

REVIEW

Open Access



Association between life satisfaction and health behaviours among older adults: a systematic review and meta-analysis

Chiedozie James Alumona^{1,2,3*}, David R. Scott⁴, Toyin Aladejebi¹, Michael E. Kalu^{2,5}, Ogochukwu Kelechi Onyeso^{1,2,5}, Adesola C. Odole⁶, Laura Vogelsang¹, Jerome Singleton⁷ and Oluwagbohunmi Adetunji Awosoga¹

Abstract

Background Life satisfaction is a key indicator of quality of life among older adults. This systematic review and meta-analysis synthesised evidence on the association between life satisfaction and health behaviours such as smoking status, alcohol use, physical activity, diet/nutrition, and sleep among older adults aged 60 years and older.

Methods The review was conducted and reported following the PRISMA guidelines. We searched the electronic databases MEDLINE, APA PsycINFO, Web of Science, CINAHL, and Global Health from inception to 10 January 2025 for observational studies reporting an association between life satisfaction and health behaviours. Two independent reviewers completed article screening, data extraction, and risk of bias assessment. The result was summarised through a narrative synthesis, and meta-analysis was completed using CMA (version 4).

Results The 56 included studies were conducted across 22 countries between 1990 and 2025. The pooled mean age and female proportion were 70.59 years (95% CI: 68.98, 72.21) and 58.0% (95% CI: 55.1, 60.7), respectively. Narrative synthesis showed that most studies found quality sleep and/or 7–8 h of sleep (77.3%), a higher physical activity level (69.1%), and a regular intake of fruit and vegetables and/or a balanced diet regularly (52.9%) were significantly associated with higher life satisfaction. Smoking and alcohol use were associated with lower life satisfaction in 33.3% and 15.8% of the analysis, respectively. The meta-analysis showed that higher physical activity levels ($r=0.12$, $p=0.003$) were associated with higher life satisfaction. Only four studies on physical activity met the criteria for meta-analysis, and no studies on other health behaviours did.

Conclusions Quality sleep and/or 7–8 h of sleep, a higher physical activity level, and regularly eating fruit and vegetables and/or a balanced diet are associated with higher life satisfaction. The review provides evidence for policymakers, healthcare workers, caregivers, and society to encourage healthy behaviours that foster healthy ageing. Future studies should use standardised instruments to assess health behaviours and life satisfaction, facilitating cross-study comparisons and the meta-synthesis of research findings.

Systematic review registration PROSPERO (CRD42023441386).

Keywords Well-being, Healthy ageing, Lifestyle, Quality of life, Sustainable development goal

*Correspondence:
Chiedozie James Alumona
chiedozejames@yahoo.com

Full list of author information is available at the end of the article



© The Author(s) 2026. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

Background

Ageing is a natural and inevitable process that affects people of all races, cultures, social classes, and geographical locations [1, 2]. In 2017, 13% of the global population was aged 60 and over, and this figure is expected to rise to 21% by 2050 [3]. The World Health Organisation [4] also reported that the number of older adults will increase from 1 billion in 2020 to 2.1 billion in 2050. Given the projected increase in the ageing population, various stakeholders, including governments, policy-makers, health practitioners, and researchers, are keenly interested in promoting the health and quality of life of older adults.

Life satisfaction is an indicator of the quality of life [5] and predicts morbidity and mortality among older adults [6]. It is an evaluative component of subjective well-being through which individuals measure the quality of their lives according to their perspectives [7, 8]. It is a judgment that reflects the difference between individuals' present conditions and the ideal standard they set for themselves [8]. The narrower the gap between individuals' current state and aspirations, the higher their life satisfaction.

The determinants of life satisfaction have been grouped into demographic and socioeconomic factors, physical and mental health, social support, and health behaviours [9, 10]. Health behaviours are everyday actions that influence health and well-being, such as dietary choices, physical activity, and substance use. Recent systematic reviews examined mainly the association between life satisfaction and psychophysical, socioeconomic, and demographic characteristics among older adults [11–13], leaving a gap in the literature on the influence of health behaviours. Existing reviews on health behaviours focused on well-being indicators, including anxiety, depression, emotional distress, or functional quality of life [14–16], which are conceptually distinct from life satisfaction. To our knowledge, no review has synthesised evidence of the association between health behaviours and life satisfaction. Comprehending how health behaviours contribute to individuals' life satisfaction in old age is crucial to improving well-being and guiding care and policy development [9, 10]. The current review adds to the existing literature by synthesising the association between life satisfaction and five key health behaviours: smoking, alcohol use, physical activity, diet/nutrition, and sleep, which have been reported in primary studies [17–19].

Guided by the biopsychosocial framework [20], we conceptualised the influence of health behaviours on life satisfaction as occurring through multiple pathways, including biological, psychological, and social means. From the biological perspective, health behaviours impact physical health, functional ability, and energy levels [21]. Psychologically, they can affect mood, self-image,

self-esteem, and stress management [22]. Socially, they influence the engagement in meaningful activities and social connectedness [23, 24]. These pathways suggest that health behaviours are vital targets for interventions aimed at enhancing life satisfaction.

The study was anchored on the United Nations' Sustainable Development Goal (SDG) three: to ensure healthy lives and promote well-being for all, including older adults [25]. Promoting healthy behaviours among older adults is the bedrock of preventing and reducing mortality rates from non-communicable diseases and enhancing well-being [26, 27]. Moreover, the inclusion of a campaign against substance abuse, including narcotic abuse, and harmful alcohol use, among the strategies to achieve the SDG goal three suggests the importance of behaviours to enhance a healthy ageing experience.

Therefore, we conducted a systematic review and meta-analysis of the association between health behaviours and life satisfaction among older adults. The review aimed to describe the direction and strength of the association between health behaviours and life satisfaction among community-dwelling older adults. Since health behaviours are modifiable through personal choices and targeted policy interventions, the outcome of this review will benefit ageing research, clinical practice, and policy-making regarding evidence-based practice.

Methods

Protocol and registration

The protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO, CRD42023441386) and also published [17]. The review was conducted and reported according to the updated Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-2020) [28] and the Meta-analysis of Observational Studies in Epidemiology (MOOSE) [29] guidelines. The PRISMA-2020 checklist is given in Supplementary File 1.

Population, exposure, outcome, and timeline (PEOT) criteria

The *population* was community-dwelling older adults aged 60 years and over. The *exposure* was behavioural factors: smoking, alcohol use, physical activity, diet/nutrition, and sleep, which have been widely researched [18, 19]. Smoking was defined as a habit (yes, no, current, former, or never) [10, 18], while alcohol use was operationalised as either a habit or a level of consumption [9, 30]. Physical activity was mainly evaluated by the level of activity engaged in [31, 32]. For older adults, good sleep refers to getting 7 to 8 h of quality sleep with minimal disturbance [19, 33]. A healthy diet was operationalised as eating fruit and vegetables or a balanced diet regularly [34, 35]. The *outcome* was life satisfaction assessed

with self-report measures, including satisfaction with life scale, life satisfaction index, and a single-item question [36–38]. The review *timeline* was from the inception of each database to 10 January 2025.

Eligibility criteria

Studies were included if (1) they were observational studies describing the association between any of the health behaviours and life satisfaction, (2) conducted among apparently healthy community-dwelling older adults with a mean age of ≥ 60 years, (3) written in English language, (4) peer-reviewed, and (5) published on or before 10 January 2025. Studies were included in the meta-analysis if they reported zero-order associations between life satisfaction and health behaviour, as adjusted effect sizes would introduce bias due to differing covariate adjustment, limiting comparability across studies. Studies were excluded if (1) they were qualitative, (2) conducted among older adults with specific disease conditions, including stroke, dementia, diabetes, and Alzheimer's disease, and (3) residing in institutions such as nursing homes and long-term care facilities.

Information sources

Following the recommendation of an optimal database combination [39], we searched the MEDLINE, APA PsycINFO, Web of Science, CINAHL, and Global Health databases from inception to 10 January 2025. We also hand-searched and reviewed articles identified through the reference lists of all included articles.

Search strategy

Search terms were identified through consultations between the primary investigator (ACJ), content experts (OAA, ACO, LV and JS), and the librarian (DRS) and a review of the titles and abstracts of nine seed articles [9, 10, 18, 19, 34, 40–43] gathered by the primary investigator [17]. Elements of search strings developed for previously published reviews also informed the search strategy [11, 44–48]. The search string was first developed for MEDLINE (Fig. 1) and then adapted for the other four databases (Supplementary File 2).

When possible, subject headings from controlled vocabularies (e.g., MeSH) were used in the search. To increase sensitivity, concepts were also entered in the search string as keywords, with truncation (e.g., diet*) and proximity operators (e.g., adj3) used when appropriate. Boolean operators connected subject headings and keywords as shown in Fig. 1. No limits were placed on publication dates, though results were limited to studies written in English.

Selection process

The retrieved articles' bibliographic information (e.g., title, abstract, authors, publication information, subject headings) was imported into EndNote 20 for deduplication [39]. After deduplication, all the remaining citations were transferred to Covidence, a systematic review management tool [49] for title/abstract and full-text screening. Covidence randomly assigned articles to two independent screeners from the authorship list and conflict resolution to a third independent reviewer (CJA or MEK).

Data collection process

Three reviewers (CJA, TA, OKO) conducted a pilot data extraction of five articles using a customised Microsoft Excel spreadsheet. The goal was to identify and discuss potential ambiguities in the data extraction form and to calibrate the understanding of the extraction criteria, ensuring uniformity in their approach. Thereafter, a pair of the reviewers completed the data extraction and reviewed the reference lists of the included articles.

Data items

We extracted the following data from each article: first author's surname, year of publication, country of publication, title of the study, study design (e.g., cross-sectional or longitudinal), sample size, name of secondary dataset, measures of health behaviours (smoking, alcohol drinking, physical activity, diet/nutrition, and sleep) and life satisfaction, and descriptive summary of age, sex, health behaviours and life satisfaction. Additionally, we collected inferential statistical results, including correlation and regression coefficients, other effect sizes, effect directions, confidence intervals, and *p*-values.

Risk of bias assessment

Two reviewers (TA, OKO) independently assessed the risk of bias (ROB) using the Joanna Briggs Institute (JBI) critical appraisal tool for analytical cross-sectional studies [50], and a third reviewer (CJA) resolved the disagreements. The 8-item JBI tool provides clear instructions and guidelines for evaluating a study's clarity of inclusion criteria, descriptions of participants and settings, measures of exposure, conditions, and outcomes, strategies for identifying and dealing with confounding factors, and appropriateness of statistical analysis used [51]. Each item was rated as "Yes = 1," "Unclear = 0," or "No = 0," with a total score ranging from 0 to 8 and categorised as High (0–3), Moderate (4–5), or Low (6–8).

Data synthesis methods

Narrative synthesis

The units of synthesis were health behaviours, types of inferential statistics (bivariate and multivariate analysis),

MEDLINE search strategy for the systematic review	
1	exp Aged/ [MeSH]
2	exp Geriatrics/ [MeSH]
3	((old* or age*) adj3 (people* or person* or adult* or women* or men* or citizen* or residen*)).mp.
4	(aged or elderly or senior* or geriatric*).mp.
5	or/1-4
6	exp personal satisfaction/ [MeSH]
7	((life or lives or personal) adj2 satisf*).mp.
8	or/6-7
9	exp Health Behavior/ [MeSH]
10	exp Healthy Lifestyle/ [MeSH]
11	(health* adj3 (behavior* or behaviour* or lifestyle*)).mp.
12	exp Diet/ [MeSH]
13	(diet* or nutrition or fruit* or vegetable*).mp.
14	(food* adj3 (choice* or consum* or pattern* or intak*)).mp.
15	exp Sleep/ [MeSH]
16	sleep*.mp.
17	exp Smoking/ [MeSH]
18	exp "Tobacco Use"/ [MeSH]
19	(smok* or tobacco).mp.
20	exp Alcohol Drinking/ [MeSH]
21	exp Alcohol-Related Disorders/ [MeSH]
22	(alcohol* adj2 (drink* or intoxicat* or use* or abus* or misus* or risk* or consum*)).mp.
23	(drink* adj2 (excess or heavy or heavily or harm or harmful or hazard* or binge or harmful or problem*)).mp.
24	(alcoholic* or alcoholism).mp.
25	exp Exercise/ [MeSH]
26	Physical Exertion/ [MeSH]
27	exp Physical Fitness/ [MeSH]
28	exp Sports/ [MeSH]
29	(exercis* or fitness or sport* or walk*).mp.
30	(physical* adj2 activ*).mp.
31	or/9-30
32	comparative study/ [MeSH]
33	Follow-Up Studies/ [MeSH]
34	Time Factors/ [MeSH]
35	chang*.mp.
36	evaluat*.mp.
37	reviewed.mp.
38	prospective*.mp.
39	retrospective*.mp.
40	baseline.mp.
41	cohort.mp.
42	case series.mp.
43	or/32-42
44	5 and 8 and 31 and 43
45	limit 44 to English language
<p>Note: MeSH = medical subject heading; exp = used with a MeSH term to include all narrower MeSH terms; .mp. = field code for multi-purpose, which searches titles, abstracts, and subject headings, among other fields; adj# = search for records with terms within # words of each other; * after keyword indicates truncation (e.g., evaluat* will retrieve "evaluate", "evaluates", "evaluation", etc.)</p>	

Fig. 1 MEDLINE search strategy for the systematic review

and study designs (cross-sectional and longitudinal). A narrative synthesis was completed to illustrate the direction of effects across all included studies. The synthesis for each health behaviour was reported under the headings of bivariate analyses (including simple linear regression, Pearson correlation, and tests of differences, such as t-test and analysis of variance) and multivariate analyses.

Meta-analysis

The meta-analysis was completed using the Comprehensive Meta-Analysis (CMA, version 4) software [52]. The pooled effect size was computed using a random-effects model, which assumes that the studies are a random sample from a universe of potential studies and allows statistical inference to be made on studies not included in the analysis [53, 54]. The pooled effect size was Fisher's z-transformed correlation coefficient and reported with its 95% confidence interval and *p*-value [55]. The CMA software weights studies by inverse variance and calculates the weighted average by aggregating the weights of the individual studies. The software generated the forest and funnel plots for the pooled estimate and the publication bias, respectively.

Three indicators of heterogeneity: *Q*-statistic, I^2 statistic and Tau-squared (Tau^2) were used to assess the heterogeneity of the included studies [56]. A *Q*-statistic tested the null hypothesis that the included studies have the same effect size. If all the studies have the same effect size, the *p*-value will be greater than or equal to the criterion alpha of 0.1. An I^2 statistic shows the percentage variance in the observed effect that is accounted for by the true effect rather than sampling error, while Tau^2 shows the variance of the true effects. Finally, a 95% Prediction Interval was computed to determine the effect size range that 95% of all studies comparable to those in the analysis will fall [56]. An I^2 statistic of 50% or less was set as the threshold for proceeding with the meta-analysis [57]. To minimise heterogeneity, the meta-analysis was conducted across studies using the same instrument, with a plan to perform a subgroup analysis based on publication date if higher heterogeneity was observed.

A sensitivity analysis using a "one-study-removed" approach was computed to determine if the basic conclusion of the meta-analysis would change [58]. Publication bias was assessed using two indicators: the funnel plot and Egger's regression intercept [52].

Results

Study characteristics

The search across five databases yielded 6,403 citations, of which 1,888 duplicates were removed (Fig. 2). The team screened 4,515 titles and abstracts, excluding 4,425 studies that did not meet the inclusion criteria. The full texts of the remaining 90 articles were retrieved and

screened, yielding 52 articles for data extraction. Four additional articles were found through a review of the references of the included articles, bringing the total to 56 articles.

The studies were conducted across 22 countries between 1990 and 2025 (Fig. 3). The studies' characteristics (Table 1 and Supplementary File 3) showed that 38 (67.9%) employed cross-sectional analyses, 24 (42.9%) were published between 2011 and 2020, 34 (60.7%) utilised secondary datasets, 24 (42.9%) assessed life satisfaction using a single-item question, and 41 (73.2%) focused on a single health behaviour. The pooled mean age and proportion of women were 70.59 years (95% CI: 68.98, 72.21) and 58.0% (95% CI: 55.1, 60.7), respectively.

The summary of the narrative synthesis (Table 2) showed that 77.3%, 69.1%, and 52.9% of the unique analyses found an association between higher life satisfaction and good sleep, physical activity level, and healthy diet/nutrition, respectively. Smoking and alcohol use were associated with lower life satisfaction in 33.3% and 15.8% of the analysis, respectively. Supplementary File 4 shows the summary of results from the 56 included studies.

Smoking

Eighteen unique analyses across thirteen studies examined the association between smoking habits and life satisfaction (Table 2). Six analyses reported that smoking was significantly associated with lower life satisfaction, while 12 analyses found no significant association. Among the analyses showing significant results, two reported bivariate associations, and four were multivariate analyses that retained significance after adjusting for covariates. No study reported that smoking was associated with higher life satisfaction. The following paragraphs provide a detailed synthesis and citations organised by analytical approach and study design.

Bivariate analysis

A cross-sectional bivariate analysis found that the prevalence of being satisfied with life was significantly higher among older adults who never smoked [59]. However, two cross-sectional bivariate analyses found no significant association between smoking status and life satisfaction [18, 60]. Similarly, no significant longitudinal association was found between smoking and incident life satisfaction among older men after four years of follow-up [30], though smokers had higher odds of persistent lower life satisfaction [30].

Multivariate analysis

A cross-sectional multivariate analysis found that being a smoker significantly predicted lower life satisfaction [32]. Two cross-sectional analyses reported the same effect direction, but the coefficients were not statistically

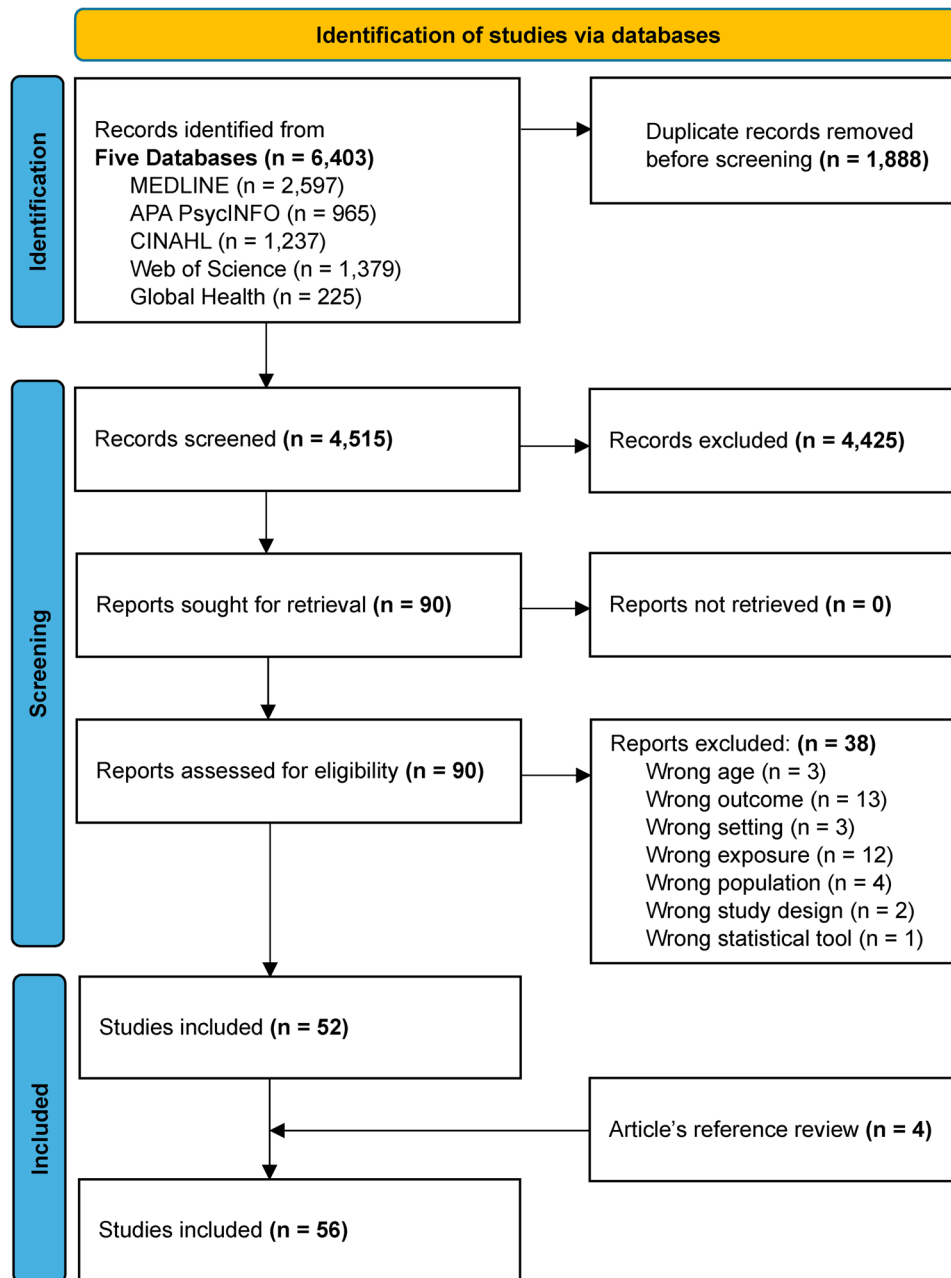
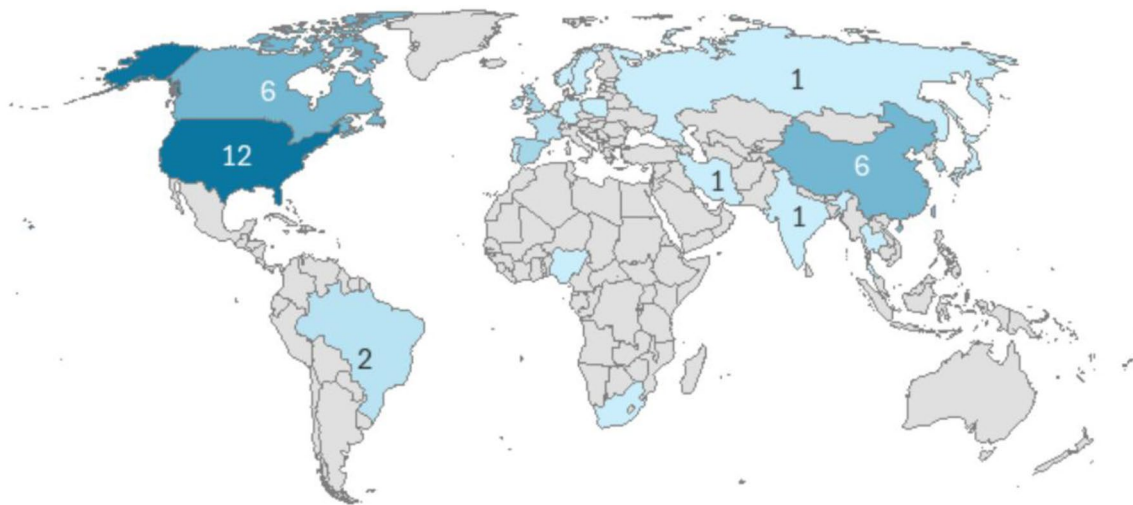


Fig. 2 PRISMA flowchart

significant [10, 61]. Four cross-sectional studies found smokers to have slightly higher life satisfaction, but the coefficients were not statistically significant [9, 10, 18, 62]. The longitudinal multivariate analyses showed that smoking was a significant predictor of lower life satisfaction after the follow-up periods of four [30, 63] and 16 years [35]. However, four longitudinal studies found no significant association between smoking and life satisfaction after two [61], five [31], and seven years of follow-up [32, 64].

Alcohol use

Nineteen analyses from 14 studies explored the association between alcohol use and life satisfaction (Table 2). Three analyses reported that alcohol use was significantly associated with lower life satisfaction, while 15 analyses found no significant association. In contrast, one analysis reported that alcohol use was associated with higher life satisfaction. Among the analyses showing significant results, one was bivariate, and two were multivariate analyses.



Brazil = 2, Canada = 6, China = 6, France = 2, Germany = 1, India = 1, Iran = 1, Ireland = 1, Japan = 1, Nigeria = 1, Norway = 1, Poland = 1, Portugal = 1, Russia = 1, South Africa = 1, South Korea = 4, Spain = 3, Sweden = 1, Taiwan = 5, Thailand = 1, United Kingdom = 3, United States of America = 12

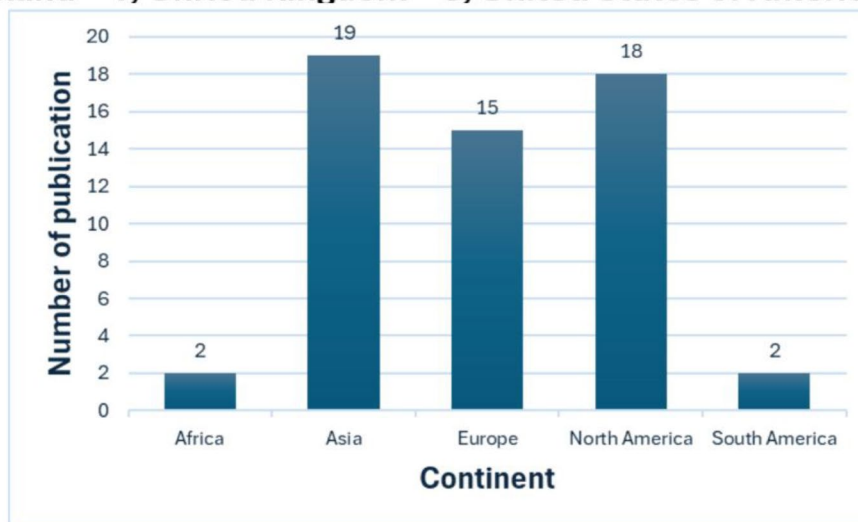


Fig. 3 Countries where the included studies were conducted

Bivariate analysis

A cross-sectional study found that heavy alcohol drinkers had significantly lower life satisfaction than non-heavy drinkers [65], while three studies found no significant association [18, 59, 60]. There was no significant longitudinal influence of alcohol dependence on life satisfaction after four years [30].

Multivariate analysis

Di Gessa and Zaninotto [66] and Jung et al. [10] reported high alcohol use to be significantly associated with lower life satisfaction in older people and higher life satisfaction

in men, respectively, while five other studies found no significant influence of alcohol use [9, 10, 18, 32, 61]. A longitudinal analysis showed that increased alcohol drinking over 6 months significantly decreased life satisfaction [66]. However, there was no significant effect of alcohol use on life satisfaction after follow-up periods of two [61], five [31], seven [32, 64], eight [67], and 16 years [35].

Physical activity

Fifty-five analyses from 37 studies examined the association between physical activity and life satisfaction

Table 1 Study characteristics

Characteristics	Frequency	Percentage
Study design		
Cross-sectional	38	67.9
Longitudinal	12	21.4
Both cross-sectional and longitudinal	6	10.7
Year of publication		
1990–2010	10	17.9
2011–2020	24	42.9
2021–2025	22	39.2
Secondary dataset		
Yes	34	60.7
No	22	39.3
Life satisfaction measure		
Satisfaction With Life Scale	18	32.1
Life Satisfaction Index	7	12.5
Single-item question	24	42.9
Others	7	12.5
Number of health behaviours		
Single	41	73.2
Multiple	15	26.8

(Table 2). Thirty-eight analyses reported that higher physical activity levels were significantly associated with higher life satisfaction, while 16 analyses found no significant association. In contrast, one analysis reported

that lower physical activity was associated with higher life satisfaction. Among the analyses showing significant results, 21 were bivariate, and 18 retained significance after adjusting for covariates.

Bivariate analysis

Sixteen cross-sectional bivariate analyses found that higher physical activity was significantly associated with higher life satisfaction [18, 37, 41, 43, 59, 60, 67–76], while Bourque et al. [77] reported a significant association between lower physical activity and higher life satisfaction. Six cross-sectional analyses reported a non-significant association between higher physical activity and higher life satisfaction [38, 43, 78–81]. Four bivariate longitudinal analyses showed a significant association between higher physical activity and greater life satisfaction after three [82], four [30], seven [36], and eight years of follow-up [67]. However, an 18-month longitudinal analysis found no significant association between higher physical activity and higher life satisfaction [43].

Multivariate analysis

Eight multivariate cross-sectional analyses showed that higher physical activity significantly predicted greater life satisfaction [18, 37, 59, 66, 68, 73, 75, 83]. However, six cross-sectional analyses reported a non-significant

Table 2 Summary of the narrative synthesis of the association between health behaviours and life satisfaction

Result	Bivariate analysis		Multivariate analysis		Total f (%)
	f (%)		f (%)		
	Cross-sectional	Longitudinal	Cross-sectional	Longitudinal	
Smoking					
Smoking → significantly lower life satisfaction	1 (33.3)	1 (50.0)	1 (16.7)	3 (42.9)	6 (33.3)
Smoking → significantly higher life satisfaction	-	-	-	-	-
Result was not statistically significant	2 (66.7)	1 (50.0)	5 (83.3)	4 (57.1)	12 (66.7)
Alcohol drinking					
Alcohol use → significantly lower life satisfaction	1 (25.0)	-	1 (14.3)	1 (14.3)	3 (15.8)
Alcohol use → significantly higher life satisfaction	-	-	1 (14.3)	-	1 (5.3)
Result was not statistically significant	3 (75.0)	1 (100.0)	5 (71.4)	6 (85.7)	15 (78.9)
Physical activity					
Higher physical activity level → significantly higher life satisfaction	16 (69.6)	4 (80.0)	8 (57.1)	10 (76.9)	38 (69.1)
Lower physical activity level → significantly higher life satisfaction	1 (4.3)	-	-	-	1 (1.8)
Result was not statistically significant	6 (26.1)	1 (20.0)	6 (42.9)	3 (23.1)	16 (29.1)
Diet/Nutrition					
Healthy diet/nutrition → significantly higher life satisfaction	5 (71.4)	-	2 (33.3)	1 (100.0)	9 (52.9)
Unhealthy diet/nutrition → significantly higher life satisfaction	-	-	-	-	-
Result was not statistically significant	2 (28.6)	2 (100.0)	4 (66.7)	-	8 (47.1)
Sleep					
Good sleep → significantly higher life satisfaction	8 (80.0)	1 (100.0)	5 (71.4)	3 (75.0)	17 (77.3)
Poor sleep → significantly higher life satisfaction	-	-	-	-	-
Result was not statistically significant	2 (20.0)	-	2 (28.6)	1 (25.0)	5 (22.7)

Good sleep refers to getting 7 to 8 h of quality sleep with minimal disturbance. A healthy diet was operationalised as eating fruit and vegetables or a balanced diet regularly. NB: The total number of studies included was 55, but some studies have different results based on analysis types (bivariate vs. multivariate), study design (cross-sectional vs. longitudinal), subgroups (men vs. women), years of follow-ups (e.g. three vs. four), and type of longitudinal life satisfaction (e.g. incident vs. persistent)

influence of physical activity on life satisfaction [10, 32, 41, 61, 77, 84]. The longitudinal multivariate analyses revealed that higher physical activity contributed significantly to higher life satisfaction after the follow-up periods of six months [66], one year [85], three [82], four [30, 86], six [87], seven [36, 64], eight [67], and 16 years [35]. No significant association was reported by Shojima et al. [61], Gureje et al. [31], and Peng et al. [32] after two-, five-, and seven-year follow-up, respectively.

Meta-analysis

Four cross-sectional studies [38, 43, 71, 80] that examined the bivariate association between physical activity and life satisfaction using the same instruments, Physical Activity Scale for the Elderly and the Satisfaction With Life Scale, respectively, were included in the meta-analysis (Fig. 4). We did not complete a separate meta-analysis of other instruments because not more than two studies assessed both physical activity and life satisfaction with the same tools.

The result shows that the pooled correlation coefficient between physical activity and life satisfaction is

significant, $r=0.12$ (95% CI=0.04, 0.20), $p=0.003$. The Q-test for heterogeneity shows that the true effect size is the same across all studies ($Q=4.13$, $df=3$, $p=0.248$). The I^2 statistic shows that 27.4% of the variance in the observed effects is accounted for by the true effects rather than sampling error (I^2 statistic=27.4), and the variance of true effect sizes (Tau²) is 0.002. The prediction interval is -0.13 to 0.38, reflecting the range in which the true effect size falls in 95% of comparable studies. Sensitivity analysis by removing one of the studies [71] with the largest effect size showed that the basic conclusions did not change, with a pooled effect size $r=0.08$ (95% CI = 0.01, 0.16), $p=0.037$. There was no statistical evidence of publication bias; Egger’s test = -0.325, 95% CI = -14.20, 13.56, $p=0.929$.

Diet/nutrition

Seventeen analyses across 12 studies investigated the association between diet/nutrition and life satisfaction (Table 2). Nine analyses reported that a healthy diet was significantly associated with higher life satisfaction, while eight analyses found no significant association. Among

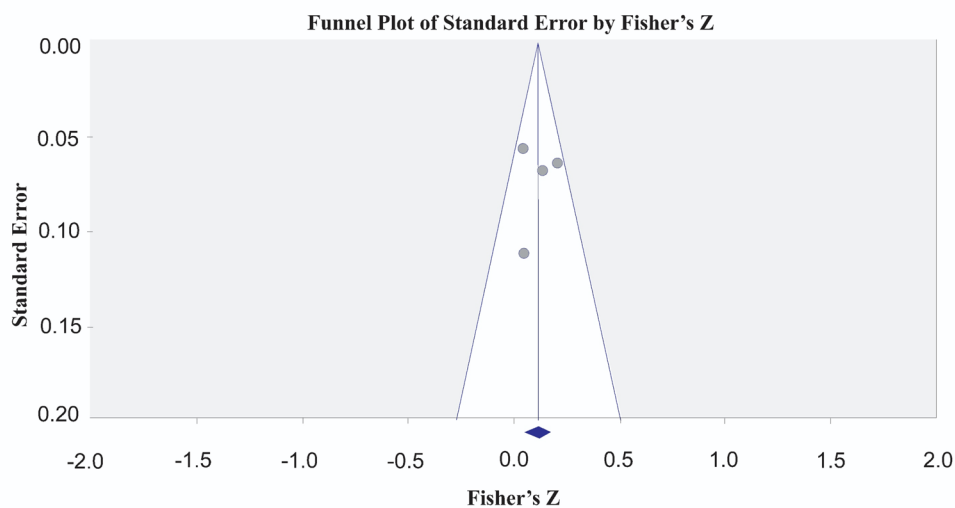
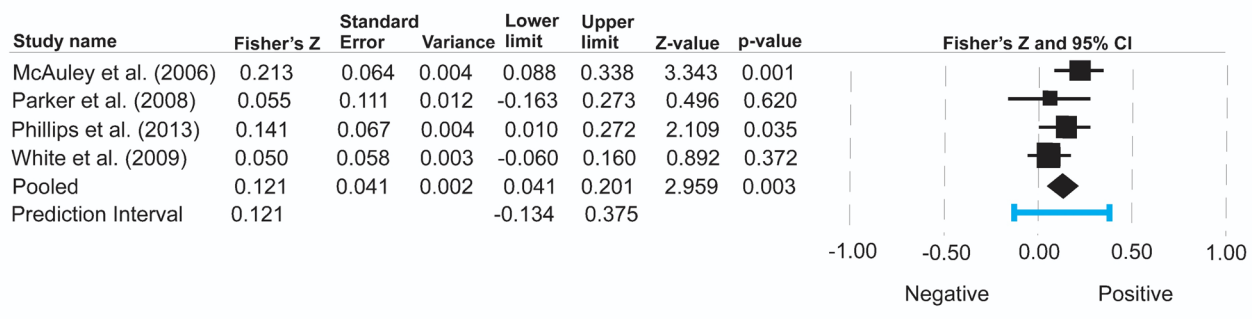


Fig. 4 Meta-analysis of the association between physical activity and life satisfaction

the analyses showing significant results, five were bivariate, and three retained the significant association after covariate adjustment in multivariate analyses. No analyses reported that an unhealthy diet was associated with higher life satisfaction.

Bivariate analysis

Five cross-sectional bivariate analyses found that being in a healthy food cluster [34] and a higher fruit and vegetable consumption [5, 18, 88, 89] were significantly associated with greater life satisfaction, while only two studies reported a non-significant association [60, 90]. A five-year and four-year longitudinal bivariate analysis reported no significant association between improved diet and increased life satisfaction [91] and between fruit/vegetable intake and life satisfaction [30], respectively.

Multivariate analysis

In a cross-sectional analysis, Jung et al. [10] reported that a higher degree of nutritional diet significantly predicted a higher life satisfaction among both older men and women, while Zaragoza-Marti et al. [92] found that a Mediterranean diet was associated with higher life satisfaction among older women, but not among older men. Three cross-sectional multivariate analyses reported a non-significant association between a fruit and vegetable diet and higher life satisfaction [18, 88, 90]. A 16-year longitudinal multivariate analysis showed that fruit and vegetable intake significantly influenced higher life satisfaction [35].

Sleep

Twenty-two analyses across fourteen studies explored the association between sleep and life satisfaction. Seventeen analyses reported that good sleep was significantly associated with higher life satisfaction, while five analyses found no significant association. Among the analyses showing significant results, nine were bivariate and eight were multivariate analyses. No analyses reported that poor sleep was associated with higher life satisfaction.

Bivariate analysis

Most cross-sectional bivariate analyses reported that quality sleep [19, 93–95], less sleep disturbance [33, 37], normal or longer sleep duration [19, 96, 97] were significantly associated with higher life satisfaction, while only two cross-sectional studies found a non-significant association [74, 98]. A seven-year longitudinal bivariate analysis found that longer sleep duration was associated with higher life satisfaction [96].

Multivariate analysis

The cross-sectional multivariate analyses reported that quality sleep [19, 93], less sleep disturbance [33], and

longer sleep duration [19, 66, 97] were significantly associated with higher life satisfaction [19, 33, 66, 93, 97]. However, two cross-sectional analyses found no significant association between sleep and life satisfaction [32, 37]. The longitudinal multivariate analyses showed that longer sleep duration was significantly associated with increased life satisfaction after six months of follow-up [66]. Similarly, quality sleep was associated with higher life satisfaction after three and four years [99] and seven years of follow-up [64]. A seven-year longitudinal multivariate analysis reported no significant influence of sleep duration on life satisfaction [32].

Risk of bias

Figure 5 summarises each item in the ROB tool for all included studies. The detailed evaluations for each study are presented in Supplementary File 5. Fifty-three (94.6%) of the included studies had a low risk of bias, three (5.4%) had a moderate risk, and none were classified as high risk. The average ROB score was 7.2, indicating a low risk.

Discussion

We synthesised the evidence on the direction and magnitude of the association between health behaviours and life satisfaction among older adults. Regarding the direction of association, most of the included studies suggest that good sleep (quality sleep and/or 7–8 h of sleep), higher physical activity level, and fruit and vegetable intake were associated with higher life satisfaction, while a few studies reported that smoking and alcohol use were associated with lower life satisfaction. For the magnitude of association, only four cross-sectional bivariate studies on the association between physical activity and life satisfaction met the inclusion criteria for meta-analysis. The meta-analysis showed a weak but significant correlation between higher physical activity levels and higher life satisfaction.

The review was grounded on the United Nations' SDG three of ensuring healthy lives and promoting well-being, especially among older adults [25]. From this perspective, we conceptualised that health behaviours are the foundation for enhancing the healthy ageing experience. Guided by the biopsychosocial framework [20], the findings were interpreted by highlighting how health behaviours can affect life satisfaction through biological and psychosocial lenses.

The narrative synthesis showed that the association between good sleep and higher life satisfaction was reported in 77.3% of unique analyses, making it the most significant among the reviewed health behaviours. Although in another outcome, similar reviews have reported that good sleep is independently associated with a lower risk of all-cause mortality and

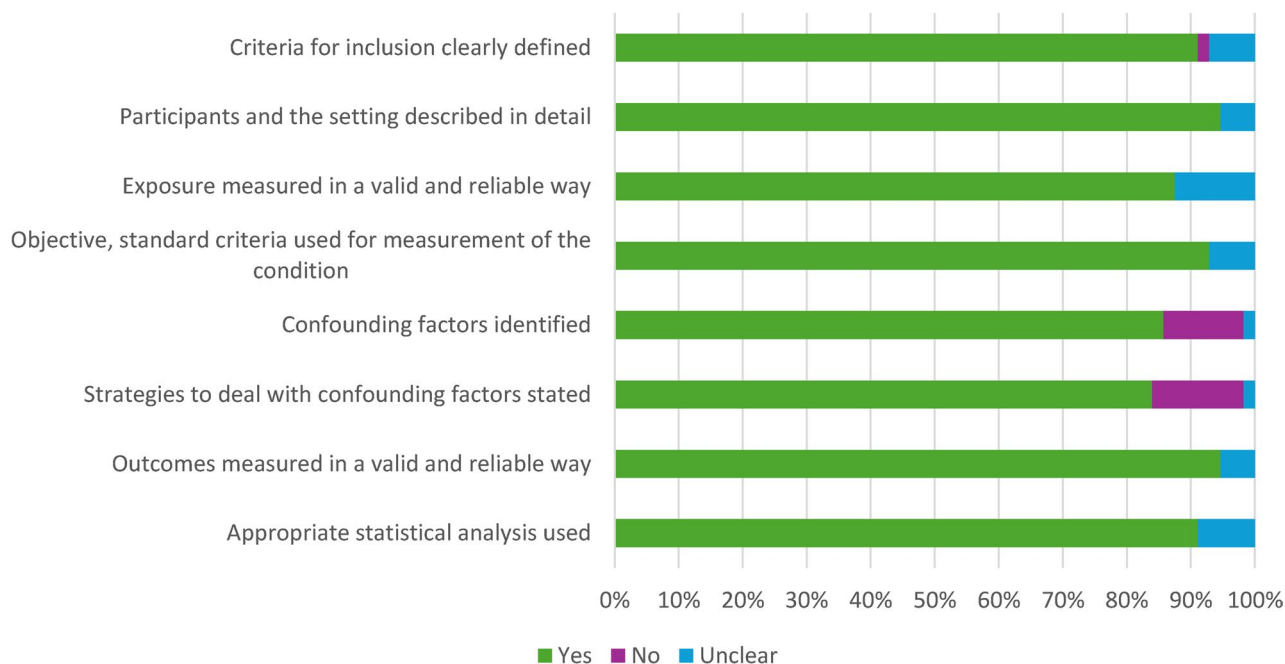


Fig. 5 Summary of each item in the risk of bias tool for all included studies

cardiovascular events [100] and with the quality of life [101]. An umbrella review reported that good sleep is associated with good health outcomes [102]. These findings, along with ours, highlight the critical importance of good sleep in the ageing population, as their biopsychosocial pathways are proximal to life satisfaction than many other health behaviours [103], whose benefits (e.g., physical activity) accumulate gradually over time. Good sleep is essential for the body’s restorative processes, especially among older adults, to reduce the rate of age-related decline [104]. Quality sleep was associated with better immune function, higher mental acuity/cognitive function, and a lower risk of chronic conditions, ultimately leading to higher life satisfaction [97, 99, 105]. Sleep also improves mental health functioning by mitigating disordered mood states, including anger, depression, and anxiety, thereby promoting social interaction and fostering greater life satisfaction [19, 106]. Additionally, it can improve social and psychological factors, such as self-image, boost self-esteem, and contribute to a positive outlook, which are essential for higher life satisfaction [22].

The physical activity was positively associated with life satisfaction in 69.1% of the unique analyses. However, the pooled effect size of the association is small ($r = 0.12$) and significant. Although the meta-analysis included only studies that assessed physical activity and life satisfaction and reported zero-order correlations, limitations inherent in measurement and study design likely attenuated the observed effect. First, the assessment of the constructs relied on self-report measures, which are

prone to recall bias and social desirability, potentially diluting the pooled coefficient [107]. Additionally, the cross-sectional design of the included studies means that associations were captured at a single point in time [108], potentially underestimating the true relationship. The influence of physical activity on life satisfaction often unfolds gradually and may not be fully reflected in cross-sectional snapshots [85]. As a result, cross-sectional correlations tend to be smaller than associations observed in longitudinal or intervention designs. Finally, the use of zero-order correlations means that the pooled effect does not account for other determinants of life satisfaction, including demographic and socioeconomic factors, health status, and social support [11–13].

Notwithstanding the small effect size, it is established that physical activity is beneficial to health by maintaining bone and muscle strength, enhancing cardiovascular and brain health and reducing the risks of non-communicable diseases [109–111]. Maintaining physical activity is also important for older adults to experience greater life satisfaction through psychosocial gains [112]. Physical activity provides older adults with an environment to meet and make friends, creating a sense of belonging and social integration [23, 112]. It improves mood, self-image, and self-esteem and fosters a sense of control and self-efficacy [113, 114]. Moreover, physical activity provides an alternative form of engagement for retired older adults, helping them maintain their sense of purpose and meaning [24].

A healthy diet can enhance older adults’ life satisfaction by improving their health. This improvement can

be achieved by supplying essential nutrients that support body function, maintain endocrine balance, boost energy levels and the immune system, and prevent chronic diseases [27, 115, 116]. Maintaining a healthy diet can enhance body image, boost self-esteem, and improve mood [117, 118].

Alcohol use and smoking show inconsistent associations with life satisfaction, with a few of the included studies identifying them as drivers of lower life satisfaction. The inconsistent associations may reflect cultural and social variations, as smoking or alcohol use carries different meanings and social consequences across countries [119, 120]. In societies where moderate alcohol use is embedded in social rituals and communal gatherings, drinking may support social engagement, while in some cultures, alcohol use is discouraged or stigmatised. Similarly, smoking may be viewed as a socially acceptable habit in some societies, while in others it may be prohibited. Additionally, variability in measurement approaches across studies likely contributes to inconsistent associations. Instruments differ in whether they assess habit versus frequency/ quantity, or social versus problematic use. For example, measures that distinguish moderate social drinking from hazardous or binge drinking are more likely to detect negative associations [65, 66], while those that capture only broad categories (e.g., “drinks alcohol: yes/no”) obscure meaningful differences in use patterns [9, 59].

Although these habits may serve as coping behaviours or social connections, they have severe health implications. Excessive alcohol use and smoking are known risk factors for various diseases, such as multiple organ cancers, diabetes, hypertension, dementia, and chronic lung, liver, and kidney diseases [120, 121]. Additionally, long-term drinking and smoking have been associated with mood disorders such as depression and anxiety [122, 123]. Harmful alcohol use can also lead to suicidal ideation, violence, and aggression, and when consumed before driving, it increases the risk of accidents [120]. Furthermore, smokers may face social isolation as others avoid them due to the smoke [124]. Avoiding these health and psychosocial effects of smoking and alcohol drinking could enhance life satisfaction among older adults. Even if these habits provide immediate gratification, the accumulation of their effects leads to chronic diseases with a remarkable reduction in life satisfaction [30, 65, 120, 121].

There is potential for bidirectionality, where life satisfaction functions as both an outcome and a determinant of behavioural patterns in later life. For instance, Lappan et al. [63] reported that being a smoker longitudinally predicted lower life satisfaction, and greater life satisfaction also longitudinally predicted a reduced likelihood of smoking. While bidirectionality appears practically

true, health behaviours may first influence life satisfaction before the bidirectional cycle begins. Moreover, it appears practically impossible to develop a direct intervention to improve life satisfaction without modifying health behaviours and other determinants [9, 18].

Strengths and limitations

This study is the first systematic review and meta-analysis to synthesise evidence on the association between a broad range of health behaviours and life satisfaction among community-dwelling older adults, addressing a clear gap in the literature. Another strength of this review lies in its comprehensive and transparent methodological rigour, including adherence to PRISMA guidelines, protocol registration, extensive searches across multiple major databases, and dual independent screening, data extraction, and risk of assessment with conflict resolution by a third reviewer. The comprehensiveness of the methodology enhances the reproducibility and credibility of the findings. Finally, the review is grounded in a biopsychosocial conceptual framework and anchored on the United Nations’ SDG three, offering a theoretically and practically informed interpretation of the association between life satisfaction and health behaviours.

The data in the included studies were collected using questionnaires, which may be prone to self-report errors, particularly recall bias. Moreover, questions on habits and health behaviours, such as smoking and alcoholism, are prone to social desirability biases. These biases may lead to either an underestimation or an overestimation of the effect size. No causal inferences can be made from the review results because we included only observational studies. Causality is typically drawn from randomised, controlled, interventional studies or trials. Study selection was limited to the English language and only observational studies, leading to the exclusion of other potential articles outside this scope.

The limited number of studies that assessed physical activity and life satisfaction with the same instruments restricted our ability to include more studies in the meta-analysis, potentially reducing statistical power and increasing uncertainty in the pooled associations. We were unable to complete meta-analyses on smoking, alcohol consumption, diet, and sleep due to the wide variability in the instruments used to measure both life satisfaction and the health behaviours. The reliance on narrative synthesis means that conclusions must be interpreted cautiously, as narrative approaches cannot account for between-study variability in the same systematic way that meta-analytic techniques allow, limiting comparability across studies.

Implications of findings

The review's outcomes have provided policymakers with valuable evidence to support healthy behaviours, such as physical activity, a healthy diet, and good sleep, to enhance the quality of life for older adults, aligning with the United Nations' SDG three [25]. To promote healthy behaviours, it may be necessary to ensure access to nutritious food, create environments that facilitate physical activity, and campaign against risky behaviours.

Healthcare workers and caregivers can integrate the study findings into their evidence-based practices. These findings may inspire the incorporation of healthy behaviour practices into routine care tailored to the needs of older adults. As health behaviours are modifiable factors that individuals can control, adopting them may help older adults achieve higher life satisfaction.

Finally, the review has bridged the literature gap on the synthesis of the association between health behaviours and life satisfaction. However, future studies should employ a standardised instrument to assess health behaviours and life satisfaction, enabling cross-study comparisons and meta-synthesis of the research findings. Additionally, reporting both bivariate and multivariate analyses would provide a better understanding of the crude and adjusted effects of health behaviours on life satisfaction.

Conclusions

Quality sleep and/or 7–8 h of sleep, a higher physical activity level, and regularly eating fruit and vegetables and/or a balanced diet are significantly associated with higher life satisfaction. In contrast, both cross-sectional and longitudinal studies sparsely supported the influence of smoking and alcohol consumption on lower life satisfaction. The review provides evidence for policymakers, healthcare workers, caregivers, and society to encourage healthy behaviours and foster healthy ageing. Future studies should use standardised instruments to assess health behaviours and life satisfaction.

Abbreviations

APA	American Psychological Association
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CMA	Comprehensive Meta-Analysis
JBI	Joanna Briggs Institute
MEDLINE	Medical Literature Analysis and Retrieval System Online
MeSH	Medical Subject Headings
MOOSE	Meta-Analyses and Systematic Reviews of Observational Studies
PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analysis
PROSPERO	International Prospective Register of Systematic Reviews
ROB	Risk of Bias Assessment
SDG	Sustainable Development Goal
Tau ²	Tau-squared

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12966-026-01877-1>.

Supplementary Material 1.

Acknowledgements

We thank Soroush Shirazi, UpJesus Onwuasoanya, and Ernest Ugwu for participating in the screening process.

Authors' contributions

CJA and OAA conceived the study, while CJA, DRS, TA, MK, OKO, ACO, LV, JS, and OAA designed it. CJA and DRS developed the search strategy. DRS completed the literature search and deduplication. CJA, TA, MK, and OKO participated in article screening, data extraction, or risk of bias assessment. CJA, DRS, and OAA drafted the manuscript. All authors gave critical input to the final manuscript and approved it for publication. CJA serves as the guarantor of the manuscript.

Funding

There was no external funding for this study.

Data availability

The data supporting this study's findings can be found in Supplementary Files 3 and 4.

Declarations

Ethics approval and consent to participate

Ethical approval is not needed for this study because it is not a primary study [125]. The study involved an analysis of secondary data within databases.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Faculty of Health Sciences, University of Lethbridge, Lethbridge, Alberta, Canada

²Emerging Researchers and Professionals in Ageing-African Network, Abuja, Nigeria

³Department of Physiotherapy, College of Basic Medical Sciences, Chrisland University, Abeokuta, Ogun, Nigeria

⁴University of Lethbridge Library, Lethbridge, Alberta, Canada

⁵School of Kinesiology and Health Sciences, Faculty of Health, York University, Toronto, Ontario, Canada

⁶Department of Physiotherapy, Faculty of Clinical Sciences, College of Medicine, University of Ibadan, Ibadan, Oyo, Nigeria

⁷School of Health and Human Performance, Faculty of Health, Dalhousie University, Halifax, Nova Scotia, Canada

Received: 12 June 2025 / Accepted: 19 January 2026

Published online: 26 January 2026

References

1. Fung HH. Aging in culture. *Gerontologist*. 2013;53(3):369–77.
2. Shilpa A, Kalyani S, Manisha S. Ageing process and physiological changes. In: Grazia DO, Antonio G, Daniele S, editors. *Gerontology*. Rijeka: IntechOpen; 2018. Ch. 1.
3. United Nations Living arrangements of older persons: a report on an expanded international dataset; 2017. Available from: <https://www.un.org/en/development/desa/population/publications/pdf/ageing/LivingArrangements.pdf>.
4. World Health Organisation. Ageing and health; 2024. Available from: <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health#>.

5. Wiest M, Schüz B, Wurm S. Life satisfaction and feeling in control: indicators of successful aging predict mortality in old age. *J Health Psychol.* 2013;18(9):199–208.
6. Kimm H, Sull JW, Gombojav B, Yi SW, Ohrr H. Life satisfaction and mortality in elderly people: the Kangwha cohort study. *BMC Public Health.* 2012;12:54.
7. Diener E. Subjective well-being. *Psychol Bull.* 1984;95(3):542–75.
8. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. *J Pers Assess.* 1985;49(1):71–5.
9. Banjare P, Dwivedi R, Pradhan J. Factors associated with the life satisfaction amongst the rural elderly in Odisha, India. *Health Qual Life Outcomes.* 2015;13(1):201.
10. Jung M, Muntaner C, Choi M. Factors related to perceived life satisfaction among the elderly in South Korea. *J Prev Med Public Health.* 2010;43(4):292–300.
11. Cheng A, Leung Y, Brodaty H. A systematic review of the associations, mediators and moderators of life satisfaction, positive affect and happiness in near-centenarians and centenarians. *Aging Mental Health.* 2022;26(4):651–66.
12. Khodabakhsh S. Factors affecting life satisfaction of older adults in asia: a systematic review. *J Happiness Stud.* 2022;23(3):1289–304.
13. Stahnke B, Cooley M. A systematic review of the association between partnership and life satisfaction. *Family J.* 2020;29(2):182–9.
14. Windle G, Hughes D, Linck P, Russell I, Woods B. Is exercise effective in promoting mental well-being in older age? A systematic review. *Aging Ment Health.* 2010;14(6):652–69.
15. Brett L, Traynor V, Stapley P. Effects of physical exercise on health and well-being of individuals living with a dementia in nursing homes: A systematic review. *J Am Med Dir Assoc.* 2016;17(2):104–16.
16. Taylor G, McNeill A, Girling A, Farley A, Lindson-Hawley N, Aveyard P. Change in mental health after smoking cessation: systematic review and meta-analysis. *BMJ: Br Med J.* 2014;348:g1151.
17. Alumona CJ, Scott DR, Odole AC, Nweke M, Kalu M, Awosoga OA. Association between life satisfaction and health behaviours among older adults: a systematic review and meta-analysis protocol. *BMJ Open.* 2024;14(11):e088302.
18. Phulkerd S, Thapsuwan S, Chamratrithirong A, Gray RS. Influence of healthy lifestyle behaviors on life satisfaction in the aging population of thailand: a National population-based survey. *BMC Public Health.* 2021;21(1):43.
19. Zhi TF, Sun XM, Li SJ, Wang QS, Cai J, Li LZ, et al. Associations of sleep duration and sleep quality with life satisfaction in elderly chinese: the mediating role of depression. *Arch Gerontol Geriatr.* 2016;65:211–7.
20. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science.* 1977;196(4286):129–36.
21. Chodzko-Zajko WJ, Proctor DN, Fiatarone Singh MA, Minson CT, Nigg CR, Salem GJ, et al. American college of sports medicine position stand. Exercise and physical activity for older adults. *Med Sci Sports Exerc.* 2009;41(7):1510–30.
22. Lemola S, Räikkönen K, Gomez V, Allemand M. Optimism and self-esteem are related to sleep. Results from a large community-based sample. *Int J Behav Med.* 2013;20(4):567–71.
23. Mappanasingam A, Madigan K, Kalu ME, Maximos M, Dal Bello-Haas V. Engaging in and sustaining physical activity and exercise: a descriptive qualitative study of adults 65 years and older using the self-determination theory. *J Ageing Longev.* 2024;4(2):156–76.
24. Yemiscigil A, Vlaev I. The bidirectional relationship between sense of purpose in life and physical activity: a longitudinal study. *J Behav Med.* 2021;44(5):715–25.
25. United Nations. Transforming our world: the 2030 agenda for sustainable development. Resolution adopted by the General Assembly on 25 September 2015; 2015. Available from: <https://docs.un.org/en/A/RES/70/1>.
26. Oduro JK, Okyere J, Nyador JKMT. Risky health behaviours and chronic conditions among aged persons: analysis of SAGE selected countries. *BMC Geriatr.* 2023;23(1):145.
27. Shi Z, Zhang T, Byles J, Martin S, Avery JC, Taylor AW. Food habits, lifestyle factors and mortality among oldest old chinese: the Chinese longitudinal healthy longevity survey (CLHLS). *Nutrients.* 2015;7(9):7562–79.
28. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ.* 2021;372:n71.
29. Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis of observational studies in epidemiology (MOOSE) group. *JAMA.* 2000;283(15):2008–12.
30. Peltzer K, Pengpid S. Impact of somatic conditions and lifestyle behaviours on depressive symptoms and low life satisfaction among middle-aged and older adult men in South Africa. *J Men's Health.* 2023;18(9):194.
31. Gureje O, Oladeji BD, Abiona T, Chatterji S. Profile and determinants of successful aging in the Ibadan study of ageing. *J Am Geriatr Soc.* 2014;62(5):836–42.
32. Peng MM, Liang Z, Wang P. Lifestyle factors, physical health, and life satisfaction under different changes in depressive symptoms among Chinese community-dwelling older adults: A longitudinal analysis. *Int J Soc Psychiatry.* 2024;70(6):1062–74.
33. Siegmund LA, Siedlecki SL, Bena JF. Physical, social, psychological, and environmental predictors of life satisfaction among older adults. *Clin Nurse Spec.* 2025;39(1):35–41.
34. André B, Canhão H, Espnes GA, Ferreira Rodrigues AM, Gregorio MJ, Nguyen C, et al. Is there an association between food patterns and life satisfaction among norway's inhabitants ages 65 years and older? *Appetite.* 2017;110:108–15.
35. Wang RS, Huang YN, Wahlqvist ML, Wan TTH, Tung TH, Wang BL. The combination of physical activity with fruit and vegetable intake associated with life satisfaction among middle-aged and older adults: a 16-year population-based cohort study. *BMC Geriatr.* 2024;24(1):41.
36. Achour EC, Barthelemy JC, Lionard KC, Trombert B, Lacour JR, Thomas-Anterior C, et al. Level of physical activity at the age of 65 predicts successful aging seven years later: the PROOF study. *Rejuven Res.* 2011;14(2):215–21.
37. Ni Mhaolain AM, Gallagher D, O'Connell H, Chin AV, Bruce I, Hamilton F, et al. Subjective well-being amongst community-dwelling elders: what determines satisfaction with life? Findings from the Dublin healthy aging study. *Int Psychogeriatr.* 2012;24(2):316–23.
38. Parker SJ, Strath SJ, Swartz AM. Physical activity measurement in older adults: relationships with mental health. *J Aging Phys Act.* 2008;16(4):369–80.
39. Bramer WM, Rethlefsen ML, Kleijnen J, Franco OH. Optimal database combinations for literature searches in systematic reviews: a prospective exploratory study. *Syst Reviews.* 2017;6(1):245.
40. Maher JP, Pincus AL, Ram N, Conroy DE. Daily physical activity and life satisfaction across adulthood. *Dev Psychol.* 2015;51(10):1407–19.
41. Bae W, Ik Suh Y, Ryu J, Heo J. Physical activity levels and well-being in older adults. *Psychol Rep.* 2017;120(2):192–205.
42. Martin-Maria N, Caballero FF, Moreno-Agostino D, Olaya B, Haro JM, Ayuso-Mateos JL, et al. Relationship between subjective well-being and healthy lifestyle behaviours in older adults: a longitudinal study. *Aging Ment Health.* 2020;24(4):611–9.
43. Phillips SM, Wojcicki TR, McAuley E. Physical activity and quality of life in older adults: an 18-month panel analysis. *Qual Life Res.* 2013;22(7):1647–54.
44. Fraser C, Murray A, Burr J. Identifying observational studies of surgical interventions in MEDLINE and EMBASE. *BMC Med Res Methodol.* 2006;6:41.
45. Kaner EF, Beyer FR, Garnett C, Crane D, Brown J, Muirhead C, et al. Personalised digital interventions for reducing hazardous and harmful alcohol consumption in community-dwelling populations. *Cochrane Database Syst Reviews.* 2017;9(9):Cd011479.
46. Mishra SI, Scherer RW, Geigle PM, Berlanstein DR, Topaloglu O, Gotay CC, et al. Exercise interventions on health-related quality of life for cancer survivors. *Cochrane Database Syst Reviews.* 2012;2012(8):Cd007566.
47. Demicheli V, Jefferson T, Di Pietrantonj C, Ferroni E, Thorning S, Thomas RE, et al. Vaccines for preventing influenza in the elderly. *Cochrane Database Syst Reviews.* 2018;2(2):Cd004876.
48. Frazer K, Callinan JE, McHugh J, van Baarsel S, Clarke A, Doherty K, et al. Legislative smoking bans for reducing harms from secondhand smoke exposure, smoking prevalence and tobacco consumption. *Cochrane Database Syst Reviews.* 2016;2(2):Cd005992.
49. Kellermeyer L, Harnke B, Knight S. Covidence and Rayyan. *J Med Libr Assoc.* 2018;106(4):580–3.
50. Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfetcu R, et al. Chapter 7: systematic reviews of etiology and risk. 2020. In: *JBI Manual for Evidence Synthesis*. JBI. Available from: <https://synthesismanual.jbi.global>.
51. Ma L-L, Wang Y-Y, Yang Z-H, Huang D, Weng H, Zeng X-T. Methodological quality (risk of bias) assessment tools for primary and secondary medical studies: what are they and which is better? *Military Med Res.* 2020;7(1):7.
52. Borenstein M, Hedges LE, Higgins JPT, Rothstein HR. *Comprehensive meta-analysis version 4*. Biostat, Inc.; 2022.
53. Borenstein M, Hedges LV, Higgins JP, Rothstein HR. A basic introduction to fixed-effect and random-effects models for meta-analysis. *Res Synthesis Methods.* 2010;1(2):97–111.

54. Hedges LV, Vevea JL. Fixed- and random-effects models in meta-analysis. *Psychol Methods*. 1998;3(4):486–504.
55. Quintana DS. From pre-registration to publication: a non-technical primer for conducting a meta-analysis to synthesize correlational data. *Front Psychol*. 2015;6:1549.
56. Borenstein M, Higgins JP, Hedges LV, Rothstein HR. Basics of meta-analysis: I(2) is not an absolute measure of heterogeneity. *Res Synthesis Methods*. 2017;8(1):5–18.
57. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ*. 2003;327(7414):557–60.
58. Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. Introduction to meta-analysis. Second ed: Wiley; 2021.
59. Teixeira Vaz C, de Souza Andrade AC, Proietti FA, Coelho Xavier C, de Lima Friche AA, Teixeira Caiaffa W. A multilevel model of life satisfaction among older people: individual characteristics and neighborhood physical disorder. *BMC Public Health*. 2019;19(1):861.
60. Cho D, Cheon W. Older adults' advance aging and life satisfaction levels: effects of lifestyles and health capabilities. *Behav Sci (Basel)*. 2023;13(4):293.
61. Shojima K, Mori T, Wada Y, Kusunoki H, Tamaki K, Matsuzawa R, et al. Factors contributing to subjective well-being and supporting successful aging among rural Japanese community-dwelling older adults: A cross-sectional and longitudinal study. *Geriatr Gerontol Int*. 2024;24(Suppl 1):311–9.
62. Kolosnitsyna M, Khorkina N, Dorzhiev H. Determinants of life satisfaction in older Russians. *Ageing Int*. 2017;42(3):354–73.
63. Lappan S, Thorne CB, Long D, Hendricks PS. Longitudinal and reciprocal relationships between psychological well-being and smoking. *Nicotine Tob Res*. 2020;22(1):18–23.
64. Yuan T, Liang L, Zheng C, Li H, Zhang J, Kiyum M, et al. Bidirectional association between attitudes toward own aging and quality of life in Chinese older adults: A prospective cohort study. *Appl Psychology: Health Well Being*. 2024;16(4):2169–89.
65. Colsher PL, Wallace RB. Elderly men with histories of heavy drinking: correlates and consequences. *J Stud Alcohol*. 1990;51(6):528–35.
66. Di Gessa G, Zaninotto P. Health behaviors and mental health during the covid-19 pandemic: evidence from the english longitudinal study of aging. *J Appl Gerontol*. 2023;42(7):1541–50.
67. Ku P-W, Fox KR, Chen L-J. Leisure-time physical activity, sedentary behaviors and subjective well-being in older adults: an eight-year longitudinal research. *Soc Indic Res*. 2016;127(3):1349–61.
68. Bertelli-Costa T, Neri AL. Life satisfaction and participation among community-dwelling older adults: data from the FIBRA study. *J Health Psychol*. 2021;26(11):1860–71.
69. Park CH, Elavsky S, Koo KM. Factors influencing physical activity in older adults. *J Exerc Rehabilitation*. 2014;10(1):45–52.
70. Bourque P, Pushkar D, Bonneville L, Beland F. Contextual effects on life satisfaction of older men and women. *Can J Aging*. 2005;24(1):31–44.
71. McAuley E, Konopack JF, Motl RW, Morris KS, Doerksen SE, Rosengren KR. Physical activity and quality of life in older adults: influence of health status and self-efficacy. *Ann Behav Med*. 2006;31(1):99–103.
72. Skalacka K, Błońska K. Physical leisure activities and life satisfaction in older adults. *Act Adapt Aging*. 2023;47(3):379–96.
73. Syue SH, Yang HF, Wang CW, Hung SY, Lee PH, Fan SY. The associations between physical activity, functional fitness, and life satisfaction among community-dwelling older adults. *Int J Environ Res Public Health*. 2022;19(13):8043.
74. Wickrama K, Ralston PA, O'Neal CW, Ilich JZ, Harris CM, Coccia C, et al. Linking life dissatisfaction to health behaviors of older African Americans through psychological competency and vulnerability. *Res Aging*. 2013;35(5):591–611.
75. You S, Kwon M. Religious engagement and successful aging among Korean older adults. *Religions*. 2023;14(2):184.
76. Zapata-Lamana R, Poblete-Valderrama F, Ledezma-Dames A, Pavón-León P, Leiva AM, Fuentes-Alvarez MT, et al. Health, functional ability, and environmental quality as predictors of life satisfaction in physically active older adults. *Social Sci*. 2022;11(6):265.
77. Bourque P, Léger C, Pushkar D, Béliand F. Self-reported sensory impairment and life satisfaction in older French-speaking adults. *Can J Nurs Res*. 2007;39(4):155–71.
78. Parra-Rizo MA, Sanchis-Soler G. Satisfaction with life, subjective well-being and functional skills in active older adults based on their level of physical activity practice. *Int J Environ Res Public Health*. 2020;17(4):1299.
79. Rodrigues F, Jacinto M, Couto N, Monteiro D, Monteiro AM, Forte P et al. Motivational correlates, satisfaction with life, and physical activity in older adults: a structural equation analysis. *Med (Kaunas Lithuania)*. 2023;59(3):599.
80. White SM, Wójcicki TR, McAuley E. Physical activity and quality of life in community dwelling older adults. *Health Qual Life Outcomes*. 2009;7:10.
81. Withall J, Stathi A, Davis M, Coulson J, Thompson JL, Fox KR. Objective indicators of physical activity and sedentary time and associations with subjective well-being in adults aged 70 and over. *Int J Environ Res Public Health*. 2014;11(1):643–56.
82. Kang YT. Impact of physical activity on life satisfaction among middle-aged and older adults in china: A longitudinal National study. *Int J Psychiatry Med*. 2025;60(3):235–53.
83. An HY, Chen W, Wang CW, Yang HF, Huang WT, Fan SY. The relationships between physical activity and life satisfaction and happiness among young, middle-aged, and older adults. *Int J Environ Res Public Health*. 2020;17(13):4817.
84. Maher JP, Conroy DE. Daily life satisfaction in older adults as a function of (in)activity. *The journals of gerontology series B. Psychol Sci Social Sci*. 2017;72(4):593–602.
85. Gellert P, Wienert J, Ziegelmann JP, Kuhlmeier A. Profiles of physical activity biographies in relation to life and aging satisfaction in older adults: longitudinal findings. *Eur Rev Aging Phys Activity*. 2019;16:14.
86. Morgan K, Bath PA. Customary physical activity and psychological wellbeing: a longitudinal study. *Age Ageing*. 1998;27(Suppl 3):35–40.
87. Yen HY, Lin GH, Huang HY. Leisure participation for mental health promotion in later life: a six-year longitudinal study. *J Appl Gerontol*. 2024;43(6):656.
88. Lengyel CO, Tate RB, Obirek Blatz AK. The relationships between food group consumption, self-rated health, and life satisfaction of community-dwelling Canadian older men: the Manitoba Follow-up study. *J Nutr Elder*. 2009;28(2):158–73.
89. Wickrama KAS, Ralston PA, O'Neal CW, Ilich JZ, Harris CM, Coccia C, et al. Life dissatisfaction and eating behaviors among older African Americans: the protective role of social support. *J Nutr Health Aging*. 2012;16(9):749–53.
90. Johannesson J, Gustafsson S, Slinde F, Rothenberg E. Exploring meal frequency and vegetable intake among immigrants 70 years or older in Sweden. *J Ethnic Foods*. 2021;8(1):39.
91. Caligiuri S, Lengyel C, Tate R. Changes in food group consumption and associations with self-rated diet, health, life satisfaction, and mental and physical functioning over 5 years in very old Canadian men: the Manitoba Follow-Up study. *J Nutr Health Aging*. 2012;16(8):707–12.
92. Zaragoza-Marti A, Ferrer-Cascales R, Hurtado-Sanchez JA, Laguna-Perez A, Cabanero-Martinez MJ. Relationship between adherence to the mediterranean diet and health-related quality of life and life satisfaction among older adults. *J Nutr Health Aging*. 2018;22(1):89–96.
93. Crawford-Achour E, Dauphinot V, Saint Martin M, Tardy M, Gonthier R, Barthelemy JC, et al. Can subjective sleep quality, evaluated at the age of 73, have an influence on successful aging? The PROOF study. *Open J Prev Med*. 2014;4(2):51–6.
94. Papi S, Cheraghi M. Relationship between life satisfaction and sleep quality and its dimensions among older adults in City of Qom, Iran. *Social Work Public Health*. 2021;36(4):526–35.
95. Park JH, Yoo MS, Bae SH. Prevalence and predictors of poor sleep quality in Korean older adults. *Int J Nurs Pract*. 2013;19(2):116–23.
96. Liu Q, Pan HM, Pei YL. Sleep duration and life satisfaction among older people in china: a longitudinal investigation. 2023;42(35):30737–46.
97. Rodrigues R, Nicholson K, Guaiana G, Wilk P, Stranges S, Anderson KK. Sleep problems and psychological well-being: baseline findings from the Canadian longitudinal study on aging. *Can J Aging*. 2023;42(2):230–40.
98. Fichten CS, Libman E, Creti L, Bailes S, Sabourin S. Long sleepers sleep more and short sleepers sleep less: a comparison of older adults who sleep well. *Behav Sleep Med*. 2004;2(1):2–23.
99. Zhu CE, Zhou LL, Zhang XJ, Walsh CA. Reciprocal effects between sleep quality and life satisfaction in older adults: the mediating role of health status. *Healthcare*. 2023;11(13):1912.
100. Yin J, Jin X, Shan Z, Li S, Huang H, Li P, et al. Relationship of sleep duration with all-cause mortality and cardiovascular events: a systematic review and dose-response meta-analysis of prospective cohort studies. *J Am Heart Association*. 2017;6(9):e005947.
101. Sella E, Miola L, Toffalini E, Borella E. The relationship between sleep quality and quality of life in aging: a systematic review and meta-analysis. *Health Psychol Rev*. 2023;17(1):169–91.

102. Chaput JP, Dutil C, Featherstone R, Ross R, Giangregorio L, Saunders TJ, et al. Sleep duration and health in adults: an overview of systematic reviews. *Appl Physiol Nutr Metab*. 2020;45(10):S218–31. Suppl. 2).
103. Sin NL, Almeida DM, Crain TL, Kossek EE, Berkman LF, Buxton OM. Bidirectional, Temporal associations of sleep with positive events, affect, and stressors in daily life across a week. *Ann Behav Med*. 2017;51(3):402–15.
104. Brinkman JE, Reddy V, Sharma S. Physiology of sleep; 2021. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482512/>.
105. Ragab A, Chen J, Cao Y, Doyle M, Lunetta K, Murabito J. Association of sleep measures with immune cell phenotypes in the Framingham heart study. *Innov Aging*. 2024;8(Suppl 1):1094–5.
106. Bower B, Bylsma LM, Morris BH, Rottenberg J. Poor reported sleep quality predicts low positive affect in daily life among healthy and mood-disordered persons. *J Sleep Res*. 2010;19(2):323–32.
107. Prince SA, Adamo KB, Hamel ME, Hardt J, Connor Gorber S, Tremblay M. A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review. *Int J Behav Nutr Phys Act*. 2008;5:56.
108. Savitz DA, Wellenius GA. Can cross-sectional studies contribute to causal inference? It depends. *Am J Epidemiol*. 2022;192(4):514–6.
109. Warburton DER, Bredin SSD. Health benefits of physical activity: a systematic review of current systematic reviews. *Curr Opin Cardiol*. 2017;32(5):541–56.
110. Bullard T, Ji M, An R, Trinh L, Mackenzie M, Mullen SP. A systematic review and meta-analysis of adherence to physical activity interventions among three chronic conditions: cancer, cardiovascular disease, and diabetes. *BMC Public Health*. 2019;19(1):636.
111. World Health Organisation. Physical activity; 2024. Available from: <https://www.who.int/news-room/fact-sheets/detail/physical-activity>.
112. Kleiber DA, Genoe MR. The relevance of leisure in theories of aging. In: Gibson HJ, Singleton JF, editors. *Leisure and aging: theory and practice*. Champaign Illinois: Human Kinetics; 2012.
113. Mahindru A, Patil P, Agrawal V. Role of physical activity on mental health and well-being: a review. *Cureus*. 2023;15(1):e33475.
114. Netz Y, Wu MJ, Becker BJ, Tenenbaum G. Physical activity and psychological well-being in advanced age: a meta-analysis of intervention studies. *Psychol Aging*. 2005;20(2):272–84.
115. Fekete M, Szarvas Z, Fazekas-Pongor V, Feher A, Csipo T, Forrai J, et al. Nutrition strategies promoting healthy aging: from improvement of cardiovascular and brain health to prevention of age-associated diseases. *Nutrients*. 2022;15(1):47.
116. Brookie KL, Best GI, Conner TS. Intake of Raw fruits and vegetables is associated with better mental health than intake of processed fruits and vegetables. *Front Psychol*. 2018;9:487.
117. González-Fernández E, Xandri-Martínez R, Gómez-Díaz M, Navas-López J. Nutritional and psychosocial intervention to improve the self-concept of body image and increase the self-esteem of overweight and obese individuals: a quasi-experimental study. *Nutrients*. 2024;16(16):2708.
118. Ma X, Li Y, Xu Y, Gibson R, Williams C, Lawrence AJ, et al. Plant-based dietary patterns and their association with mood in healthy individuals. *Food Funct*. 2023;14(5):2326–37.
119. Knodel J, Pothisiri W. Smoking and drinking behaviors among older adults: A comparative analysis of three Southeast Asian countries. *J Cross-Cult Gerontol*. 2021;36(4):369–86.
120. World Health Organisation. Global status report on alcohol and health Geneva, Switzerland; 2018. Available from: <https://www.who.int/publications/i/item/9789241565639>.
121. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. The health consequences of smoking—50 years of progress: a report of the surgeon general: centers for disease control and prevention (US); 2014. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK179276/>.
122. Taylor G, McNeill A, Girling A, Farley A, Lindson-Hawley N, Aveyard P. Change in mental health after smoking cessation: systematic review and meta-analysis. *BMJ*. 2014;348:g1151.
123. Boden JM, Fergusson DM. Alcohol and depression. *Addiction*. 2011;106(5):906–14.
124. Philip KE, Bu F, Polkey MI, Brown J, Steptoe A, Hopkinson NS, et al. Relationship of smoking with current and future social isolation and loneliness: 12-year follow-up of older adults in England. *Lancet Reg Health Europe*. 2022;14:100302.
125. Wormald R, Evans J. What makes systematic reviews systematic and why are they the highest level of evidence? *Ophthalmic Epidemiol*. 2018;25(1):27–30.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.