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The link between sexual satisfaction and subjective well-being: a longitudinal perspective based on the German Ageing Survey

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Abstract

Purpose The objective of this study was to examine whether sexual satisfaction is associated with subjective well-being longitudinally.

Methods Data from 2002, 2008 and 2011 were drawn from a nationally representative study among individuals residing in private households aged 40 and over ($n = 12{,}105$ in regression analysis). The established Satisfaction with Life Scale was used to assess life satisfaction. The well-recognized Positive and Negative Affect Schedule was used to quantify positive and negative affect, respectively. A single-item measure was used to quantify sexual satisfaction, ranging from 1 to 5 (higher values correspond to higher sexual satisfaction). The analysis was stratified by sex and age group (40–59 years, 60 years and over).

Results The mean sexual satisfaction score was 3.4 (± 1.0) in men and 3.5 (± 0.9) in women. Fixed-effects regressions revealed that sexual satisfaction was positively associated with life satisfaction (total sample: $\beta = .08$, $p < .001$; men: $\beta = .08$, $p < .001$; women: $\beta = .07$, $p < .001$) and positive affect (total sample: $\beta = .04$, $p < .001$; men: $\beta = .04$, $p < .001$; women: $\beta = .03$, $p < .01$) as well as was negatively associated with negative affect (total sample: $\beta = -.05$, $p < .001$; men: $\beta = -.05$, $p < .001$; women: $\beta = -.04$, $p < .001$).

Conclusion This study emphasizes the longitudinal association between sexual satisfaction and subjective well-being both in men and women. Life satisfaction is associated with satisfaction with sex life in both age groups. We conclude that sexual satisfaction is a life domain related to life satisfaction among older men and women. Thus, maintaining or improvement of sexual satisfaction could have an impact on successful ageing. Research is required to further elucidate the underlying mechanisms.

Keywords Sexual satisfaction · Life satisfaction · Subjective well-being · Positive affect · Negative affect · Old age

Introduction

Despite decreasing desire and sexual activity with age, for many older individuals, sexuality remains an important aspect of life [1–3]. Several studies have shown that older adults are still sexually active in their 70s, 80s and even beyond [2, 4–6]. It has been shown that many individuals continue to have sex in late life and current cohorts of older adults may be more sexually active than preceding cohorts [7]. A recent study from England showed that almost 84% of men and almost 60% of women aged 60–69 had been sexually active in the previous year [3]. Sexuality and sexual behaviour in individuals in second half of life do not only pertain to intercourse. Kissing, fondling, masturbation, emotional intimacy remain significant aspects of sexual behaviour [3, 8].

Since sexuality and satisfaction with sex life are important issues for people in their second half of life, they could also contribute to successful ageing. The model of Rowe and Kahn [9] distinguished three components of successful ageing: absence of disease and risk factors, maintenance of physical and cognitive functioning, and active engagement in life. However, according to Bowling et al. [10] the definition of successful ageing should also incorporate the aspects

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of life that are important and relevant to older people. If elderly regard sexual activities as relevant and important, this could influence successful ageing. Subjective well-being is considered to be one of the indicators of successful ageing [11].

Thus far, several studies have identified various factors associated with subjective well-being (SWB). According to Diener, SWB refers to how people think and feel about their lives [12]. SWB consists of affective (positive affect (PA) and negative affect (NA)) and cognitive well-being (life satisfaction) [13] which differ in their predictors and their stability over time [13]. For example, it has been shown that employment status, income, health or marital status are important for SWB [13]. There is some evidence about the association between SWB and sexual satisfaction; however, this evidence is most commonly based on findings from cross-sectional studies. These studies mainly showed a positive association between sexual satisfaction and life satisfaction [14–17]. Few researchers have addressed the issue of sexual satisfaction in a representative sample of healthy community-dwelling individuals in their second part of life (e.g. [4]). This issue is especially important as sexual activity may have potential benefits for quality of life [4]. It has been shown that sexual expression could improve psychological and physical well-being [4]. It has also been shown that healthier individuals engage in sexual behaviour more often [18]. Moreover, sexual well-being is linked to physical and mental health [19]. However, cross-sectional studies fail to identify the relation between these factors over time. Cross-sectional studies have many advantages, for example, they describe trends in the general population. However, these studies do not give insight into changes that happen over time and/or within the individual. Moreover, they fail to account for unobserved heterogeneity (e.g. genetic disposition). A landmark study conducted by Ferrer-i-Carbonell and Frijters [20] showed that it is very important to control for time-constant unobserved heterogeneity in SWB research. In fact, they concluded that "what matters to the estimates is how one takes account of time-invariant unobserved factors" (p. 655) and "as to future research, it would seem of great importance to take individual fixed-effects into account" (p. 655).

We identified only a few studies that used a longitudinal approach. Based on $n = 90$ women (average age 27.4 years; SD: 6.7 years), one short (4 weeks) longitudinal study showed that sexual well-being was associated with life satisfaction both cross-sectionally and longitudinally. This study used random coefficient models [21]. It was restricted to young women experiencing sexual problems. Consequently, the generalizability of this study is limited. Only one longitudinal study [22] examined the relation between sexual satisfaction and life satisfaction using linear fixed-effects (FE) regressions based on data from the German Panel Analysis of Intimate Relationships and Family Dynamics (pairfam). Using FE regressions, they were able to control for time-constant unobserved heterogeneity, which is a main challenge in large survey studies. They [22] used data from the waves 2 to 6. The mean age in wave 2 was 30.4 years (±7.4) in women and 31.2 years (±6.9) in men. Specifically, adolescents born between 1991 and 1993, young adults born between 1981 and 1983 and adults nearing midlife born between 1971 and 1973 were included. Therefore, it remains unclear as to whether sexual satisfaction is related to SWB longitudinally in older adults. Thus, it is worthwhile to study the relationship between sexual satisfaction and SWB in older adults.

In order to close this gap in knowledge, the aim of the current study was to examine whether sexual satisfaction is associated with SWB based on a nationally representative sample of community-dwelling individuals in the second half of life (aged 40 years and over) in Germany (also applying FE regressions). This is important, especially in older age, as high levels of SWB may be associated with successful ageing [9]. As sexual satisfaction is thought to be modifiable [22, 23], knowledge about this relationship may help to maintain or increase SWB in the second half of life. Maintaining the well-being of individuals in the second half of life is a significant objective for health policy [24]. Indeed, Diener has argued that SWB is a fundamental goal of nations [25]. With an ageing population, this could also represent a public health concern. SWB is also associated with health [26], successful ageing [9] and longevity [27]. With this in mind, and in view of an ageing population, it is important to study the link between sexual satisfaction and SWB.

Based on previous cross-sectional and longitudinal findings, we hypothesize that sexual satisfaction is positively associated with SWB. This may be explained by the fact that this remains also an important life domain in the second half of life [28]. In addition, in line with previous studies [1, 2, 6] which showed gender differences, we expect to observe that the impact of sexual satisfaction on SWB is more pronounced in men, as sexual satisfaction may be a more important life domain.

Materials and methods

Sample

In this study, we used data from the German Ageing Survey ("Deutscher Alterssurvey", DEAS). This study is funded by the Federal Ministry of Family Affairs, Senior Citizens, Women and Youth. It is a nationwide, longitudinal cohort study of the German population in their second

half of life (40 +) living in private households. Key issues revealed by this study are, among others, the process of ageing, the health status of people aged 40 and over, and the prevalence of health risks in this population.

The DEAS has a cohort-sequential design. It combines large cross-sectional samples with longitudinal samples. In 1996, the first survey was conducted ($n = 4838$; stratified random sample from registered population). It was followed by further panel waves in 2002 ($n = 1524$), 2008 ($n = 1991$), 2011 ($n = 4854$) and 2014 ($n = 4322$). In addition to the panel data, every 6 years from 1996, a new cross-sectional baseline sample has been introduced (in 2002, 2008, and 2014). The response rates (25.0–50.3%) are comparable to other surveys conducted in Germany [29]. The retention rate, i.e. the proportion of valid re-interviews to the number of valid interviews in the baseline wave, varies between years. The retention rate in 2011 was 46.1%, based on the 2008 baseline sample. The retention rates are comparable to other European countries [30].

In the DEAS study, a two-stage sampling methodology is used. First, a random sample of municipalities was drawn (290 out of 12,000). In the second step, a sample of community-dwelling individuals was drawn in each baseline year from the local population registers. The baseline samples were stratified into age groups (40–54, 55–69, 70–85), gender and region (East and West Germany). The cohort profile and sampling method is described in detail elsewhere [31]. Due to a cohort-sequential profile of the DEAS study, it is possible to assess intra-individual change, e.g. in health and SWB.

The DEAS study consists of a structured face-to-face interview, conducted in each wave by trained interviewers. Before the interview, all the responders (target population) received a personal letter regarding the survey, as well as an accompanying letter from the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth. This interview takes place in the respondent's home. Furthermore, after the interview, responders are asked to fill in an additional written questionnaire. This questionnaire consists of a set of questions related to sensitive issues such as income, sexual orientation and satisfaction with sex life. The question regarding satisfaction with sexual life was included in the additional written questionnaire from 2002 to 2011. Thus, we analysed consecutive waves—second (2002), third (2008) and fourth (2011). Furthermore, we restricted our sample to individuals who filled in this additional written questionnaire.

Analytic sample

Altogether, there were 14,802 observations in wave 2, wave 3 and wave 4 of the German Ageing Survey (Fig. 1). In a first step, observations with missing values related to the dependent variable were excluded. In a second step, observations

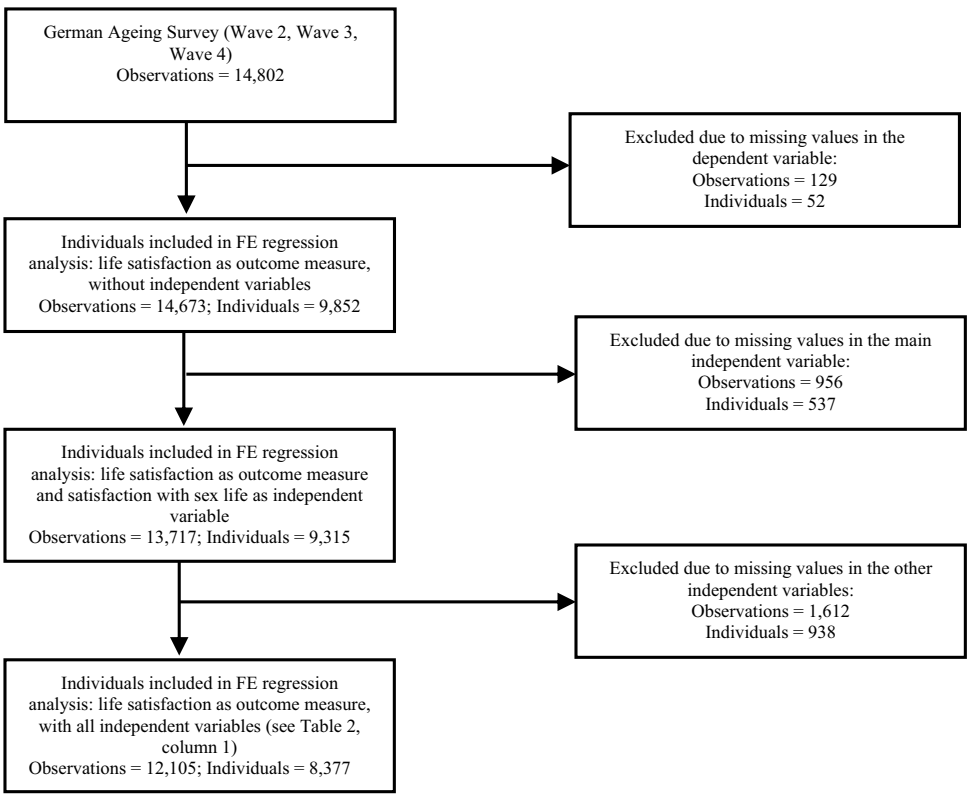

Fig. 1 Flow chart (individuals included in FE regression analysis)

with missing values pertaining to the main and other independent values were excluded. The final sample size consisted of 8377 individuals (12,105 observations). Please see Fig. 1 for detailed information.

Written consent was given by all participants. It was not necessary to obtain permission from institutional review boards or ethic committees, as the criteria for requiring an ethics statement were not met (e.g. risk for the respondents, lack of information about the aims of the study, examination of patients).

Dependent variables

As per Diener [12, 32, 33], there are three separable major components of SWB: life satisfaction, positive experiences (positive affect) and negative experiences (negative affect).

Life satisfaction was quantified using the well-established Satisfaction with Life Scale (SWLS) developed by Diener et al. [33]. The SWLS consists of five items: (i) "In most ways my life is close to my ideal"; (ii) "The conditions of my life are excellent"; (iii) "I am satisfied with my life"; (iv) "So far I have gotten the important things I want in life"; (v) "If I could live my life over, I would change almost nothing". Each item is assessed from 1 = "strongly agree", 2 = "agree", 3 = "neither agree nor disagree", 4 = "disagree", and 5 = "strongly disagree". In the DEAS study, due to length restrictions and to facilitate the comprehension of the questionnaire, the original 7-point scale of the SWLS was replaced by a 5-point scale. The SWLS ranges from 1 to 5, with higher values corresponding to higher satisfaction with life. The SWLS has high internal consistency and high temporal reliability [34]. In our study, Cronbach's alpha was .86.

The positive affect and negative affect schedule (PANAS), which has excellent psychometric properties, was used to measure PA and NA [35]. It comprises ten negative and positive feelings each and asks individuals to report whether they have these feeling (ranging from 1 = "very slightly or not at all", 2 = "a little", 3 = "moderately", 4 = "quite a bit", or 5 = "extremely"). Both scales range from 1 to 5, with higher values corresponding to higher NA or PA, respectively. The NA and PA subscales showed Cronbach's alphas of .86 and .87, respectively.

Independent variables

Similar to other large longitudinal studies [36–38], individuals were asked how satisfied he or she felt with his or her sex life. Participants respond using a 5-point scale from 1 = very unsatisfied to 5 = very satisfied.

The selection of the control variables included in the analysis was based on previous cross-sectional studies, longitudinal research, systematic review and theoretical considerations regarding sexual satisfaction, life satisfaction and successful ageing [1–4, 6, 9, 10, 21, 22].

In the regression analysis, we adjusted for age, marital status [(1) married, living together with spouse; (2) others (a) married, living separated from spouse; (b) divorced; (c) widowed; (d) single)], log monthly net equivalent income (OECD scale), and labour force participation (employed; retired; other: not employed). Moreover, self-rated health (from 1 = very good to 5 = very bad) and the incidence of depression (15-item version of the Center for Epidemiologic Studies Depression Scale ≥ 18) [39] were included. Physical functioning was assessed using the Physical Functioning Subscale of the SF-36 [40], ranging from 0 (worst) to 100 (best). Furthermore, the total number of physical illnesses (e.g. cardiac and circulatory disorders, cancer, bladder problems) was used. The participants were provided with a list of eleven illnesses and were asked to indicate whether they had one of the illnesses included in the list. The sum score was used (ranging from 0 to 11). The use of a sum score has advantages when compared to the use of single self-reported illnesses [41]. Moreover, less complex indices, e.g. number of medications, count of chronic diseases, have been reported to perform at least as well as more complex ones [42, 43].

In a sensitivity analysis, the main model was extended by adding an overall assessment of current relationship as a control variable. This single item measure ranges from 1 = "very good" to 5 = "very bad". We only included this variable in a sensitivity analysis, as previous research has shown that well-being could be related to sexual satisfaction in women who are not necessarily in a relationship [16]. In a further sensitivity analysis, we tested whether the link between satisfaction with sex life and the outcome measures differed by gender using interaction terms (gender x satisfaction with sex life).

The following variables were collected as part of the additional questionnaire completed individually: satisfaction with sex life, positive affect, negative affect (PANAS), life satisfaction, income, number of physical diseases. Other variables were collected during structured face-to-face interview.

Statistical analysis

Previous studies have demonstrated that controlling for unobserved factors (e.g. genetic disposition) is of significant importance in SWB research [20]. Consequently, linear FE regressions (Stata command: 'xtreg' with the 'fe' option) were used in our study because other popular panel econometric techniques (e.g. random effects regressions) yield inconsistent estimates when unobserved time-constant factors are systematically associated with the independent variables [44–46]. In contrast to these

Table 1 Characteristics of the observations included in linear FE regression (Waves 2–4, pooled, stratified by sex, $n = 12{,}105$)

	Men ($n = 6327$)	Women ($n = 5778$)
Variables	*N* (%)/mean (SD); range	*N* (%)/mean (SD); range
Age	63.4 (11.5); 40–95	61.4 (11.3); 40–92
Marital status: divorced/widowed/single/married, living separated from spouse (Ref.: married, living together with spouse)	1306 (20.6%)	1878 (32.5%)
Employment status:		
Employed	2333 (36.9%)	2097 (36.3%)
Retired	3501 (55.3%)	2638 (45.7%)
Other (not employed)	493 (7.8%)	1043 (18.0%)
Monthly net equivalent income (in €)	1731.7 (1294.3); 166.7–34,200	1627.4 (1570.5); 127.8–65,000
Self-rated health (from 1 = very good to 5 = very bad)	2.5 (0.8); 1–5	2.5 (0.8); 1–5
Physical functioning (from 0 = worst score to 100 = best score)	85.9 (20.9); 0–100	82.7 (22.8); 0–100
Absence of depression (CES-D < 18)	6005 (94.9%)	4562 (98.5%)
Number of physical illnesses	2.4 (1.9); 0–11	2.3 (1.8); 0–10
Satisfaction with sex life (from 1 = very unsatisfied to 5 = very satisfied)	3.4 (1.0); 1–5	3.5 (0.9); 1–5
Life satisfaction	3.8 (0.7); 1–5	3.8 (0.8); 1–5
Positive affect	3.5 (0.5); 1–5	3.5 (0.6); 1–5
Negative affect	2.0 (0.5); 1–4.6	2.1 (0.6); 1–4.8

The SWLS was used to quantify life satisfaction [34]. The PANAS was used to quantify positive and negative affect, respectively [61]. The CES-D was used to quantify depression [62]. Physical functioning was measured by the subscale "Physical Functioning" of SF-36 Short Form Health Survey (0–100 range) [40]

methods, FE regressions produce consistent estimates when this association exists [47, 48]. This choice was corroborated by Sargan-Hansen tests (Hausman-tests with cluster-robust standard errors). For example, the Sargan-Hansen test statistic was 125.01 ($p < .001$; total sample with life satisfaction as outcome measure).

Moreover, the linear fixed-effects model is our method of choice because our interest lay in the relative size of the parameters, as suggested by Monte Carlo simulations performed by Riedl and Geishecker (2014). Their simulations demonstrated that it is key to control for time-constant unobserved heterogeneity. Moreover, they demonstrated that the linear FE model yields almost the same results as other binary recoding schemes (e.g. 'Blow-up and Cluster' estimator by Baetschmann et al. [49]) and is the most efficient.

Only changes within units (individuals) over time are used in linear FE regressions. Thus, it was examined whether sexual satisfaction contributes to SWB. Factors constant within individuals over time such as sex or race cannot be used as main effects in FE regressions. However, it should be stressed that these factors are implicitly controlled. Further details are available elsewhere [46, 47]. The analysis was stratified by sex. In an additional analysis, we stratified our sample according to age (< 60 and 60 +).

Cluster-robust standard errors (Stata command: 'robust') were computed [50]. The statistical significance was tested with $p < 0.05$. Stata 15.0 (StataCorp, College Station, Texas, USA) was used to perform the statistical analysis.

Results

Sample characteristics

The pooled descriptive characteristics (stratified by sex) of the observations used in linear FE regressions (with life satisfaction as outcome variable) are described in Table 1 ($n = 12{,}105$ observations, relying on 8377 individuals). The characteristics of observations that are included in particular waves are described in Appendix 1. It should be emphasized that the Stata command for linear FE regressions also includes individuals with only one observation. This means that these individuals contribute to the calculation of the variance components, the constant, the between R^2, the overall R^2 as well as the link between individual effects constant over time and the regressors. However, it does *not* affect the beta-coefficients and the standard errors. Further details are provided by Drukker [51].

In our sample, 46.9% were female. In men, average age was 63.4 years (± 11.5 years) and in women, it was 61.4 years (± 11.3 years). In men, average satisfaction with sex life was 3.4 (± 1.0) and in women it was 3.5 (± 0.9). Average life satisfaction was 3.8 (± 0.7) in men and 3.8 (± 0.7) in women. Average PA was 3.5 (± 0.5) in men and 3.5 (± 0.6) in women. Average NA was 2.0 (± 0.5) in men and 2.1 (± 0.6) in women. Further details are displayed in Table 1. According to the skewness/kurtosis tests for

Table 2 Determinants of subjective well-being: Results of linear fixed-effects regressions

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Life satisfaction			Positive affect			Negative affect		
	Total sample	Men	Women	Total sample	Men	Women	Total sample	Men	Women
Satisfaction with sex life (from 1 = very unsatisfied to 5 = very satisfied)	0.08***	0.08***	0.07***	0.04***	0.04***	0.03**	−0.05***	−0.05***	−0.04***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age	0.00	0.01*	−0.00	−0.00	−0.00	0.00	−0.01***	−0.01**	−0.00+
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Marital status: divorced/widowed/single/married, living separated from spouse (Ref.: married, living together with spouse)	−0.07	0.02	−0.15*	−0.01	0.04	−0.05	−0.04	−0.01	−0.08
	(0.05)	(0.08)	(0.07)	(0.04)	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)
Employment status:									
Retired (Ref.: employed)	0.07*	0.06	0.07	0.08**	0.08*	0.09*	−0.08**	−0.06+	−0.10*
	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)
Other (not employed)	−0.03	−0.03	−0.04	0.03	0.07+	0.00	−0.07*	−0.09*	−0.05
	(0.04)	(0.05)	(0.05)	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
(Log) monthly net equivalent income	0.14***	0.10*	0.19***	0.07**	0.05	0.08**	0.01	0.04	−0.03
	(0.03)	(0.04)	(0.04)	(0.02)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)
Self-rated health (from 1 = very good to 5 = bad)	−0.07***	−0.09***	−0.06**	−0.06***	−0.08***	−0.04**	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Physical functioning (from 0 = worst score to 100 = best score)	0.001	−0.000	0.002*	0.002***	0.003***	0.002***	−0.001*	−0.002*	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Depression (CES-D ≥ 18)	−0.21***	−0.22**	−0.19**	−0.16***	−0.15**	−0.17***	0.27***	0.25***	0.29***
	(0.05)	(0.07)	(0.06)	(0.03)	(0.05)	(0.04)	(0.03)	(0.05)	(0.05)
Number of physical illnesses	−0.04***	−0.04***	−0.03**	−0.02**	−0.01	−0.03**	0.07***	0.08***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	2.61***	2.69***	2.46***	2.93***	3.04***	2.78***	2.53***	2.30***	2.81***
	(0.26)	(0.37)	(0.36)	(0.21)	(0.32)	(0.28)	(0.20)	(0.27)	(0.29)
Observations	12,105	6,327	5,778	12,111	6,331	5,780	12,111	6,331	5,780
Number of individuals	8377	4361	4016	8383	4365	4018	8383	4365	4018
R^2	0.06	0.07	0.07	0.06	0.07	0.06	0.10	0.11	0.09

Unstandardized Beta-Coefficients are reported; Cluster-robust standard errors in parentheses. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, +$p < 0.10$. The SWLS was used to quantify life satisfaction [34]. The PANAS was used to quantify positive and negative affect, respectively [61]. The CES-D was used to quantify depression [62]. Physical functioning was measured by the subscale "Physical Functioning" of SF-36 Short Form Health Survey (0–100 range) [40]. It is worth noting that the Stata command for FE regression analysis ('xtreg, fe') include individuals with only one observation in calculating the number of observations because these individuals provide information about the variance components, the constant, the between R^2 and so on. Nevertheless, it does not affect the beta-coefficients as well as the standard errors. First column: life satisfaction as outcome measure (total sample); second column: life satisfaction as outcome measure (men); third column: life satisfaction as outcome measure (women); fourth column: positive affect as outcome measure (total sample); fifth column: positive affect as outcome measure (men); six column: positive affect as outcome measure (women); seventh column: negative affect as outcome measure (total sample); eight column: negative affect as outcome measure (men); ninth column: negative affect as outcome measure (women)

normality, we can reject the hypothesis that the outcome measures are normally distributed (each case: $p < .001$). Average satisfaction with sex life was 3.6 in wave 2, 3.4 in wave 3 and 3.3 in wave 4 (Appendix 1).

Regression analysis

In Table 2, we presented three main models with the following outcomes variables: life satisfaction, PA and NA. Those

outcomes variables correspond to the three components of SWB. All main models were adjusted using the same set of control variables (including age). Moreover, we presented results for the total sample and stratified by sex.

Results of FE regression analysis are presented in Table 2 (column 1–3: life satisfaction as outcome measure (total sample, men and women, respectively); column 4–6: PA as outcome measure (total sample, men and women, respectively); column 7–9: NA as outcome measure (total sample, men and women, respectively). To ease the comparison of the results, other regression techniques (random effects regressions, random intercept regressions, random coefficient regressions) were conducted. The results of these regression techniques are displayed in Appendix 3 (Supplementary Table 3a–c).

The FE regression revealed that satisfaction with sex life is associated with SWB, in the total sample and stratified by sex.

Satisfaction with sex life was positively associated with life satisfaction in the total sample ($\beta = .08$, $p < .001$) and with PA ($\beta = .04$, $p < .001$). Moreover, it was negatively associated with NA ($\beta = -.05$, $p < .001$). All those effects were comparable for women and men (Table 2).

It is worth noting that the interaction terms (sex x satisfaction with sex life; not displayed in Table) did not achieve statistical significance (interaction term with life satisfaction as outcome measure: $\beta = .003$, $p = .87$; with PA as outcome measure: $\beta = -.012$, $p = .41$; with NA as outcome measure: $\beta = .004$, $p = .82$).

Furthermore, our analysis demonstrated that the incidence of depression was associated with (all components of) SWB, that is life satisfaction, PA and NA (in the total sample and in both sexes). Number of physical illnesses was negatively associated with life satisfaction, PA and positively associated with NA in the total sample and stratified by sex (except for PA in men). Additionally, worsening self-rated health was negatively associated with life satisfaction and PA. In a sensitivity analysis (results not shown, but available upon request), the main model was extended by adding as a control variable an overall assessment of current relationships. Our results remained almost the same in terms of beta-coefficients and significance (except for the association between satisfaction with sex life and PA in women where the significance disappeared, $\beta = .02$, $p = .15$).

Analysis stratified by age showed that the association between satisfaction with sex life and life satisfaction is the same for both age groups ($\beta = .08$, $p < .001$) and for both sexes. In contrast to the individuals aged 40–59 years old, the association between sexual satisfaction and PA disappeared for both men and women ($p > .05$) aged 60 years and over. For men aged 60 years and above, satisfaction with sex life is negatively associated with NA ($\beta = -.04$, $p < .05$). For women aged 60 years and above, this association disappeared. The results of the stratified analysis (age > 60, 60 +) are reported in the appendix (Appendix 2—Supplementary Table 1, 2).

Discussion

Main findings

Based on a large nationally representative sample of individuals aged 40 and over, we examined whether sexual satisfaction was associated with SWB longitudinally. The mean sexual satisfaction score was 3.4 (± 1.0) in men and 3.5 (± 0.9) in women. Adjusting for various potential confounders (e.g. socio-economic variables, self-rated health, physical functioning, physical illnesses or depression), FE regressions revealed that sexual satisfaction was positively associated with life satisfaction and PA and was negatively associated with NA. With respect to potential confounders, only the incidence of depression was consistently associated with the outcome measures in the total sample and in both sexes.

Analysis stratified by age

Moreover, our analysis revealed that the association between satisfaction with sex life and subjective well-being differs slightly across the adult (40–59 years old) and older individual age groups (60 +).

Firstly, life satisfaction is associated with satisfaction with sex life in both age groups. It can thus be suggested that for both age groups, satisfaction with sex life is a determinant of life satisfaction.

In contrast to adults (40–59 years old), satisfaction with sex life is not associated with PA among women and men aged 60 and over. There are several potential explanations for these results. It could be possible that despite decreasing satisfaction with sex life, individuals aged 60 + do not associate this fact with feeling sad or feeling lethargic (or as if they have low energy) [35, 52]. That may be why PA is not associated with satisfaction with sex life.

Interestingly, our analyses have revealed that, for older men (60 +), satisfaction with sex life was negatively associated with NA. In contrast, such an association for women in the same age group, did not remain. NA indicates subjective distress and is connected to fear, nervousness and guilt [35, 53]. A speculative explanation may be that for older women other life domains rather than satisfaction with sex life are more important for NA as well as subjective distress. This may explain why we observe a decrease in NA only in men. However, future research is required to clarify our possible explanations.

Previous research and possible explanations

In our study, FE regressions showed that sexual satisfaction is consistently associated with the outcome measures—life satisfaction, PA and NA in the total sample and both sexes. In regard to control variables, only the incidence of depression

was consistently associated with those outcome measures. The effect of more physical illnesses on life satisfaction was consistent for outcome measures in total sample and in both sexes (except for PA in men). Our results indicate that the satisfaction with sexual life is a life domain related to life satisfaction for both women and men in the second half of life.

With respect to the previous literature in this area, a few cross-sectional studies have shown that sexual satisfaction is positively associated with life satisfaction [14–17]. Woloski-Wruble et al. [17] and Rosen et al. [19] showed that sexual satisfaction is important component of life satisfaction. Using a small sample of women experiencing sexual difficulties ($n=87$, average age was 27.4 years $\pm$ 6.7 years) and applying hierarchical linear models, it has been shown that changes in sexual satisfaction were positively associated with changes in satisfaction with life over 4 weeks [21]. In addition, using linear FE regressions, Schmiedeberg et al. [22] have shown that increases in sexual satisfaction are associated with increases in life satisfaction in younger adults (in both women and men) longitudinally. This is in accordance with our study that investigates sexual satisfaction and SWB comprehensively among older adults. We assume that satisfaction with sexual life remains an important life domain among individuals in the second half of life for two main reasons. First, this appears plausible because individuals remain sexually active in older adulthood and late life due to positive changes in attitudes towards sexuality in later life [7]. Second, older individuals may still feel physically capable of sexual activity (e.g. because effective therapies for sexual dysfunctions are available or due to healthy lifestyles) [54].

In summary, there are some mechanisms that have been proposed to explain the previously reported relationship between sexual activity and SWB. Several researchers argue that sexual activity could contribute to general well-being, largely because older people rate and perceive sexual activity as important part of their life [1, 19, 55]. Older people wish to continue engaging in sexual activities and this could contribute to successful ageing [17]. Due to attitude changes, engagement in sexual activities is expected to be more common among older individuals. Thus, individuals in the second half of life should be able to discuss with their physician matters related to their sexual health that may lead to changes in satisfaction with sex life. Health professionals ought to be proactive and not neglect the sexual health and sexual satisfaction of older individuals. It may be beneficial to increase the awareness of physicians of the sexuality of individuals in their second half of life. This is important as satisfaction with sex life is related to SWB.

Our second hypothesis was that the effect of sexual satisfaction on SWB would be more pronounced in men. However, no significant differences were observed. This could be explained by the fact that older women could have lower expectations with regard to their sex life and not consider it as important [1, 2, 56, 57]. For example, an increase in sexual satisfaction may lead to a marked increase in life satisfaction in women because the actual state regarding sexual satisfaction may be higher than expected. Other research has showed that gender differences were not seen only among individuals with a low level of sexual activity or some functional difficulties [55]. Moreover, Schmiedeberg et al. [22] did not find gender differences in a sample of young adults, suggesting that satisfaction with sex life is one of important factors for a satisfying life (for both women and men). However, we are not aware of studies investigating potential gender differences in the expectations with regard to sexual life in late life. Future research is needed to investigate this relationship in further detail.

Our study contributes to the scarce evidence on the *longitudinal* association between sexual satisfaction and SWB. More specifically, there has only been one study to date that examines the relation between sexual satisfaction and life satisfaction among younger adults using panel regression models. To extend existing knowledge, we focused on individuals in their second half of life (average age 61.4 years for women and 63.4 years for men). Taking this age group into account is particularly important as the attitudes towards sexual satisfaction in old age have changed significantly in past years [7]. Furthermore, in our study we covered the concept of SWB comprehensively, considering both cognitive well-being (life satisfaction) and affective well-being (PA and NA).

Strengths and limitations

This is the first study showing that sexual satisfaction is associated with SWB longitudinally among older adults. Data were used from a population-based sample of individuals living in private households. Life satisfaction was quantified using the validated SWLS and affective well-being was measured using the established PANAS. FE regression analysis was used to mitigate the problem of unobserved heterogeneity. In FE regression analysis, various potential time-varying confounders were adjusted for (e.g. socio-economic variables, self-rated health, incidence of depression, physical functioning or physical illnesses).

When comparing our results with the other studies, it is important to be cognizant that, in addition to different study designs as well as differences in sample characteristics, studies sometimes use different instruments to measure the same construct (e.g. life satisfaction, sexual satisfaction).

While it is sometimes considered a shortcoming of the FE strategy that time-invariant cannot be included as main effect, Brüderl and Ludwig [47] stated that it is a key strength of FE estimates. This is explained by the fact that bias evoked by genetic differences between respondents, a covariate which is almost impossible to assess in large survey studies, is not a problem.

A single-item measure was used to assess overall sexual satisfaction, which has been demonstrated to perform

well when assessing domain satisfaction [58]. Although the response rate is only moderate in the DEAS study, only small selectivity effects have been observed [59]. The distribution of socio-demographic factors in the sample is very close to that of the German population [60]. Community-dwelling individuals were interviewed in the DEAS study. Hence, it may be difficult to generalize our findings to individuals residing in institutionalized settings.

Due to the nature of the question about satisfaction with sex life (sensitive, intimate issue), potential desirability bias may have occurred. However, the question about satisfaction with sex life was placed in a drop-off questionnaire which was independently completed by the participant after the oral interview. We expect that this reduces this potential bias.

Conclusion

This study emphasizes the longitudinal association between sexual satisfaction and SWB both in men and women in the second half of life. Life satisfaction is associated with satisfaction with sex life in both age groups. We conclude that sexual satisfaction is a life domain related to life satisfaction among older men and women. Thus, maintaining or improvement of sexual satisfaction could have an impact on successful ageing. Research is required to further elucidate the underlying mechanisms.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Please note that an ethical statement for the DEAS study was not necessary as criteria for requiring an ethical statement were not met (risk for the respondents, lack of information about the aims of the study, examination of patients). The German Centre of Gerontology (DZA) decided that an ethical statement was not necessary. The DEAS study has a permanent advisory board. Prior to each wave of data collection, the permanent advisory board received detailed information about the sampling method, the consent to participate and the instruments used in the DEAS study. The permanent advisory board concluded that the DEAS study did not need approval from an ethics committee.

Informed consent Informed consent was obtained from all individual participants included in the study.

Appendix 1

See Table 3.

Table 3 Characteristics of the observations included in linear fixed-effects regressions (waves 2–4)

Variables *N* (%)/mean (SD); range	Wave 2 (2002) (*N* = 3681)	Wave 3 (2008) (*N* = 4998)	Wave 4 (2011) (*N* = 3426)
Age	60.5 (11.7); 40–90	62.3 (11.5); 40–93	64.8 (10.7); 43–95
Sex: male	1954 (53.1%)	2630 (52.6%)	1743 (50.9%)
Marital status: divorced/widowed/single/married, living separated from spouse (Ref.: married, living together with spouse)	2720 (73.9%)	3667 (73.4%)	2534 (74.0%)
Employment status:			
Employed	1430 (38.9%)	1844 (36.9%)	1156 (33.7%)
Retired	1676 (45.5%)	2528 (50.6%)	1935 (56.5%)
Other (not employed)	575 (15.6%)	626 (12.5%)	335 (9.8%)
Monthly net equivalent income (in €)	1457.4 (810.4); 127.8–10,000	1715.7 (1698.6); 166.7-65,000	1873.9 (1502.0); 186.7–40,000
Self-rated health (from 1 = very good to 5 = very bad)	2.5 (0.8); 1–5	2.4 (0.8); 1–5	2.5 (0.8); 1–5
Physical functioning (from 0 = worst score to 100 = best score)	84.2 (22.8); 0–100	85.3 (21.1); 0–100	83.2 (22.0); 0–100
Absence of depression (CES-D < 18)	3337 (90.65%)	4744 (94.92%)	3216 (93.87%)
Number of physical illnesses	2.3 (1.9); 0–11	2.3 (1.8); 0–10	2.5 (1.9); 0–10
Satisfaction with sex life (from 1 = very unsatisfied to 5 = very satisfied)	3.6 (1.0); 1–5	3.4 (1.0); 1–5	3.3 (0.9); 1–5
Life satisfaction	3.8 (0.8); 1–5	3.4 (0.7); 1–5	3.9 (0.7); 1–5
Positive affect	3.5 (0.6); 1–5	3.5 (0.5), 1–5	3.5 (0.5); 1.5–5
Negative affect	2.0 (0.6); 1–4.6	2.0 (0.5), 1–4.8	2.0 (0.5); 1–4.5

The SWLS was used to quantify life satisfaction [34]. The PANAS was used to quantify positive and negative affect, respectively [61]. The CES-D was used to quantify depression [62]. Physical functioning was measured by the subscale "Physical Functioning" of SF-36 Short Form Health Survey (0-100 range)[40]. Altogether there were 12,105 observations in waves 2–4 (8377 individuals)

References

1. Laumann, E. O., Paik, A., Glasser, D. B., Kang, J. H., Wang, T., Levinson, B., et al. (2006). A cross-national study of subjective sexual well-being among older women and men: Findings from the global study of sexual attitudes and behaviors. *Archives of Sexual Behavior, 35*(2), 145–161. https://doi.org/10.1007/s10508-005-9005-3.
2. Lindau, S. T., Schumm, L. P., Laumann, E. O., Levinson, W., O'Muircheartaigh, C. A., & Waite, L. J. (2007). A study of sexuality and health among older adults in the United States. *New England Journal of Medicine, 357*(8), 762–774. https://doi.org/10.1056/NEJMoa067423.
3. Lee, D. M., Nazroo, J., O'Connor, D. B., Blake, M., & Pendleton, N. (2016). Sexual health and well-being among older men and women in england: Findings from the english longitudinal study of ageing. *Archives of Sexual Behavior, 45*(1), 133–144. https://doi.org/10.1007/s10508-014-0465-1.
4. DeLamater, J. (2012). Sexual expression in later life: A review and synthesis. *Journal of Sex Research, 49*(2–3), 125–141. https://doi.org/10.1080/00224499.2011.603168.
5. Ni Lochlainn, M., & Kenny, R. A. (2013). Sexual activity and aging. *Journal of the American Medical Directors Association, 14*(8), 565–572. https://doi.org/10.1016/j.jamda.2013.01.022.
6. Heywood, W., Lyons, A., Fileborn, B., Hinchliff, S., Minichiello, V., Malta, S., et al. (2018). Sexual satisfaction among older Australian heterosexual men and women: Findings from the sex, age & me study. *Journal of Sex and Marital Therapy, 44*(3), 295–307.
7. Beckman, N., Waern, M., Gustafson, D., & Skoog, I. (2008). Secular trends in self reported sexual activity and satisfaction in Swedish 70 year olds: Cross sectional survey of four populations, 1971–2001. *BMJ, 337,* a279.
8. Ginsberg, T. B., Pomerantz, S. C., & Kramer-Feeley, V. (2005). Sexuality in older adults: Behaviours and preferences. *Age and Ageing, 34*(5), 475–480. https://doi.org/10.1093/ageing/afi143.
9. Rowe, J. W., & Kahn, R. L. (1997). Successful aging. *Gerontologist, 37*(4), 433–440.
10. Bowling, A., & Dieppe, P. (2005). What is successful ageing and who should define it? *BMJ, 331*(7531), 1548–1551. https://doi.org/10.1136/bmj.331.7531.1548.
11. Inui, T. S. (2003). The need for an integrated biopsychosocial approach to research on successful aging. *Annals of Internal Medicine, 139*(5 Pt 2), 391–394.
12. Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*(3), 542–575.
13. Luhmann, M., Hofmann, W., Eid, M., & Lucas, R. E. (2012). Subjective well-being and adaptation to life events: A meta-analysis on differences between cognitive and affective well-being. *Journal of Personality and Social Psychology, 102*(3), 592–615.
14. Brody, S., & Costa, R. M. (2009). ANATOMY/PHYSIOLOGY: Satisfaction (sexual, life, relationship, and mental health) is associated directly with penile-vaginal intercourse, but inversely with other sexual behavior frequencies. *The Journal of Sexual Medicine, 6*(7), 1947–1954.
15. Cheng, Z., & Smyth, R. (2015). Sex and happiness. *Journal of Economic Behavior & Organization, 112,* 26–32.
16. Davison, S. L., Bell, R. J., LaChina, M., Holden, S. L., & Davis, S. R. (2009). PSYCHOLOGY: The relationship between self-reported sexual satisfaction and general well-being in women. *The Journal of Sexual Medicine, 6*(10), 2690–2697.
17. Woloski-Wruble, A. C., Oliel, Y., Leefsma, M., & Hochner-Celnikier, D. (2010). Sexual activities, sexual and life satisfaction, and successful aging in women. *The Journal of Sexual Medicine, 7*(7), 2401–2410.
18. Lindau, S. T., & Gavrilova, N. (2010). Sex, health, and years of sexually active life gained due to good health: Evidence from two US population based cross sectional surveys of ageing. *BMJ, 340,* c810. https://doi.org/10.1136/bmj.c810.
19. Rosen, R. C., & Bachmann, G. A. (2008). Sexual well-being, happiness, and satisfaction, in women: The case for a new conceptual paradigm. *Journal of Sex and Marital Therapy, 34*(4), 291–297. https://doi.org/10.1080/00926230802096234.
20. Ferrer-i-Carbonell, A., & Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness? *The Economic Journal, 114*(497), 641–659. https://doi.org/10.1111/j.1468-0297.2004.00235.x.
21. Stephenson, K. R., & Meston, C. M. (2015). The conditional importance of sex: exploring the association between sexual well-being and life satisfaction. *Journal of Sex and Marital Therapy, 41*(1), 25–38.
22. Schmiedeberg, C., Huyer-May, B., Castiglioni, L., & Johnson, M. D. (2017). The more or the better? How sex contributes to life satisfaction. *Archives of Sexual Behavior, 46*(2), 465–473.
23. Loewenstein, G., Krishnamurti, T., Kopsic, J., & McDonald, D. (2015). Does increased sexual frequency enhance happiness? *Journal of Economic Behavior & Organization, 116,* 206–218.
24. Steptoe, A., Deaton, A., & Stone, A. A. (2015). Subjective wellbeing, health, and ageing. *Lancet, 385*(9968), 640–648. https://doi.org/10.1016/s0140-6736(13)61489-0.
25. Diener, E. (2006). Guidelines for national indicators of subjective well-being and ill-being. *Journal of Happiness Studies, 7*(4), 397–404.
26. Diener, E., & Chan, M. Y. (2011). Happy people live longer: Subjective well-being contributes to health and longevity. *Applied Psychology: Health and Well-Being, 3*(1), 1–43.
27. Sadler, M. E., Miller, C. J., Christensen, K., & McGue, M. (2011). Subjective wellbeing and longevity: A co-twin control study. *Twin Research and Human Genetics, 14*(3), 249–256.
28. Hyde, Z., Flicker, L., Hankey, G. J., Almeida, O. P., McCaul, K. A., Chubb, S. P., et al. (2010). Prevalence of sexual activity and associated factors in men aged 75 to 95 years: A cohort study. *Annals of Internal Medicine, 153*(11), 693–702.
29. Neller, K. (2005). Kooperation und Verweigerung Eine. Non-response-studie [co-operation and refusal: A non-response study]. *ZUMA Nachrichten, 29*(57), 9–36.
30. Blom, A. G., & Schröder, M. (2011). Sample Composition 4 Years on: Retention in SHARE Wave 3. In M. Schröder (Ed.), *Retrospective data collection in the survey of health, ageing and retirement in Europe. SHARELIFE methodology*. Mannheim: MEA.
31. Klaus, D., Engstler, H., Mahne, K., Wolff, J. K., Simonson, J., Wurm, S., et al. (2017). Cohort profile: The German ageing survey (DEAS). *International Journal of Epidemiology, 46*(4), 1105–1105g. https://doi.org/10.1093/ije/dyw326.
32. Diener, E. (2013). The remarkable changes in the science of subjective well-being. *Perspectives on Psychological Science, 8*(6), 663–666. https://doi.org/10.1177/1745691613507583.
33. Pavot, W., & Diener, E. (1993). Review of the satisfaction with life scale. *Psychological Assessment, 5*(2), 164.
34. Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13.
35. Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070.
36. Steptoe, A., Breeze, E., Banks, J., & Nazroo, J. (2013). Cohort profile: The English longitudinal study of ageing. *International Journal of Epidemiology, 42*(6), 1640–1648. https://doi.org/10.1093/ije/dys168.

37. Health, Work and Retirement Study surveys (New Zealand Longitudinal Study of Ageing (NZSLA)). http://www.massey.ac.nz/massey/learning/departments/school-of-psychology/research/hart/new-zealand-health-work-and-retirement-study/health-work-and-retirement-questionnaires.cfm. Accessed 24 Aug 2018.
38. Huinink, J., Brüderl, J., Nauck, B., Walper, S., Castiglioni, L., & Feldhaus, M. (2011). Panel analysis of intimate relationships and family dynamics (pairfam): Conceptual framework and design. *Zeitschrift für Familienforschung, 23*(1), 77–101.
39. Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385–401.
40. Ware, J. E., Jr., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical Care, 30*(6), 473–483.
41. Wurm, S., Tesch-Römer, C., & Tomasik, M. J. (2007). Longitudinal findings on aging-related cognitions, control beliefs, and health in later life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 62*(3), P156–P164.
42. Di Bari, M., Virgillo, A., Matteuzzi, D., Inzitari, M., Mazzaglia, G., Pozzi, C., et al. (2006). Predictive validity of measures of comorbidity in older community dwellers: The Insufficienza Cardiaca negli Anziani Residenti a Dicomano Study. *Journal of the American Geriatrics Society, 54*(2), 210–216.
43. Perkins, A. J., Kroenke, K., Unützer, J., Katon, W., Williams, J. W., Hope, C., et al. (2004). Common comorbidity scales were similar in their ability to predict health care costs and mortality. *Journal of Clinical Epidemiology, 57*(10), 1040–1048.
44. Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: Methods and applications*. New York: Cambridge University Press.
45. Greene, W. H. (2012). *Econometric analysis* (7th ed.). Boston, Mass: Pearson.
46. Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. Cambridge, Mass: MIT Press.
47. Brüderl, J., & Ludwig, V. (2015). Fixed-effects panel regression. In C. Wolf (Ed.), *The Sage handbook of regression analysis and causal inference* (pp. 327–357). Los Angeles: SAGE.
48. Gunasekara, F. I., Richardson, K., Carter, K., & Blakely, T. (2013). Fixed effects analysis of repeated measures data. *International Journal of Epidemiology, 43*(1), 264–269.
49. Baetschmann, G., Staub, K. E., & Winkelmann, R. (2015). Consistent estimation of the fixed effects ordered logit model. *Journal of the Royal Statistical Society: Series A (Statistics in Society), 178*(3), 685–703.
50. Stock, J. H., & Watson, M. W. (2008). Heteroskedasticity-robust standard errors for fixed effects panel data regression. *Econometrica, 76*(1), 155–174.
51. Drukker, D. M. (2002). Re: st: Wrong no. of obs. in xtreg fixed effect option. http://www.stata.com/statalist/archive/2002-07/msg00311.html. Accessed 28 Aug 2018.
52. Diener, E., Pressman, S. D., Hunter, J., & Delgadillo-Chase, D. (2017). If, Why, and when subjective well-being influences health, and future needed research. *Applied Psychology: Health and Well-Being, 9*(2), 133–167. https://doi.org/10.1111/aphw.12090.
53. Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine, 4*(1), 1–39.
54. Laumann, E. O., Nicolosi, A., Glasser, D. B., Paik, A., Gingell, C., Moreira, E., et al. (2005). Sexual problems among women and men aged 40–80 y: Prevalence and correlates identified in the global study of sexual attitudes and behaviors. *International Journal of Impotence Research, 17*(1), 39.
55. Lee, D. M., Vanhoutte, B., Nazroo, J., & Pendleton, N. (2016). Sexual health and positive subjective well-being in partnered older men and women. *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences, 71*(4), 698–710. https://doi.org/10.1093/geronb/gbw018.
56. Gott, M., & Hinchliff, S. (2003). How important is sex in later life? The views of older people. *Social Science and Medicine, 56*(8), 1617–1628.
57. Deacon, S., Minichiello, V., & Plummer, D. (1995). Sexuality and older people: Revisiting the assumptions. *Educational Gerontology, 21*(5), 497–513. https://doi.org/10.1080/0360127950210509.
58. Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *Journal of Applied Psychology, 82*(2), 247.
59. Klaus, D., Engstler, H., Mahne, K., Wolff, J. K., Simonson, J., Wurm, S., et al. (2017). Cohort profile: The German ageing survey (DEAS). *International Journal of Epidemiology, 46*(4), 1105. https://doi.org/10.1093/ije/dyw326.
60. Klaus, D., & Engstler, H. (2017). Data and methods of German Ageing Survey [Daten und Methoden des Deutschen Alterssurveys]. In K. Mahne, J. K. Wolff, J. Simonson, & C. Tesch-Römer (Eds.), *Ageing in Social Change. Two Decades of the German Ageing Survey [Altern im Wandel: Zwei Jahrzehnte Deutscher Alterssurvey (DEAS)]*. Wiesbaden: Springer Fachmedien Wiesbaden.
61. Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063.
62. Radloff, L. S. (1977). The CES-D scale a self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385–401.