

Trait resilience and mental health in older adults: A meta-analytic review

FRANCESCA FÄRBER¹ AND JENNY ROSENDAHL² ¹Department of Epidemiology and Health Monitoring, Robert Koch Institute, Berlin, Germany; ²Institute of Psychosocial Medicine and Psychotherapy, Jena University Hospital, Jena, Germany

ABSTRACT

Objectives – This study aims to systematically review research on the association between resilience as a personality trait and mental health in older adults and to meta-analytically quantify this relation.

Methods – We included studies assessing older adults (mean age 60 years or older), measuring trait resilience with a version of the Resilience Scale (RS) by Wagnild and Young and mental health. We conducted a comprehensive search in Medline, Web of Science, PsycInfo, PubPsych, ProQuest Dissertations and Theses Full Text database and the theses database of the German National Library for eligible studies. Study data on associations between resilience and mental health were aggregated using a random-effects model.

Results – Twenty-seven studies with 13 444 participants were included. Trait resilience and mental health were strongly interrelated ($r = 0.40$, 95% CI [0.36; 0.44]) with substantial heterogeneity ($I^2 = 83\%$). Published studies revealed larger associations between resilience and mental health ($r = 0.41$ [0.37; 0.45]) than unpublished studies ($r = 0.25$ [0.11; 0.38]).

Conclusions – Higher levels of resilience are associated with better mental health in older persons. Because associations were solely assessed cross-sectionally, longitudinal studies are highly needed to draw causal inferences. © 2020 The Authors Personality and Mental Health Published by John Wiley & Sons Ltd

Introduction

In the light of the growing aging of the population worldwide, issues of healthy aging raised increasing awareness. According to the World Health Organization, health comprises physical, mental and social well-being. In this regard, mental health has been defined as ‘a state of well-being in which the individual realize his or her own abilities, can cope with the normal stress of life, can work productively and fruitfully, and is able to make a contribution to his or her community’ (p. 1).¹ Older adults may experience not only life stressors as people of all ages but also stressors that are more typical for later life, like a steadily decrease of functional abilities and capacities. Older people may suffer from health problems such as

chronic pain, frailty or mobility impairment, chronic diseases and multimorbidity and might more frequently experience bereavement, isolation and loneliness. All of these stressors can result in increased mental distress. It has been estimated that about every fifth older adult is suffering from clinically relevant depressive symptoms with a mean prevalence of current major depressive disorder of 3%. Additionally, about 5% are diagnosed with a current specific phobia and 2% with a current generalized anxiety disorder.²

In contrast, evidence also suggests that older populations, although less healthy and less productive in general, may be more satisfied with their lives and experience less stress or worry than do middle-aged people. This U-shaped pattern is most strongly evident in the rich,

English-speaking world.³ Other research findings revealed that negative mood and depression are intraindividually declining with age.⁴ Completing the inconsistency of findings, some studies demonstrated that levels of happiness might be stable across age groups.⁵

Moreover, research reveals that there is a huge interindividual heterogeneity in quality of life and mental health. While some of older persons feel severely distressed or even develop mental disorders, others actually experience high wellbeing and quality of life, and low stress despite the onset of chronic conditions.^{6–8} Predictors of successful aging in terms of high personal well-being and good mental health have been investigated extensively. One of the frequently discussed characteristics is resilience. Definitions of resilience include three main orientations: resilience as personality trait, resilience as dynamic process, and resilience as outcome.⁹ As a trait, resilience is defined as positive personality characteristic that enhances individual adaption.¹⁰ In this sense, trait resilience is seen as a stable resource to respond to adversities in a flexible rather than rigid manner.¹¹ Because of explicitly allowing the experience of adversity and age-related functional decline in contrast to the concept of successful aging, trait resilience has been discussed not only as a promising construct in aging research but also as an objective for public health policy.¹²

A number of instruments have been developed to measure trait resilience of which the Resilience Scale (RS) by Wagnild and Young¹⁰ is most commonly used.¹³ It assesses the individual level of resilience as a positive personality characteristic in terms of a personal resource enhancing individual adaptation. The scale represent two underlying factors; factor I 'personal competence' includes items on self-reliance, independence, mastery, resourcefulness and perseverance, while factor II 'acceptance of self and life' is described by items on adaptability, balance, flexibility and balanced perspective of life.¹⁰ The RS consists of 25 items to be evaluated on a 7-point Likert-type scale (values from 1 to 7). It has been translated into numerous languages, and various short versions are available. When comparing the psychometric properties of instruments designed to measure psychological

resilience as a personality trait, the RS revealed the most convincing evidence with regard to theoretical foundation, reliability and validity.^{14,15} Particularly in older age, the RS has been most widely used and is most theoretically robust compared to other resilience measures (i.e. Connor-Davidson Resilience Scale and Brief Resilient Coping Scale¹⁶).

Current research

Meta-analyses of the association between resilience and mental health as an indicator of positive adaption to stress have shown strong associations between trait resilience and mental health.^{17–19} In a review of 60 studies including children and adolescents as well as adults, trait resilience measured with various scales was negatively correlated to depression, anxiety and negative affect and positively correlated to life satisfaction and positive affect.¹⁷ This research confirmed the findings of a prior review including 33 studies using the Connor-Davidson Resilience Scale²⁰ and the Resilience Scale¹⁰ to measure trait resilience. Furthermore, a significant correlation of resilience with age and gender was found, although small in effect size.¹⁸ In a recent meta-analysis, we examined the relation of trait resilience and mental health in people suffering from a somatic disease or facing a health problem. Inclusion was restricted to resilience measured with the Resilience Scale by Wagnild and Young.¹⁰ Considering 55 studies, a significant positive correlation ($r = 0.43$; 95% confidence interval (CI) [0.39; 0.48]) between resilience and various indicators of mental health was found.¹⁹

In older people evidence on the relation between resilience and mental health has been summarized in another meta-analytic review. Across seven included studies, a moderate inverse correlation between resilience and depression in older adults was found ($r = -0.35$; 95% CI [-0.41; -0.28]).²¹ However, inclusion was not restricted on resilience measured as a trait.

Aims of the present study

The aim of this study was to examine the association between trait resilience and mental health in

older adults, based on a systematic review and meta-analysis of the existing evidence. Considering the high heterogeneity of the operational definitions and assessment of resilience our review aimed at ensuring conceptual and methodological homogeneity of the resilience construct. Hence, we restricted inclusion on the use of the Resilience Scale by Wagnild and Young¹⁰ as a widely used measure of trait resilience. Furthermore, we wanted to investigate the association of resilience and age or gender, respectively.

Methods

Registration

The review was registered at PROSPERO International Prospective Register of Systematic Reviews (CRD42018107130).

Eligibility criteria

We considered studies meeting the following inclusion criteria: a sample of older individuals (mean age 60 years and older), inclusion of a measure of trait resilience using the Resilience Scale by Wagnild und Young¹⁰ and a measure of mental health (depression, anxiety, mental distress, well-being or mental health as components of health-related quality of life), and report of a statistical measure of association between resilience and mental health. There were no limits regarding publication status, year or language unless an abstract in English was available.

Information sources and search

We performed a systematic literature search using electronic databases such as Medline, Web of Science, PsycInfo and PubPsych (date last searched: 15 January 2019; see Table S1 for details of the search strategy). We also checked references of recent reviews, meta-analyses and included primary studies to identify additional studies that could not be found by the electronic search. In order to detect unpublished studies, we searched the ProQuest Dissertations and Theses Full Text database and the theses database of the German National Library.

Study selection

Studies identified in the literature search were screened for eligibility by two independent researchers (F. F. and J. R.). Disagreements were resolved by consensus. We initially included all studies reporting a mean age of 60+ years. In a second step, we checked the age range of the participants for meeting the minimum age criterion of 50 years. If studies did not report the age range, study authors were contacted and asked for further information. If studies included participants <60 years and primary data were available, we calculated necessary statistics for the eligible subgroup of participants aged 50+.

Data extraction

Two researchers independently extracted the following data from the included studies: information on publication (e.g. authors, publication year and country of origin), sample characteristics (e.g. sample size, gender and age), resilience (e.g. used version of the RS, reliability of the scale, mean score of resilience for total sample, women and men), mental health variable (e.g. used measure and reliability) and measures of association (correlations, standardized regression coefficients from univariate regression analyses and rank correlation coefficients). In any such case where other or no measures of association between resilience and mental health were reported, study authors were contacted and asked for correlational data. Disagreements were resolved by consensus.

Risk of bias in individual studies

Risk of bias in the included studies was assessed by two independent raters using the appraisal tool for cross-sectional studies (AXIS tool).²² Disagreements between the raters were resolved by discussion. The AXIS tool consists of 20 questions to assess each individual aspect of study design and reporting quality (see Table S2). We further assessed the reliability (internal consistency) of the resilience measure and of the mental health/mental distress measure, respectively. Reliability was judged as doubtful if Cronbach's α

was below 0.80. Additionally, we considered the response rate in the included studies.

Age and sex differences in trait resilience

We determined mean corrected correlations and 95% confidence intervals for each association between age and trait resilience and pooled the data using a random-effects model. If studies reported means and standard deviations of resilience scores for women and men separately, we calculated standardized mean differences corrected for small sample bias (Hedges' g^{23}) for each study and calculated a pooled effect size estimate with 95% confidence interval using a random-effects model.

Association between trait resilience and mental health

We computed mean corrected correlations and 95% confidence intervals for each association between trait resilience and mental health. Correlation coefficients for negative symptom measures (e.g. depression and anxiety) were multiplied with -1 to allow for a consistent interpretation with positive measures (e.g. well-being and quality of life). Because we expected a heterogeneous effect size distribution, a random-effects model was used for data aggregation. If a study reported data on more than one association (e.g. for anxiety and depression), data were first aggregated on single study-level.

Risk of bias across studies

In order to address potential publication bias, we visually inspected funnel plots and performed Egger's regression test for funnel plot asymmetry.²⁴ Additionally, Duval and Tweedie's trim and fill procedure²⁵ was used to determine whether small studies with non-significant effects were underrepresented in the meta-analysis. Possible missing studies were imputed, and the effect size estimate was recalculated. Additionally, classic fail safe N was computed.²⁶

Additional analyses

Subgroup analyses were conducted on the association between trait resilience and mental health with respect to publication status (published/

unpublished), country of study origin, and sample (ill/representative or healthy). We also run meta-regression analyses to test the impact of response rate, sample size, age of participants, proportion of women, year of publication, number of RS items and mean RS item score. In addition, we performed sensitivity analyses to test for the robustness of results using the leave-one-out method. Additionally, we run sensitivity analyses with setting the inclusion criterion of participants' mean age up to 65+ and 70+ years, respectively.

Results

Study selection

We screened a total of 4 840 records and finally included $N = 27$ studies in the meta-analysis. Figure 1 contains the flow chart of the study selection process.

Study characteristics

Included studies were published between 1993 and 2018 and reported samples with 13 444 participants. Characteristics of the included studies are shown in Table 1.

Mean age of the participants was 69.6 years, 57% were female. Nine studies were from Germany, five from the USA, two each from Italy, Australia and Brazil, and one each from Norway, Sweden, Switzerland, China, Canada, Japan and India. All studies used a cross-sectional design with trait resilience and mental health measured at the same time. In 10 studies, the RS with 25 items was applied, while 17 studies used short versions, including RS with 14 items ($n = 6$), 13 ($n = 5$), 11 ($n = 3$), 10 ($n = 2$) or 5 items ($n = 1$). Measures of mental distress assessing symptoms of mental health impairment (e.g. anxiety and depression) were used in 20 studies, while positive aspects of mental health (e.g. quality of life and well-being) were applied in 14 samples. The following mental health outcomes were assessed: anxiety ($n = 13$), depression ($n = 19$), quality of life ($n = 11$), post-traumatic stress symptoms ($n = 2$), well-being ($n = 2$), stress ($n = 1$) and general life satisfaction ($n = 1$).

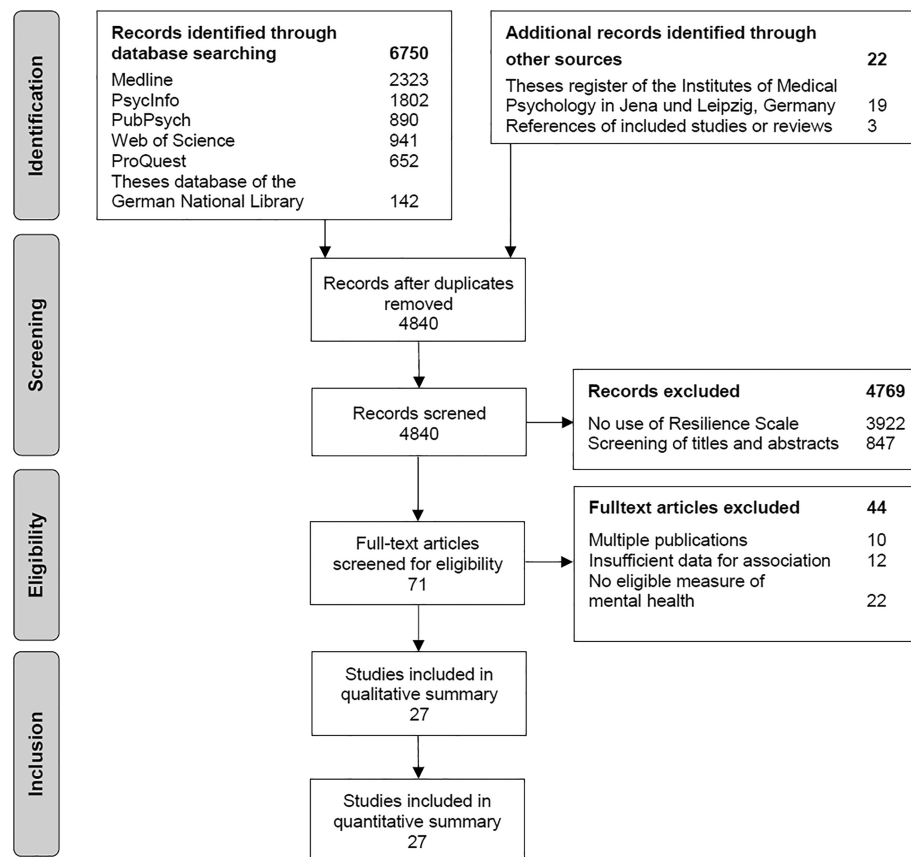


Figure 1: Study flow

Risk of bias within studies

Evaluation of study quality according to the AXIS tool is presented in Table S2. Negative appraisal of primary studies in the AXIS tool was related to missing sample size justification, lack of addressing and describing non-responders, and risk of non-response bias. Internal consistency of the RS ranged from $\alpha = 0.80$ to 0.95 (in eight studies, it was unclear because of missing information). For mental health measures, internal consistency was $\alpha = 0.70$ to 0.95 across studies. It was acceptable ($\alpha \geq 0.80$) for 19 measures, doubtful ($\alpha < 0.80$) for 11 measures and unclear for 21 measures. Response rate was ranging between 20% and 100% across studies with a mean response rate of 63%. Larger associations between trait resilience and mental health were found in studies with acceptable reliability of the respective measures ($r = 0.45$; 95% CI $[0.40; 0.51]$; $n = 19$; $I^2 = 86\%$) than in studies with doubtful or unclear reliability

($r = 0.38$; 95% CI $[0.34; 0.43]$; $n = 32$; $I^2 = 90\%$; $p = 0.056$). Response rate did not have an impact on the size of correlation between trait resilience and mental health.

Age and sex differences in trait resilience

There was no significant correlation between age and trait resilience across studies: $r = 0.02$; 95% CI $[-0.09; 0.11]$; $n = 12$; $p = 0.774$. Heterogeneity was substantial; correlations in the individual studies ranged from $r = -0.22$ to 0.20 resulting in $I^2 = 90\%$. Men and women did not differ in mean resilience scores; $g = 0.04$; 95% CI $[-0.07; 0.14]$; $n = 11$; $p = 0.487$. Individual study differences ranged from $g = -0.20$ to 0.29 ($I^2 = 54\%$).

Association between trait resilience and mental health

Across all outcomes, we found a significant mean correlation between trait resilience and mental

Table 1: Characteristics of the included studies and correlations of resilience and mental health

Author(s) and year	Sample	Country	Resilience measure	Mental health index (measure)	N	r	95% KI	p
Bathke (2012) ³⁷	Patients with obesity recruited in general practice, 69% fem, age: 50–84 years (M = 64.9)	Germany	RS-13	Anxiety (HADS-A) Depression (HADS-D) Mental quality of life (SF-12 MCS)	131 131 131	0.27 0.39 0.06	0.11; 0.42 0.23; 0.52 −0.12; 0.22	0.002 <0.001 0.533
Freitag <i>et al.</i> (2016) ³⁸	Older adults in northern Germany, 62% fem, age: 64–91 years (M = 75.3)	Germany	RS-11	Anxiety (GAI) Depression (PHQ-9) Mental quality of life (SF-12 MCS)	210 200 197	0.32 0.50 0.35	0.19; 0.43 0.39; 0.60 0.22; 0.47	<0.001 <0.001 <0.001
Garland <i>et al.</i> (2017) ³⁹	Older adults with multiple sclerosis, 78% fem, age: 55–88 years (M = 64.6)	Canada	RS-25	Anxiety (HADS-A) Depression (HADS-D)	743 743	0.38 0.56	0.32; 0.44 0.51; 0.61	<0.001 <0.001
Gerino <i>et al.</i> (2017) ⁴⁰	Older adults, 70% fem, age: 65–90 years	Italy	RS-10	Anxiety (HADS-A) Depression (HADS-D) Mental quality of life (WHOQOL-BREF)	290 290 290	0.39 0.50 0.68	0.29; 0.48 0.41; 0.58 0.61; 0.73	<0.001 <0.001 <0.001
Hennig (2011) ³⁰	Patients with hypertension, 53% fem, age: 50–84 years (M = 68.2)	Germany	RS-13	Mental quality of life (SF-12 MCS)	205	0.11	−0.02; 0.25	0.104
Jaenichen <i>et al.</i> (2012) ²⁸	Patients after severe sepsis and their relatives, 65% fem, age: 50–90 years (M = 66.1)	Germany	RS-13	Anxiety (HADS-A) Depression (HADS-D) Mental quality of life (SF-12 MCS)	80 80 76	0.57 0.70 0.70	0.40; 0.70 0.56; 0.79 0.57; 0.80	<0.001 <0.001 <0.001
Kocalevent <i>et al.</i> (2015) ⁴¹	Representative sample of general population, 53% fem, age: 50–92 years (M = 64.4)	Germany	RS-11	Post-traumatic stress symptoms (PTSS-10) Anxiety (GAD-7) Depression (PHQ-2)	80 2,389 2,389	0.63 0.29 0.34	0.47; 0.74 0.25; 0.32 0.30; 0.37	<0.001 <0.001 <0.001
Krause (2011) ⁴²	Patients with diabetes mellitus recruited in general practice, 54% fem, age: 50–80 years (M = 64.9)	Germany	RS-13	Anxiety (HADS-A) Depression (HADS-D) Mental quality of life (SF-12 MCS)	169 169 162	0.43 0.53 0.19	0.30; 0.55 0.41; 0.63 0.04; 0.34	<0.001 <0.001 0.014
Kukihara <i>et al.</i> (2018) ⁴³	Community-dwelling older adults, 58% fem, age: 60–96 years (M = 74.1)	Japan	RS-25	Depression (GDS) Mental quality of life (SF-8 MCS)	369 369	0.50 0.30	0.42; 0.57 0.20; 0.39	<0.001 <0.001

(Continues)

Table 1: (continued)

Author(s) and year	Sample	Country	Resilience measure	Mental health index (measure)	N	r	95% KI	p
Leppert <i>et al.</i> (2005) ⁴⁴	Representative sample of general population, 54% fem, age: 61–95 years (M = 69.6)	Germany	RS-25	General life satisfaction (NRS)	599	0.41	0.34; 0.47	<0.001
Leppert & Strauß (2011) ⁴⁵	Representative sample of older German adults, 51% fem, age: 50–80 years (M = 65.4)	Germany	RS-13	Depression (GDS)	453	0.50	0.43; 0.57	<0.001
Li & Miller (2017) ⁴⁶	Older adults, 59% fem, age: 55–90 years (M = 66.7)	Australia	RS-14	Anxiety (CASE)	324	0.30	0.20; 0.40	<0.001
McGee <i>et al.</i> (2017) ⁴⁷	People with early-stage dementia, 61% fem, age: 56–93 years (M = 74.4)	USA	RS-14	Anxiety (GAI)	31	0.72	0.49; 0.86	<0.001
Moe <i>et al.</i> (2013) ⁴⁸	Individuals suffering from chronic diseases and receiving help from home nursing care, 66% fem, age: 80–101 years (M = 87.5)	Norway	RS-25	Depression (GDS)	36	0.54	0.26; 0.74	0.001
				Mental quality of life (SF-36 MCS)	120	0.39	0.22; 0.53	<0.001
Nygren <i>et al.</i> (2005) ⁴⁹	Older adults, 68% fem, age: 85+ years	Sweden	RS-25	Mental quality of life (SF-36 MCS)	125	0.37	0.21; 0.51	<0.001
Pascoe & Edvardsson (2016) ²⁷	Patients with prostate cancer undergoing androgen deprivation, 0% fem, age: 53–92 years (M = 72.0)	Australia	RS-14	Anxiety (HADS-A)	209	0.55	0.45; 0.64	<0.001
Paula Couto <i>et al.</i> (2011) ⁵⁰	Older adults, 83% fem, age: 56–85 years (M = 68.6)	Brazil	RS-25	Depression (HADS-D)	209	0.59	0.49; 0.67	<0.001
Rebagliati <i>et al.</i> (2016) ⁵¹	Geriatric patients with multiple comorbidities during rehabilitation after orthopaedic surgery, age: 60–94 years (M = 74.4)	Italy	RS-10	Well-being (PWB)	111	0.34	0.16; 0.50	<0.001
				Depression (GDS)	81	0.43	0.24; 0.60	<0.001
Sharma & Sharma (2013) ⁵²	Retired, senior citizen from India, 80% fem, age: 60–70 years (M = 65.6)	India	RS-14	Well-being (WBMMS)	150	0.26	0.11; 0.41	0.001
Spahni <i>et al.</i> (2015) ⁵³	Married and widowed older people, 53% fem, age: 60–89 years (M = 74.1)	Switzerland	RS-11	Depression (CES-D)	1,020	0.34	0.28; 0.39	<0.001
Torma <i>et al.</i> (2013) ⁵⁴	Older adults diagnosed with fibromyalgia, 95% fem, age: 50+ years (M = 62.1)	USA	RS-25	Depression (GDS-SF)	221	0.54	0.44; 0.63	<0.001
von Eisenhart-Rothe <i>et al.</i> (2013) ⁵⁵	Representative sample of general population, 52% fem, age: 64–94 years (M = 73.0)	Germany	RS-5	Anxiety (GAD-7)	3,712	0.29	0.26; 0.32	<0.001
				Depression (GDS-15)	3,712	0.34	0.31; 0.37	<0.001

(Continues)

Table 1: (continued)

Author(s) and year	Sample	Country	Resilience measure	Mental health index (measure)	N	r	95% KI	p
Wagnild & Young (1993) ¹⁰	Community-dwelling older adults, 62% fem, age: 53–95 years (M = 71.1)	USA	RS-25	Depression (BDI)	810	0.37	0.31; 0.43	<0.001
Wells (2009) ⁵⁶	Rural residents in New York State, 54% fem, age: 65–94 years (M = 75.0)	USA	RS-25	Mental quality of life (SF-12 MCS)	106	0.58	0.44; 0.69	<0.001
Wells <i>et al.</i> (2012) ⁵⁷	Catholic nuns, 100% fem, age: 55+ (M = 72.5)	USA	RS-14	Depression (PHQ-9)	45	0.45	0.18; 0.65	0.002
				Mental quality of life (SF-12 MCS)	40	0.14	−0.18; 0.44	0.378
Wermelinger Ávila <i>et al.</i> (2018) ²⁹	Participants of a program for active older adults, 89% fem, age: 60+ (M = 69.6)	Brazil	RS-25	Anxiety (DASS-21)	312	0.10	−0.02; 0.20	0.091
				Depression (DASS-21)	312	0.19	0.08; 0.30	0.001
				Stress (DASS-21)	312	0.14	0.03; 0.25	0.015
Yang <i>et al.</i> (2016) ⁵⁸	Patients with bladder or kidney cancer, 31% fem, age: 50–79 years (M = 63.4)	China	RS-14	Anxiety (SAS)	389	0.47	0.39; 0.54	<0.001
				Depression (CES-D)	389	0.48	0.40; 0.56	<0.001
				Post-traumatic stress symptoms (PCL)	389	0.46	0.37; 0.53	<0.001

BDI = Beck Depression Inventory; CASE = Clinical Assessment Scale for the Elderly; fem = female; CES-D = Center of Epidemiology Depression Scale; DASS-21 = Depression Anxiety Stress Scales-21; GAD = Geriatric Anxiety Scale; GAI-SF = Geriatric Anxiety Inventory - Short Form; GDS = Geriatric Depression Scale; GDS-SF = Geriatric Depression Scale - Short Form; HADS-A = Hospital Anxiety and Depression Scale, Anxiety subscale; HADS-D = Hospital Anxiety and Depression Scale, Depression subscale; NRS = Numeric rating scale; PCL = PTSD Checklist; PHQ = Patient Health Questionnaire, Depression module; PWB = Psychological Well-Being Scale; RS = Resilience Scale; SAS = Zung Self-Rating Anxiety Scale; SF-8 MCS = Short Form 8 Health Survey, Mental Component Summary; SF-12 MCS = Short Form 12 Health Survey, Mental Component Summary; SF-36 MCS = Short Form 36 Health Survey, Mental Component Summary; WBMMS = Well-Being Manifestation Measure Scale; WHOQOL-BREF = World Health Organization QoL Questionnaire.

health of $r = 0.40$ (95% CI [0.36; 0.44]). However, correlations reported in the individual studies ranged between $r = 0.11$ and $r = 0.65$ (Figure 2) resulting in a substantial heterogeneity ($I^2 = 83\%$). Results for various mental health measures are shown in Table 2.

Risk of bias across studies

There was no indication of small sample bias as the funnel plot showed no asymmetry. Although

Egger's regression test was significant ($p = 0.042$), the Trim and Fill analysis revealed no studies missing (Figure 3).

Classic fail safe N analysis indicated that 770 studies would be needed to bring p -value to >0.05 . However, significant differences ($p = 0.021$) in the size of associations of trait resilience and mental health were found between published ($r = 0.41$; 95% CI [0.37; 0.45]) and unpublished studies ($r = 0.25$; 95% CI [0.11; 0.38]; Table 3).

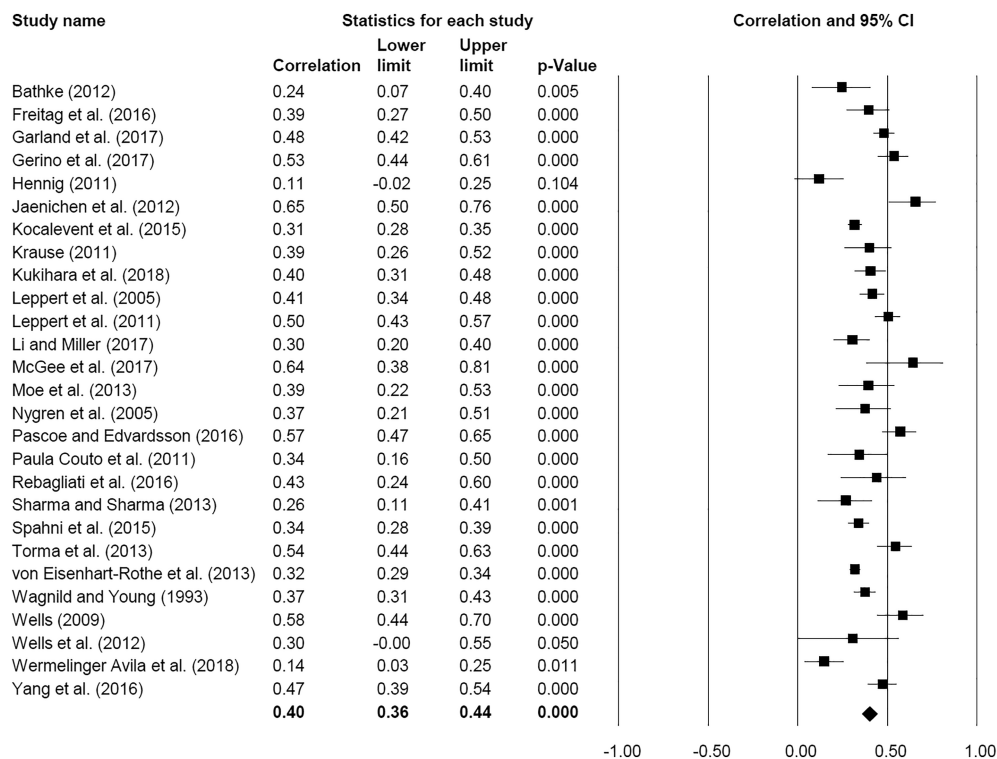


Figure 2: Meta-analytic results on the association of trait resilience and mental health

Table 2: Mean correlations between resilience and various mental health measures

	<i>n</i>	<i>R</i>	95% CI	<i>p</i>	<i>Q</i>	<i>p</i> (<i>Q</i>)	<i>I</i> ²
All outcomes	27	0.40	0.36; 0.44	<0.001	156.88	<0.001	83%
Mental distress	20	0.42	0.38; 0.47	<0.001	129.79	<0.001	85%
Mental health	14	0.37	0.26; 0.47	<0.001	121.93	<0.001	89%
Depression	19	0.46	0.41; 0.50	<0.001	149.99	<0.001	88%
Anxiety	13	0.37	0.31; 0.42	<0.001	78.28	<0.001	85%
Quality of life	11	0.38	0.23; 0.51	<0.001	118.49	<0.001	92%

n = number of studies.

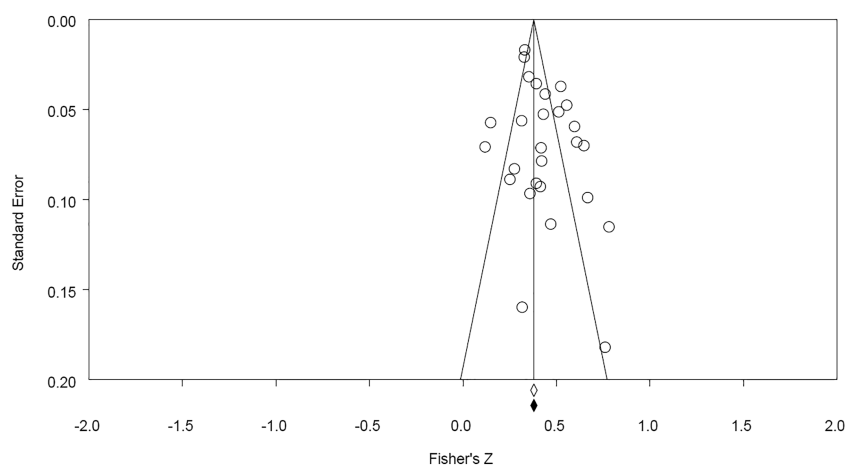


Figure 3: Funnel plot of standard error by Fisher's Z

Additional analyses

We conducted subgroup analyses to explain the substantial amount of heterogeneity across the included studies. Country of study origin significantly influenced size of correlation ($p = 0.028$) with studies from South America showing the smallest and from North America the largest associations. In samples including patients with illness or health problem larger correlations were found ($r = 0.44$; 95% CI [0.38; 0.50]) than in healthy or representative samples ($r = 0.37$; 95% CI [0.32; 0.42]) although differences were significant by trend only ($p = 0.061$; Table 3).

Meta-regression analyses revealed no further effect modifier. Neither sample size, year of

publication, mean age of the participants, proportion of female participants, number of RS items nor mean RS item score did significantly impact the size of correlations between trait resilience and mental health. Leave-one-out analyses proved the robustness of results with mean correlations between $r = 0.39$ (Pascoe and Edvardsson²⁷ or Jaenichen *et al.*²⁸ removed) and $r = 0.41$ (Wermelinger Ávila *et al.*²⁹ or Hennig³⁰ removed) that remained significant in all cases. Additionally, sensitivity analyses revealed similar findings when the inclusion criterion on participants' mean age was set up to 65+ years ($r = 0.39$; 95% CI [0.34; 0.43]; $I^2 = 82\%$; $n = 22$) or 70+ years ($r = 0.41$; 95% CI [0.36; 0.46]; $I^2 = 74\%$; $n = 11$).

Table 3: Results of subgroup analyses

	<i>n</i>	<i>r</i>	95% CI	<i>p</i>	<i>Q</i>	<i>p</i> (<i>Q</i>)	<i>I</i> ²	<i>p</i> diff
Publication status								0.021
Published	24	0.41	0.37; 0.45	<0.001	139.91	<0.001	84%	
Unpublished	3	0.25	0.11; 0.38	0.001	8.27	0.016	76%	
Country								0.028
Europe	14	0.38	0.33; 0.43	<0.001	72.13	<0.001	82%	
Asia/Oceania	5	0.41	0.32; 0.49	<0.001	20.08	<0.001	80%	
North America	6	0.48	0.40; 0.55	<0.001	18.10	0.003	72%	
South America	2	0.22	0.06; 0.38	0.008	3.54	0.060	72%	
Sample								0.061
Representative/healthy	16	0.37	0.32; 0.42	<0.001	71.57	<0.001	79%	
Ill/with health problem	11	0.44	0.38; 0.50	<0.001	54.48	<0.001	82%	

RS = resilience scale; *n* = number of studies.

Discussion

Summary of the evidence

The aim of the present meta-analysis was to systematically summarize the evidence on the association between trait resilience and mental health in older adults. We included 27 studies in our meta-analysis and found a significant positive medium-sized correlation of $r = 0.40$ across the included studies. The higher trait resilience in older persons, the better they considered their mental health to be. Heterogeneity of study results was substantial; however, all studies found significant positive correlations of trait resilience and mental health that were significant for all but one study.³⁰

Previous reviews on the association between resilience and mental health in older persons²¹ as well as in other populations^{17–19} revealed effect sizes ranging between $r = 0.27$ and $r = 0.61$ depending on the type of mental health outcome. While some of the previous reviews reported that the correlation between negative indicators of mental health (e.g. anxiety or depression) and resilience is smaller than the correlation between positive factors (e.g. quality of life or well-being) and resilience,^{17,18} our results indicate a similar effect size for positive and negative indicators. Overall, our meta-analysis extends the findings on the relation between resilience and depression²¹ and included various mental health outcomes but at the same time restricted measurement of trait resilience to the Resilience Scale by Wagnild and Young.¹⁰ Hence, we included more studies using more homogeneous methods than in the previous review.

Correlations between trait resilience and mental health showed a broad range across the included studies of this review and resulted in a substantial heterogeneity. In order to explain this heterogeneity, we run subgroup analyses and found several differences that are noteworthy. First, country of study origin had an impact on the effect size. Studies from South America reported the smallest correlations between trait resilience and mental health, while studies from North America found the largest associations. However, those differences should be interpreted with

caution because only two studies from South America were included. We further found larger effect sizes in samples including patients with acute/chronic illness or health problem (e.g. diabetes, multiple sclerosis and cancer) than in representative samples. Comparable results have been found in a recent meta-analysis on the association of trait resilience and mental health in patients with physical illness¹⁹ with largest effects being reported for patients undergoing medical interventions, followed by patients with acute or chronic illness, and smallest effects for patients having a health problem (e.g. infertility). Comparably, in another meta-analytic review,¹⁷ resilience was found to reduce the mental distress caused by adversities or exposure to traumatic events.

In the face of adversity, trait resilience seems to have greater impact on mental health than in normal life which has been discussed as a central defining aspect of resilience.¹⁰ Moreover, Hu *et al.*¹⁷ suggest that trait resilience might contain both innate and acquired facets that are relatively stable on the one hand but influenced by environmental factors on the other hand.

Moreover, unpublished studies reported significantly smaller effects than published studies. This has been found in a previous resilience review¹⁹ and reflects direct evidence for a reporting bias that has been discussed for decades as 'File drawer problem'.^{31,32} For reasons of conceptual and methodological homogeneity, we exclusively included studies in our review that used the Resilience Scale by Wagnild and Young.¹⁰ Altogether, the RS proved to be a reliable instrument in the included studies. Available short forms appear to be appropriate to measure resilience as a personality trait in an economical way.

Another aim of our review was to investigate the association of trait resilience and age or gender, respectively. However, we could neither find a significant association between age and trait resilience nor sex differences in resilience scores as proposed in another review.¹⁸ Furthermore, mean age of the participants and proportion of female participants did not impact the strength of the relation between resilience and mental health as found in previous research.¹⁷

Limitations

A key limitation of this meta-analysis is based on the design of the included studies; all studies used a cross-sectional study design that does not allow drawing causal inferences about the association between trait resilience and mental health. Furthermore, heterogeneity of study results was substantial and could not fully be explained by subgroup analyses and meta-regression analyses. However, all studies found positive associations that were significant in all but one study and could be interpreted as moderate to large in 24 of 28 of samples.³³ It is sometimes argued that there might be a potential conceptual overlap between resilience and depression, i.e. that some items of the Resilience Scale are merely positively worded depression-specific statements. If this would be the case, the specific association between resilience and depression should be significantly stronger compared with the association between resilience and anxiety. However, this was not confirmed in our analyses. Although we did not find clear indications for a small sample bias, subgroup analyses revealed that published studies reported a significant larger correlation between trait resilience and mental health than unpublished studies. Hence, the effect size of the association between trait resilience and mental health might be overestimated to some degree. Finally, our definition of older adults as minimum age of 50 years and minimum mean age of 60 years could be discussed critically. Currently, there is no consensus at what age a person is defined as 'old adult'.³⁴ Although the majority of research uses a 60+ or 65+ years criterion, the World Health Organization Study on Global Aging and Adult Health involves nationally representative cohorts of respondents aged 50 and over.³⁵ For reasons of including a sufficient number of eligible studies, we set the minimum age criterion to 50 years and additionally defined participants' mean age for inclusion to be 60+ years. Results of sensitivity analyses revealed comparable results regardless of whether the minimum mean age was set to 60+, 65+ or 70+ years, respectively.

Conclusions

Despite the limitations, the results of this meta-analysis indicate that in older age a higher level of trait resilience is associated with better mental health. In view of the broad and diverse research on psychological resilience, the homogeneity of the primary studies with regard to the underlying conceptualization of resilience as a personality trait and the use of the Resilience Scale by Wagnild and Young¹⁰ are strengths of this review. Compared with individual studies, this meta-analysis ensures a higher validity of findings, increases statistical power and allows for a more precise and accurate estimation of the true effect of the association between trait resilience and mental health.³⁶ However, future research should focus on prospective studies designed to clarify the causal nature of the association between trait resilience and mental health.

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References

1. World Health Organisation (WHO). *Strengthening mental health promotion* (Fact sheet, No. 220). Geneva: World Health Organization, 2001.
2. Volkert J, Schulz H, Härter M, Włodarczyk O, Andreas S. The prevalence of mental disorders in older people in Western countries—a meta-analysis. *Ageing Res Rev* 2013; **12**: 339–53. <https://doi.org/10.1016/j.arr.2012.09.004>.
3. Steptoe A, Deaton A, Stone AA. Subjective wellbeing, health, and ageing. *Lancet* 2015; **385**: 640–8. [https://doi.org/10.1016/S0140-6736\(13\)61489-0](https://doi.org/10.1016/S0140-6736(13)61489-0).
4. Campbell KE, Dennerstein L, Tacey M, Szoek CE. The trajectory of negative mood and depressive symptoms over two decades. *Maturitas* 2017; **95**: 36–41. <https://doi.org/10.1016/j.maturitas.2016.10.011>.

5. Cooper C, Bebbington P, King M, Jenkins R, Farrell M, Brugha T et al. Happiness across age groups: results from the 2007 National Psychiatric Morbidity Survey. *Int J Geriatr Psychiatry* 2011; **26**: 608–14. <https://doi.org/10.1002/gps.2570>.
6. Walters SJ, Munro JF, Brazier JE. Using the SF-36 with older adults: a cross-sectional community-based survey. *Age Ageing* 2001; **30**: 337–43. <https://doi.org/10.1093/ageing/30.4.337>.
7. Lowsky DJ, Olshansky SJ, Bhattacharya J, Goldman DP. Heterogeneity in healthy aging. *J Gerontol A Biol Sci Med Sci* 2014; **69**: 640–9. <https://doi.org/10.1093/geronol/glt162>.
8. MacLeod S, Musich S, Hawkins K, Alsgaard K, Wicker ER. The impact of resilience among older adults. *Geriatr Nurs* 2016; **37**: 266–72. <https://doi.org/10.1016/j.gerinurse.2016.02.014>.
9. Fletcher D, & Sarkar M. Psychological resilience: a review and critique of definitions, concepts, and theory. *Eur Psychol* 2013; **18**: 12–23. <https://doi.org/10.1027/1016-9040/a000124>.
10. Wagnild GM, & Young HM. Development and psychometric evaluation of the resilience scale. *J Nurs Meas* 1993; **1**: 165–78.
11. Fontes AP, & Neri AL. Resilience in aging: literature review. *Cien Saude Colet* 2015; **20**: 1475–95. <https://doi.org/10.1590/1413-81232015205.00502014>.
12. Cosco TD, Howse K, Brayne C. Healthy ageing, resilience and wellbeing. *Epidemiol Psychiatr Sci* 2017; **26**: 579–83. <https://doi.org/10.1017/S2045796017000324>.
13. Windle G, Bennett KM, Noyes J. A methodological review of resilience measurement scales. *Health Qual Life Outcomes* 2011; **9**: 8. <https://doi.org/10.1186/1477-7525-9-8>.
14. Pangallo A, Zibarras L, Lewis R, Flaxman P. Resilience through the lens of interactionism: a systematic review. *Psychol Assess* 2015; **27**: 1–20. <https://doi.org/10.1037/pas0000024>.
15. Helmreich I, Kunzler A, Chmitorz A, König J, Binder H, Wessa M et al. Psychological interventions for resilience enhancement in adults. *Cochrane Database Syst Rev* 2017; **2**: CD012527. <https://doi.org/10.1002/14651858.CD012527>.
16. Cosco TD, Kaushal A, Richards M, Kuh D, Stafford M. Resilience measurement in later life: a systematic review and psychometric analysis. *Health Qual Life Outcomes* 2016; **14**: 16. <https://doi.org/10.1186/s12955-016-0418-6>.
17. Hu T, Zhang D, Wang J. A meta-analysis of the trait resilience and mental health. *Pers Individ Dif* 2015; **76**: 18–27. <https://doi.org/10.1016/j.paid.2014.11.039>.
18. Lee JH, Nam SK, Kim AR, Kim B, Lee MY, Lee SM. Resilience: a meta-analytic approach. *J Couns Dev* 2013; **91**: 269–79. <https://doi.org/10.1002/j.1556-6676.2013.00095.x>.
19. Färber F, & Rosendahl J. The association between resilience and mental health in the somatically ill. *Dtsch Arztebl Int* 2018; **115**: 621–7. <https://doi.org/10.3238/arztebl.2018.0621>.
20. Connor KM, & Davidson JR. Development of a new resilience scale: the Connor-Davidson resilience scale (CD-RISC). *Depress Anxiety* 2003; **18**: 76–82. <https://doi.org/10.1002/da.10113>.
21. Wermelinger Ávila MP, Lucchetti AL, Lucchetti G. Association between depression and resilience in older adults: a systematic review and meta-analysis. *Int J Geriatr Psychiatry* 2017; **32**: 237–46. <https://doi.org/10.1002/gps.4619>.
22. Downes MJ, Brennan ML, Williams HC, Dean RS. Development of a critical appraisal tool to assess the quality of cross-sectional studies (AXIS). *BMJ Open* 2016; **6**: e011458. <https://doi.org/10.1136/bmjopen-2016-011458>.
23. Hedges LV, & Olkin I. *Statistical methods for meta-analysis*. New York: Academic Press, 1985.
24. Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. *Brit Med J* 1997; **315**: 629–34. <https://doi.org/10.1136/bmj.315.7109.629>.
25. Duval S, & Tweedie R. Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics* 2000; **56**: 455–63. <https://doi.org/10.1111/j.0006-341X.2000.00455.x>.
26. Rosenthal R. The ‘file drawer problem’ and tolerance for null results. *Psychol Bull* 1979; **86**: 638–41. <https://doi.org/10.1037/0033-2909.86.3.638>.
27. Pascoe EC, & Edvardsson D. Psychological characteristics and traits for finding benefit from prostate cancer: correlates and predictors. *Cancer Nurs* 2016; **39**: 446–54. <https://doi.org/10.1097/NCC.0000000000000323>.
28. Jaenichen D, Brunkhorst FM, Strauss B, Rosendahl J. Physical and mental long-term sequelae following intensive care of severe sepsis in patients and relatives. *Psychother Psychosom Med Psychol* 2012; **62**: 335–43. <https://doi.org/10.1055/s-0032-1306354>.
29. Wermelinger Ávila MP, Corrêa JC, Lucchetti ALG, Lucchetti G. The role of physical activity in the association between resilience and mental health in older adults. *J Aging Phys Act* 2018; **26**: 248–53. <https://doi.org/10.1123/japa.2016-0332>.
30. Hennig K. [Psychosocial aspects of type D personality in patients with hypertension] [Unpublished dissertation thesis]. Friedrich-Schiller University, Jena, Germany, 2011. <https://d-nb.info/1019969636/34>.
31. Sterling TD. Publication decisions and their possible effects on inferences drawn from tests of significance—or vice versa. *J Am Stat Assoc* 1959; **54**(285): 30–34. <https://doi.org/10.2307/2282137>.
32. Sterling TD, Rosenbaum WL, Weinkam JJ. Publication decisions revisited: the effect of the outcome of statistical tests on the decision to publish and vice versa. *Am*

- Stat 1995; **49**: 108–12. <https://doi.org/10.1080/00031305.1995.10476125>.
33. Cohen J. *Statistical power analysis for the behavioral sciences*, 2nd Edition. Hillsdale: Erlbaum, 1988.
 34. Kowal P, Naidoo N, Chatterji S. WHO study on global AGEing and adult health (SAGE): Health status, chronic conditions and health care utilization in respondents aged 50 and older from 70 countries in the world Health survey/SAGE wave 0. World Health Organisation, 2012. https://www.who.int/healthinfo/sage/SAGEWorkingPaper1_Wave0_Oct12.pdf
 35. Shenkin SD, Harrison JK, Wilkinson T, Dodds RM, Ioannidis JPA. Systematic reviews: guidance relevant for studies of older people. *Age Ageing* 2017; **46**: 722–8. <https://doi.org/10.1093/ageing/afx105>.
 36. Cuijpers P. *Meta-analyses in mental health research: a practical guide*. Amsterdam: Vrije Universiteit Amsterdam, 2016.
 37. Bathke J. [Psychosocial factors influencing physical and mental health of patients with obesity] [Unpublished dissertation thesis]. Friedrich-Schiller University, Jena, Germany, 2012. <https://d-nb.info/1025255992/34>
 38. Freitag S, Schmidt S, Gobbens RJ. Tilburg frailty indicator. German translation and psychometric testing. *Z Gerontol Geriatr* 2016; **49**: 86–93. <https://doi.org/10.1007/s00391-015-0889-9>.
 39. Garland SN, Scurry SRM, Ploughman M, Health, Life-style and Aging with MS Canadian Consortium. Factors associated with poor sleep in older adults with multiple sclerosis. *Int J Behav Med* 2017; **24**: 937–45. <https://doi.org/10.1007/s12529-017-9653-4>.
 40. Gerino E, Rollé L, Sechi C, Brustia P. Loneliness, resilience, mental health, and quality of life in old age: a structural equation model. *Front Psychol* 2017; **8**: 2003. <https://doi.org/10.3389/fpsyg.2017.02003>.
 41. Kocalevent RD, Zenger M, Heinen I, Dwinger S, Decker O, Brähler E. Resilience in the general population: standardization of the resilience scale (RS-11). *PLoS One* 2015; **10**: e0140322. <https://doi.org/10.1371/journal.pone.0140322>.
 42. Krause F. [Influence of psychosocial factors on mental and physical health of patients with diabetes mellitus type 2] [Unpublished dissertation thesis]. Friedrich-Schiller University, Jena, Germany, 2011. <https://d-nb.info/102109885X>
 43. Kukihara H, Yamawaki N, Ando M, Tamura Y, Arita K, Nakashima E. The mediating effects of resilience, morale, and sense of coherence between physical activity and perceived physical/mental health among Japanese community-dwelling older adults: a cross-sectional study. *J Aging Phys Act* 2018; **26**: 544–52. <https://doi.org/10.1123/japa.2017-0265>.
 44. Leppert K, Gunzelmann T, Schumacher J, Strauss B, Brähler E. Resilience as a protective personality characteristic in the elderly. *Psychother Psychosom Med Psychol* 2005; **55**: 365–9. <https://doi.org/10.1055/s-2005-866873>.
 45. Leppert K, & Strauss B. The role of resilience for coping in different age groups. *Z Gerontol Geriatr* 2011; **44**: 313–17. <https://doi.org/10.1007/s00391-011-0193-2>.
 46. Li WW, & Miller DJ. The impact of coping and resilience on anxiety among older Australians. *Aust J Psychol* 2017; **69**: 263–72. <https://doi.org/10.1111/ajpy.12152>.
 47. McGee JS, Zhao HC, Myers DR, Kim SM. Positive psychological assessment and early-stage dementia. *Clin Gerontol* 2017; **40**: 307–19. <https://doi.org/10.1080/07317115.2017.1305032>.
 48. Moe A, Hellzen O, Ekker K, Enmarker I. Inner strength in relation to perceived physical and mental health among the oldest old people with chronic illness. *Aging Ment Health* 2013; **17**: 189–96. <https://doi.org/10.1080/13607863.2012.717257>.
 49. Nygren B, Aléx L, Jonsén E, Gustafson Y, Norberg A, Lundman B. Resilience, sense of coherence, purpose in life and self-transcendence in relation to perceived physical and mental health among the oldest old. *Aging Ment Health* 2005; **9**: 354–62. <https://doi.org/10.1080/1360500114415>.
 50. Paula Couto MCP, Koller SH, Novo R. Stressful life events and psychological well-being in a Brazilian sample of older persons: the role of resilience. *Ageing Int* 2011; **36**: 492–505. <https://doi.org/10.1007/s12126-011-9123-2>.
 51. Rebagliati GA, Sciumè L, Iannello P, Mottini A, Antonietti A, Caserta VA et al. Frailty and resilience in an older population. The role of resilience during rehabilitation after orthopedic surgery in geriatric patients with multiple comorbidities. *Funct Neurol* 2016; **31**: 171–7. <https://doi.org/10.11138/fneur/2016.31.3.171>.
 52. Sharma M, & Sharma NR. Resilience and self-efficacy as correlates of well-being among the elderly persons. *Journal of the Indian Academy of Applied Psychology* 2013; **39**: 281–8.
 53. Spahni S, Morselli D, Perrig-Chiello P, Bennett KM. Patterns of psychological adaptation to spousal bereavement in old age. *Gerontology* 2015; **61**: 456–68. <https://doi.org/10.1159/000371444>.
 54. Torma LM, Houck GM, Wagnild GM, Messecar D, Jones KD. Growing old with fibromyalgia: factors that predict physical function. *Nurs Res* 2013; **62**: 16–24. <https://doi.org/10.1097/NNR.0b013e318273b853>.
 55. von Eisenhart RA, Zenger M, Lacruz ME, Emeny R, Baumert J, Haefner S et al. Validation and development of a shorter version of the resilience scale RS-11: results from the population-based KORA-age study. *BMC Psychol* 2013; **1**: 25. <https://doi.org/10.1186/2050-7283-1-25>.
 56. Wells M. Resilience in rural community-dwelling older adults. *J Rural Health* 2009; **25**: 415–19. <https://doi.org/10.1111/j.1748-0361.2009.00253.x>.

57. Wells M, Avers D, Brooks G. Resilience, physical performance measures, and self-perceived physical and mental health in older Catholic nuns. *J Geriatr Phys Ther* 2012; **35**: 126–31. <https://doi.org/10.1519/JPT.0b013e318237103f>.
58. Yang YL, Liu L, Li MY, Shi M, Wang L. Psychological disorders and psychosocial resources of patients with newly diagnosed bladder and kidney cancer: a cross-sectional study. *PLoS One* 2016; **11**: e0155607. <https://doi.org/10.1371/journal.pone.0155607>.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Address correspondence to: Jenny Rosendahl, Institute of Psychosocial Medicine and Psychotherapy, Jena University Hospital, Jena, Germany. Email: jenny.rosendahl@med.uni-jena.de