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New Directions in Aging

Well-Being as a Protective Factor Against Cognitive Decline and Dementia: A Review of the Literature and Directions for Future Research

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Abstract

Objectives: Treatments that target the biological causes of dementia remain limited, making prevention critically important. Well-being—defined broadly as living in accordance with one's potential and experiencing one's life as enjoyable and satisfying—is a promising avenue for prevention. It can be targeted by large-scale, noninvasive interventions and has been linked with better cognitive health and lower dementia risk. In the current review, we begin by summarizing empirical evidence linking well-being to cognitive functioning, cognitive decline, dementia diagnosis, and dementia-related neuropathology. Then, we highlight 3 key areas for future research.

Methods: We searched the literature on wellbeing, cognitive decline, and dementia, focusing on prospective and longitidinal evidence.

Results: The research reviewed here provides consistent evidence for associations of well-being with cognitive decline, dementia risk, and cognitive resilience to neuropathology. However, several open questions remain regarding (1) causality and mechanism(s), (2) specificity versus generalizability of associations, and (3) timing.

Discussion: To inform potential intervention efforts, the field must address complex open questions about whether, how, when, and for whom well-being influences dementia risk. The majority of existing research on well-being and cognitive health is correlational, and few studies have tested potential mechanisms that may explain those associations. Further, relatively little is known about the generalizability of associations across different aspects of well-being and for different sociocultural groups. Finally, we do not yet understand when in the life span and on what timescale well-being might influence cognitive health. We discuss challenges and opportunities for addressing each of these open questions, including concrete recommendations for research designs and use of open science practices.

Keywords: Cognitive aging, Life satisfaction, Purpose, Review paper

Alzheimer's disease and related dementias are a leading cause of death and disability worldwide, and access to disease-modifying treatments is limited (National Institute on Aging, 2021; World Health Organization, 2021). Prevention is a crucial avenue to reduce the public health burden and quality of life impact of dementia. Psychosocial factors are key prevention targets, given their potential for noninvasive and large-scale intervention and their associations with cognitive

health outcomes. Well-being—defined broadly as living in accordance with one's potential and experiencing one's life as enjoyable and satisfying—is a promising prevention target. Prior research has shown that well-being is amenable to intervention (Bolier et al., 2013) and is associated with better cognitive health (Dewitte et al., 2020; Gerstorf et al., 2007; Hittner et al., 2020; Kim et al., 2019; Windsor et al., 2015) and lower dementia risk (Boyle et al., 2010, 2022; Peitsch et al., 2016; Rawtaer et al., 2017; Sutin et al., 2018). The present paper reviews empirical evidence linking well-being to cognitive functioning, cognitive decline, dementia diagnosis, and dementia-related neuropathology. Then, we highlight key open questions related to causality and mechanism(s), specificity and generalizability, and timing. The overarching aims of this review are to synthesize the current state of knowledge on well-being and cognitive health associations, and to identify key gaps in this knowledge. Through this process, we outline a research agenda that would push the field closer to understanding whether and how to apply this knowledge to improve cognitive health in older adulthood.

Defining Well-Being

Well-being is a multifaceted construct, with many different aspects of what it means to be psychologically "well." In the current review, we will focus on *positive* aspects of well-being, which can be distinguished from negative aspects of psychological functioning (e.g., depression), and on *psychosocial* aspects of well-being, which can be distinguished from *physical* well-being (e.g., health conditions). A common theoretical distinction in the well-being literature is between hedonic well-being (i.e., experiencing life as enjoyable and satisfying) and eudaimonic well-being (i.e., living in a way that is consistent with one's potential; Ryff et al., 2021). Within these broad conceptualizations of well-being, theoretical and measurement models specify multiple well-being components. Hedonic well-being (also called subjective well-being) is characterized by affective experiences (i.e., positive and negative affect) and cognitive evaluations of one's life (life satisfaction; Diener et al., 1999). A prominent model of eudaimonic well-being is characterized by six components that together describe challenges that people face as they strive to function optimally: self-acceptance, autonomy, environmental mastery, positive relations, purpose in life, and personal growth (Ryff, 1989). The majority of research on well-being and cognitive health has focused on hedonic aspects of well-being or on purpose in life, a component of eudaimonic well-being that reflects the extent to which one feels that they have personally meaningful goals and directions guiding them through life (Ryff, 1989). In addition to these two dominant types of well-being, some research on well-being and cognitive health has used measures developed specifically for use in older adulthood, such as the Quality of Life Scale (CASP-19), which measures quality of life based on the extent to which psychological needs are satisfied (Hyde et al., 2003). The current review will consider associations between each of these aspects of well-being and cognitive health.

Literature Search Procedure and Inclusion Criteria

The first and third author conducted the literature search using Google Scholar and PubMed with search terms related to our working definition of well-being (e.g., psychosocial well-being, psychological well-being, eudaimonic well-being, subjective well-being, hedonic well-being, life satisfaction, satisfaction with life, positive affect, sense of purpose) and our outcomes of interest (e.g., cognitive functioning, cognitive decline, cognitive impairment, cognitive resilience, dementia, Alzheimer's disease). First, we identified potentially relevant articles based on a review of their titles. This approach means that we focused on articles for which associations between well-being and cognitive health were a central focus. Then we further narrowed down the list of potentially relevant articles by reading their abstracts. The first author made the final decision on which studies to include based on the following criteria: (a) two or more measurement occasions and prospective or longitudinal analyses; (b) well-being measure(s) that matched our working definition of well-being as predictor(s); and (c) cognitive functioning levels, cognitive decline, incident cognitive impairment or dementia, dementia-related neuropathology, and/or cognitive resilience as outcome(s). We supplemented this search with our knowledge of the literature, and by using https://www.connectedpapers.com/, a website which identifies similar papers based on co-citation and bibliographic similarity. Finally, we added additional articles during the peer-review process. Although we aimed to be thorough in our search of the literature and inclusion of relevant literature, this is not a formal systematic review.

Review of Empirical Findings

Well-Being, Cognitive Functioning, and Cognitive Decline

First, we will review research on associations between well-being and cognitive functioning (i.e., performance on cognitive tests evaluating domains such as memory and processing speed). The majority of research on well-being and cognitive functioning has been based on longitudinal cohort studies of midlife and older adulthood, including multiple studies using data from the Midlife in the United States study, the Health and Retirement Study, the Berlin Aging Study, the Australian Longitudinal Study of Aging, the English Longitudinal Study of Aging, the Emory Healthy Aging Study, the Rush Memory and Aging Project (MAP) and Minority Aging Research Study (MARS), and the Betula Cohort Study. Major strengths of this body of research include relatively large sample sizes (*N*s = ~500 to tens of thousands) and representative sampling methods.

Across these studies, multiple aspects of well-being have been positively associated with cognitive functioning *levels* (e.g., Dewitte et al., 2020; Lee et al., 2016; Wagner et al., 2022). In addition to associations with cognitive

functioning *levels*, several components of well-being have been associated with slower rates of cognitive *decline* across time. Associations with lesser cognitive decline have been observed for multiple types of well-being, including positive affect (Hittner et al., 2020), sense of purpose (Boyle et al., 2010; Kim et al., 2019), and life satisfaction (Gerstorf et al., 2007), and for multiple cognitive domains, including general cognitive function (Boyle et al., 2010; Kim et al., 2019), memory (Hittner et al., 2020), and perceptual speed (Gerstorf et al., 2007). Aspects of well-being and cognitive functioning have also been found to change together within people across time. For example, Lewis and Hill (2021) found that people performed better on memory tests and mental status exams at occasions when they felt more purposeful than usual. Similarly, Zainal and colleagues (2022) found that reductions in life satisfaction predicted future decreases in cognitive functioning.

Despite a growing body of evidence for associations between well-being, cognitive functioning levels, and cognitive decline, null findings have also been reported in the literature. For example, some studies observed associations between well-being and cognitive functioning *levels* but did not observe associations between well-being and cognitive *decline* (Wagner et al., 2022; Windsor et al., 2015; Zhu et al., 2022). Moreover, Nyström and colleagues (2019) observed cross-sectional associations between hedonic well-being and subjective memory but did not observe any prospective associations between hedonic well-being at one time point and memory at the next time point. Similarly, Allerhand and colleagues (2014) found between-person associations between quality of life and cognitive performance, but within-person fluctuations in quality of life explained little variance in later within-person fluctuations in cognitive performance. Finally, Berk et al. (2017) did not observe an association between positive affect and cognitive decline. With the exception of Berk et al. (2017), the aforementioned null findings were reported in papers that also reported statistically significant associations (e.g., at a different level of analysis or for a different cognitive domain). Thus, there may be additional null findings that did not make it into the literature due to file drawer effects.

In sum, well-being has been positively associated with later cognitive functioning at the between- and within-person levels, and with lesser cognitive decline. These associations have been replicated across different well-being constructs and measures. However, additional preregistered work is needed to test the replicability and boundary conditions of specific associations between well-being and cognitive functioning and decline.

Well-Being, Cognitive Impairment, and Dementia Diagnosis

In addition to associations with cognitive functioning, several longitudinal, epidemiological studies have found that well-being is associated with lower incidence of mild cognitive impairment (MCI) and dementia among older adults. Together these studies have many strengths, including large sample sizes (*N*s = ~1,000 to 10,000+), longitudinal follow-ups over 5–17 years, objective cognitive assessments and clinical diagnoses, and samples spanning nearly two dozen countries and three continents, including one study that used data from 14 countries (Sutin et al., 2020). Three studies found that global life satisfaction predicted lower risk of MCI and dementia (Peitsch et al., 2016; Rawtaer et al., 2017; Zhu et al., 2022), whereas one study did not find an association between global life satisfaction and later cognitive impairment (Kim et al., 2021). A handful of studies, including two small meta-analyses, found that higher purpose or meaning in life predicted lower incidence of cognitive impairment or dementia (Bell et al., 2022; Boyle et al., 2010, 2022; Sutin et al., 2018, 2020, 2021).

Relatively few studies have directly compared associations between different components of well-being and cognitive outcomes such as dementia risk. One notable exception examined associations between five components of well-being (i.e., life satisfaction, optimism, mastery, purpose in life, and positive affect) and dementia risk (Sutin et al., 2018). Positive affect, life satisfaction, and sense of purpose all predicted lower dementia risk, but only the effect of sense of purpose remained after adjusting for depressive symptoms and other risk factors (Sutin et al., 2018). In addition, Bell et al. (2022) found meta-analytic evidence for an association between sense of purpose and dementia risk, but not for positive affect and dementia risk. Considered together, multiple types of well-being have been associated with lower risk for cognitive impairment and dementia, with the most well-replicated and robust findings for sense of purpose.

Well-Being and Dementia-Related Neuropathology

When considering associations between well-being and neuropathology, it is useful to distinguish between factors that impart resistance (i.e., the avoidance of neuropathology) and those that impart resilience (i.e., the ability to maintain cognitive functioning despite the presence of neuropathology; Arenaza-Urquijo & Vemuri, 2018). Two longitudinal, epidemiological investigations using data from the Rush MAP found that multiple components of well-being were generally not directly associated with dementia-related neuropathology observed at autopsy (Boyle et al., 2012; Willroth et al., 2022). Despite lack of evidence for well-being as a resistance factor, it may still confer resilience. Indeed, the aforementioned Rush MAP studies found that higher levels of multiple types of well-being were associated with better-than-expected cognitive functioning and less-than-expected cognitive decline for a given level of neuropathology (Boyle et al., 2012; Willroth et al., 2022). In other words, although well-being may not prevent neuropathology, it appears to

increase people's ability to tolerate a higher neuropathological burden while remaining cognitively healthy.

Research Synthesis and Directions for Future Research

Causality and Mechanism(s)

The growing body of research reviewed here provides strong evidence for associations of well-being with cognitive functioning, cognitive decline, dementia risk, and cognitive resilience. However, several open questions remain regarding causality and mechanism(s). The causal relationship between well-being and cognitive health is likely complex. First, well-being may serve as a protective factor that improves cognitive functioning, slows cognitive decline, prevents cognitive impairment and dementia, and confers resilience to dementia-related neuropathology. Second, the causal arrow may go in the other direction, such that cognitive changes may affect well-being. Third, other variables such as neurological changes, genetics, or lifestyle factors may causally influence both well-being and cognitive health. Finally, it is possible that more than one of these causal relationships is true at once, such as in the case of bidirectional feedback loops.

Research on well-being as a protective factor has attempted to elucidate directionality by using longitudinal designs in which well-being is assessed in cognitively healthy middle or older adults and cognitive outcomes are assessed years or decades later. In addition to using longitudinal designs, some of the reviewed studies used statistical models that account for previous measurement occasions of both well-being and cognition. These designs provide more stringent tests of whether well-being precedes changes in cognition or whether cognition precedes changes in well-being. In addition to the direction of effects, a related issue concerns the level of effects (i.e., within-person vs between-person). In other words, do people who are higher in well-being experience better cognitive outcomes relative to people who are lower in well-being? Or do changes or fluctuations in well-being across time drive changes or fluctuations in cognitive outcomes? Only a handful of the reviewed studies used statistical models that could disentangle between- and within-person effects, and results of those studies were mixed (e.g., Allerhand et al., 2014; Lewis & Hill, 2021).

Establishing causal effects of well-being on cognitive health is complicated because well-being and cognitive health share a myriad of common causes (Rohrer & Lucas, 2020). To address the possibility that the same common causes affect both well-being and cognitive health, the majority of research on this topic included statistical adjustment for potential third variable confounds. The most common confounds that were accounted for were sociodemographic characteristics, personality traits, health status, health behaviors, depression, and genetic dementia risk factors (see Table 1). Using this approach, causality can only be inferred if all possible common causes are accounted for and free from measurement error (Rohrer & Lucas, 2020). This strong assumption may be implausible in most scenarios. Causal inference using observational data is particularly challenging given that some variables, such as health behaviors, could plausibly be confounders or mediators of the association between well-being and cognitive health. Thus, selecting which variables to statistically adjust for is not straightforward. Moreover, it is difficult to rule out within-person confounders such as changes in life circumstances that may have immediate effects on well-being and more delayed effects on cognitive health outcomes.

Experimental designs generally provide a stronger test of causality compared to observational studies, but experimental manipulations of well-being come with their own challenges. First, an experimental manipulation would likely need to have sustained, long-term effects on well-being in order to influence cognitive health. Most research on well-being interventions has used follow-up periods of up to 1 year (Bolier et al., 2013); thus, the longer-term effects of these interventions are unknown. Second, experimental manipulations of well-being are likely to influence other factors such as health behaviors, independent of their effects on well-being. Thus, even if a well-being intervention led to changes in cognitive health, it may or may not be the active ingredient that caused those observed changes. Mendelian randomization, which uses genetic information to rule out common causes, has been posited as a promising approach to examine causal effects of well-being on health outcomes. One such Mendelian randomization study found evidence for an independent effect of hedonic well-being on Alzheimer's disease risk (Ma et al., 2021).

In sum, although existing evidence is generally consistent with a causal effect of well-being on cognitive health outcomes, this research has often relied on strong assumptions and several open questions remain. Rohrer and Lucas (2020) offer several recommendations for conducting research on casual effects of well-being on health outcomes, such as advancing conceptual work on causal identification strategies and being clear about the assumptions underlying causal claims.

Related to these open questions about causality, we do not yet know the mechanism(s) that underlie associations between well-being and cognitive health. Theoretical models and empirical evidence in other health domains suggest that well-being may influence cognitive health through biological processes including sleep, neuroendocrine, immune, and cardiovascular functioning (e.g., Ryff et al., 2004), as well as through health protective behaviors (e.g., Cross et al., 2018; Pfund et al., 2022). We propose that the modifiable dementia risk factors identified by the Lancet Commission on Dementia Prevention, Intervention, and Care (Livingston et al., 2020) are a promising set of potential mechanisms of the association between well-being and cognitive health. For example, well-being may protect against cognitive decline and dementia by promoting

more social and physical activity, and by reducing depression, smoking, excessive alcohol consumption, hypertension, diabetes, and hearing loss. Although causal inference is challenging (Rohrer & Lucas, 2020), the potential to identify mechanisms linking well-being to cognitive health outweighs the risks of potential false positives. Thus, we encourage researchers to test potential mechanisms, while being transparent about the assumptions and limitations inherent to their research strategy.

Specificity and Generalizability

Several open questions remain regarding the specificity versus generalizability of associations between well-being and cognitive health. First, to what extent are these associations specific to positive versus negative aspects of psychological functioning? Previous research has found that depression is a risk factor for cognitive decline and dementia (e.g., Wilson et al., 2014). Given moderate to strong negative associations between well-being and negative aspects of functioning such as depression (Wood & Joseph, 2010), it is important to understand whether the effects of well-being are independent from negative aspects of psychological functioning. Approximately half of the reviewed studies statistically adjusted for depression, distress, or negative affect. Most of these studies observed unique effects of well-being, above and beyond negative aspects of psychological functioning. This is consistent with prior research which has found protective effects of positive psychological functioning on health outcomes, independent from negative affect (Ong, 2010; Willroth et al., 2020).

Second, the existing literature has provided little information about the generalizability versus specificity of well-being and cognitive health associations across different types of well-being (i.e., eudaimonic vs hedonic well-being vs quality of life) as well as across specific well-being components (e.g., sense of purpose, positive affect, life satisfaction). Although there is some debate about the exact structure of well-being and the best level at which to make distinctions (e.g., Disabato et al., 2016; Gallagher et al., 2009), the various components of well-being are conceptually distinct and have been shown to have differential associations with health outcomes (e.g., Sutin et al., 2018). Moreover, interventions to improve well-being are likely to be more successful if they are designed to target specific well-being components (Hill et al., 2021). The majority of the reviewed studies examined a single well-being construct, with only a handful of studies directly comparing two or more well-being constructs (Bell et al., 2022; Sutin et al., 2018; Willroth et al., 2022). When multiple types of well-being were directly compared, the effects of eudaimonic (compared to hedonic) aspects of well-being were generally more robust, particularly when including covariates such as depression (Bell et al., 2022; Sutin et al., 2018; Willroth et al., 2022).

Third, more research is needed to determine the replicability and generalizability of associations between well-being and cognitive outcomes across diverse individuals and groups. This is particularly important given evidence that protective factors observed in one sociocultural group do not always generalize to other sociocultural groups (Avila et al., 2021). Most of the reviewed studies were conducted in the United States or Western Europe, with a few conducted in Asia, Australia, and Eastern Europe (Rawtaer et al., 2017; Sutin et al., 2020; Windsor et al., 2015). Sutin and colleagues (2020) examined the association between meaning in life and risk of cognitive impairment in 14 countries and found similar associations in four regions of Europe and Israel. Many of the reviewed studies also used representative sampling strategies which resulted in somewhat diverse samples, and a handful used data from the MARS, a longitudinal study of older African Americans (e.g., Boyle et al., 2022; Wagner et al., 2022). A handful of studies have examined moderation by sociodemographic factors. The majority of these studies did not observe moderation by sociodemographic factors, such as geographic region, age, gender, sex, education, marital status, or income (Hittner et al., 2020; Lee et al., 2016; Sutin et al., 2020). However, Kim et al. (2019) found that the association between sense of purpose and cognitive decline was stronger for Black Americans compared to White Americans and for older adults compared to younger adults.

Coordinated data analysis is a promising approach to investigate the specificity versus generalizability of associations between well-being and cognitive health across well-being types and for different sociocultural groups (e.g., Graham et al., 2022). Similar to a meta-analysis, coordinated data analysis provides a single meta-analytic estimate of the effect of interest. In contrast to traditional meta-analysis, this strategy uses the raw data from multiple independent samples, allowing for an investigation for the reasons for heterogeneity across studies and avoiding publication bias. For the current question, a coordinated data analysis would be able to test whether findings differ based on which aspects of well-being were assessed, the country of data collection, and the sociodemographic composition of the sample.

Timing

Several open questions remain related to timing of associations between well-being and cognitive outcomes. First, when in the life span is well-being most influential? Life-span developmental theory suggests that psychosocial characteristics such as well-being may influence health outcomes such as cognitive decline and dementia risk in both distal and proximal ways (Mroczek et al., 2020). For example, the protective effects of well-being may be cumulative and take time to accrue, in which case well-being in early and midlife may have distal effects on cognitive health through long-term explanatory

Table 1. Summary of Empirical Studies of Well-Being and Cognitive Health

Authors	Sample size	Timescale	Well-being variable(s)	Cognitive variable(s)	Covariates
Allerhand et al. (2014)	10,985	4 time points across 6 years	Quality of life (CASP-19)	Verbal fluency, immediate and delayed verbal memory, and attention	Depression, sex, age at finishing full-time education, household wealth, activities of daily living, physical exercise, physical health, smoking status
Bell et al. (2022)	Varies across 11 studies; 698–22,514	Varies across 11 studies; 1–20 years	Varies across 11 studies; life satisfaction, mastery, meaning in life, optimism, positive affect, Psychological Well-being Scale (Ryff), Purpose in Life Subscale (Ryff)	Varies across 11 studies; incident cognitive impairment, MCI, and/or dementia assessed via mental status exams (e.g., MMSE, TICSm), neuropsychiatric evaluation, clinical diagnosis, and cognitive tests (e.g., memory recall, animal naming, word recall, clock drawing, orientation)	Varies across 11 studies; age, sex, race, ethnicity, education, wealth, depressive symptoms, history of a mental disorder, smoking, alcohol, cholesterol/dyslipidemia, blood pressure/hypertension, diabetes, body weight, history of stroke/heart disease, APOE4 allele status, physical activities, social activities, productive activities, living alone, loneliness, marital status, BMI, antidepressant use, baseline cognitive function, working status, activities of daily living
Berk et al. (2017)	258	3 time points across 12 years	Positive affect	Memory, executive functioning, information processing speed	Age, sex, education, depressive symptoms
Boyle et al. (2010)	951	Annual evaluations across up to 7 years	10-item Purpose in Life Subscale (Ryff)	Clinical diagnoses of Alzheimer's disease and MCI; global cognitive decline assessed annually with 19 cognitive tests capturing episodic memory, semantic memory, working memory, perceptual speed, and visuospatial ability	Age, sex, education, depressive symptoms, neuroticism, social network, baseline medical conditions
Boyle et al. (2012)	246	3 time points (baseline, cognitive assessment proximal to death, autopsy) across 0–8 years	10-item Purpose in Life Subscale (Ryff)	Cognitive resilience assessed using Alzheimer's disease pathological changes observed autopsy (global Alzheimer's disease pathologic changes, amyloid, and tangles) and global cognitive function proximal to death assessed with 19 cognitive tests capturing episodic memory, semantic memory, working memory, perceptual speed, and visuospatial ability	Age at death, sex, education, depressive symptoms, neuroticism, social network, baseline medical conditions, physical activity, APOE4 allele status
Boyle et al. (2022)	2,558	Annual assessments (mean = 7)	10-item Purpose in Life Subscale (Ryff)	Clinical dementia diagnosis	Depressive symptoms, medical comorbidities, income
Dewitte et al. (2020)	3,633	2 time points ~9 years apart	Seven-item Purpose in Life Subscale (Ryff)	Objective memory performance (Brief Test of Adult Cognition by Telephone), and subjective memory beliefs	Age, education, gender, negative affect, positive affect, self-rated health

Table 1. Continued

Authors	Sample size	Timescale	Well-being variable(s)	Cognitive variable(s)	Covariates
Gerstorf et al. (2007)	516	6 time points across 13 years	Philadelphia Geriatric Center Morale Scale, which includes life satisfaction, as well as aging satisfaction and nonagitation	Perceptual speed	Baseline health conditions, openness, social participation
Hittner et al. (2020)	991	2 time points ~9 years apart	Positive affect	Memory (Brief Test of Adult Cognition by Telephone)	Age, gender, education, depression, extraversion, negative affect
Kim et al. (2019)	11,557	2 time points across 4 years	Seven-item Purpose in Life Subscale (Ryff)	Global cognition assessed with total word recall (immediate and delayed word recall scores); mental status (sum of serial 7's, counting backward from 20, object, date, naming of president and vice president)	Age and age^2, marital status, employment status, self-reported health status, medical conditions, smoking status, weight status, number of alcoholic drinks per week, household income, net worth, health insurance, number of living siblings, children, and people in the household
Kim et al. (2021)	12,998	3 time points across 8 years	Life satisfaction	Cognitive impairment	Age, sex, race/ethnicity, marital status, annual household income, total wealth, education, employment, health insurance, geographic region, religious service attendance, personality, childhood abuse
Korthauer et al. (2018)	2,137	Annual assessments (mean = 11)	Positive affect	MCI and probable dementia based on neuropsychiatric evaluation	Age, race, education, marital status, physical activity, smoking status, drinking status, medical history, BMI, depressed mood
Lee et al. (2016)	2,214	2 time points ~9 years apart	Positive affect	Subjective memory concerns	Age, sex, education, financial situation, emotional disorders, physical activity
Lewis and Hill (2021)	4,599	4 time points across 12 years	Seven-item Purpose in Life Subscale (Ryff)	Word recall and memory status (TICS)	Age, sex, education, depressive symptoms
Ma et al. (2021)	834,714	Varies across 59 cohorts	Genetically predicted positive affect and life satisfaction	Risk of Alzheimer's disease	Age, sex, and cohort specific covariates (e.g., batch)
Nyström et al. (2019)	586	2 time points 5 years apart	Global life satisfaction, global happiness, past month life enjoyment	Episodic memory and subjective memory	Age, sex
Peitsch et al. (2016)	1,024	2 time points 5 years apart	Life satisfaction	Clinical dementia diagnosis	Age, gender, education, comorbid medical conditions
Rawtaer et al. (2017)	1,601	3 time points across 8 years	Life satisfaction	MCI and dementia diagnosis	Living alone, loneliness, marital status, age, sex, education, ethnicity, smoking, alcohol, dyslipidemia, hypertension, diabetes, central body fat, history of stroke or heart disease APOE4 allele status, depression, physical activities, social activities, productive activities

Table 1. Continued

Authors	Sample size	Timescale	Well-being variable(s)	Cognitive variable(s)	Covariates
Sutin et al. (2018)	10,099	4–5 time points across 6–8 years	Life satisfaction, optimism, perceived mastery, positive affect, seven-item Purpose in Life Subscale (Ryff)	Incident dementia assessed with TICS	Age, sex, race, ethnicity, education, body weight, diabetes, hypertension, physical activity, smoking status, household income, household wealth, APOE4 allele status
Sutin et al. (2020)	22,514	Up to 4 time points across 9 years	One-item measure of meaning in life from the CASP-19	Cognitive impairment status based on performance on a memory recall task and an animal fluency task	Age, sex, marital status, education, income
Sutin et al. (2021)	53,499 across six studies	Varies across studies; 6–16 years	Varies across studies; seven-item Purpose in Life Subscale (Ryff), one-item measure of meaning/purpose in life from the CASP-19, one-item measure of purpose in life: "My life has meaning and purpose"	Varies across studies; incident cognitive impairment, MCI, and/or dementia assessed via mental status exams (e.g., MMSE, TICSm), clinical diagnosis, and cognitive tests (e.g., memory, orientation, executive function)	Age, gender, race/ethnicity, education, diabetes, hypertension, smoking status, body weight, depression, physical activity
Wagner et al. (2022)	857	Annual measurement occasions (M = 6)	10-item Purpose in Life Subscale (Ryff)	Global cognitive function and domain cognition assessed with 19 cognitive tests capturing episodic memory, semantic memory, working memory, perceptual speed, and visuospatial ability	Age, sex, education, smoking status, physical activity, medical comorbidities, use of antidepressant medication, depressive symptoms
Willroth et al. (2022)	348	3 time points (baseline, cognitive assessment proximal to death, autopsy) across 0–11 years	18-item Psychological Well-being (Ryff), 10-item Purpose in Life Subscale (Ryff), Life satisfaction	Cognitive resilience assessed as the residual when regressing global cognitive function (assessed with 19 cognitive tests) onto neuropathololgy observed at autopsy (beta-amyloid, neurofibrillary tangles, Lewy bodies, vascular pathologies, hippocampal sclerosis, and TDP-43)	Age at death, sex, early life socioeconomic status, education, baseline cognitive activity, neuroticism, depressive symptoms, APOE4 allele status, medical comorbidities
Windsor et al. (2015)	1,475	6 time points across 18 years	Three-item Purpose in Life Subscale (Ryff)	Processing speed (digit symbol substitution subscale of the revised Wechsler Adult Intelligence Test), episodic memory (immediate recall items from an abbreviated version of the Boston Naming Task)	Age, education, sex

Table 1. Continued

Authors	Sample size	Timescale	Well-being variable(s)	Cognitive variable(s)	Covariates
Zainal et al. (2022)	520	5 time points across up to 11 years	Life satisfaction	Spatial cognition, processing speed, verbal working memory	None
Zhu et al. (2022)	8,021	Up to 7 time points across 12 years	Life satisfaction	Korean version of the MMSE	Age, cardiovascular conditions, depressive symptoms, education, functional limitations, gender, physical activity, smoking status, social contact

Notes: APOE = apolipoprotein E; BMI = body mass index; CASP-19 = Quality of Life Scale; MCI = mild cognitive impairment; MMSE = Mini Mental State Examination; TICSm = Modified Telephone Interview of Cognitive Status; TDP-43 = TAR DNA-binding protein 43.

chains. Alternatively, well-being may be most protective in older adulthood because this is when neuropathological burden is greatest. Understanding *when* in the life span well-being is most influential will inform potential mechanisms to investigate, as well as when interventions to increase well-being and reduce dementia risk may be most impactful. The majority of the research in this area has examined well-being in late midlife or older adulthood and assessed cognitive outcomes in older adulthood, but only a handful of studies examined age as a moderator of the strength of the associations. For example, Kim and colleagues (2019) found that the relationship between sense of purpose and cognitive decline was strongest among older adults, suggesting the importance of contextualizing well-being and cognitive health findings across ages.

A related question concerns the timescale at which changes in well-being should be expected to influence changes in cognitive functioning. Are associations between well-being and cognitive health stronger when the variables are assessed closer in time (e.g., across months) or do effects take time to accumulate (e.g., across years)? The reviewed studies had time lags between measurement occasions spanning ~1–9 years, but the effect of measurement lag on the magnitude of associations was not examined. Further, should we expect well-being and cognition to be coupled at the within-person level? One possibility is that having higher well-being on a given occasion is beneficial for concurrent cognition and having lower well-being on a given occasion is detrimental for concurrent cognition. In this case, we would expect well-being and cognition to fluctuate together over time. Alternatively, occasion-specific well-being may affect *future* cognition on the scale of months or years. In this case, we would expect well-being to have cross-lagged associations with cognition. Finally, within-person fluctuations in well-being may matter less for cognitive outcomes than stable individual differences in well-being or long-term sustained changes in well-being. In this case, we may not expect to find within-person associations like those described above.

These questions have important implications for how researchers design studies, which statistical models are used to test hypotheses, and what types of interventions might be effective for improving well-being and reducing dementia risk. Future research should directly test these questions by varying and evaluating the role of time lag, participant age, and statistical modeling approach on the magnitude and consistency of associations between well-being and cognitive health.

Transparency and Openness

Psychological and social sciences have increasingly recognized the importance of transparency and openness for promoting cumulative science and producing replicable findings. The research reviewed here has embraced many

open science practices such as using publicly available data and depositing findings in open access repositories. However, very few of the reviewed studies preregistered their analytic approach or made their analysis code publicly available, limiting the ability for other researchers to reproduce their results. Further, in the current review, the majority of null results were reported within manuscripts that also reported statistically significant findings. Thus, it is unclear whether entire studies of null results would make it into the published literature in this area. Preregistration and registered reports would help to guard against this type of file drawer effect by ensuring that findings are published regardless of whether the results are statistically significant or not.

To advance research in this area, we recommend future research on well-being and cognitive health, including secondary data analysis projects, utilizes analysis preregistration and make data, analysis code, and findings publicly available whenever possible. Multisite and multistudy collaborations may also be useful for increasing replicability, reproducibility, and generalizability of findings. Given the complexity of this research topic, these open science practices are critical to accelerating scientific progress in this area.

Concluding Remarks

A growing body of evidence supports well-being as a protective factor against cognitive decline and dementia. Multiple aspects of well-being have been associated with better cognitive functioning, less cognitive decline, lower risk of cognitive impairment and dementia, and resilience to dementia-related neuropathology. These studies have many strengths including the use of large representative samples, longitudinal designs, diverse measures of well-being, a wide array of cognitive health outcomes, and statistical adjustment for key potential confounds. Together, this research suggests that intervening to improve well-being may be an opportunity to improve quality of life in older adulthood while simultaneously addressing an urgent public health need. To realize this potential application, the field must address complex questions about whether, how, when, and for whom well-being causally influences cognitive health and dementia risk.

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Conflict of Interest

None declared.

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