.469 ^{a,b}
	Standard Deviation	0.270	0.317	0.337
	Minimum	0.002	0.002	0.011
	Maximum	0.893	0.992	0.998

Notes. Statistics are weighted to yield national probability estimates; Percentages may not sum to 100 due to rounding; Q1 = first quartile; Q3 = third quartile; Letters indicate significant differences in means at the .05 level with Bonferroni correction across sexual identity groups:

^a = 100% straight,

^b = Mostly straight,

^c = Bisexual,

^d = Mostly homosexual,

^e = 100% homosexual