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Life Satisfaction Across Adulthood in Bisexual Men and Women: Findings from the Midlife in the United States (MIDUS) Study

Britney M. Wardecker[1] · Jes L. Matsick[2,3] · Jennifer E. Graham-Engeland[1,4] · David M. Almeida[1,5]

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Abstract The number of lesbian, gay, and bisexual (LGB) adults aged 50 and older is projected to reach 5 million in the U.S. by 2030 (Fredriksen-Goldsen, Kim, Shiu, Goldsen, & Emlet, 2015). Older bisexuals experience more negative mental and physical health outcomes when compared to both heterosexuals and other sexual minorities (Fredriksen-Goldsen, Shiu, Bryan, Goldsen, & Kim, 2017). As bisexuals are the numeric majority of sexual minorities in the U.S. (Herbenick et al., 2010), bisexual aging processes are critical to understand if researchers wish to reduce sexual minority health disparities and promote healthy aging. In the current study, we use a national probability sample of adults from the Midlife in the United States (MIDUS) study to assess life satisfaction across an 18-year period. We aimed to identify whether life satisfaction—an indicator of psychological health and well-being—is similar for same-age bisexual, lesbian and gay, and heterosexual midlife individuals, and whether sexual orientation predicts change in life satisfaction across adulthood. Further, we tested whether life satisfaction among bisexuals changes at the same rate and in the same pattern as for lesbian, gay, and heterosexual individuals. Overall, we found a linear pattern of increase in life satisfaction across adulthood. However, when we accounted for sexual orientation, a different pattern emerged for bisexuals. Whereas heterosexuals and lesbian and gay individuals experienced increases in life satisfaction across adulthood, bisexuals' life satisfaction did not increase over this period. Implications for bisexual health and well-being are discussed.

Keywords Bisexual · Life satisfaction · Older adults · Midlife · LGB aging · Sexual orientation

Introduction

Research on sexual minority health during middle and later adulthood is scant, yet the number of lesbian, gay, and bisexual (LGB) adults aged 50 and older is projected to reach 5 million in the U.S. by 2030 (Fredriksen-Goldsen et al., 2015). LGB adults share similar aging concerns as their heterosexual counterparts and also experience unique challenges related to stigma and discrimination that may contribute to the aging process (Hatzenbuehler, 2009; Kimmel, 2014; Meyer, 2003; Orel, 2014). Compared to heterosexual peers, LGB older adults report higher rates of loneliness and depression, and they also evidence greater rates of cardiovascular disease and weakened immune systems, among other health disparities (for a review, see Choi & Meyer, 2016; Emlet, 2016). Further, there is increasing evidence that older bisexuals experience significantly poorer health when compared not only to heterosexuals, but also to other sexual minorities (Fredriksen-Goldsen et al., 2017). Many of the health disparities experienced by LGB individuals are preventable or

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✉ Britney M. Wardecker
bmw5006@psu.edu

1 Center for Healthy Aging, The Pennsylvania State University, University Park, PA 16802, USA

2 Department of Psychology, The Pennsylvania State University, University Park, PA, USA

3 Department of Women's, Gender, and Sexuality Studies, The Pennsylvania State University, University Park, PA, USA

4 Department of Biobehavioral Health, The Pennsylvania State University, University Park, PA, USA

5 Department of Human Development and Family Studies, The Pennsylvania State University, University Park, PA, USA

modifiable. If overlooked, however, they will contribute to a substantial rise in healthcare costs as LGB individuals age (Institute of Medicine, 2011; U.S. Department of Health and Human Services, 2012).

In this article, we investigate patterns of change across 18 years in self-reported life satisfaction by sexual orientation. Specifically, we examine how bisexual individuals compare to their lesbian, gay, and heterosexual counterparts in terms of life satisfaction across the adult life span. Life satisfaction is a key indicator of an individual's overall mental and physical health and is typically defined as a global evaluation of one's past, present, or future well-being (Diener, 1984; Diener et al., 2017; Shin & Johnson, 1978). People's assessments of life satisfaction draw on, for example, past experiences, personal values, and comparisons with others (Diener, Suh, Lucas, & Smith, 1999). Recent studies have linked life satisfaction to several specific measures of health; for example, cross-sectional studies have found that greater life satisfaction is associated with better health behaviors (e.g., more physical exercise; Grant, Wardle, & Steptoe, 2009) and better physical health (Pressman & Cohen, 2005; Salovey, Rothman, Detweiler, & Steward, 2000). Longitudinal studies similarly demonstrate that greater life satisfaction predicts better long-term physical health (Rauma et al., 2014; Siahpush, Spittal, & Singh, 2008), fewer disabilities (Collins, Goldman, & Rodriguez, 2008; Koivumaa-Honkanen et al., 2004), and reduced risk of mortality (Chida & Steptoe, 2008; Xu & Roberts, 2010). Particularly relevant to examining health and well-being across the life span, there is evidence to suggest that individual's perceived life satisfaction may be tied to their age.

In general, older adults in the U.S. have greater life satisfaction than younger adults, and some research shows that life satisfaction remains stable or unchanged throughout middle adulthood (from 30's through 40's) and then increases thereafter (from 40's through 60's; Lachman, Teshale, & Agrigoroaei, 2015). It is unclear, however, how life satisfaction unfolds with age among sexual minorities—a group of individuals who experience high levels of stress and maltreatment throughout their life span. The primary goals of the current research were to identify whether life satisfaction in adulthood is similar for same-age bisexual, lesbian and gay, and heterosexual individuals, and whether sexual orientation predicts change in life satisfaction across adulthood. Further, we tested whether life satisfaction among bisexuals changes at the same rate and in the same pattern as it does for lesbian, gay, and heterosexual individuals across adulthood.

Life Satisfaction and Subjective Well-Being Across Adulthood

Life satisfaction is a central component of subjective well-being and an indicator of people's overall evaluation of the conditions of their lives (Diener et al., 2017). When asked to evaluate their satisfaction with life, people tend to draw on the quality of immediate factors in their lives such as their health, financial security, close relationships, and work conditions (DeNeve, Diener, Tay, & Xuereb, 2013; Kahneman & Deaton, 2010; Schimmack & Oishi, 2005). Unsurprisingly, there are many benefits associated with greater life satisfaction and subjective well-being (for reviews, see DeNeve et al., 2013; Diener, Kanazawa, Suh, & Oishi, 2015). People with greater subjective well-being compared to those with lower subjective well-being tend to have more supportive relationships, to live longer, and to have evidence of a stronger immune system and cardiovascular function (Diener & Seligman, 2002; Lyubomirsky, King, & Diener, 2005; Pressman & Cohen, 2005). In fact, life satisfaction may even relate to health at the day-to-day level. Smyth, Zawadzki, Juth, and Sciamanna (2017) found that individuals with higher (vs lower) levels of life satisfaction experienced better daily indicators of well-being, such as less stress and better momentary affect; this same study controlled for physical limitations, suggesting that life satisfaction has important implications for well-being in everyday life above and beyond physical problems. Put simply, life satisfaction and well-being are tightly intertwined.

Recent research suggests that life satisfaction changes in significant ways across the adult life span. Cross-sectional studies have found mean differences in subjective well-being between age groups. Compared to younger adults, older adults in the U.S. report significantly greater life satisfaction (Hamarat et al., 2001; Prenda & Lachman, 2001), happiness (Thomas et al., 2016), meaning in life (Steger, Oishi, & Kashdan, 2009), and lower negative affect (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Mroczek & Almeida, 2004). Despite declines in physical health, the idea that we become happier as we age has been dubbed the "paradox of aging" (Thomas et al., 2016). A number of explanations have been given for this observation. For example, older adults are more aware of their mortality; thus, they may invest more time in meaningful goals and activities (Charles & Carstensen, 2010). Older adults are also often better equipped to regulate emotional material after a lifetime of learning effective strategies. Finally, it is possible that those who live longer may tend to be healthier and therefore happier (see Charles & Carstensen, 2009, 2010). Each of these reasons could play a role in eventual increases in psychological well-being as people age.

There is also growing evidence that subjective well-being follows a curvilinear shape across the adult life span. Specifically, both women and men in the U.S. report somewhat stable levels of life satisfaction and happiness throughout middle adulthood, with increases in life satisfaction from middle to older adulthood (Lachman et al., 2015). The stability of life satisfaction in midlife has been attributed to midlife being a time replete with positive *and* negative experiences.

Midlife is filled with the demands of balancing work, family, and children; but also, it is a time of peak-earning potential, self-confidence, and community involvement (Aldwin & Levenson, 2001; Finke, Huston, & Sharpe, 2006; Mroczek & Almeida, 2004). Despite some inconsistences, research overall suggests that life gets better emotionally with time. However, less is known about these psychological processes of aging among subpopulations and minority groups who may have less fortunate and privileged life circumstances. We were particularly interested in whether sexual minorities' life satisfaction increased with age as has been documented in previous aging literature (e.g., Lachman et al., 2015).

Bisexual Older Adults' Health and Well-Being

The minority stress model theorizes that adverse health outcomes in sexual minorities are predicted by increased exposure to environmental and lifetime stressors, discrimination, and victimization (Meyer, 2003). These experiences accrue over time and have been tied to negative health outcomes, especially among older LGB adults (Fredriksen-Goldsen et al., 2015; Grossman, D'Augelli, & O'Connell, 2001). Stressors include both major and minor events, such as being denied a job or promotion, managing disclosure of a stigmatized identity, and expectations of social rejection. Disparities in health between older sexual minorities and heterosexual peers are considerable: Sexual minorities report higher rates of physical limitations, immune dysfunction, and mental distress compared to their heterosexual counterparts (Cochran, Sullivan, & Mays, 2003; Fredriksen-Goldsen, Kim, Barkan, Muraco, & Hoy-Ellis, 2013; Mays & Cochran, 2001). Reporting an LGB identity has also been associated with lower eudaimonic well-being scores, including purpose in life, self-acceptance, and environmental mastery (Riggle, Rostosky, & Danner, 2009). Moreover, a higher proportion of older LGB adults tend to be single, to live alone, and to be childless compared to older heterosexuals (de Vries, 2009; Wallace, Cochran, Durazo, & Ford, 2011). In one study, more than half of LGB elders reported feelings of loneliness and isolation from others (Fredriksen-Goldsen et al., 2011). In this same study, bisexual women and men reported more loneliness on average than lesbian and gay older adults.

Along these lines, bisexuals appear to face the greatest mental and physical health disparities within the LGB community as a whole, and this pattern replicates in older bisexual adults (Bostwick, Hughes, & Everett, 2015; Fredriksen-Goldsen, Kim, Barkan, Balsam, & Mincer, 2010; Fredriksen-Goldsen et al., 2017; Gonzales, Przedworski, & Henning-Smith, 2016). For instance, in one study, bisexual adults reported a higher propensity for smoking and alcohol use, compared to straight and gay counterparts (Gorman, Denney, Dowdy, & Medeiros, 2015). Using data from a national population-based study in the U.S., Bostwick, Boyd, Hughes, and McCabe (2010) found that men and women who identified as bisexual or engaged in bisexual behavior were at heightened risk compared with gay and straight peers for mood and anxiety disorders both over the past year and over the course of a lifetime. By midlife, bisexual adults also report a decrease in contact with the bisexual community and subculture (Weinberg, Williams, & Pryor, 2001). Thus, bisexuals may find themselves in a particularly vulnerable position for health as they not only are faced with the psychological stress of being a sexual minority, but also likely encounter greater health issues.

The Present Study

The findings reviewed above highlight the need for researchers to identify bisexuals as a distinct group with their own health issues and concerns within sexual minority samples rather than collapsing all sexual minority individuals into a single and homogenous entity. Despite cross-sectional designs that have provided valuable information on the lived experiences and challenges of bisexuals, it remains unclear how life satisfaction changes in the same individuals across time and by sexual orientation. Age-related changes can be described as changes that happen to everyone as they age (Baltes, Reese, & Nesselroade, 1977; Forbes, Eaton, & Krueger, 2017). In the current study, we hypothesized age-related changes in life satisfaction over time but also that bisexuals will experience lower life satisfaction on average—and less rapid inclines in life satisfaction across adulthood—than their lesbian, gay, and heterosexual peers. We examined these questions in the Midlife in the United States (MIDUS) study. MIDUS is a national probability sample and includes three waves of longitudinal data collected over a span of 18 years (1995–2014), which afforded us with the ability to examine bisexuals' change in life satisfaction over time and in comparison with heterosexuals and other sexual minorities.

Using MIDUS data, we tested linear and curvilinear trends in life satisfaction that have been documented in other studies of adult samples in the U.S. (e.g., Lachman et al., 2015). We examined whether sexual orientation predicted variability in age-related change in life satisfaction when accounting for covariates (e.g., gender, education). To test whether bisexual individuals experienced similar trends in life satisfaction as their heterosexual, lesbian, and gay counterparts in adulthood, we performed four steps of analyses. In Steps 1 and 2, we examined age-related changes in life satisfaction over time and we accounted for sociodemographic characteristics (i.e., gender, race, education, and marital status) that have been shown to influence age-satisfaction trajectories. Next, we tested whether sexual orientation predicted reports of average life satisfaction and, finally, we investigated whether

changes in life satisfaction over 18 years varied by sexual orientation.

Method

Subjects

Data were from the Midlife in the United States (MIDUS) study (Brim, Ryff, & Kessler, 2004). MIDUS was first sponsored by the MacArthur Midlife Research Network and later funded by the National Institute on Aging. Details important to the interpretation of the present study are below, and additional information about MIDUS is provided in other documents (see Brim et al., 2007; Radler, 2014; Ryff et al., 2012, 2017). MIDUS is a national probability sample of non-institutionalized, English-speaking adults recruited through nationwide random digit dialing. The MIDUS project was designed to investigate factors associated with age-related differences and changes in health and well-being across the adult life span. There are three waves of data in MIDUS (MIDUS-I, MIDUS-II, and MIDUS-III), and each wave is separated by approximately 9 years.

A total of 7108 participants were interviewed first in 1995–1996 (MIDUS-I: age range 20–75 years, $M = 46.40$, $SD = 13.00$; 51.1% female). Of the initial participants, 4963 were followed up a second time in 2004–2006 (MIDUS-II: retention rate = 69.8%; age range 28–84 years, $M = 55.40$, $SD = 12.45$; 53.3% female), and 3294 for a third time in 2013–2014 (MIDUS-III: retention rate = 46.3%; age range 39–93 years, $M = 63.60$, $SD = 11.35$; 54.9% female). Data were collected at each wave via a computer-assisted personal interview protocol and subsequent self-administered questionnaires sent through the mail. These self-administered, mail-back questionnaires were the focus of the present study. Data collection for the MIDUS studies were approved by Institutional Review Boards at each participating site, and all participants provided informed consent. Monetary incentives were used to maximize participation in all three phases of data collection.

Participants were part of the present study if they reported both their sexual orientation and life satisfaction at least once across the three waves of data. These criteria were met by a final sample of 6304 participants (88.7% of the full MIDUS sample). People who did not provide data on their sexual orientation and/or life satisfaction ($n = 804$) tended to be slightly younger at the start of the study ($M_{\text{MIDUS-I}}$ [SD] = 43.75 [13.96]), $t(7047) = -5.85$, $p < .001$, and included a larger percentage of men, $\chi^2(1, N = 7058) = 8.96$, $p = .003$, compared to those who reported on these primary variables of interest. All 6304 participants at MIDUS-I reported their age and gender, and 96.6% had no missing data that was relevant to the primary analyses. Of these 6304 participants, 4742 (75.2%) were recontacted and subsequently took part in the second wave of MIDUS (MIDUS-II), with 84.6% reporting all primary variables of interest. Of these 4742 participants, 3230 (68.1%) people completed the third wave (MIDUS-III) and 84.3% had no missing data. Rates of attrition and missing data in the present sample are comparable to (and even lower than) the full MIDUS sample in which 7108, 4963 (69.8%), and 3294 (66.4%) people completed MIDUS-I, II, and III, respectively (see Radler & Ryff, 2010 for information on MIDUS retention). Participants' sexual orientation was identified and coded as heterosexual ($n = 6108$), lesbian or gay ($n = 112$), and bisexual ($n = 84$), and ages ranged from 20 to 75 (MIDUS-I), 30 to 84 (MIDUS-II), and 39 to 93 (MIDUS-III). Descriptive statistics for participants in the current study are presented in Table 1.

Measures

Sexual Orientation

A single item measured sexual orientation at each wave: "How would you describe your sexual orientation? Would you say you are heterosexual (sexually attracted only to the opposite sex), homosexual (sexually attracted only to your own sex), or bisexual (sexually attracted to both men and women)?" Although a handful of studies have explored sexual orientation in the MIDUS sample (i.e., Cochran et al., 2003; Corliss, Cochran, & Mays, 2002; Mays & Cochran, 2001; Riggle et al., 2009) and results from these studies have provided compelling evidence for relationships between LGB status and health within the MIDUS dataset, most were published prior to the collection of MIDUS-II and III, and therefore these studies included only a single wave of participants' sexual orientation (reports were from MIDUS-I in 1995). More than one report of sexual identity paints a more comprehensive picture of sexual orientation across the adult life span. Mock and Eibach (2012) found that approximately 2% of men and women identified their sexual identity differently 9 years later, from MIDUS-I to MIDUS-II (see also Diamond & Rosky, 2016, for sexual orientation stability and change in MIDUS). We created two different coding schemes (described below) to examine whether sexual orientation predicted life satisfaction; although both coding procedures yielded a similar pattern and direction of results, both are presented given that this study is the first to examine the role of sexual orientation across three MIDUS waves of data collection.

First, we coded participants' sexual orientation using the last instance they reported their identity (Coding Scheme A). For example, if a woman identified as heterosexual at MIDUS-I and then as lesbian at MIDUS-II and III, she was coded as lesbian or gay via this coding method. Using this

Table 1 Sample descriptive statistics (by sexual orientation) presented by MIDUS wave: Mean (standard deviation) or *N* (valid %) (coding scheme A)

	MIDUS-I (1995–1996) ($n = 6304$)				MIDUS-II (2004–2006) ($n = 4742$)				MIDUS-III (2013–2014) ($n = 3230$)			
	Heterosexual	Lesbian/Gay	Bisexual	Total	Heterosexual	Lesbian/Gay	Bisexual	Total	Heterosexual	Lesbian/Gay	Bisexual	Total
ns	6108 (96.9%)	112 (1.8%)	84 (1.3%)	6304 (100%)	4595 (96.9%)	79 (1.7%)	68 (1.4%)	4742 (100%)	3132 (97.0%)	59 (1.8%)	39 (1.2%)	3230 (100%)
Age (in years)	46.77 (12.85)	42.49 (12.12)	47.08 (13.50)	46.70 (12.85)	55.59 (12.37)	52.62 (12.11)	56.87 (13.16)	55.56 (12.38)	63.74 (11.31)	59.86 (10.68)	63.74 (11.78)	63.67 (11.32)
Gender												
Female	3206 (52.5%)	49 (43.8%)	43 (51.2%)	3298 (52.3%)	2471 (53.8%)	32 (40.5%)	38 (55.9%)	2541 (53.6%)	1742 (55.6%)	21 (35.6%)	20 (51.3%)	1783 (55.2%)
Male	2902 (47.5%)	63 (56.3%)	41 (48.8%)	3006 (47.7%)	2124 (46.2%)	47 (59.5%)	30 (44.1%)	2201 (46.4%)	1390 (44.4%)	38 (64.4%)	19 (48.7%)	1447 (44.8%)
Race/ethnicity												
White	5352 (90.7%)	104 (93.7%)	74 (90.2%)	5530 (90.8%)	4106 (93.0%)	75 (96.2%)	61 (92.4%)	4242 (93.0%)	2833 (93.7%)	55 (94.8%)	35 (92.1%)	2923 (93.7%)
non-White	546 (9.3%)	7 (6.3%)	8 (9.8%)	561 (9.2%)	309 (7.0%)	3 (3.8%)	5 (7.6%)	317 (7.0%)	191 (6.3%)	3 (5.2%)	3 (7.9%)	197 (6.3%)
Education												
Some college or more	3826 (62.8%)	76 (67.9%)	54 (64.3%)	3956 (62.9%)	2999 (65.4%)	59 (74.7%)	45 (66.2%)	3103 (65.5%)	2163 (69.1%)	45 (76.3%)	29 (74.4%)	2237 (69.3%)
High school or less	2270 (37.2%)	36 (32.1%)	30 (35.7%)	2336 (37.1%)	1588 (34.6%)	20 (25.3%)	23 (33.8%)	1631 (34.5%)	965 (30.9%)	14 (23.7%)	10 (25.6%)	989 (30.7%)
Marital Status												
Married	4209 (68.9%)	24 (21.4%)	31 (36.9%)	4264 (67.7%)	3330 (72.5%)	16 (20.8%)	24 (36.4%)	3370 (71.2%)	2146 (68.6%)	12 (20.3%)	17 (43.6%)	2175 (67.4%)
Not married	1897 (31.1%)	88 (78.6%)	53 (63.1%)	2038 (32.3%)	1262 (27.5%)	61 (79.2%)	42 (63.6%)	1365 (28.8%)	982 (31.4%)	47 (79.7%)	22 (56.4%)	1051 (32.6%)
Life Satisfaction (0–10)	7.72 (1.29)^{a}	7.30 (1.37)^{b}	7.33 (1.65)^{b}	7.71 (1.29)	7.77 (1.23)^{a}	7.53 (1.47)$^{a, b}$	7.35 (1.54)^{b}	7.76 (1.24)	7.83 (1.28)^{a}	7.34 (1.80)^{b}	6.71 (1.75)^{b}	7.80 (1.31)

Table reflects coding scheme in which participants are coded as lesbian, gay, or bisexual if they identified as lesbian, gay, or bisexual at the last wave that participants reported their sexual orientation. Subscripts indicate instances in which *a* differs from *b* within each MIDUS wave at $p < .01$ with a Bonferroni correction in post hoc analyses. Greater scores indicate greater levels of life satisfaction

method, participants were coded as heterosexual ($n = 6108$), lesbian or gay ($n = 112$), and bisexual ($n = 84$; see Table 1 for details on this classification). Using a second method, we categorized participants as a sexual minority if they endorsed a lesbian, gay, or bisexual identity at least once across the three waves (Coding Scheme B). For example, if a woman identified as lesbian at MIDUS-I, lesbian at MIDUS-II, and heterosexual at MIDUS-III, we categorized her as lesbian or gay in the current analyses. This categorization resulted in a larger number of sexual minorities: heterosexual ($n = 6067$), lesbian or gay ($n = 129$), and bisexual ($n = 108$; see Supplementary Table 1 for details on this classification). Primary analyses use the first coding system, but we report the analyses of the second coding system in supplementary materials. We coded sexual orientation as [2] heterosexual, [1] lesbian or gay, and [0] bisexual because SPSS identifies the highest coded value as the reference group, and we intended for heterosexuals to be our reference category.

Age

Participants reported their age at each wave. We specified age as a continuous, time-varying predictor to estimate the functional relationship of age with life satisfaction. Age was centered at 46.70 years, the mean of all 6304 participants in the first wave of data collection (MIDUS-I). Centering age in this manner allows the intercept to be interpreted as the estimated initial status (i.e., the expected value of life satisfaction when age in years = 46.70). Each regression coefficient can be interpreted as the effect of a 1-year age difference. Wave was coded as [2] (MIDUS-I: 1995–1996), [1] (MIDUS-II: 2004–2006), and [0] (MIDUS-III: 2013–2014), and these codes were used to designate each wave as a repeated measurement.

Covariates

Sociodemographic factors were selected as covariates based on their potential for confounding the association between our primary variables of interest. Gender, race/ethnicity, education, and marital status represent important individual differences to consider with respect to aging and sexual orientation (e.g., Knies, Nandi, & Platt, 2016; Stutzer & Frey, 2006). Participants reported their gender at each wave (coded as [1] female, [0] male), and we treated gender as time-invariant (constant) because no participants reported a change in gender across the three waves. Race/ethnicity was also treated as constant and coded as [1] White or [0] not White (reports were from MIDUS-I). Education and marital status were analyzed as time-dependent covariates because some participants bettered their education and/or had a change in marital status over the 18-year study period. Education was coded as [1] graduated high school or less or [0] attended some college or more, and marital status as [1] married or [0] not married to designate high school or less and married as reference groups, respectively. These variables have been dichotomized similarly in previous studies that have analyzed MIDUS data (e.g., Forbes et al., 2017; Riggle et al., 2009).

Life Satisfaction

Life satisfaction was assessed using a five-item measure in which participants were asked to rate five dimensions of their lives on a scale from 0 (*the worst possible*) to 10 (*the best possible*): life overall, work, health, relationship with spouse/partner, and relationship with children (Prenda & Lachman, 2001). For example, participants responded to the following item for the health dimension, "Using a scale from 0 to 10 where 0 means 'the worst possible health' and 10 means 'the best possible health,' how would you rate your health these days?" Scores for relationship with spouse/partner and relationship with children are averaged to create one item. This score is used with the other three items to calculate an overall mean score of life satisfaction. Higher scores indicate greater overall life satisfaction. Life satisfaction was assessed identically at MIDUS-I, MIDUS-II, and MIDUS-III, and internal consistency across each wave has been documented as .67, .65, and .63, respectively (see Brim et al., 2007; Fleeson, 2004).

Analysis Plan

The linear mixed models (LMMs) procedure in SPSS (version 24) was used to conduct all analyses (see Hoffman, 2015; Shek & Ma, 2011; West, 2009 for more on the linear mixed models technique in SPSS). We computed growth models for change using multilevel modeling (MLM) procedures established for data analysis with repeated measures, with life satisfaction as the dependent variable (assessed identically at three MIDUS waves). MLM procedures can accommodate missing data at the within-person level and observations that are unevenly spaced; thus, this technique provides powerful and reliable estimates of changes over time (Bryk & Raudenbush, 1987; Rogosa & Willett, 1985). Using MLM procedures, we simultaneously modeled how each person's life satisfaction changed with age (within-person change) and how trends in life satisfaction differed across bisexual, lesbian or gay, and heterosexual people (between-person differences in change).

To explore the optimal predictor(s) of change in life satisfaction over time, we assessed model fit with the Bayesian information criterion (BIC): The smaller the information criterion value is, the better the model fit (as suggested by

Table 2 Estimates of fixed effects (95% confidence intervals) for the full models predicting change in life satisfaction (coding scheme A)

Parameter (reference category)	Step 1 ($n = 6304$)	Step 2 ($n = 6085$)	Step 3 ($n = 6085$)	Step 4 ($n = 6085$)
Intercept	**7.66 (7.63, 7.69)**	**7.80 (7.75, 7.86)**	**7.81 (7.76, 7.87)**	**7.81 (7.75, 7.86)**
Age (mean centered at 46.70 years)	**.008 (.007, .01)**	**.009 (.007, .01)**	**.008 (.007, .01)**	**.009 (.007, .01)**
Gender (ref: female)	–	**−.12 (−.18, −.06)**	**−.12 (−.17, −.06)**	**−.12 (−.17, −.06)**
Race/ethnicity (ref: white)	–	−.04 (−.14, .06)	−.05 (−.15, .05)	−.05 (−.15, .05)
Education (ref: graduated high school or less)	–	**.08 (.03, .14)**	**.09 (.03, .14)**	**.09 (.03, .14)**
Marital status (ref: married)	–	**−.41 (−.46, −.36)**	**−.40 (−.45, −.35)**	**−.40 (−.45, −.35)**
Sexual orientation (ref: heterosexual)				
Lesbian/Gay	–	–	−.15 (−.36, .06)	−.15 (−.36, .06)
Bisexual	–	–	**−.41 (−.66, −.17)**	**−.34 (−.59, −.09)**
Age × sexual orientation (ref: heterosexual)				
Lesbian/Gay	–	–	–	−.003 (−.02, .01)
Bisexual	–	–	–	**−.01 (−.03, −.0001)**

Table reflects coding scheme in which participants are coded as lesbian, gay, or bisexual if they identified as lesbian, gay, or bisexual at the last wave that participants reported their sexual orientation. Estimates are in bold when the global *F*-test for the effect or the *t* test for the different levels of categorical effects was significant ($p < .05$). Greater scores indicate greater levels of life satisfaction

Forbes et al., 2017; Yang & Land, 2013). The unstructured variance–covariance structure, which estimates unique correlations for each pair of time points, fit to our data best and allowed our models to converge. We additionally fit our multilevel model for change with maximum likelihood (ML) estimation to calculate missing responses based on available data, rather than through imputation (see Raudenbush & Bryk, 2002). All analyses built on the first step, and we used *F*-tests and/or *t*-tests as appropriate to evaluate the significance of the fixed effects in our models.

To control for dependency in the observations, we specified in the repeated command of each model that measurements over the three waves of data were from the same individual. We included a random intercept (i.e., our heterosexual, lesbian/gay, and bisexual groups might each have different baselines defining their life satisfaction trajectories) and a random effect for age, which allowed each groups' life satisfaction slopes to vary by age. Life satisfaction was the dependent variable for all steps of analyses. Sexual orientation, race, and gender were held constant (fixed), and education and marital status were analyzed as time-dependent. We also tested whether patterns of life satisfaction were linear or curvilinear over time.

Results

To test whether bisexual individuals experienced similar age-related trends in life satisfaction as their heterosexual, lesbian, and gay counterparts during adulthood, we performed four steps of analyses.

Age-Related Predictors of Change in Life Satisfaction Across Adulthood

First, we examined whether age accounted for change in people's life satisfaction across adulthood (see Table 2, Step 1). Age was positively related to life satisfaction, such that life satisfaction increases throughout adulthood, $F(1, 8925.98) = 98.80$, $p < .001$. We also tested a quadratic age variable to assess whether life satisfaction changed in a curvilinear fashion over time, but this effect was not significant, $F(1, 7435.71) = 1.12$, $p = .290$. Additional computations supported linear changes in life satisfaction as the model that best described our data, as opposed to curvilinear. The BICs for the linear age model versus the quadratic age model were 40497.17 and 40505.57, respectively; thus, we computed whether the decrease in −2 Log Likelihood (−2LL) between these two models was significant ($\chi^2_{\text{change}} = 40393.04 - 40391.97 = 1.07$; $df_{\text{change}} = 12 - 11 = 1$). The critical value for the chi-square statistic for $df = 1$ is 6.63 ($p < .01$); therefore, as 1.07 is less than 6.63, the addition of the quadratic term did not significantly improve the model. Thus, the quadratic term was not included in any of our models.

Sociodemographic Covariates of Age and Sexual Orientation

Second, we accounted for additional sociodemographic characteristics (i.e., gender, race, education, and marital status) to examine whether our linear age effects held above and beyond these individual differences (see Table 2, Step 2). Consistent with extant research, gender, education, and marital status each separately predicted life satisfaction, such that

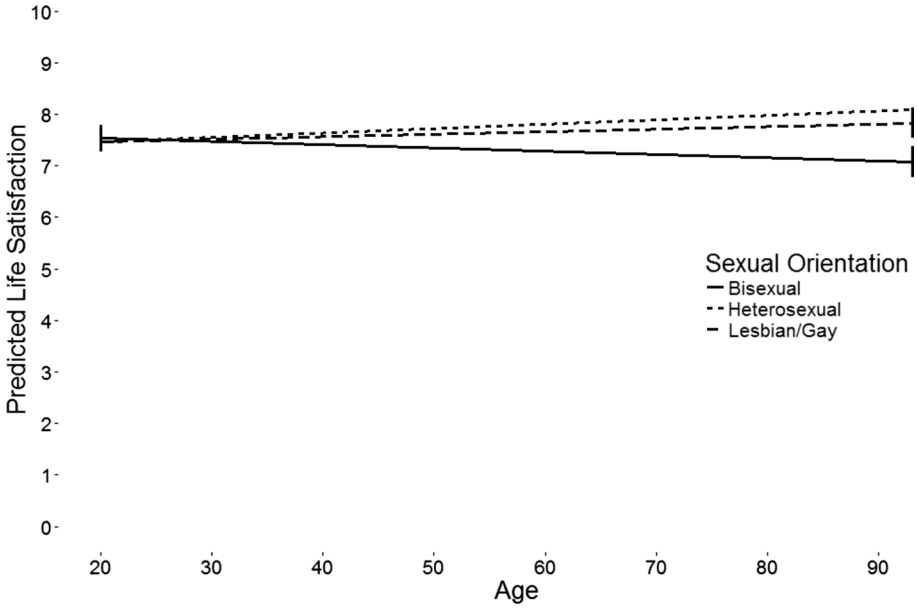

Fig. 1 Growth plot of fitted data from the final model (Step 4). Plot illustrates the interaction between sexual orientation and age in predicting life satisfaction

women had significantly greater life satisfaction than men on average, $t(5674.45) = -4.15$, $p < .001$, more educated people had greater life satisfaction on average than people with a high school diploma or less, $t(9539.44) = 3.14$, $p = .002$, and married people were more satisfied with life than nonmarried people on average, $t(12{,}115.73) = -16.21$, $p < .001$. Race/ethnicity was not a significant predictor of life satisfaction in the current study, $t(5914.81) = -0.87$, $p = .383$. The parameters in our first model remained mostly unchanged with the addition of these covariates, again suggesting that linear age was a robust predictor of change in life satisfaction in the present sample.

Life Satisfaction as a Function of Sexual Orientation

Third, we investigated whether overall reports of life satisfaction varied by sexual orientation. Sexual orientation was a significant predictor of life satisfaction, $F(2, 5312.57) = 6.61$, $p < .001$. As shown in Table 2 (Step 3), bisexuals reported significantly lower life satisfaction on average compared to their heterosexual counterparts, $t(5499.87) = -3.83$, $p = .001$; however, lesbian and gay individuals did not differ from heterosexuals in their overall reports of life satisfaction, $t(5131.74) = -1.42$, $p = .157$.[1]

[1] We adjusted our reference group to bisexuals (by recoding our sexual orientation variable as [2] bisexual, [1] lesbian or gay, and [0] heterosexual) so that we could examine whether life satisfaction differed between bisexuals and lesbian and gay individuals. Contrary to our hypothesis, lesbian and gay individuals did not differ from bisexuals in life satisfaction, $t(5488.86) = 1.64$, $p = .101$; lesbian or gay individuals' reports of life satisfaction were somewhere in between those of heterosexuals and bisexuals, but did not significantly differ from either group.

Age-Related Change in Life Satisfaction as a Function of Sexual Orientation

In the final step of our analyses, we added to our model the interaction between age and sexual orientation to test whether bisexuals, lesbian and gay individuals, and heterosexuals had different trajectories of change in life satisfaction across the adult life span. As expected, heterosexuals showed a linear increase in life satisfaction with age, $b = .009$, $t(8721.77) = 10.63$, $p < .001$ (see Fig. 1). Lesbian and gay individuals had a similar pattern in life satisfaction over time compared to heterosexuals, such that their trajectories did not significantly differ from those of heterosexuals, $b = -.003$, $t(8143.45) = -.437$, $p = .662$. However, bisexuals' patterns in life satisfaction across age differed from the pattern experienced by heterosexuals, $b = -.01$, $t(9452.97) = -1.97$, $p = .049$. These results suggest that bisexuals do not experience an increase in life satisfaction with age, as compared to their gay/lesbian and heterosexual counterparts.

Discussion

The current study used a national probability sample to investigate how bisexual people compare to their lesbian, gay, and heterosexual counterparts in terms of life satisfaction across the adult life span. We predicted age-related changes in life satisfaction over time, and that bisexuals would experience lower life satisfaction compared to their lesbian, gay, and heterosexual peers. In the overall sample, we found age-related linear patterns of change in life satisfaction across adulthood, such that life satisfaction increases with every year of age. However, as expected, compared with heterosexuals,

bisexual adults experienced significantly lower life satisfaction and differed in change trajectories of life satisfaction. Although bisexuals' life satisfaction trajectory differed from that of heterosexuals, we did not find a significant difference between bisexuals and lesbian and gay people (nor did lesbian and gay people's trajectory for life satisfaction significantly differ from that of heterosexuals), suggesting that lesbian and gay individuals' average life satisfaction and changes in life satisfaction fall somewhere in between those of heterosexual and bisexual individuals, but do not significantly differ from either group. Yet, the stark contrast in average levels and changes in life satisfaction between bisexuals and heterosexuals is alarming and deserves future attention.

Why might bisexuals have lower life satisfaction and different trajectories than heterosexual peers? The minority stress model provides clear evidence that negative experiences endured by sexual minorities contribute to health disparities between heterosexuals and bisexuals (Meyer, 2003). However, despite the large body of research that tests various aspects of the minority stress model, we know relatively less about how the minority stress model accounts for experiences and health in older adult samples. We demonstrate that older bisexual adults may be particularly vulnerable to disparities in health and well-being, perhaps because of the accumulation of stress and psychosocial disadvantages over a lifetime. Notably, the minority stress model highlights certain buffers to the disruptive ways negative life events contribute to minority-related stress and negative health outcomes. Channels of social and community support, for example, may buffer minority stress and, in turn, attenuate health disparities (Meyer, 2003). There is emerging evidence that bisexuals may be less likely to have access to such buffers and, in particular, feelings of isolation and loneliness may be relevant to older age (Fredriksen-Goldsen et al., 2017).

Although bisexuals are the largest subgroup of sexual and gender minorities (Herbenick et al., 2010), they have been termed "a minority within a minority" and report receiving "double stigma" from both lesbian/gay and heterosexual communities (McLean, 2008; Pistella, Salvati, Ioverno, Laghi, & Baiocco, 2016). This "double stigma" can begin at a very young age and persist over the life span (Hatzenbuehler & Pachankis, 2016). For example, bisexual women and men report feeling marginalized, excluded, and stigmatized both within and outside of sexual minority communities (Callis, 2013; Hartman, 2006; McLean, 2008) and older bisexuals report less social support and community belonging compared with older lesbian and gay adults (Fredriksen-Goldsen et al., 2017). Thus, though lesbian, gay, and bisexual people did not significantly differ from one another in this research, it seems reasonable that bisexuals may be less satisfied with life than their lesbian and gay counterparts given that their experiences of stigma are different, they may lack access to community-level social support relative to lesbian and gay individuals, and they may experience more health problems. Given the relatively small sample sizes of bisexuals and lesbian and gay people, it is possible that differences between bisexuals and lesbian and gay people may be uncovered with more statistical power, which would be consistent with recent research that finds psychological health disparities across LGB people broadly (Bostwick et al., 2015; Fredriksen-Goldsen et al., 2010, 2017; Gonzales et al., 2016). Moreover, we were unable to explore gender as an additional layer of sexual minority status, despite having relatively equal numbers of bisexual women and men, because our sample size was too small for testing a three-way interaction between age, LGB status, and gender.

Another worthy future direction is to evaluate the roles of social and community support networks for bisexuals in later adulthood (e.g., what kind of support do bisexuals perceive or expect to receive in older age?). Increasing channels of social support may be a significant pathway to healthy and successful aging for bisexuals by increasing life satisfaction. The minority stress model predicts that social and community-level support help to counter the negative health impacts of stress on sexual minorities (Meyer, 2003). Many lesbian and gay individuals find support and care through "families of choice" or people they choose to play a significant role in their lives even though they are not legally or biologically related (Barker, Herdt, & de Vries, 2006; Brennan-Ing, Seidel, Larson, & Karpiak, 2014; Croghan, Moone, & Olson, 2014; Grossman, D'Augelli, & Hershberger, 2000). However, some bisexuals report a lack of social and community-level support from other sexual minorities and report feeling stigmatized from both the heterosexual and lesbian/gay communities (e.g., Callis, 2013; Dworkin, 2006; McLean, 2008). This may be particularly true of older bisexuals. For example, in one study, lesbian and gay elders were more inclined to care for other elder lesbian and gay adults than they were to care for bisexual and heterosexual elders (Grossman, D'Augelli, & Dragowski, 2007). To improve life satisfaction among bisexuals, future research must consider how to improve social dynamics within broader LGB communities.

Implications and Limitations

Fortunately, subjective well-being is malleable and thus presents a possible target for intervention. Future research should consider strategies to increase life satisfaction for at-risk adults. Interventions do not need to occur solely in early life. Midlife can be an advantageous time for people to gain control of their health and set themselves on a healthier path to aging. As life satisfaction may decrease from major life events such as bereavement and unemployment (Anusic, Yap, & Lucas, 2014; Clark, Diener, Georgellis, & Lucas, 2008), life satisfaction is also susceptible to factors that may increase well-being.

Future research could additionally examine how the three facets of subjective well-being (i.e., life satisfaction, positive affect, and negative affect; Diener, 1984) vary by LGB status. In the current research, we chose to attend to patterns of life satisfaction given the little attention paid to how life satisfaction varies by sexual orientation across age, and the many implications that life satisfaction has for various aspects of well-being, such as health, financial security, close relationships, and work conditions. However, positive affect and negative affect should be explored as additional indicators of whether bisexuals depart from heterosexuals in terms of their psychological health. Further, it may be more feasible to intervene on positive affect and negative affect (e.g., interventions to improve gratitude and pride to boost positive affect; Lyubomirsky, Dickerhoof, Boehm, & Sheldon, 2011) than on life satisfaction, which may function as a broader concept that relates to past treatment as well as current status. Intervention on life satisfaction may require a more long-term process, such as through improving LGB community relations or reducing stigma toward bisexuality.

We encourage researchers to consider bisexuals as their own group with their own health concerns, stressors, and challenges. Bisexuals are frequently collapsed within the "LGB" category in research. Only about one quarter of studies that include bisexuals consider bisexual women as a distinct category separate from lesbian women (Carr, 2011). Our research adds to a growing body of literature that supports disaggregating these groups to fully understand their experiences, strengths, and risk factors. For example, if bisexuals were included in the lesbian and gay category in the present study, we may have concluded that LGB people do not differ from heterosexuals as a whole. This conclusion would have been inaccurate, as it would neglect the nuance we found in life satisfaction: Bisexuals are not experiencing an increase in life satisfaction despite what theories of life satisfaction and general aging processes might predict.

Along these lines, people's sexual orientation can and does change over time. In the current study, we were unable to treat sexual orientation as a predictor that varied with time because we did not have enough variability in within-person reports of sexual orientation across the three waves (i.e., most people did not change their reports of sexual orientation in the 18-year time frame). Moreover, we had a narrow measure of sexual orientation—one that assesses attraction, as opposed to treating sexual orientation as a complex and multifaceted construct that could include identity, desire, and behavior. A measure that was more focused on identity, for example, would likely have excluded people who experience same-gender attraction but do not identify with a bisexual, lesbian, or gay label. On the other hand, a measure that is linked to attraction (as used in the current study) may have captured people who experience attraction, but do not identify themselves as bisexual, lesbian, or gay. It is an empirical and fascinating question to consider how the properties of sexual orientation measurement may yield slightly different results given that slightly different people and experiences are represented in the samples.

Conclusion

Although the causal directionality of the life satisfaction and health connection is not well-established, it is clear that life satisfaction is a telling indicator of well-being (see Diener & Chan, 2011). Ultimately, the negative outcomes associated with lower life satisfaction are concerning for bisexuals, as life satisfaction is related to a host of negative health outcomes that we observe in bisexual people's adulthood (e.g., depression and social isolation). Health and policy advocates benefit from understanding how to best target interventions toward different older adult age groups. The current study represents one step toward understanding disparities in well-being among those who identify as bisexual. Using MIDUS and other midlife samples of LGB people, researchers can identify specific age brackets that are most vulnerable to certain health outcomes and, likewise, most susceptible to change. The current research highlights how life satisfaction does not follow a universal upward trajectory across the life span, and when used as a multifaceted proxy for psychological health, can identify disparities in people's quality of life. Again, we found that aging bisexuals in the current study did not report increases in life satisfaction that were experienced by their lesbian/gay and heterosexual counterparts. We hope that the findings of this research motivate researchers to consider sexual orientation as an integral part of the aging process.

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