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RESEARCH ARTICLE

The Longitudinal Association between Psychological Factors and Health Care Use

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Objective. Little attention has been given to psychological factors as correlates of health care use, which could be an important key to manage it. We analyzed the association of psychological factors with health care use.

Data Sources. Primary data were obtained from three follow-ups (2002, 2008, and 2011) of a large population-based study with participants aged 40+.

Study Design. Using a longitudinal observational study, we analyzed the psychological factors of negative and positive affect (affective well-being), life satisfaction (cognitive well-being), self-efficacy, loneliness, self-esteem, optimism, and flexible goal adjustment using fixed-effects regressions.

Data Collection. The participants provided data on health care use (visits to general practitioners [GPs] and specialists as well as hospitalization) and psychological factors via self-administered questionnaires and personal interviews (7,116 observations). The sample was drawn using national probability sampling.

Principal Findings. Controlling for self-rated health, chronic diseases and sociodemographics, increases in affective well-being, and optimism decreased health care use of GPs, specialists, and hospital treatment. Increases in cognitive well-being decreased health care use of GPs and specialists. Increases in self-efficacy decreased hospitalization.

Conclusions. The study underlines the influence of psychological factors on health care use. Thus, whenever possible, future studies of health care use should include psychological factors, and efforts to reduce health care use might focus on such factors.

Key Words. Psychology, observational data/quasi-experiments, health policy/politics/law/regulation, primary care, hospitals

Patterns of health care use have often been investigated in Germany (Janssen, Swart, and von Lengerke 2014). In Germany, approximately 90 percent of the population is covered by statutory health insurance (SHI). SHI is a social health insurance that is financed by a payroll tax according to the principle of solidarity. Employees and their families are compulsory members of the SHI.

Approximately 10 percent of the population is covered by private health insurance (PHI). In particular, civil servants, self-employed individuals, and employees above a certain income threshold can opt for PHI. Regardless of type of health insurance, all insurees have access to comprehensive health care and can utilize outpatient specialists' services without referral from general practitioners (GPs). From 2004 to 2012, members of the SHI had to pay a small copayment for outpatient physician services. Whereas small copayments must also be paid for prescription drugs, SHI directly reimburses the vast majority of these expenditures. Patients can be admitted to the hospital via outpatient physician referral; however, in the case of an emergency, hospitals are obligated to provide care. More details regarding the health care system of Germany are provided elsewhere (Passon et al. 2009).

A widely used theoretical model to examine health care use is Andersen's Behavioral Model (Andersen and Newman 1973), which divides the determinants of health care use into three main categories: predisposing factors, enabling resources, and need factors. Predisposing factors in particular are sociodemographic variables such as age, gender, marital status, education, ethnicity, or religion. Predisposing factors cover beliefs, values, attitudes, and knowledge about health and disease. Enabling resources are related to the individual, for example, income, health insurance, or community-related such as the prices of health services. Need factors distinguish between perceived and evaluated symptoms and diagnoses.

Since its development, Andersen's Behavioral Model has been modified several times (Andersen 1995; Gelberg, Andersen, and Leake 2000; Andersen and Davidson 2007) and has been applied in many different health care systems and contexts (Babitsch, Gohl, and von Lengerke 2012). However, although Andersen and Newman included "values" and "attitudes" in the first proposal of the Behavioral Model, little attention has been given to psychological factors as predictors of health care use (Bradley et al. 2002). This is despite the fact that the modified Behavioral Model for Vulnerable Populations (Gelberg, Andersen, and Leake 2000) explicitly includes "psychological resources" as predisposing factors and gives as examples "mastery, coping,

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self-esteem, cognitive ability, developmental delay" (Gelberg, Andersen, and Leake 2000). Many studies have instead underlined the importance of need factors as determinants of health care use (Babitsch, Gohl, and von Lengerke 2012). This notion is very plausible, and a variety of studies has demonstrated that perceived and evaluated symptoms and diagnoses are crucial to understanding the determinants of health care use (Broyles, McAuley, and Baird-Holmes 1999; Nabalamba and Millar 2007; Heider et al. 2014). However, whether a person assesses his or her health status as sufficiently poor to warrant utilizing health care services depends on the individual's perception, preferences, emotional constitution, and values and is subjective. Thus, many psychological constructs may have a decisive influence on the use of health care services.

Previous research has already focused on various psychological factors and their relationship to health behavior and (in some cases) to health care use. This research specifically investigated the following factors:

Subjective well-being refers to how people evaluate their lives (including thoughts and feelings). Subjective well-being covers two main aspects, namely cognitive and affective well-being. While cognitive well-being (life satisfaction) refers to the cognitive evaluation of the whole life, affective well-being refers to the presence or absence of positive (feelings such as joy or happiness) and negative (emotions such as anxiety or anger) affects. While negative affect "subsumes a broad range of negative mood states, including fear, anxiety, hostility, scorn, and disgust," positive affect reflects "one's level of pleasurable engagement with the environment" (Watson, Clark, and Carey 1988a). Negative affect is generally correlated with depression and anxiety in contrast to positive affect, which generally correlates only with anxiety (Watson, Clark, and Carey 1988a). It is assumed that decreases in cognitive well-being are associated with greater health care use (Shapiro and Roos 1982). Moreover, it is assumed that shifts in affective well-being are related to changes in health care use as previous studies have shown that negative moods are positively associated with somatic complaints (Campo et al. 2004). Somatic complaints are in turn related to health care use (Roth-Isigkeit et al. 2004). Beyond the association between mental health factors (e.g., depression, anxiety, or psychological distress) and health care use, we assume that the psychological factors investigated in our study have an independent effect on the use of health care services.

The concept of *self-efficacy* covers the "belief in one's capability successfully to execute the recommended courses of action" (Conner and Norman 2005) and is assumed to be closely related to health-related behavior (Clark

et al. 1988; Grembowski et al. 1993; Conner and Norman 2005). Individuals with high self-efficacy are more likely to maintain or start healthy behavior, control their behavior (such as weight), or stop bad habits (Strecher et al. 1986). For example, individuals scoring high in self-efficacy tend to exercise more and are more likely to seek preventive care (Bandura 1986; Gecas 1989). Individuals with high self-efficacy tend to be sick less often than individuals with low self-efficacy. Furthermore, individuals scoring high in self-efficacy recover better and faster from illnesses (Gecas 1989). Hence, we assume that higher self-efficacy increases health status. Consequently, increases in self-efficacy might reduce health care use (Grembowski et al. 1993).

Loneliness the state in which a person's social network is smaller or less satisfying than desired (Peplau and Perlman 1979), is related to a variety of negative health-related outcomes, such as anxiety, fatigue, and mental disorder (Andersson 1998). Cross-sectional evidence additionally showed significant positive correlations between loneliness and medical care seeking (Berg et al. 1981). Moreover, loneliness has been found to be an independent factor for a higher rate of hospitalization (Geller et al. 1999). Yet longitudinal investigation of the relationship between loneliness and outpatient as well as inpatient services is lacking. We assume that loneliness is associated with increased health care use.

Flexible goal adjustment (also known as "accommodative flexibility") is the ability to "adjust personal preferences to situational constraints" (Brandtstädter and Renner 1990). Hence, it represents one mode of coping. Flexible goal adjustment plays an important role in subjective well-being and physical health (Wrosch et al. 2007). Thus, it appears plausible that it could also have an impact on health care use independent from self-rated and objective health status.

Self-esteem refers to a negative or positive orientation toward oneself (Rosenberg 1979). There is evidence that physical activity is positively related to self-esteem (McAuley et al. 2005), so that we assume that people with high self-esteem have a healthier lifestyle. Therefore, we hypothesize that the higher a person's self-esteem is, the lower his or her health care use.

Optimism is the stable and general expectation that things will go a person's way and the belief that good things rather than bad things will happen (Scheier and Carver 1985). Optimism has been shown to be negatively associated with several adverse health statuses (Rasmussen, Scheier, and Greenhouse 2009), in particular with facial pain (Sipilä et al. 2006), coronary heart diseases (Kubzansky et al. 2001), and mental health outcomes (Scheier and Carver 1992). Additionally, optimism has been found to be associated with better general health behavior such as attending checkups or less smoking in

adolescents (Jones et al. 2008). This suggests that optimism might equally influence health care use. For one specific illness, sickle cell disease, optimism was found to moderate the relationship between pain and medication use (Pence et al. 2007). However, it is unclear whether optimism itself has an impact on health care use.

In the following, we consider the psychological factors negative affect, positive affect (affective well-being), cognitive well-being, self-efficacy, loneliness, flexible goal adjustment, self-esteem, and optimism. The aim of this study was to describe and analyze the association between these psychological factors and health care use among adult Germans over 40 years of age in a longitudinal setting. As previous studies have found that these psychological factors are potentially modifiable (McAuley, Bane, and Mihalko 1995; Dykstra, Van Tilburg, and de Jong Gierveld 2005; Robins and Trzesniewski 2005; Darlington et al. 2007; Baird, Lucas, and Donnellan 2010; Luhmann et al. 2012; Chopik, Kim, and Smith 2015), knowledge regarding how they affect health care use might be crucial for generating interventional strategies.

METHODS

Sample

For this study, the data were derived from the second (2002), third (2008), and fourth (2011) wave of the German Ageing Survey (DEAS, beginning in 1996). The first wave could not be used because the outcome measures and many psychological factors (optimism, loneliness, flexible goal adjustment, and self-esteem) were not assessed. Community-dwelling individuals from the "second half of life" (aged 40 and above) were recruited. The sample was drawn by means of national probability sampling, which means that a systematic random sample of the German population above the age of 40 years was selected. Therefore, DEAS exploited the fact that there is a compulsory registration in Germany. Thus, in a first step, 200 western and 90 eastern German communities were selected whose demography was similar to that of Germany as a whole. In a second step, a systematic random sample for each community was drawn via interval sampling. The selected communities provided data for a varying fee per provided address, and the corresponding residents were invited via mail to participate in the study.

The topics of DEAS include, for example, income, social support, integration, well-being, and health. The DEAS consists of a structured personal interview (with sociodemographic data) and an additional questionnaire

(including health-related data, for example). The participants were interviewed at their homes. Following the interview, the participants filled out the questionnaires and returned them (using prepaid return envelopes).

A total of 4,838 individuals from the birth cohorts 1911–1956 were interviewed in the first wave (50 percent response rate), and 5,194 individuals were interviewed in the second wave (38 percent response rate). A total of 8,200 individuals were interviewed in the third wave (38 percent response rate), and 4,855 individuals were interviewed in the fourth wave (56 percent response rate). The response rates are comparable to other German surveys (Neller 2005). Whereas the fourth wave is a pure panel survey, new samples were introduced in the second and third waves. For example, 1,524 of the original participants from 1996 were re-interviewed in the second wave. Moreover, while 6,205 participants were interviewed for the first time in the third wave, 1,995 participants had already been interviewed before. More details regarding the DEAS are provided elsewhere (Tesch-Römer, Engstler, and Wurm 2009; Engstler and Motel-Klingebiel 2010). The main reasons for a lack of follow-up data were refused further participation and health reasons. For example, the reasons for not participating in the fourth wave (2011) were as follows: 10 percent could not be contacted, 23 percent did not want to participate anymore, and 5 percent did not participate for health reasons.

Measures

Outcome Variable: Health Care Use. Health care use was measured for outpatient and inpatient treatment. Thus, (1) while visits to a GP and (2) visits to a specialist were considered to represent the outpatient sector, (3) hospital stays were recorded reflecting inpatient treatment. The corresponding health care use was recorded retrospectively for a period of 12 months. Regarding specialists, the participants could report their visits to internists; gynecologists; ophthalmologists; orthopedist; ear, nose, and throat specialists; neurologists; psychiatrists; dermatologists; urologists; and other specialists (open answer). For each specialist and for GPs, the individuals could report the corresponding number of visits as "never," "once," "2–3 times," "4–6 times," "7–12 times," or "more often" (open answer). The responses were recoded as "never" = 0; "once" = 1; "2–3 times" = 2.5; "4–6 times" = 5; "7–12 times" = 9.5; and "more often" = 13. Hospital stays were collected as a dichotomous variable (zero or "one or more").

As the proportion of users of psychiatrist services (and psychotherapists) is very low (for example, 10.4 percent in wave 4), we refrained from analyzing these

mental health services separately. Additionally, with respect to inpatient treatment, specific information on type of ward (psychiatry vs. somatic) was not collected.

Affective Well-Being. Affective well-being was assessed based on the positive and negative affect schedule—PANAS (Watson, Clark, and Tellegen 1988b). It has very good psychometric properties (Crawford and Henry 2004). Cronbach's alpha for the PANAS was 0.86. Further details of all psychological measures reported in this study are presented in the Appendix SA2.

Cognitive Well-Being. Cognitive well-being was assessed based on the Satisfaction with Life Scale (Pavot and Diener 1993). It has proven to be valid and reliable (Glaesmer et al. 2011). Cronbach's alpha was 0.86.

Self-Efficacy. Self-efficacy was measured using a well-validated scale developed by Snyder et al. (1991). This eight-item scale differentiates between pathways (four items) and agencies (four items). The subscales were considered as one as the correlations between the subscales are very high (Schöllgen et al. 2011). Cronbach's alpha was 0.82.

Loneliness. Loneliness was operationalized using a short version (Gierveld and Van Tilburg 2006) of the validated 11-item De Jong Gierveld Loneliness Scale (Gierveld and Kamphuls 1985). This scale is valid and reliable (Gierveld and Van Tilburg 2006, 2010). Cronbach's alpha was 0.83.

Flexible Goal Adjustment. Flexible goal adjustment is assessed using a validated scale with ten items (Brandtstädter and Renner 1990). Cronbach's alpha was 0.83.

Self-Esteem. Self-esteem was measured using the Rosenberg scale (Rosenberg 1965). This is a valid and reliable instrument (Ferring and Filipp 1996). Cronbach's alpha was 0.82.

Optimism. The validated scale covering five items developed by Brandtstädter and Wentura (Brandtstädter and Wentura 1994) was used to assess the participants' optimism. Cronbach's alpha was 0.85.

Other Variables. With respect to predisposing factors, age; gender; family status (married, living together with spouse, others [married, living separated from spouse, divorced, widowed, never married]); employment status (working, retired, not employed); and educational level (International Standard Classification of Education (ISCED) (United Nations Educational Scientific and Cultural Organization 1997) were used. The ISCED distinguishes between low (ISCED 0–2: respondents without formal vocational qualification), medium (ISCED 3–4: respondents with vocational training (at work or at school), including respondents with a higher general school certificate without professional training), and high (ISCED 5–6: respondents with completed professional development training [professional, master or technical school, university of cooperative education, or academies] and respondents with completed university studies [university or university of applied science]). Regarding enabling resources, (log) equivalent monthly net income in Euro was used (according to the OECD scale). In terms of need factors, subjective health and morbidity were used. Subjective health was assessed using a self-rated scale ranging from 1 ("very good") to 5 ("very bad") (Ware and Sherbourne 1992). Morbidity was measured by the total number of chronic illnesses (adapted from the Charlson Comorbidity Index [Charlson et al. 1994]). Furthermore, health behavior domain factors were used, including current smoking status (yes, no) and self-reported excess weight (according to the WHO thresholds for body mass index (BMI): underweight [BMI < 18.5 kg/m^2], normal weight [18.5 kg/m$^2 \leq$ BMI < 25 kg/m^2], overweight [25 kg/m$^2 \leq$ BMI < 30 kg/m^2], and obese [BMI ≥ 30 kg/m^2]). It is worth noting that educational level was used solely for descriptive purposes because it is a time-constant variable for individuals of older age.

In an additional analysis, the main model was extended by including depression as a covariate. Depression was measured using the Center for Epidemiologic Studies-Depression Scale (CES-D scale (Radloff 1977)) with a cutoff CES-D ≥ 18 (Lehr et al. 2008).

Statistical Analyses

Fixed-effects (FE) regressions were used to study the correlates of health care use. Under the assumption that time-constant unobserved factors (for example, genetic disposition) are systematically associated with the independent variables, other techniques such as pooled ordinary least-squares regressions or random effects (RE) estimators produce inconsistent estimates (Cameron and Trivedi 2010). In contrast to these techniques, the FE estimator produces

consistent estimates even if time-constant factors (observed and unobserved) are systematically correlated with the regressors (Cameron and Trivedi 2010). Therefore, the FE estimator is the method of choice (also indicated by Hausman tests).

An important characteristic of the FE estimator is that it only uses within-individual variation (intraindividual changes over time). Hence, the FE estimator is also known as the "within estimator." Therefore, time-constant factors (such as country of origin or sex) cannot be used as independent variables. Wooldridge provides more details concerning the assumptions (Wooldridge 2010).

FE Poisson regressions (for GP and specialist visits as outcome variable) and conditional FE logistic regressions (hospital stay as outcome variable) were used. In the additional models, we also include depression in the regression models for robustness checks. Depression was omitted in the main models due to its high correlation with the psychological factors.

The level of significance was set at $p < .05$. The statistical analysis was conducted using Stata 14.0 (Stata Corp., College Station, TX, USA). Listwise deletion was used. The rate of missing values was less than 3 percent for all independent variables (except income, which had 5 percent missing values).

RESULTS

Sample Characteristics

Table 1 shows the pooled descriptive characteristics of the observations used for the FE regressions with GP visits, specialists, and hospital treatment as outcome measures. Characteristics of observations used in the models for self-esteem are presented. Due to missing values in the remaining psychological factors, the models for psychological factors other than self-esteem comprise fewer observations. In addition, total observations differ among GP visits, specialist visits, and hospitalization, as there were either a different number of missing values or varying number of changes over time in these outcome variables. Thus, for hospital care, there were considerably more observations with no use of care at any time, that is, no change in the outcome variable. Consequently, the FE regression is based on $n = 2{,}302$ observations only (GP visits: $n = 6{,}882$; visits to specialist: $n = 7{,}116$).

Table 1: Characteristics of the Observations Included in the Fixed-Effects Regressions (with GP Visits, Specialist Visits, or Hospitalization as Outcome Variable, Waves 2–4, Pooled)

		GP visits	*Specialist Visits*	*Hospitalization*
Time-constant variables (not included as independent variables in FE regressions)	Female: *N*(%)	3,520 (51.2)	3,549 (49.9)	1,245 (54.1)
	Low education (ISCED-97; 0–2): *N*(%)	365 (7.3)	374 (7.2)	133 (8.4)
	Medium education (ISCED-97; 3–4): *N*(%)	2,576 (51.4)	2,633 (50.5)	851 (53.4)
	High education (ISCED-97; 5–6): *N*(%)	2,069 (41.3)	2,204 (42.3)	609 (38.2)
Outcome variables	GP visits (mean (SD))/specialist visits (mean (SD))/hospitalization (*N*(%))	3.9 (3.1)	5.7 (5.8)	1,067 (46.4)
Predisposing factors	Age (in years): mean (SD)	63.1 (11.0)	63.5 (11.0)	65.2 (10.8)
	Married, living together with spouse: *N*(%)	5,144 (74.8)	5,331 (74.9)	1,709 (74.2)
	Working: *N*(%)	2,507 (36.4)	2,493 (35.0)	641 (27.8)
	Retired: *N*(%)	3,570 (51.9)	3,801 (53.4)	1,420 (61.7)
	Other: not employed: *N*(%)	805 (11.7)	822 (11.6)	241 (10.5)
Enabling resources	Monthly equivalent net income in Euro: mean (SD)	1,722.9 (1,414.1)	1782.4 (1,629.9)	1,727.8 (1,413.6)
Need factors	Self-rated health (from 1 = "very good" to 5 = "very bad"): mean (SD)	2.4 (0.8)	2.5 (0.8)	2.7 (0.8)
	Number of chronic diseases: mean (SD)	2.4 (1.8)	2.5 (1.8)	2.9 (1.9)
	Underweight: *N*(%)	43 (0.6)	47 (0.7)	20 (0.9)
	Normal weight: *N*(%)	2,476 (36.0)	2,619 (36.8)	763 (33.1)
	Overweight: *N*(%)	2,907 (42.2)	2,981 (41.9)	1,021 (44.4)
	Obesity: *N*(%)	1,456 (21.2)	1,469 (20.6)	498 (21.6)
	Currently smoking: *N*(%)	1,123 (16.3)	1,101 (15.5)	354 (15.4)

Continued

Table 1. *Continued*

		GP visits	*Specialist Visits*	*Hospitalization*
Psychological factors	Negative affect (PANAS, Watson, Clark, and Tellegen 1988b): mean (SD); range	2.0 (0.5); 1–4.5	2.0 (0.5); 1–4.5	2.1 (0.5); 1–4.4
	Positive affect (PANAS, Watson, Clark, and Tellegen 1988b): mean (SD); range	3.5 (0.5); 1–5	3.5 (0.5); 1–5	3.5 (0.5); 1–5
	Life satisfaction (SWLS, Pavot and Diener 1993): mean (SD); range	3.8 (0.7); 1–5	3.8 (0.7); 1–5	3.8 (0.7); 1–5
	Self-efficacy (Snyder et al. 1991): mean (SD); range	3.1 (0.4); 1–4	3.1 (0.4); 1–4	3.0 (0.4); 1.1–4
	Loneliness (Gierveld and Van Tilburg 2006): mean (SD); range	1.7 (0.5); 1–4	1.7 (0.5); 1–4	1.7 (0.5); 1–3.5
	Flexible goal adjustment (Flex, Brandtstädter, and Renner 1990): mean (SD); range	3.6 (0.5); 1–5	3.6 (0.5); 1–5	3.6 (0.5); 1.1–5
	Self-esteem (Rosenberg 1965; Ferring and Filipp 1996): mean (SD); range	3.4 (0.4); 1.3–4	3.4 (0.4); 1.3–4	3.4 (0.4); 1.5–5
	Optimism (Brandtstädter and Wentura 1994): mean (SD); range	2.9 (0.6); 1–4	2.9 (0.6); 1–4	2.9 (0.6); 1–4
	Observations	6,882	7,116	2,302

Bivariate Correlations

Pairwise Pearson correlations are reported in Table 2. GP and specialist visits and hospitalization were significantly positively associated with negative affect. Moreover, these outcome variables were significantly negatively associated with positive affect, cognitive well-being, self-efficacy, self-esteem, and optimism. Furthermore, GP visits and hospitalization were unrelated to loneliness and flexible goal adjustment, whereas specialist visits were significantly negatively associated with flexible goal adjustment.

Inferential Statistics

Table 3 depicts the findings of the FE regressions for GP visits. Adjusting for numerous covariates, the FE regressions revealed that GP visits increased with increases in negative affect ($\beta = 0.09$, $p < .001$) as well as decreases in positive affect ($\beta = -0.09$, $p < .01$), cognitive well-being ($\beta = -0.08$, $p < .001$), self-esteem ($\beta = -0.09$, $p < .05$), and optimism ($\beta = -0.07$, $p < .01$), whereas self-efficacy, loneliness, and flexible goal adjustment did not affect physician visits.

Table 4 presents the results of the FE regressions for specialist visits. Adjusting for potential confounders, FE regressions showed that specialist visits increased with increasing negative affect ($\beta = 0.12$, $p < .001$) as well as decreasing cognitive well-being ($\beta = -0.08$, $p < .01$) and optimism ($\beta = 0.11$, $p < .01$). Changes in positive affect, self-efficacy, loneliness, flexible goal adjustment, and self-esteem did not affect specialist visits.

Table 5 depicts the results of the FE regressions for hospitalization. Adjusting for several covariates, the FE regressions revealed that the probability of hospitalization increased with increases in negative affect (OR: 1.42, $p < .01$) as well as decreases in positive affect (OR: 0.68, $p < .01$), self-efficacy (OR: 0.68, $p < .05$), and optimism (OR: 0.77, $p < .05$). Changes in cognitive well-being (OR: 0.85, $p = .08$), loneliness, flexible goal adjustment, and self-esteem (OR: 0.74, $p = .07$) did not reach the level of statistical significance.

Additionally, the FE regressions showed that the need factors were the predominant correlates of health care use for all three considered health care use outcomes.

The main model was extended by adding depression. In terms of effect sizes and significance, the results of the psychological factors remained virtually the same (results not shown).

Table 2: Pairwise Correlations (with Bonferroni Correction for Multiple Comparisons)

	GP Visits	*Specialist Visits*	*Hospitalization (Ref.: No)*	*Negative Affect*	*Positive Affect*	*Life Satisfaction*	*Self-Efficacy*	*Loneliness*	*Flexible Goal Adjustment*	*Self-Esteem*	*Optimism*
GP visits	1										
Specialist visits	0.374***	1									
Hospitalization (Ref.: No)	0.248***	0.254***	1								
Negative affect	0.0919***	0.154***	0.0603***	1							
Positive affect	−0.150***	−0.0853***	−0.0923***	−0.270***	1						
Life satisfaction	−0.113***	−0.125***	−0.0681***	−0.400***	0.451***	1					
Self-efficacy	−0.0931***	−0.0852***	−0.0680***	−0.364***	0.607***	0.571***	1				
Loneliness	0.0246	0.0354	0.0107	0.412***	−0.373***	−0.457***	−0.407***	1			
Flexible goal adjustment	−0.0369	−0.0456**	−0.0183	−0.207***	0.345***	0.322***	0.458***	−0.231***	1		
Self-esteem	−0.0978***	−0.0817***	−0.0787***	−0.529***	0.555***	0.520***	0.659***	−0.511***	0.299***	1	
Optimism	−0.173***	−0.163***	−0.108***	−0.360***	0.507***	0.610***	0.607***	−0.401***	0.345***	0.549***	1
Observations	7,116										

Notes. Negative affect (PANAS, Watson, Clark, and Tellegen 1988b); positive affect (PANAS, Watson, Clark, and Tellegen 1988b); life satisfaction (SWLS, Pavot and Diener 1993); self-efficacy (Snyder et al. 1991); loneliness (Gierveld and Van Tilburg 2006); flexible goal adjustment (Flex, Brandtstädter and Renner 1990); self-esteem (Rosenberg 1965; Ferring and Filipp 1996); optimism (Brandtstädter and Wentura 1994).
***$p < 0.001$; **$p < 0.01$, *$p < 0.05$, +$p < 0.10$.

Table 3: Correlates of GP Visits: Results of Fixed-Effects Poisson Regressions (Waves 2–4)

Independent Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Potential confounders†	✓	✓	✓	✓	✓	✓	✓	✓
Negative affect	0.0915*** (0.0275)							
Positive affect		−0.0869** (0.0284)						
Life satisfaction			−0.0764*** (0.0219)					
Self-efficacy				−0.0512 (0.0380)				
Loneliness					0.0378 (0.0275)			
Flexible goal adjustment						−0.0379 (0.0277)		
Self-esteem							−0.0886* (0.0351)	
Optimism								−0.0746** (0.0285)
Observations	6,816	6,816	6,824	6,874	6,791	6,801	6,882	6,864
Number of individuals	3,108	3,108	3,112	3,134	3,100	3,104	3,138	3,131

Notes. Negative affect (PANAS, Watson, Clark, and Tellegen 1988b); positive affect (PANAS, Watson, Clark, and Tellegen 1988b); life satisfaction (SWLS, Pavot and Diener 1993); self-efficacy (Snyder et al. 1991); loneliness (Gierveld and Van Tilburg 2006); flexible goal adjustment (Flex, Brandtstädter and Renner 1990); self-esteem (Rosenberg 1965; Ferring and Filipp 1996); optimism (Brandtstädter and Wentura 1994).
***$p < .001$; **$p < .01$; *$p < .05$; +$p < .10$.
†All estimations include age, (log) monthly equivalent net income, self-rated health, number of chronic diseases as well as dummy variables for marital status, employment status, weight categories, and smoking status as potential confounders. Poisson regression coefficients were reported; cluster-robust standard errors in parentheses.

Table 4: Correlates of Specialist Visits: Results of Fixed-Effects Poisson Regressions (Waves 2–4)

Independent Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Potential confounders[†]	✓	✓	✓	✓	✓	✓	✓	✓
Negative affect	0.122***							
	(0.0343)							
Positive affect		−0.0444						
		(0.0344)						
Life satisfaction			−0.0801**					
			(0.0272)					
Self-efficacy				−0.0473				
				(0.0533)				
Loneliness					0.00525			
					(0.0343)			
Flexible goal adjustment						0.00228		
						(0.0334)		
Self-esteem							−0.0339	
							(0.0478)	
Optimism								−0.114**
								(0.0347)
Observations	7,040	7,040	7,044	7,108	7,021	7,038	7,116	7,096
Number of individuals	3,204	3,204	3,206	3,235	3,199	3,207	3,239	3,231

Notes. Negative affect (PANAS, Watson, Clark, and Tellegen 1988b); positive affect (PANAS, Watson, Clark, and Tellegen 1988b); life satisfaction (SWLS, Pavot and Diener 1993); self-efficacy (Snyder et al. 1991); loneliness (Gierveld and Van Tilburg 2006); flexible goal adjustment (Flex, Brandtstädter and Renner 1990); self-esteem (Rosenberg 1965; Ferring and Filipp 1996); optimism (Brandtstädter and Wentura 1994).
***$p < .001$, **$p < .01$, *$p < .05$, +$p < .10$.
[†]All estimations include age, (log) monthly equivalent net income, self-rated health, number of chronic diseases as well as dummy variables for marital status, employment status, weight categories, and smoking status as potential confounders. Poisson regression coefficients were reported; cluster-robust standard errors in parentheses.

Table 5: Correlates of Hospitalization (Ref.: No): Results of Conditional Fixed-Effects Logistic Regressions (Waves 2–4)

Independent Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Potential confounders†	✓	✓	✓	✓	✓	✓	✓	✓
Negative affect	1.424** (1.116–1.816)							
Positive affect		0.675** (0.523–0.873)						
Life satisfaction			0.846+ (0.701–1.020)					
Self-efficacy				0.679* (0.489–0.943)				
Loneliness					1.066 (0.842–1.351)			
Flexible goal adjustment						0.923 (0.734–1.161)		
Self-esteem							0.738+ (0.532–1.023)	
Optimism								0.766* (0.600–0.979)
Observations	2,281	2,281	2,282	2,300	2,274	2,264	2,302	2,292
Individuals	1,003	1,003	1,003	1,012	1,002	998	1,013	1,009
Pseudo R^2	0.075	0.075	0.069	0.072	0.069	0.068	0.070	0.072

Notes. Negative affect (PANAS, Watson, Clark, and Tellegen 1988b); positive affect (PANAS, Watson, Clark, and Tellegen 1988b); life satisfaction (SWLS, Pavot and Diener 1993); self-efficacy (Snyder et al. 1991); loneliness (Gierveld and Van Tilburg 2006); flexible goal adjustment (Flex, Brandtstädter and Renner 1990); self-esteem (Rosenberg 1965; Ferring and Filipp 1996); optimism (Brandtstädter and Wentura 1994).
***$p < .001$, **$p < .01$, *$p < .05$, +$p < .10$.
†All estimations include age, (log) monthly equivalent net income, self-rated health, number of chronic diseases as well as dummy variables for marital status, employment status, weight categories, and smoking status as potential confounders. Odds ratios reported; 95% CI in parentheses.

DISCUSSION

In our study, health care use significantly increased with decreases in *affective well-being* (except for the relation between positive affect and specialist visits). Moreover, outpatient visits significantly increased with decreases in *cognitive well-being.* Thus far, only a few studies have examined the relation between subjective well-being and health care use. In a longitudinal study of adolescents, Gil et al. found that increases in negative affect were associated with increased health care use, whereas increases in positive affect were associated with decreases in health care use (Gil et al. 2003). This trend was also found in samples of older populations (Porter et al. 2000; Gil et al. 2004). Our findings might be explained by the fact that decreases in subjective well-being (affective well-being and cognitive well-being) are strongly related to increases in somatic complaints (Watson 1988). Generally, these complaints are associated with increased health care use (Michael et al. 2005).

Self-efficacy showed bivariate correlations with health care use and still had a negative association with hospitalization controlling for comorbidity. Scherer and Bruce found a negative association of self-efficacy with the number of emergency department visits and use of hospitals in the United States (Scherer and Bruce 2001), which is in contrast to another study that found no relationship between self-efficacy and health care use (Wysocki et al. 1992).

Loneliness was not a correlate of health care use. As loneliness is known to be associated with both poorer physical and mental health (Luanaigh and Lawlor 2008), it is surprising that there was no correlation between loneliness and health care use in our study. In the very specific context of persons suffering from Alzheimer's disease, living alone decreased the likelihood of using health care such as outpatient physician services or hospital care (Webber, Fox, and Burnette 1994). However, "living alone" is not completely congruent with loneliness. One study found a positive association between loneliness and frequency of seeking medical advice and a higher consumption of hypnotics and sedatives in Sweden (Berg et al. 1981).

While *flexible goal adjustment* was negatively related to specialist visits (bivariate) in our study, it was unrelated to health care use in the FE regression analysis. Previous studies have shown that flexible goal adjustment is significantly related to subjective well-being and physical as well as mental health (Hall et al. 2010)—factors that are strongly related to health care use (Rosemann et al. 2007; Scholte-Stalenhoef et al. 2016). The nonsignificant association between flexible goal adjustment and health care use in our study might

be partially explained by the relation between flexible goal adjustment and need factors such as self-rated health (Schmitz, Saile, and Nilges 1996).

We found that GP visits increased with decreases in *self-esteem.* This is in accordance with a longitudinal study by Mechanic, who found that low self-esteem was significantly associated (bivariate) with frequency of consultations with physicians (Mechanic 1980). Cairney et al. (2004) found that higher self-esteem was associated with lower mental health care use. Our findings might be explained by the positive relation between self-esteem and physical activity (McAuley et al. 2005). Increases in physical activity are in turn related to decreases in GP visits.

Greater optimism was associated with less use of health care in all of the considered health care use measures. Higher levels of optimism are associated with better outcomes in various specific illnesses and with better health behavior (see Introduction). Therefore, it appears to be plausible that there are significant bivariate correlations with health care use (see Table 2). However, beyond that, our study suggests that there is an independent effect of optimism on health care use (see Tables 3–5). This extends the existing literature on optimism to the domain of health care use, whereas previous studies concerning optimism focused predominantly on its relationship with other psychological factors such as coping or subjective well-being, (health) behavior, or morbidity (Carver, Scheier, and Segerstrom 2010). One previous study showed optimism to predict pharmaceutical use in adolescents with sickle cell disease (Pence et al. 2007). In contrast, another study, focusing on congenital heart disease, did not find that optimism affected outpatient physician contacts or hospitalization (Schoormans et al. 2016). Scheier et al. (1999) showed optimism to be an independent predictor of rehospitalization after a coronary artery bypass graft surgery. Similar to our study, they found that optimism decreased (re-)hospitalization.

In sum, our analysis has shown that several psychological factors are important correlates of health care use. Many studies from a primarily health economic perspective that have focused on health care use as an outcome measure have ignored the potential influence of psychological factors, and very few have considered these factors. In contrast, studies from a more psychological point of view seldom investigate the outcome of health care use. With respect to most of the psychological factors considered, the relevant literature was sparse and was often based on small sample sizes in rather specific settings. However, the present study shows that it is worth bridging the gap between psychological factors and the analysis of health care use, as they play a central role in an individual's choice to use health care services.

A major strength is that our results are derived from a large population-based study of community-dwelling individuals 40 years of age and over living in Germany (Engstler and Motel-Klingebiel 2010). In contrast to virtually all the studies cited in the previous discussion section, our study is not limited to one specific index disease. Beyond the association with related mental health factors such as depression, we examined and identified modifiable psychological factors as important factors for health care use—also independent from an index disease. Knowing these modifiable psychological factors might help to manage health care use. Consequently, it is worth investigating these factors.

In addition, we analyzed various psychological factors in a longitudinal setting using FE regressions, an approach that extended beyond the scope of most of the previously cited studies. Consequently, our estimates are not biased by time-constant unobserved and observed factors. Furthermore, we employed well-validated and widely used psychological measures.

Our study also has some limitations. While important lifestyle factors were used, alcohol consumption was excluded due to data availability. In addition, for reasons of data availability, type of health insurance (enabling factor) was omitted. Besides, we could not run separate analysis for mental health service use. Furthermore, both potential sample selection bias and panel attrition are limiting factors of our study. Thus, the likelihood of taking part in the study was not independent from general observable characteristics because the likelihood of participating decreased, for example, with age. Moreover, women were more likely to respond than men, and people living in the eastern parts of Germany were more likely to respond than western citizens, as was shown for the first wave (Schmid, Hess, and Gilberg 1997). Once an individual had begun taking part in the survey, panel attrition could be observed, as further participation was dependent on certain characteristics such as self-rated health, education, marital status, or income. Consequently, it might be difficult to generalize our findings to, for example, less educated, divorced, less healthy individuals and those with low income. However, various ageing studies have demonstrated that panel attrition is not a major problem in selected longitudinal samples focusing on the relationship between the variables (Kempen and van Sonderen 2002; Wurm, Tesch-Römer, and Tomasik 2007).

A further limitation is that our psychological constructs might have influenced the patients' ability to recall their health care use accurately. Moreover, the psychological constructs might be associated with the willingness to report accurate health care use, for example, in cases in which certain services

appear to be stigmatizing, such as visits to a psychiatrist or psychotherapist. For reasons of endogeneity (reverse causality; for example, health care use influencing cognitive well-being), we cannot rule out that our estimates are biased. More specifically, health care use was assessed *retrospectively* for the 12 months preceding the interview. Thus, we cannot dismiss the possibility that the individuals used health care services that influenced psychological factors. However, possible solutions to this problem (such as panel instrumental variables approaches) depend on very strong assumptions. Moreover, an external instrument is difficult to find.

Finally, the international generalizability of our results must be questioned, as it is well known that psychological factors such as life satisfaction or positive and negative affect differ around the world (Diener and Diener 2009). Different from other studies, our study used *changes* in psychological factors over time to estimate their effect on health care use. As there is no source for comparing changes in psychological factors over time in various countries, we cannot compare our measure to measures used in other countries. Furthermore, the effect of psychological factors on health care use is likely to also depend on country-specific characteristics, such as the availability of health care services and, for example, organizational, social, or cultural barriers to health care use (Gulliford et al. 2002).

CONCLUSION

Our data underline the influence of psychological factors on health care use. Thus, whenever possible, future studies aiming to determine the factors influencing health care use should include psychological factors. As the included psychological variables are modifiable, efforts to manage health care use might focus on factors such as affective well-being, optimism, or self-efficacy. GPs might additionally consider these variables when guiding patients' health care use. Future research is necessary to examine the impact of modifying psychological factors on health-related outcomes or quality of care.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the supporting information tab for this article:

Appendix SA1: Author Matrix.
Appendix SA2: Psychological Factors: Items and Explanations.