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To cite this article: Miriam K. Forbes, Nicholas R. Eaton & Robert F. Krueger (2016): Sexual Quality of Life and Aging: A Prospective Study of a Nationally Representative Sample, The Journal of Sex Research, DOI: [10.1080/00224499.2016.1233315](https://doi.org/10.1080/00224499.2016.1233315)

To link to this article: <http://dx.doi.org/10.1080/00224499.2016.1233315>

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 Published online: 31 Oct 2016.

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Sexual Quality of Life and Aging: A Prospective Study of a Nationally Representative Sample

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Unlike other life domains, sexual quality of life (SQoL) has a negative relationship with age. This study disentangled the effect of age in this relationship from confounding sociocultural influences (e.g., the period of time in which data were collected, and cohort differences) and aimed to understand the roles of other sexual domains (i.e., frequency, perceived control, thought and effort invested in sex, and number of sexual partners). We analyzed data from the longitudinal Midlife in the United States study ($n = 6,278$; age range 20–93), which were collected between 1995 and 2013. Repeated measures linear mixed-effects models showed that age was the most robust time-related predictor of declining SQoL. However, after the sexual domains were included in the model, age had a positive relationship with SQoL and older adults' SQoL was differentially influenced by the quality—not quantity—of sex. When partnership characteristics were included in the model, age was no longer related to SQoL. These findings suggest that aging may be associated with the acquisition of skills and strategies that can buffer age-related declines in SQoL, particularly in the context of a positive relationship. We summarize these findings as sexual wisdom.

Introduction

A fulfilling sex life is important for well-being in adulthood, and subjectively perceived quality of the sexual aspects of life (sexual quality of life [SQoL]) has diverse associations with multiple domains of functioning in English-speaking countries. For example, low SQoL is associated with depression, predicts instability in intimate relationships, and acts as a precursor to subsequent relationship distress (Mitchell et al., 2013; Wang et al., 2015; Yeh, Lorenz, Wickrama, Conger, & Elder, 2006). In contrast, high SQoL is associated with greater relationship satisfaction, love, commitment, and relationship stability across the lifespan (Byers, 2005; Davison, Bell, LaChina, Holden, & Davis, 2009; Lindau & Gavrilova, 2010; Sprecher, 2002). While there is a comparative dearth of research on SQoL in older adulthood, some Western studies have found that older adults tend to report less sexual satisfaction than younger adults (e.g., Araujo, Mohr, & McKinlay, 2004; Field et al., 2013; Lindau & Gavrilova, 2010). Preliminary evidence also suggests a specific association for older adults between higher SQoL and

better physical health in the United States (Lindau & Gavrilova, 2010)—as well as greater life satisfaction in Israel (Woloski-Wruble, Oliel, Leefsma, & Hochner-Celnikier, 2010). However, sexuality in aging remains a largely unexplored area of research (Koh & Sewell, 2015).

In the United States, age has a positive relationship with the quality of other life domains such as marriage, work, relationships with children, and finances (e.g., Fleeson, 2004), but the opposite is true for SQoL: Cross-sectional research has found a negative relationship between age and SQoL (e.g., Balsis & Carpenter, 2004; Fleeson, 2004). This negative association is particularly pronounced for women (Balsis & Carpenter, 2004; Fleeson, 2004; Lindau & Gavrilova, 2010), which is a concern given that American women report lower SQoL than men, regardless of age (Carpenter, Nathanson, & Kim, 2009; Lindau & Gavrilova, 2010). Understanding how and why the quality of our sex lives would diverge from other life domains as we age is critical for facilitating successful aging and positive sexual experiences across the lifespan (Woloski-Wruble et al., 2010). Past research on aging and sexuality has been confounded by the sociocultural influences that are intertwined with age differences (e.g., Araujo et al., 2004). The first step toward better understanding the relationship between aging and SQoL is thus to disentangle it from these factors.

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Sociocultural influences on sexuality are important to consider in research with a focus on the effects of aging, as each generation is shaped by its sociocultural context. For example, the impact of the sexual revolution in the United States that began in the 1960s would be different for people who were adults during the sexual revolution (children during World War II; the Silent Generation), compared to people who were born after that war (i.e., Baby Boomers) or those born during—or after—the sexual revolution (i.e., Generation X). Indeed, past research found that earlier generations in North America that did not grow up with the social norms of the sexual revolution tended to have more conservative attitudes toward sex, even in midlife (e.g., Fessler & Wood, 1972). Further, the time period in which research is conducted is important, as age- and gender-related norms of sexuality change over time (e.g., Christensen & Gregg, 1970; Oliver & Hyde, 1993).

Essentially, research that aims to understand aging needs to consider three types of effects: (1) differences that characterize a generation that are independent of the process of aging (i.e., *cohort effects*); (2) changes at a particular time that affect all age groups and cohorts uniformly (i.e., *period effects*); and (3) changes that affect all cohorts as they age, independent of time period (i.e., *age effects*) (Blanchard, Bunker, & Wachs, 1977). These effects are intertwined and confound the interpretation of apparent age-related changes, particularly in cross-sectional research (Yang & Land, 2013). For example, results from a cross-sectional analysis might not be accurately interpreted as “older adults have lower SQoL” (an age effect) but rather as “adults born in the 1920s have lower SQoL compared to those born in the 1950s” (a cohort effect). It is necessary to disentangle age, period, and cohort effects to determine how much of the change in SQoL over time is actually due to aging and how much is due to something else—such as the particular period in history being analyzed or the specific cohort-related time and circumstances in which an individual aged (Segall, 2013). To separate these three effects, longitudinal data are required (Yang & Land, 2013).

In addition to determining which time-related factors drive the apparent negative relationship between age and SQoL, it is important to identify specific mechanisms that might account for between-individual differences and within-individual change in SQoL over time. The most likely explanation for age-related changes in subjective SQoL seems to be the simultaneous decline in other domains of sexuality with age. For example, population studies in the United States and the United Kingdom have found that frequency and likelihood of engaging in sexual activity currently have a negative relationship with age from midlife onward (Field et al., 2013; Lee, Nazroo, O’Connor, Blake, & Pendleton, 2016; Schick et al., 2010; Thomas, Hess, & Thurston, 2015), particularly for women (Lindau et al., 2007). Older adults in the United States have also reported putting less thought and effort into their sex lives (Balsis & Carpenter, 2004). While older adults in the United States tend to report higher levels of perceived control or mastery in many life domains, the reverse is true

for sex where older adults report lower levels of control over their sex lives than in their intimate relationships, health, work life, relationship to their children, contributions to others, or finances (Lachman & Firth, 2004). This effect is stronger for men, who tend to have lower levels of perceived control over their sex lives than women (Lachman & Firth, 2004). Taken together, extant research suggests that these sexual domains may account for the negative relationship between age and SQoL but may have different roles for men and women.

Finally, there are a variety of individual and partnership characteristics that may have a role in the relationships among age, gender, and sexuality. For example, international research over the past 20 years has found that sociodemographic characteristics—such as race (e.g., Huang et al., 2009), sexual minority status (e.g., Institute of Medicine, 2011), education (e.g., Haavio-Mannila & Kontula, 1997), marital status (e.g., Schick et al., 2010), having children (e.g., Hansson & Ahlborg, 2012), and religiosity (e.g., Iveniuk, O’Muircheartaigh, & Cagney, 2016)—are related to differences in sexual pleasure, satisfaction, and/or SQoL for men and women. Recent research from the United States specifically has found that mental and physical health mediate age-related differences in rates of sexual activity (Huang et al., 2009) and predict sexual satisfaction (Lindau et al., 2007; Schick et al., 2010; Wang et al., 2015). Partnership characteristics are also influential: Having a healthy partner is important for SQoL in older adults in particular (e.g., Kingsberg, 2002), and relationship quality is central to SQoL (Byers, 2005; Sprecher, 2002). As such, these characteristics represent covariates to consider in our research as we aim to understand the processes involved in the relationship between SQoL and aging.

The Present Study

To date, most population studies on sexuality and aging have relied on cross-sectional or repeated cross-sectional data (e.g., Field et al., 2013; Kontula & Haavio-Mannila, 2009; Lindau et al., 2007; Reece et al., 2010) and consequently have not been able to separate the effects of aging from the confounding period and cohort effects. The present study used data from the Midlife in the United States (MIDUS) study, which comprises three waves of longitudinal data from 1995 to 2014 in a nationally representative sample and includes a section that assesses sexual behavior and quality of life. MIDUS consequently offers a unique and largely unexplored opportunity to understand the complex set of interrelated factors that influence sexuality across the lifespan. The present study built on previous research and aimed to characterize the processes that influence aging and sexuality, specifically by disentangling the effects of aging, period, and cohort. Following this, we examined how age and gender intersect with other sexual domains to affect SQoL across the lifespan. Finally, we tested whether these relationships are contingent on sociodemographic and partnership characteristics. Specifically, the present study addressed six research questions (RQs) that contributed incrementally to our understanding of these relationships:

- RQ1. Are changes in SQoL over time accounted for by age, period, and/or cohort effects?
- RQ2. Do these effects vary for men and women (i.e., is gender a moderator)?
- RQ3. To what extent are the age, period, and/or cohort effects accounted for by changes in sexual domains (i.e., perceived control over the sexual aspects of life, the amount of thought and effort put into the sexual aspects of life, frequency of sex, and number of sexual partners)?
- RQ4. Does the role of these four sexual domains differ with age and/or for men and women (i.e., are age and/or gender moderators for these effects)?
- RQ5. Do the above relationships change after accounting for sociodemographic covariates of sexuality and aging (i.e., visible racial minority status, sexual minority status, level of education, living with a partner, having children, religiosity, depression, and physical health)?
- RQ6. Do the above relationships change after accounting for partnership characteristics (i.e., partner health and relationship quality)?

Method

Sample and Procedures

The MIDUS study of age-related change was initially led by the MacArthur Midlife Research Network and subsequently supported by the National Institute on Aging. The relevant contents of the study are described below, and the methods have been detailed elsewhere (Radler, 2014). Briefly, MIDUS is a longitudinal study of adult development based on a nationally representative sample of noninstitutionalized, English-speaking adults in the United States. It currently comprises three data collection waves (MIDUS-I, MIDUS-II, and MIDUS-III), each separated by 9 years on average. At MIDUS-I, beginning in 1995, 7,108 individuals participated (51.1% female; age range 20–75 years, mean = 46.4, $SD = 13.00$). MIDUS-I comprised a national random digit dialing (RDD) sample ($n = 3,487$) with an oversample in select metropolitan areas ($n = 757$); siblings of individuals from the RDD sample ($n = 950$); and a national RDD sample of twins ($n = 1,914$). The MIDUS-II sample ($n = 4,963$) included the subset of MIDUS-I participants (69.8%) who were successfully recontacted and agreed to participate an average of 9 years later (53.3% female; age range 28–84 years, mean = 55.4, $SD = 12.45$). The MIDUS-III sample ($n = 3,294$) represented the subset of participants from MIDUS-I (46.3%) who could be recontacted and agreed to participate an average of 18 years later (54.9% female; age range 39–93 years, mean = 63.6, $SD = 11.35$). The attrition in MIDUS has been analyzed in detail elsewhere (Radler & Ryff, 2010) and does not appear to fundamentally bias the representativeness of the study sample. All participants completed a 30-minute telephone interview at each wave and were asked to complete extensive self-administered questionnaires in private

and return them by mail. The present study focuses on content from these questionnaires.

Analytic sample. Participants were included in the present study if they reported on their SQoL at one or more of the waves of data collection. This resulted in a final sample of 6,278 participants (88.3% of the full sample), including 6,072 at MIDUS-I (96.0% of the participants who returned questionnaires), 3,773 at MIDUS-II (93.4% of the participants who returned questionnaires), and 2,529 at MIDUS-III (93.1% of the participants who returned questionnaires). People who returned their self-administered questionnaires but did not provide any data on their SQoL ($n = 167$; 2.3% of the full sample) tended to be older ($M_{\text{MIDUS-I}}[SD] = 56.1[14.40]$, $t(268.17) = 8.34$, $p < .0005$) and were more likely to be female ($\chi^2(1) = 30.20$, $p < .0005$, $\phi = .06$), compared to those who did report on their SQoL. At MIDUS-I, 95.7% of the included sample had no missing items for the purposes of the primary analyses in the present study (99.3% had one or zero items missing); at MIDUS-II, 92.1% of the sample had no missing items (98.7% had one or zero items missing); and at MIDUS-III, 92.4% of the sample had no missing items (99.0% had one or zero items missing). In short, the analytic sample represented nearly all of the participants that completed questionnaires at each wave, and the final data set had low levels of missing data. Descriptive statistics for the included participants at each wave are provided in Table 1.

Assessment

SQoL. SQoL was measured using a scale from “the worst possible situation” (0) to “the best possible situation” (10) on which participants rated “the sexual aspect of [their] life these days.” This item was based on Campbell, Converse, and Rodgers’ (1976) theoretical model of life quality, which assumes that people know and can accurately report on the quality of the distinct and relatively independent domains of their life (e.g., marriage, work, health). It was extended to include SQoL in MIDUS and is based on respondents’ own criteria for evaluating the quality of the sexual aspects of their life (Fleeson, 2004).

Age, period, and cohort information. Age was reported by all participants at each wave. Age in years was centered at the mean age of all included participants at MIDUS-I (46.6 years) and multiplied by 10 to calculate meaningful regression coefficients (i.e., the effect of a 10-year age difference). Period was coded as 0, 1, and 2 to represent the data collection periods of 1995–1996, 2004–2005, and 2013–2014, respectively. Cohort was coded into four historical generations based on year of birth: (1) the GI Generation included people who came of age in the Great Depression and World War II (WWII) and the veterans who fought in WWII (born 1901–1926); (2) the Silent Generation included people who were children during WWII and most of those who fought in the Korean War (born 1927–1945); (3) Baby Boomers

Table 1. Descriptive Statistics for the Sample at Each Wave of the Midlife in the United States (MIDUS) Study: Mean (Standard Deviation) or N (Valid %)

Sample Characteristic	MIDUS-I (1995–1996) (n = 6072)			MIDUS-II (2004–2005) (n = 3773)			MIDUS-III (2013–2014) (n = 2529)			Total ^b (n = 6278)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total
Gender ^a	2927 (48.2%)	3145 (51.8%)	6072 (100%)	1746 (46.3%)*	2027 (53.7%)*	3773 (100%)	1173 (46.4%)*	1356 (53.6%)*	2529 (100%)	3027 (47.5%)	2833 (52.5%)	6369 (100%)
Age	46.7 (12.77)	46.6 (12.86)	46.6 (12.81)	56.3 (12.13)*	54.8 (11.91)*	55.5 (12.04)	64.3 (10.81)	63.3 (10.85)	63.8 (10.84)	46.7 (12.76)	46.5 (12.84)	46.6 (12.79)
Birth cohort												
GI Generation (born 1901–1926)	198 (6.4%)	201 (6.8%)	399 (6.6%)	108 (6.2%)	85 (4.2%)	193 (5.1%)	27 (2.3%)	24 (1.8%)	51 (2.0%)	202 (6.7%)	210 (6.7%)	412 (6.6%)
Silent Generation (born 1927–1945)	974 (33.3%)	1086 (34.5%)	2060 (33.9%)	633 (34.3%)	696 (36.3%)	1329 (35.2%)	431 (36.7%)	468 (34.5%)	899 (35.5%)	1006 (33.4%)	1121 (34.3%)	2127 (33.9%)
Baby Boomers (1946–1964)	1472 (50.3%)	1547 (49.2%)	3019 (49.7%)	879 (50.3%)	1054 (52.0%)	1933 (51.2%)	635 (54.1%)	750 (55.3%)	1385 (54.8%)	1515 (50.3%)	1610 (49.3%)	3125 (49.8%)
Generation X (ref) (born 1965–1975)	283 (9.7%)	311 (9.9%)	594 (9.8%)	126 (7.2%)	192 (9.5%)	318 (8.4%)	80 (6.8%)	114 (8.4%)	194 (7.7%)	290 (9.6%)	324 (9.9%)	614 (9.8%)
Sexual quality of life (0–10) ^c	6.0 (2.85)*	5.5 (3.22)*	5.7 (3.05)	5.3 (2.89)*	4.9 (3.21)*	5.1 (3.07)	4.8 (2.97)*	4.3 (3.27)*	4.5 (3.14)	—	—	—
Control over sex life (0–10) ^c	6.3 (2.78)*	6.9 (3.07)*	6.7 (2.95)	5.5 (2.95)*	6.3 (3.27)*	5.9 (3.15)	5.0 (3.11)*	5.9 (3.55)*	5.5 (3.38)	—	—	—
Thought and effort into sex life (0–10) ^c	6.3 (2.53)*	5.5 (3.12)*	5.9 (2.88)	5.8 (2.70)*	4.9 (3.15)*	5.3 (2.98)	5.2 (2.86)*	4.1 (3.19)*	4.6 (3.09)	—	—	—
Frequency of sex in the past 6 months												
Not at all	397 (13.7%)*	783 (25.1%)*	1180 (19.7%)	396 (23.0%)*	652 (32.8%)*	1048 (28.3%)*	461 (39.8%)*	702 (52.2%)*	1163 (46.4%)*	—	—	—
< 1/month	336 (11.6%)*	278 (8.9%)*	614 (10.2%)	230 (13.4%)*	203 (10.2%)*	433 (11.7%)*	153 (13.2%)*	114 (8.5%)*	267 (10.7%)*	—	—	—
1/month	218 (7.5%)*	201 (6.5%)*	419 (7.0%)*	187 (10.9%)*	145 (7.3%)*	332 (9.0%)*	98 (8.5%)*	75 (5.6%)*	173 (6.9%)*	—	—	—
2–3 times/month	519 (18.0%)*	543 (17.4%)*	1062 (17.7%)*	308 (17.9%)*	322 (16.2%)*	630 (17.0%)*	192 (16.6%)*	164 (12.2%)*	356 (14.2%)*	—	—	—
1/week	628 (21.7%)*	552 (17.7%)*	1180 (19.7%)*	336 (19.5%)*	355 (17.9%)*	691 (18.6%)*	156 (13.5%)*	158 (11.7%)*	314 (12.5%)*	—	—	—
2+/week	791 (27.4%)*	759 (24.4%)*	1550 (25.8%)*	263 (15.3%)*	309 (15.6%)*	572 (15.4%)*	99 (8.5%)*	132 (9.8%)*	231 (9.2%)*	—	—	—
Number of sexual partners in the past year												
None	342 (11.8%)*	667 (21.2%)*	1009 (16.7%)*	306 (17.7%)*	531 (26.6%)*	837 (22.5%)*	396 (34.3%)*	640 (47.7%)*	1036 (41.5%)*	—	—	—
One	2277 (78.2%)*	2281 (72.6%)*	4558 (75.3%)*	1322 (76.6%)*	1403 (70.3%)*	2725 (73.3%)*	704 (60.4%)*	668 (49.8%)*	1372 (54.9%)*	—	—	—
Two or more	291 (10.0%)*	193 (6.1%)*	484 (8.0%)*	97 (5.6%)*	61 (3.1%)*	158 (4.2%)*	56 (4.8%)*	34 (2.5%)*	90 (3.6%)*	—	—	—
Visible racial minority status (White)	2645 (91.6%)*	2787 (89.8%)*	5432 (90.7%)*	1592 (95.0%)*	1817 (93.0%)*	3409 (93.9%)*	1087 (95.8%)*	1218 (93.2%)*	2305 (94.4%)*	2664 (91.6%)*	2833 (89.9%)*	5497 (90.7%)*
Sexual minority (i.e., not heterosexual)	91 (3.1%)*	77 (2.4%)*	168 (2.7%)*	58 (3.3%)*	47 (2.3%)*	105 (2.8%)*	50 (4.3%)*	25 (1.9%)*	75 (3.0%)*	98 (3.3%)*	82 (2.6%)*	180 (2.9%)*
Education (some college or higher)	1930 (66.1%)*	1875 (59.7%)*	3805 (62.8%)*	1237 (70.9%)*	1315 (65.0%)*	2648 (73.3%)*	884 (75.4%)*	929 (68.8%)*	1813 (71.9%)*	1994 (66.3%)*	1965 (60.4%)*	3959 (63.2%)*
Living with a partner/married	2293 (78.4%)*	2164 (68.9%)*	4457 (73.5%)*	1433 (82.2%)*	1467 (72.4%)*	2900 (76.9%)*	950 (81.1%)*	887 (65.5%)*	1837 (72.7%)*	2360 (78.4%)*	2178 (66.7%)*	4538 (72.3%)*
Has children	2331 (79.8%)*	2632 (83.8%)*	4963 (81.9%)*	1495 (85.6%)*	1795 (88.6%)*	3290 (87.2%)*	1003 (85.5%)*	1202 (88.6%)*	2205 (87.2%)*	2464 (81.9%)*	2800 (85.8%)*	5264 (83.9%)*
Somewhat/very religious	1900 (65.1%)*	2430 (77.7%)*	4330 (71.6%)*	1109 (63.9%)*	1517 (75.2%)*	2626 (70.0%)*	724 (61.9%)*	981 (73.4%)*	1705 (68.1%)*	1947 (64.8%)*	2477 (76.5%)*	4424 (70.9%)*
Depressed affect is present	233 (8.0%)*	417 (13.3%)*	650 (10.7%)*	83 (4.8%)*	248 (12.2%)*	331 (8.8%)*	50 (4.3%)*	131 (9.7%)*	181 (7.2%)*	229 (7.6%)*	417 (12.8%)*	646 (10.3%)*
Own physical health (0–4) ^c	2.6 (0.97)	2.5 (0.98)	2.5 (0.98)	2.6 (1.01)	2.6 (1.00)	2.6 (1.00)	2.5 (1.00)	2.4 (1.05)	2.5 (1.03)	2.5 (1.01)	2.5 (1.02)	2.5 (1.04)
Partner's physical health (0–4) ^c	2.6 (1.00)*	2.5 (1.02)*	2.6 (1.01)	2.5 (1.02)*	2.4 (1.08)*	2.5 (1.05)	2.6 (1.08)*	2.3 (1.08)*	2.4 (1.08)	2.6 (1.02)*	2.4 (1.06)*	2.5 (1.04)
Relationship quality (0–10) ^c	8.3 (1.76)*	7.9 (2.17)*	8.1 (1.98)	8.4 (1.71)*	8.0 (2.06)*	8.2 (1.90)	8.6 (1.63)*	8.2 (2.00)*	8.4 (1.83)	8.3 (1.82)*	7.9 (2.20)*	8.1 (2.02)

Note. * $p < .001$ significant difference between genders within wave.

^aPresented as a proportion of the total sample at each wave.

^bAt MIDUS-I.

^cHigher scores indicate higher levels.

included people born post-WWII (born 1946–1964); and (4) Generation X represented the generational change following the well-defined Baby Boom (born after 1964; 1965–1975 for the purposes of the present study). These cohorts represented the shared sociocultural influences that the generations experienced.

Gender. Gender was reported by all participants at each wave (coded as male [0] or female [1]). No participants reported gender transition over the three waves, so gender was treated as a constant.

Sexual domains. Participants rated four domains of sexuality at all three waves of data collection: (1) perceived control over their sex life and (2) amount of thought and effort they put into their sex life (both rated from “none” [0] to “very much” [10]); (3) average sexual frequency in the past 6 months (rated from “never or not at all” [0] to “2+ times per week” [5]); and (4) number of sexual partners in the past year (coded as 0, 1, and 2 or more). People who reported zero sexual partners in the past 12 months were also coded as zero for sexual frequency.

Sociodemographic covariates of sexuality and aging. Sociodemographic items included as covariates in analyses included self-reported race (coded as White or not White to represent visible racial minority status); sexual minority status (heterosexual, heterosexual); education (graduated high school or less, some college or more); whether they lived with a partner (yes, no); whether they had children (yes, no); religiosity (coded as not religious or religious), where a participant was coded as religious if they reported being somewhat or very religious; depressed affect (coded as present or absent), defined as feeling sad, blue, or depressed all day or most of the day every day or almost every day for 2 weeks in the past 12 months and endorsing four depression criteria; and self-rated physical health, rated on a 4-point scale from “poor” to “excellent.”

Partnership characteristics. People in relationships reported their partner’s physical health (on a 4-point scale from “poor” to “excellent”) and their marital/relationship quality (on an 11-point scale from “worst possible” to “best possible”).

Analyses

The mixed procedure in SPSS (version 22) was used to analyze the data. Repeated measures linear mixed-effects modeling was used for all six research questions, with SQoL as the dependent variable. All variables were assessed at all three waves, which allowed us to model how the dynamic effects of each variable (i.e., variable means and changes over time) predicted SQoL over time. Gender and race variables were held as constants. In the repeated component of each model, measurements across the three waves were nested within individuals, and individuals were nested

within families to account for the nonindependence of a given individual’s responses over time and for the nonindependence of sibling and twin observations. The variance-covariance structure was specified as autoregressive for all models to allow for stronger correlations between individuals’ observations that were closer together in time and weaker correlations between observations that were temporally further apart. Individuals with missing data were included in analyses, and their responses were calculated based on the available data using full information maximum likelihood estimation; there was no imputation of missing data, and participants were included in an analysis if they had at least one observation for each of the independent variables. All models included a random intercept and a random effect for age that allowed individuals’ rates of change (i.e., slopes) to vary by age. The specific models we analyzed to address the six research questions are described in more detail below. Only the fixed effects varied between the models, with each research question requiring additional effects to be added to the model.

The age, period, and cohort models in RQ1 were compared using the Bayesian information criterion (BIC; lower values represent better fit) to determine which model offered the best fit to the data (Yang & Land, 2013). Subsequent analyses (RQ2–RQ6) built on the best-fitting model from RQ1 and were adjudicated based on the strength and significance of the fixed effects in the model (i.e., using *F*-tests and *t*-tests of the estimated fixed effects) to elucidate which factors predicted changes in SQoL. A significance level of .001 was used in all analyses to account for the large sample size and multiple comparisons. For the same of brevity, we have not presented or interpreted the coefficients for the covariates (i.e., for RQ5 and RQ6), as they are not the focus of the present study. These results are available in the online supplement.

Results

RQ1. Are Changes in SQoL Over Time Accounted for by Age, Period, and/or Cohort Effects?

The observed mean levels of SQoL over time show evidence for age effects in particular, as well as likely period or cohort effects. Figure 1 illustrates the trends in the observed means in three ways: (1) examining change within age groups over time, showing a decline in SQoL across all age groups; (2) comparing the age distributions of SQoL at the three periods of assessment, showing possible declines in mean SQoL with each period of assessment; and (3) comparing age-matched groups at the three periods of assessment, highlighting that the effect of age was similar within each period of assessment.

To assess whether age, period, and cohort effects were required in a model to explain changes in SQoL over time, we followed the recommendations of Yang and Land (2013)

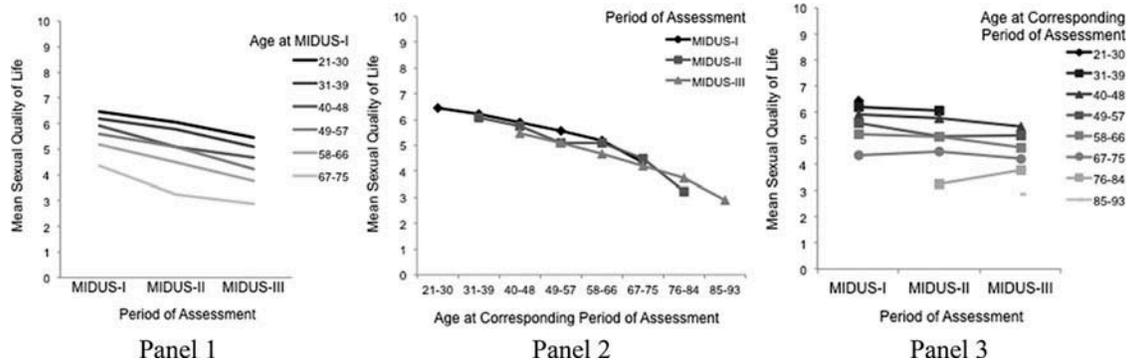


Figure 1. Illustration of the age, period, and cohort trends in the observed means of sexual quality of life (SQoL). Panel 1 shows change within age groups over time, based on the age of participants at the first wave of data collection; panel 2 compares the age distributions of mean SQoL at the three periods of assessment; and panel 3 compares age-matched groups at the three periods of assessment (e.g., the reported SQoL for participants aged 67–75 in 1995, compared to those aged 67–75 in 2004 and those aged 67–75 in 2013). Age brackets are 9 years wide to allow for the visualization of period and cohort effects, given that the waves of data collection were 9 years apart: MIDUS-I was conducted in 1995–1996, MIDUS-II was conducted in 2004–2005, and MIDUS-III was conducted in 2013–2014. MIDUS = Midlife in the United States.

Table 2. Bayesian Information Criterion (BIC) Values for the Age, Period, Cohort Models ($n = 6,278$)

Fixed effects included in the model	–2LL	k	BIC
Age	61018.42	6	61074.96
Period	61302.25	7	61368.21
Cohort	61494.92	8	61570.30
Age and period	60982.04	8	61057.43
Age and cohort	60975.72	9	61060.53
Period and cohort	61025.12	10	61119.36
Age, period, and cohort	60964.55	11	61068.21

Note. –2LL = –2 times the log-likelihood; k = number of parameters estimated in the model. The optimal model is shown in bold.

to determine the best combination of these effects as predictors for changes in SQoL. We first tested a model for each effect individually, then for the effects in pairs, then with all three effects included in a single model (see Table 2). We selected the optimal model by BIC, which included age and period effects. In this model, age had a negative relationship with SQoL, where a 10-year difference in age was associated with a 5.0% decline in SQoL ($F(1, 4965.22) = 334.58, p < .001$). Period was also a significant predictor of SQoL ($F(2, 7257.49) = 18.36, p < .001$), where MIDUS-II and MIDUS-III had lower levels of SQoL than MIDUS-I.

To understand the nature of these age and period effects, we tested a quadratic growth variable in this model to allow for nonlinear change in SQoL over time (cf. Araujo et al., 2004), but this effect was not significant, which suggested that the change in SQoL was linear. We also tested whether age moderated the rate of change between the periods in the model, finding significant moderation ($F(2, 6584.08) = 9.68, p < .001$) and showing that the estimated marginal means of SQoL for older adults had a faster rate of decline over time, compared to those of younger adults (see Figure 2). Including the age by period moderation effect in the model did not

affect model fit (BIC = 61057.05 vs. 61057.43) but aided substantive interpretation, so we retained it in the model for RQ1 (see Table 3).

RQ2. Do the Age/Period/Cohort Effects Vary for Men and Women?

To determine whether the effects observed in RQ1 varied for men and women, we included gender in the model. Gender was a significant predictor of SQoL (see Table 3), where men had 5.2% higher SQoL on average compared to women. The inclusion of gender in the model did not affect the size, direction, or significance of any of the other parameters in the model. When included as a potential moderator, gender did not show a significant (i.e., at $p < .001$) interaction with age ($F(1, 4927.61) = 5.99, p = .014$) or period effects ($F(2, 7263.77) = 1.52, p = .218$), so these moderation effects were not included in subsequent models. The model including the main effect for gender is shown in Table 3.

RQ3. To What Extent Are the Age, Period, and/or Cohort Effects Accounted for by Changes in Sexual Domains?

To address RQ3, we added four sexual domains as predictors to the model for RQ2 simultaneously: (1) perceived control over the sexual aspects of life, (2) the amount of thought and effort put into the sexual aspects of life, (3) frequency of sex, and (4) number of sexual partners. All four domains were significant predictors of SQoL (see Table 3): Higher levels of perceived control, more thought and effort, and greater frequency of sex were all associated with higher SQoL. Number of sexual partners was also a significant predictor, where people with two or more sexual partners in the past year reported lower SQoL compared to people with one sexual partner (i.e., the reference category).

Table 3. *Estimated Effects (99.9% Confidence Intervals) for Each Variable Predicting Change in Sexual Quality of Life*

Construct (Range or Reference Category)	RQ1 (n = 6278)	RQ2 (n = 6278)	RQ3 (n = 6213)	RQ4 (n = 6213)	RQ5 (n = 5934)	RQ6 (n = 4750)
Intercept	5.71 (5.58, 5.84)	5.98 (5.81, 6.15)	.06 (-.15, .27)	-.01 (-.31, .29)	-.65 (-1.05, -.26)	-1.98 (-2.49, -1.48)
Age (effect of 10 year difference)	-.44 (-.54, -.34)	-.44 (-.54, -.34)	.14 (.08, .21)	.37 (.22, .52)	.34 (.19, .50)	.03 (-.12, .18)
Period (ref: MIDUS-I [1995–1996])						
MIDUS-II (2004–2005)	-.17 (-.37, .02)	-.16 (-.35, .03)	-.06 (-.19, .07)	-.03 (-.16, .11)	-.07 (-.21, .06)	-.08 (-.21, .04)
MIDUS-III (2013–2014)	-.22 (-.58, .13)	-.20 (-.56, .15)	-.12 (-.35, .12)	-.03 (-.26, .21)	-.09 (-.33, .15)	-.10 (-.34, .13)
Age*Period (ref: MIDUS-I [1995–1996])						
MIDUS-II (2004–2005)	-.15 (-.28, -.02)	-.15 (-.29, -.02)	.07 (-.03, .16)	.02 (-.08, .11)	.03 (-.07, .12)	.03 (-.07, .12)
MIDUS-III (2013–2014)	-.20 (-.38, -.02)	-.21 (-.39, -.02)	.12 (.00, .25)	.03 (-.10, .17)	.05 (-.09, .19)	.07 (-.07, .21)
Gender (ref: Men)	–	-.52 (-.74, -.31)	-.26 (-.39, -.13)	-.30 (-.67, .07)	-.26 (-.64, .11)	-.23 (-.57, .12)
Perceived control over sex life (0–10)	–	–	.34 (.32, .36)	.44 (.40, .47)	.44 (.31, .48)	.42 (.38, .45)
Thought and effort into sex life (0–10)	–	–	.29 (.26, .31)	.20 (.16, .24)	.18 (.14, .22)	.15 (.11, .19)
Frequency of sex (0–5)	–	–	.65 (.61, .70)	.66 (.59, .72)	.64 (.58, .71)	.55 (.48, .61)
Number of partners (ref: One)						
None	–	–	.06 (-.13, .24)	-.04 (-.35, .27)	.17 (-.15, .48)	.23 (-.13, .59)
Two or more	–	–	-.56 (-.80, -.32)	-.70 (-1.01, -.39)	-.44 (-.76, -.11)	-.36 (-.81, .09)
Age*Perceived control	–	–	–	-.02 (-.03, -.00)	-.02 (-.03, -.00)	.00 (-.02, .01)
Age*Thought and effort	–	–	–	.02 (.00, .04)	.02 (.00, .04)	.03 (.01, .05)
Age*Frequency of sex	–	–	–	-.07 (-.10, -.03)	-.06 (-.10, -.03)	-.06 (-.09, -.03)
Age*Number of partners (ref: One)						
None	–	–	–	-.09 (-.23, .05)	-.13 (-.27, .01)	-.13 (-.29, .03)
Two or more	–	–	–	-.11 (-.30, .08)	-.15 (-.34, .05)	-.01 (-.29, .27)
Gender*Perceived control (ref: Male)	–	–	–	-.13 (-.17, -.09)	-.14 (-.18, -.09)	-.14 (-.19, -.10)
Gender*Thought and effort (ref: Male)	–	–	–	.14 (.08, .19)	.14 (.09, .19)	.15 (.10, .20)
Gender*Frequency of sex (ref: Male)	–	–	–	.01 (-.08, .09)	.00 (-.09, .09)	.00 (-.09, .08)
Gender*Number of partners (ref: Male and One)						
None	–	–	–	.19 (-.18, .55)	.25 (-.12, .62)	.16 (-.23, .54)
Two or more	–	–	–	.21 (-.27, .69)	.18 (-.31, .67)	.58 (-.08, 1.25)

Note. Sexual quality of life (SQoL) was measured on a scale from 0 to 10, so a coefficient of .5 corresponds to a 5% change in SQoL. Significant effects ($p < .001$) are shown in bold where the Type III test of fixed effects and the estimate of the fixed effect (i.e., the global F -test for the effect and the t -test for the different levels of categorical effects) reached significance.

ref = reference category; RQ = research question.

Covariates are not shown in the model; RQ5 and RQ6 control for sociodemographic covariates of sex and aging, and RQ6 also controls for partnership variables. The full results for these models are in the online supplement.

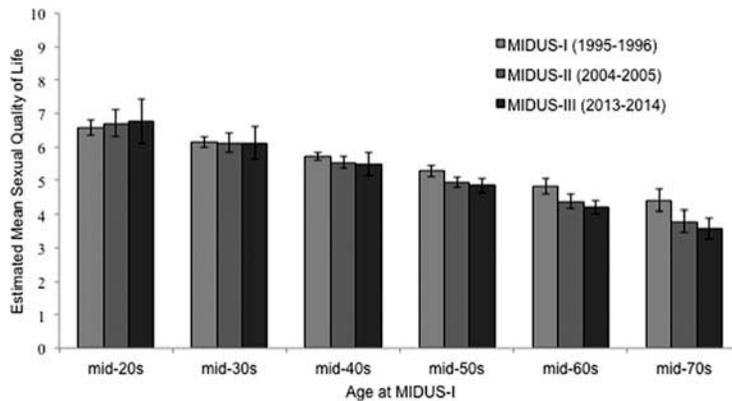


Figure 2. Estimated marginal means for sexual quality of life (SQoL) in a model with age and period effects that shows the moderating effect of age on the rate of change between periods of measurement. Older adults had a steeper decline in SQoL than younger adults. Error bars show 99.9% confidence intervals. Age at MIDUS-I is calculated in 10-year increments from the centered age variable. Exact values are mid-20s = 26.6, mid-30s = 36.6, mid-40s = 46.6, mid-50s = 56.6, mid-60s = 66.6, and mid-70s = 76.6. MIDUS = Midlife in the United States.

In contrast, people with no sexual partners did not report significantly different SQoL compared to people with one sexual partner.

The inclusion of the four sexual domains resulted in a number of changes in the parameters in the model, highlighting their strong influence as predictors of SQoL. For example, the age by period moderation effect halved in magnitude, reversed direction, and became nonsignificant and the value of the constant dropped by nearly six points to become statistically equivalent to zero. The main effect of gender also became smaller but remained significant; women were predicted to have 2.6% lower SQoL than men on average. Most notably, the effect of age was moderated by the inclusion of the four sexual domains. Specifically, the effect of age reversed, so that older people had slightly *higher* ratings of SQoL (see [Figure 3](#)): A 10-year increase in age was associated with a 1.4% increase in SQoL, holding other variables constant.

RQ4. Does the Role of These Four Sexual Domains Differ With Age or Gender?

To determine whether the strength of the four sexual domains as predictors of SQoL varied by age or gender, we added these moderation effects to the RQ3 model (see [Table 3](#)). Age significantly moderated the effects of perceived control, thought and effort, and frequency of sex. Perceived control and frequency of sex became *less* strongly associated with SQoL in older adults, whereas the amount of thought and effort invested in the sexual aspects of life became *more* strongly associated with SQoL in older adults. These interactions explained small (< 1%) but statistically significant amounts of the variance in SQoL. Gender significantly moderated the effects of perceived control and thought and effort, accounting for 1.3% to 1.5% of the

variance in SQoL. That is, perceived control was more strongly associated with SQoL in men than women, and the amount of thought and effort was more strongly associated with SQoL in women than men. The inclusion of these moderation effects resulted in a stronger main effect of age. Further, the confidence interval for the main effect of gender expanded, which meant that while women were predicted to have 3.0% lower SQoL than men, this effect was no longer significant.

RQ5. Do the Above Relationships Change After Accounting for Sociodemographic Covariates of Sexuality and Aging?

We added the following covariates to the RQ4 model to determine the robustness of our predictors to their inclusion: visible racial minority status, sexual minority status, level of education, living with a partner, having children, religiosity, depression, and physical health. The inclusion of these covariates had negligible effects on the direction, strength, and significance of the parameters in RQ4 (see [Table 3](#)). The full results for the model (i.e., including the effects of the sociodemographic characteristics) are available in the online supplement.

RQ6. Do the Above Relationships Change After Accounting for Partnership Characteristics?

In order to address this final question, we narrowed the scope of the analysis to focus on the subsample of participants in relationships who reported on their partner's health and their relationship quality ($n = 4,750$). Most of the effects in the preceding models were unchanged after adding these partnership characteristics to the RQ5 model, but there were a few notable changes (see [Table 3](#)). The coefficients of

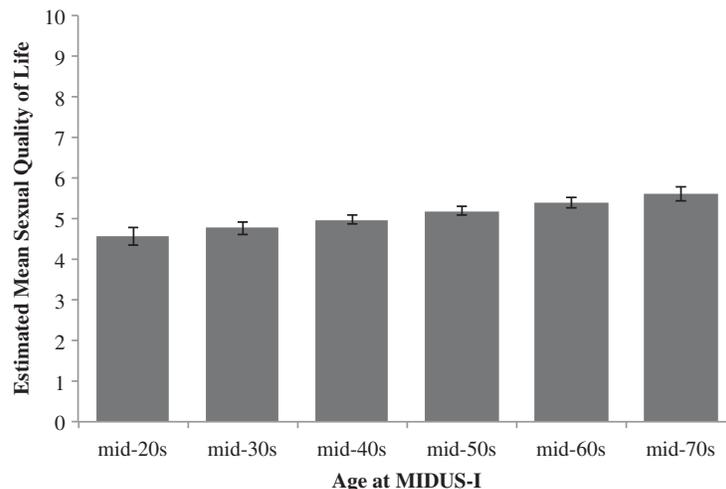


Figure 3. Estimated marginal means for sexual quality of life (SQoL) in a model controlling for period, gender, perceived control over the sexual aspects of life, thought and effort invested in the sexual aspects of life, frequency of sex, and number of sexual partners. Age has a significant positive relationship with SQoL. Error bars show 99.9% confidence intervals. Age at MIDUS-I is calculated in 10-year increments from the centered age variable. Exact values are mid-20s = 26.6, mid-30s = 36.6, mid-40s = 46.6, mid-50s = 56.6, mid-60s = 66.6, and mid-70s = 76.6. MIDUS = Midlife in the United States.

perceived control, thought and effort, and frequency of sex were slightly smaller in magnitude (.15–.55 compared to .18–.64), but remained significant; age still had a significant moderating effect on thought and effort and on frequency of sex; and gender still had a moderating effect on perceived control and thought and effort, as above. However, three parameters that were significant in RQ4 and RQ5 were no longer significant after controlling for partnership characteristics. Most notably, age was unrelated to SQoL; a 10-year age difference predicted a 0.3% change in SQoL. Further, number of sexual partners was no longer significantly related to SQoL—although the magnitude of the coefficient was similar (–.36 compared to –.44)—and age no longer had a moderating effect on the role of perceived control. The full results for the model (i.e., including the effects of the partnership characteristics and sociodemographic characteristics) are available in the online supplement.

Discussion

This study aimed to disentangle the association of aging and SQoL from the effects of sociocultural influences (i.e., period and cohort effects) by using two decades of longitudinal data from the MIDUS study. We also explored the roles of gender and four specific sexual domains in these associations and examined whether individual and partnership characteristics accounted for the relationships between these constructs across the lifespan. The findings from our six research questions are integrated below and interpreted in the context of the extant literature.

Age, Period, and Cohort Effects

Age effects. The age effect was the strongest of the three time-related effects in our models. However, the relationship between SQoL and age varied depending on the constructs that were included in the models. Initially, age had a negative relationship with SQoL, which is consistent with existing literature from the United States (Balsis & Carpenter, 2004; Fleeson, 2004): A 10-year increase in age was associated with a 5% decline in SQoL; this decline was more rapid for older adults and slower for younger adults. This effect reversed after accounting for the roles of perceived control over the sexual aspects of life, thought and effort invested in the sexual aspects of life, frequency of sex, and number of sexual partners in the past year. In the models that controlled for these sexual domains, age had a positive relationship with SQoL such that—holding the other variables constant—older adults would be predicted to have *higher* SQoL. In other words, if we compared a 40-year-old man and a 50-year-old man at MIDUS-I who had the same levels of perceived control, thought and effort, frequency of sex, and number of sexual partners, we would expect the 50-year-old to report better SQoL.

A positive relationship between age and SQoL is consistent with extant American research on the relationship

between age and other domains of quality of life, such as relationships, work, and financial matters (Fleeson, 2004); the subjective quality of these domains improves with age. Fleeson (2004) hypothesized that this is because people develop better skills and strategies over time to manage these aspects of their lives with more mastery. Correspondingly, the residual positive relationship between age and SQoL may be reflecting the benefits of life experience for sexuality as people learn more about their sexual preferences or about their partners' likes and dislikes, for example. If this were the case, we would expect these positive effects to be more likely to develop in the context of a fulfilling intimate relationship—where sexual exploration and a focus on partners' pleasure is more likely to take place (Sprecher, Cate, Harvey, & Wenzel, 2004)—and less likely to develop in a negative relationship. As such, it was fitting that the positive relationship between age and SQoL was accounted for by partnership characteristics (i.e., the quality of the relationship) in the model for RQ6. The other key finding for the association between age and SQoL was that quality—not quantity—of sexual encounters became a more important predictor of SQoL in older age: Frequency of sex became less influential with increasing age, and the amount of thought and effort invested in the sexual aspects of life became more influential (cf. Lodge & Umberson, 2012). In short, these findings suggest that age is not just associated with declines in the sexual aspects of life but also with the acquisition of knowledge, skills, and preferences that can buffer these declines. Given that wisdom is “the quality of having experience, knowledge, and good judgment” (Oxford Dictionaries, 2016), we could summarize these age-related findings as the development of *sexual wisdom*.

Period effect. While age had the strongest time-related effect, the period effect (i.e., the effect of the time at which the data were collected) was also influential in the preliminary models where there was a trend of declining SQoL over the 18 years of the study, even after controlling for age. However, given that the period effect was not significant after the age-by-period moderation was included in the analyses—and this moderation was also subsequently accounted for by the effects of the four sexual domains—it seems that the period effect was due to the aging respondents, combined with the declines in perceived control, thought and effort, and frequency of sex between the waves (i.e., controlling for these variables rendered the period effects nonsignificant).

Cohort effect. The cohort effect did not add to the predictive power of the models for SQoL. This implies that there were no important differences in SQoL characterized by the historical birth cohorts specifically. Any differences that were present were captured by the age and period effects, which means that the generational differences were either linearly related to age or were masked by societal shifts that affected all generations equally (Yang & Land, 2013). In short, the age effect was the most robust predictor of time-related changes in SQoL.

The Role of Gender

After controlling for the age and period effects, women had poorer SQoL than men, which is consistent with past research from the United States (Carpenter et al., 2009; Lindau & Gavrilova, 2010). However, it is striking that even after accounting for the effects of perceived control, thought and effort, frequency of sex, and number of sexual partners, women still had significantly poorer SQoL than men. This gender difference may reflect differences in sexual beliefs and attitudes and the role of sexual dynamics in “traditional” heterosexual relationships, which favor men’s sexual priorities in many Western countries (e.g., Fahs, 2014; Hinchliff, Gott, & Wylie, 2012; Richters, de Visser, Rissel, & Smith, 2006; Wood, Mansfield, & Koch, 2007). If this were the case, we would expect the inclusion of religiosity (cf. traditionalism) and sexual minority status (i.e., nonheterosexual sexual interactions) as covariates in the model for RQ5 to attenuate this relationship. Consistent with this, the effect of gender was nonsignificant in the model for RQ5; its magnitude, however, was unchanged, which suggests that there are other reasons for gender differences in SQoL that are not included in the present study. The moderation effects of gender were also consistent with socially normed scripts for gendered sexual interactions, which often lack variety in heterosexual encounters and are biased toward men’s pleasure in Western cultures (Messiah, Blin, & Fiche, 1995; Richters et al., 2006; Tiefer & Hall, 2010; Wiederman, 2005). Specifically, perceived control was more important for men’s SQoL, and the amount of thought and effort invested in sex was more important for women. On a more positive note, we did not find women’s SQoL to decline more rapidly than men’s, which is in contrast to previous cross-sectional research from the United States that found the negative relationship between age and SQoL to be stronger for women (Balsis & Carpenter, 2004; Fleeson, 2004; Lindau & Gavrilova, 2010).

The Effects of Controlling for Individual and Partnership Characteristics

The analyses for RQ5 and RQ6 highlighted that the relationships among age, gender, sexual behavior, and SQoL were robust to the roles of sociodemographic factors. It is important to note that this does not mean that sociodemographic factors are unrelated to SQoL, but rather that their roles are not at the intersection of age, gender, sexual behavior, and SQoL. For example, while living with a partner was related to SQoL, it was evidently not *differentially* related to SQoL with aging (i.e., the effect of cohabitation was not stronger in older age; cf. Thomas et al., 2015).

In contrast, partnership characteristics were influential. For example, they attenuated many of the effects in RQ6 and wholly accounted for the effect of age (as discussed above). Overall, the mediating effect of partnership characteristics was smaller than we might have expected, given that SQoL and relationship quality are intertwined and have

bidirectional associations (Byers, 2005; Sprecher, 2002). After controlling for partnership characteristics, the effects of perceived control, thought and effort, and frequency of sex were stable and remained significant; age still had a significant moderating effect on thought and effort and on frequency of sex; and gender still had a moderating effect on perceived control and thought and effort, as above. This suggests that while partnership characteristics play an important role in SQoL and account for the effect of age on SQoL, they do not account for the effects of other sexual domains, which is consistent with past research that found relationship quality and SQoL to operate independently (Fleeson, 2004).

Strengths and Limitations

The strengths and weaknesses of the study should be kept in mind when interpreting these results. The primary strength of this study was the use of a prospective longitudinal sample of over 6,000 adults. The primary limitation was the restricted measurement of the constructs of interest, which often relied on a single item. While many of the constructs were measured with robust validity—such as the item for SQoL, which was based on Campbell et al.’s (1976) theoretical model of life quality—some others were not. For example, the measurement of frequency of sex and number of sexual partners was limited because “sex” was not defined for the respondents (e.g., frequency of sex was measured by an item that read “How often have you had sex with someone?”). While it is likely that these items were interpreted as referring to penetrative sexual intercourse, there are, of course, broader interpretations of “sex.” The measurement of sexual minority status was also limited by the use of a dichotomous “heterosexual”/“not heterosexual” variable, which was due to the small number of participants that endorsed the “bisexual” and “homosexual” response options ($n_{wave\ 1} = 168$ total, 2.7%; $n_{wave\ 2} = 105$ total, 2.8%; $n_{wave\ 3} = 75$ total, 3.0%) and limited our understanding of SQoL within the diversity of nonheterosexuality. Further, although respondents indicated whether they were in a cohabiting relationship, it was not assessed whether any or all reported sexual activity was within this relationship.

The other primary limitation was the absence of additional constructs of interest that may have contributed to the analyses. For example, low sexual function and the experience of menopause or perimenopause are important factors to consider in research on aging and sexuality (Dundon & Rellini, 2010; Fisher et al., 2015; Kontula & Haavio-Mannila, 2009). Unfortunately, these constructs were not assessed at MIDUS-I so we excluded them in order to use the data from all three waves of MIDUS in our analyses and to maximize the sample size. Sexual attitudes and beliefs were also not measured explicitly and likely represent the mechanisms that account for many of the results in the present study. Examining the effects of these variables in the relationships between aging and SQoL would be an interesting avenue for future research. We also did not

account for relationship duration, which is related to SQoL (Schmiedeberg & Schröder, 2016), because it would have been perfectly confounded with the effect of age for people who remained with the same partner between waves of data collection. Finally, the present study has focused on SQoL and aging in the United States. While the extant literature from Western countries highlights strong similarities between other countries with European influences and the United States in the relationships among SQoL, aging, and related factors, less research has focused on these constructs in non-Western countries. As such, it is not clear to what extent these results can be expected to generalize to other cultures.

Conclusion

This study adds to the literature by extending our understanding of the relationship between aging and sexuality. Our findings suggest that while SQoL does tend to decline with age, this decline is largely related to potentially modifiable factors, such as the amount of thought and effort invested in the sexual aspects of life and frequency of sex. In fact, there was evidence to suggest that age may be associated with the acquisition of skills that can lessen age-related declines in SQoL (i.e., “sexual wisdom”). Delineating the mechanisms at work in this phenomenon (e.g., the positive age-related changes in sexual skills, beliefs, or attitudes) thus represents an interesting direction for future research, as they could offer targets for clinical interventions to facilitate positive sexual experiences across the lifespan. Overall, the results highlight a place for sexuality in the framework of successful aging (cf. Woloski-Wruble et al., 2010), which focuses on “adding life to the years” of older age rather than adding years to life (Havighurst, 1961, p. 8).

Funding

This research was supported in part by a National Institute of Drug Abuse (NIDA) training grant supporting the work of Miriam Forbes (T320A037183). NIDA had no further role in the study design; in the collection, analysis, and interpretation of data; in writing; or in the decision to submit the manuscript for publication. The MIDUS study was supported by the John D. and Catherine T. MacArthur Foundation Research Network on Successful Midlife Development and by National Institute on Aging Grant AG20166.

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