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Just as expected? Older adults' aging expectations are associated with subjective cognition

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ABSTRACT

Objectives: This study investigated the relationship between older adults' expectations regarding aging and subjective cognition. Specifically, we examined whether the three domains of aging expectations (physical health, mental health, and cognitive function) were associated with two aspects of subjective cognition: current subjective cognition and subjective cognitive decline (SCD).

Method: An online survey was conducted among U.S. adults aged 65-90 ($N=581$; $M_{\text{age}}=71.4$, $SD \pm 4.81$; 51% female). Measures included the 12-item Expectations Regarding Aging scale, the 8-item PROMIS Cognitive Abilities scale (current subjective cognition), and the 12-item Everyday Cognition scale (SCD). We used generalized linear models to examine associations between overall aging expectations and its three domains with current subjective cognition ratings and SCD.

Results: We found that more positive expectations regarding physical health, mental health, and cognitive function in aging were associated with higher ratings of current subjective cognition as well as lower SCD. The magnitude of effects across aging expectations domains were similar for both aspects of subjective cognition.

Conclusion: Aging expectations are malleable and influence an individual's perceptions of their cognitive functioning. Modifying older adults' aging expectations could support healthier cognitive aging through increased awareness and accurate assumptions about the aging process.

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Subjective cognition; subjective cognitive decline; aging expectations; self-perceptions of aging

Introduction

Older adults' expectations about the aging process, including to what extent they expect to maintain high levels of functioning, are consistently associated with aspects of physical, psychosocial, and cognitive health (Tully-Wilson et al., 2021). In particular, a strong body of evidence supports links between more positive aging expectations and health behaviors that promote health and well-being, such as physical activity participation (Andrews et al., 2017; Breda & Watts, 2017; Dogra et al., 2015). Similarly, older adults with more negative perceptions of aging tend to experience poorer long-term outcomes, including more rapid physical and cognitive decline (McGarrigle et al., 2022). Aging expectations may also contribute to the risk of Alzheimer's disease (AD) and other dementias, as one study found that persons with more positive beliefs about aging had almost half the chance of developing dementia compared to those with more negative beliefs (Levy et al., 2018). However, little is known about how these expectations may relate to older adults' self-perceptions of their cognitive functioning (i.e. subjective cognition).

Based on analysis of empirical evidence to date, Yao (2020) proposed a theory to explain the processes by which aging expectations affect health and well-being, and relatedly, how experiences throughout aging (including health and well-being) may influence one's aging expectations. In short, it is

theorized that when people are more confident in their ability to cope with aging-related changes and expect to have better outcomes, they engage in behaviors that ultimately reinforce these expectations (Levy & Myers, 2004; Yao, 2020). Alternatively, individuals who attribute declines in physical, mental, or cognitive health to "normal aging" (i.e. hold more negative aging stereotypes) may consequently have more negative aging expectations (Levy, 2009), engage in activities that align with these expectations, and ultimately experience poorer outcomes. It is important to note that the links between expectations regarding aging and aging-related outcomes are complex and develop over a lifetime of experience. Although most research to date has focused on the effect of expectations on health outcomes, evidence also demonstrates that aging expectations can change over time and be influenced by experiences of health and well-being (Kweon & Jeon, 2013; Sargent-Cox et al., 2012a).

Aging expectations are one domain of self-perceptions of aging. Other examples include attitudes toward one's own aging, aging well, and subjective age (i.e. the age a person feels or identifies with) (Bodner et al., 2017). Expectations regarding aging, however, are distinguished from other domains by their focus on the future as well as the specific inclusion of expectations for physical health, mental well-being, and cognitive function (Sarkisian et al., 2005). Furthermore, they are aligned with one's confidence regarding coping with and anticipation of

aging-related changes (Lin et al., 2024). However, studies examining relationships with subjective cognition have primarily focused on other domains of self-perceptions of aging. For example, lower subjective age has been associated with more self-reported cognitive losses as well as greater perceived declines in memory and attention among older adults in the United Kingdom (Opdebeeck et al., 2018; Sabatini et al., 2021). Attitudes toward one's own aging are also consistently related to subjective cognition. Specifically, more negative views about one's aging have been associated with poorer current subjective cognition and higher memory complaints (Sabatini et al., 2021; Sindi et al., 2012). Although research on older adults' self-perceptions of aging supports relationships with subjective cognition, links with aging expectations specifically have not been well-studied.

In addition to different domains of self-perceptions of aging, there are a variety of ways to conceptualize and measure subjective cognition. Subjective cognitive decline (SCD), or the perception of a decline in cognition over time, is most consistently linked with the trajectory of AD as a prodromal stage prior to mild cognitive impairment (MCI) (Jessen et al., 2020). In a recent meta-analysis of 22 longitudinal studies, SCD was associated with about double the risk of developing both MCI and dementia, and the risk of MCI was higher among those who were worried about their SCD, compared to those with SCD but without associated worry (Pike et al., 2022). These findings align with criteria proposed for improving the predictive utility of SCD as an indicator of AD risk (SCD-plus), which include worries associated with SCD as well as other features such as SCD onset within the last five years (Jessen et al., 2014). Although SCD is most often of interest when considering AD risk, other aspects of subjective cognition are commonly assessed as well, such as frequency of cognitive problems. Furthermore, many aspects of subjective cognition are associated with a variety of negative outcomes in aging including depressive symptoms and poorer quality of life (Hill et al., 2016, 2017). Therefore, when examining factors that may be associated with subjective cognition, consideration of SCD as well as self-perceptions of current cognitive functioning is important to best understand potential impacts on clinically meaningful outcomes.

The purpose of this study was to investigate the relationship between older adults' aging expectations and two aspects of self-perceptions of cognitive functioning: current subjective cognition and SCD. In addition, we aimed to determine whether expectations regarding physical health, mental health, and cognitive function in aging were differentially associated with subjective cognition, and whether these effects were stronger for SCD compared to current subjective cognition. Expectations regarding cognitive functioning in aging specifically may be more strongly associated with subjective cognition than physical or mental health expectations, for example, which would identify more precise targets for the development of interventions to promote cognitive health in aging.

Materials and methods

Procedures and sample

We conducted an online survey with individuals aged 65 years or older in the United States ($n=581$) as part of a larger cross-sectional study investigating older adults' perceptions of aging and

cognition. Recruitment was conducted using Qualtrics Online Panels (Qualtrics, Provo, UT; <https://www.qualtrics.com/blog/citing-qualtrics/>), which maintains a database of individuals who have opted-in to receive invitations to participate in studies for which they meet eligibility criteria. All participants were English-speaking, had no self-reported diagnosis of dementia or other cognitive impairment, and were living independently (i.e. not residing in an assisted living or skilled care nursing facility). Our sampling strategy aimed to ensure diversity in multiple sociodemographic characteristics to address limitations in previous research, including a maximum of 80% non-Hispanic White participants.

Informed consent was obtained from all participants and compensation was provided directly through the Qualtrics platform. The Institutional Review Board at the Pennsylvania State University approved this study. The full survey took approximately 30 min to complete; this study uses a portion of the data collected. Multiple measures were taken to ensure the quality of responses, including an internal review of all completed surveys and the inclusion of five attention check questions throughout the survey. Attention check questions were embedded within survey questionnaires. For example, within a question matrix with a response scale from "Never" to "Always," the following item was included: "If you are paying attention, choose 'Always.'" Similarly, within another subset of questions, participants were asked, "If you are paying attention, select the answer with the lowest number range," followed by the following answer options: "1-10," "11-20," "21-30," and "40+."

Measures

Demographics

Participants provided their age, gender, race/ethnicity, annual income, level of education, and marital status.

Aging expectations

Aging expectations were measured with the 12-item Expectations Regarding Aging scale (ERA-12) (Sarkisian et al., 2005). The ERA-12 consists of three 4-item subscales: expectations regarding physical health, expectations regarding mental health, and expectations regarding cognitive function. Items are scored on a 4-point scale ranging from "definitely true" to "definitely false" and include statements such as "Every year that people age, their energy levels go down a little more." Scores include a total for each subscale as well as an overall expectations regarding aging score that summarizes all 12 items. Higher scores indicate more positive aging expectations. Internal consistency in the current study was $\alpha=0.87$.

Current subjective cognition

Participants' current subjective cognition was measured with the 8-item PROMIS Cognitive Abilities scale (Lai et al., 2014). It includes questions regarding how participants perceive their current cognitive abilities such as "In the past 7 days, my mind has been as sharp as usual." Items are scored on a 5-point scale ranging from "not at all" to "very much"; higher scores indicate better self-perceived current cognitive performance. Total raw scores were converted to standardized T-scores ($\mu=50$; $SD=10$) based on the U.S. population average using the Health Measures Scoring Service software (Hanmer et al., 2020). Higher T-scores represent higher self-rated cognitive abilities. Internal consistency in the current study was $\alpha=0.96$.

Subjective cognitive decline (SCD)

SCD was measured with the Everyday Cognition Scale (ECog-12). Originally a 39-item questionnaire covering six domains of subjective cognition (i.e. everyday memory, everyday language, everyday visuospatial abilities, everyday planning, organization, and divided attention) (Farias et al., 2008), the shorter ECog-12 was developed and validated using two questions for each domain (Farias et al., 2011). Participants are asked, "Please rate your ability to perform certain everyday tasks now, as compared to your ability to do these same tasks 10 years ago," in response to statements such as "remembering where I have placed objects." Scoring is on a 4-point scale ranging from "better or no change" to "consistently much worse"; higher scores indicate greater SCD (i.e. self-perceived cognitive decline). Internal consistency in the current study was $\alpha = 0.89$.

Covariates

The inclusion of relevant covariates was informed by previous work on subjective cognition and aging expectations demonstrating that older adults' perceptions of cognitive performance and normative aging-related changes may differ based on demographic characteristics (Hill et al., 2018; Lin et al., 2024; Rabin et al., 2015; Roh et al., 2021). The following covariates were included in all models: age, gender, marital status (married/domestic partner, widowed, separated/divorced, single/never married), race/ethnicity (non-Hispanic White, Black, Hispanic/Latino, Other (i.e. the following groups were combined into a single group: American Indian/Alaska Native, Native Hawaiian/Pacific Islander, Asian, or more than one race)), annual income (less than or equal to \$20,000, \$20,001 - \$80,000, more than \$80,000), and level of education (high school diploma/GED or fewer years of education, vocational or technical school or Associate's degree, some college but no degree, Bachelor's degree, graduate degree).

In addition, due to the potential confounding effects of objective cognitive functioning on reporting of cognitive problems (Hill et al., 2019), a measure of episodic memory performance was also included as a covariate. Episodic memory was assessed using a version of the Rey Auditory Verbal Learning Test (Bean, 2011). Participants were provided the following instructions: "On the next screen you will be presented with a list of words. The list will be shown for 1 min before you will be able to proceed to the next screen. During the 1 min, do your best to study and remember the list of words. You will then be asked to recall as many words as you can. You do not need to remember the order of the words. It's normal to find this task challenging." Following the one-minute study period, a list of 34 items (17 targets and 17 distractors) was immediately presented, and participants were asked to indicate which items were on the original list to determine immediate recognition. For delayed recognition, the list of 34 items was presented again approximately 10 min later following a filled delay (i.e. other survey questions were asked during this time), and participants had to indicate which items were on the original list a second time. To allow sufficient time to assess delayed recognition, as well as to avoid asking participants to respond to questions regarding aging or cognition in close proximity to the memory task, all questionnaires within the filled delay as well as immediately following the delayed recognition task were related to other topics (e.g. satisfaction with life, health literacy). A summary score for performance was calculated in the form of d-prime. D-prime is computed by taking the standardized hit

rate (correct identification) and subtracting the standardized false alarm rate (incorrect identification). Taken from signal detection theory (Macmillan & Creelman, 2004), d-prime reduces bias due to endorsing all items on a recognition task as targets. Higher d-prime scores indicate better target identification relative to false alarms; that is, better episodic memory performance.

Data analysis

All analyses were conducted in SAS 9.4 in a series of steps. We first computed descriptive statistics including bivariate correlations across all variables. As part of this analysis, we determined that both current subjective cognition and SCD demonstrated issues with restriction of range and skewed distributions with 20-25% of participants reporting the best possible score on these measures. Based on these observations, we applied generalized linear models which are robust to violations of normality in outcome measures. Using generalized linear models with a negative binomial distribution and a log link resulted in adequate model fit for both outcomes (current subjective cognition: $\chi^2(565) = 575.64, p = 0.37$; SCD: $\chi^2(565) = 602.96, p = 0.13$). Results are reported in the form of Cohen's d (small = 0.2, medium = 0.5, and large = 0.8 effect size) in reports of current subjective cognition and SCD for a standard deviation unit change in the predictor (aging expectations). Continuous predictor variables were grand mean centered prior to inclusion in models. For categorical predictors, reference groups were as follows: male (gender), married/domestic partner (marital status), non-Hispanic White (race/ethnicity), under \$20,000 (annual income), and high school diploma or fewer years of education (education level).

Results

Participant characteristics

Descriptive statistics for the sample are presented in Table 1. Our final sample included 581 adults ages 65 to 90 years ($M_{\text{age}} = 71.4, SD = 4.81$) with 51% identifying as female ($n = 284$). Participants tended to be married (53%, $n = 307$) and non-Hispanic White (74%, $n = 432$). The remaining 26% were Black ($n = 75$), Hispanic ($n = 30$), or Other ($n = 44$). Level of education varied across participants, ranging from about one quarter reporting a high school diploma/GED or fewer years of education to 14% with a graduate degree.

Kendall Tau-b correlations for all variables are presented in Table 2.

Expectations regarding aging & current subjective cognition

Results for all models examining associations between aging expectations and current subjective cognition are presented in Table 3. After accounting for covariates, participants with better overall aging expectations (i.e. total score including physical health, mental health, and cognitive function expectations) tended to report better current subjective cognition ($b = 0.011, SE = 0.001, p < 0.001$). A one standard deviation increase in overall expectations regarding aging was related to a small to medium increase in current subjective cognition ratings, Cohen's $d = 0.36$.

When examining the three domains of aging expectations, after accounting for covariates, participants with more positive aging expectations for physical health ($b = 0.019$, $SE = 0.003$, $p < 0.001$), mental health ($b = 0.023$, $SE = 0.003$, $p < 0.001$), and cognitive function ($b = 0.024$, $SE = 0.003$, $p < 0.001$) tended to report better current subjective cognition. A one standard deviation increase in aging expectations regarding physical health was related to a small increase in current subjective cognition rating ($d = 0.23$). A one standard deviation increase in aging expectations regarding mental health was related to a small to medium increase in current subjective cognition ratings ($d = 0.32$). Finally, a one standard deviation increase in aging expectations regarding cognitive health was related to a small to medium increase in current subjective cognition ratings ($d = 0.32$).

Table 1. Descriptive characteristics of the sample.

Variables	Mean (SD) / n (%)
Age (years)	71.36 (4.80)
Gender	
Male	284 (48.9%)
Female	297 (51.1%)
Race/Ethnicity	
Non-Hispanic White	432 (74.4%)
Black	75 (12.9%)
Hispanic/Latino	30 (5.2%)
Other	44 (7.6%)
Annual Income	
< \$20,000	79 (13.6%)
\$20,001–\$80,000	398 (68.5%)
> \$80,001	104 (17.9%)
Level of education	
High school diploma/GED or fewer years	149 (25.7%)
Vocation, technical, or Associate's degree	71 (12.2%)
Some college but no degree	156 (26.8%)
Bachelor's degree	122 (21.0%)
Graduate degree	83 (14.3%)
Marital Status	
Married/Domestic Partner	307 (52.8%)
Widowed	94 (16.2%)
Separated/Divorced	127 (21.9%)
Single/Never married	53 (9.1%)
ERA – Overall	30.72 (6.44)
ERA – Physical Health	9.39 (2.46)
ERA – Mental Health	11.85 (2.79)
ERA – Cognitive Function	9.48 (2.63)
Current Subjective Cognition (PROMIS)	53.61 (9.88)
SCD (ECog-12)	15.71 (4.84)
Episodic Memory (d-prime)	2.71 (1.43)

Notes. ERA = Expectations Regarding Aging; PROMIS = PROMIS Cognitive Abilities Scale; SCD = Subjective Cognitive Decline; ECog-12 = Everyday Cognition Scale – 12.

Table 2. Kendall Tau-b correlations among study variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	1												
2. Gender	.025	1											
3. Marital Status	-.050	.172**	1										
4. Race/Ethnicity	-.028	-.288**	-.032	1									
5. Level of Education	.039	-.136**	-.038	.029	1								
6. Annual Income	.059	-.142**	-.326**	-.029	.319**	1							
7. Episodic Memory	.029	.158**	-.009	-.087**	.076*	.010	1						
8. ERA Overall	.040	.147**	.027	-.028	-.002	-.001	.030	1					
9. ERA Cognitive Function	.029	.115**	.065	-.050	.037	-.036	.038	.660**	1				
10. ERA Physical Health	.016	.157**	.053	-.011	-.021	-.015	.042	.653**	.423**	1			
11. ERA Mental Health	.078**	.108**	-.056	.002	-.014	.056	.004	.664**	.359**	.368**	1		
12. SCD	-.083**	-.047	-.066*	.004	-.012	.026	-.062*	-.304**	-.293**	-.203**	-.245**	1	
13. Current Subjective Cognition	.080**	.096**	.033	-.036	.038	-.007	.074*	.299**	.261**	.196**	.270**	-.528**	1

Notes. ERA = Expectations Regarding Aging; SCD = Subjective Cognitive Decline.

* $p < 0.05$.

** $p < 0.01$.

Expectations regarding aging & subjective cognitive decline (SCD)

Results for all models examining associations between aging expectations and SCD are presented in Table 4. After accounting for covariates, participants with better overall aging expectations tended to report lower SCD ($b = -0.012$, $SE = 0.002$, $p < 0.001$). A one standard deviation increase in overall aging expectations was related to a small to medium decrease in SCD scores ($d = 0.36$).

When examining the three domains of aging expectations, after accounting for covariates, participants with more positive aging expectations for physical health ($b = -0.024$, $SE = 0.005$, $p < 0.001$), mental health ($b = -0.029$, $SE = 0.004$, $p < 0.001$), and cognitive function ($b = -0.034$, $SE = 0.005$, $p < 0.001$) tended to report lower SCD. A one standard deviation increase in aging expectations regarding physical health was related to a small decrease in SCD ($d = 0.22$). A one standard deviation increase in aging expectations regarding mental health was related to a small decrease in SCD ($d = 0.29$). Finally, a one standard deviation increase in aging expectations regarding cognitive function was related to a small to medium decrease in SCD ($d = 0.33$).

Discussion

We found that older adults' expectations regarding physical health, mental health, and cognitive function in aging were associated with both aspects of subjective cognition examined: perceptions of current cognitive performance as well as perceived cognitive decline (i.e. SCD). Specifically, more positive aging expectations were related to higher ratings of current subjective cognition and lower SCD (less perceived decline). Our findings suggest that overall aging expectations, as well as specific aspects of these expectations, relate to older adults' perceptions of their cognitive functioning. Further, such associations are relatively similar for perceptions of current performance (i.e. in the past week) as well as judgments of decline over longer time periods (i.e. 10 years).

We also aimed to identify any potential differences in associations between aging expectations and subjective cognition across domains (i.e. physical, mental, or cognitive expectations) and type of subjective cognition. Although previous research has found that various aspects of subjective cognition (e.g. memory complaints) are associated with other types of self-perceptions of aging (Sabatini et al., 2021; Sindi et al., 2012), we examined whether certain domains or aging expectations relate more strongly: for example, expectations

Table 3. Associations between expectations regarding aging and current subjective cognition.

	Expectations Regarding Aging			
	Overall b (SE)	Physical Health b (SE)	Mental Health b (SE)	Cognitive Function b (SE)
Intercept	3.935 (0.030)	3.924 (0.032)	3.931 (0.031)	3.919 (0.031)
Current Subjective Cognition	0.011 (0.001)***	0.019 (0.003)***	0.023 (0.003)***	0.024 (0.003)***
Age (in years)	0.004 (0.002)*	0.004 (0.002)**	0.003 (0.002)	0.004 (0.002)*
Gender (ref = Male)				
Female	0.015 (0.016)	0.023 (0.017)	0.015 (0.016)	0.027 (0.016)
Marital Status (ref = Married/Partnered)				
Widowed	-0.027 (0.022)	-0.025 (0.023)	-0.008 (0.022)	-0.029 (0.022)
Separated/Divorced	0.013 (0.020)	0.005 (0.021)	0.018 (0.020)	0.011 (0.020)
Single/Never Married	0.019 (0.026)	0.021 (0.027)	0.032 (0.026)	0.011 (0.026)
Race/Ethnicity (ref = non-Hispanic White)				
Black	0.003 (0.022)	0.011 (0.023)	0.010 (0.022)	0.021 (0.022)
Hispanic/Latino	-0.012 (0.033)	-0.011 (0.034)	-0.017 (0.033)	-0.001 (0.033)
Other	-0.021 (0.029)	0.034 (0.030)	-0.034 (0.029)	-0.027 (0.029)
Annual Income (ref = ≤\$20,000)				
\$20,000–\$80,000	0.004 (0.022)	0.011 (0.024)	-0.008 (0.023)	0.021 (0.023)
>\$80,001	-0.021 (0.030)	-0.017 (0.031)	-0.032 (0.030)	-0.001 (0.030)
Level of Education (ref = high school diploma/GED or fewer years)				
Vocation/technical/Associate's degree	-0.009 (0.025)	-0.005 (0.026)	-0.003 (0.025)	-0.002 (0.026)
Some college but no degree	0.023 (0.020)	0.030 (0.021)	0.032 (0.020)	0.017 (0.020)
Bachelor's degree	0.022 (0.022)	0.024 (0.023)	0.032 (0.022)	0.010 (0.022)
Graduate degree	0.024 (0.025)	0.036 (0.027)	0.030 (0.026)	0.024 (0.026)
Episodic memory (d-prime)	0.010 (0.005)	0.009 (0.005)	0.011 (0.005)*	0.009 (0.005)

Notes.

*** $p < 0.001$.** $p < 0.01$.* $p < 0.05$.**Table 4.** Associations between expectations regarding aging and subjective cognitive decline.

	Expectations Regarding Aging			
	Overall b (SE)	Physical Health b (SE)	Mental Health b (SE)	Cognitive Function b (SE)
Intercept	2.789 (0.049)	2.809 (0.051)	2.796 (0.050)	2.809 (0.049)
Subjective Cognitive Decline	-0.015 (0.002)***	-0.025 (0.005)***	-0.029 (0.004)***	-0.034 (0.005)***
Age (in years)	-0.008 (0.003)**	-0.009 (0.003)***	-0.007 (0.003)**	-0.008 (0.003)**
Gender (ref = Male)				
Female	0.022 (0.026)	0.010 (0.027)	0.020 (0.026)	0.008 (0.026)
Marital Status (ref = Married/Partnered)				
Widowed	0.023 (0.036)	0.022 (0.037)	-0.001 (0.036)	0.029 (0.036)
Separated/Divorced	-0.068 (0.033)*	-0.057 (0.033)	-0.072 (0.033)*	-0.064 (0.033)
Single/Never Married	-0.050 (0.042)	-0.050 (0.043)	-0.063 (0.043)	-0.035 (0.043)
Race/Ethnicity (ref = non-Hispanic White)				
Black	0.018 (0.036)	0.008 (0.037)	0.010 (0.036)	-0.003 (0.036)
Hispanic/Latino	0.039 (0.052)	0.037 (0.054)	0.045 (0.053)	0.022 (0.053)
Other	0.061 (0.044)	0.075 (0.045)	0.079 (0.045)	0.065 (0.044)
Annual Income (ref = ≤\$20,000)				
\$20,000–\$80,000	-0.006 (0.037)	-0.018 (0.038)	0.009 (0.038)	-0.028 (0.037)
>\$80,001	0.032 (0.048)	0.026 (0.049)	0.046 (0.049)	0.007 (0.048)
Level of Education (ref = high school diploma/GED or fewer years)				
Vocation/technical/Associate's degree	0.076 (0.040)	0.070 (0.041)	0.069 (0.040)	0.065 (0.040)
Some college but no degree	-0.029 (0.032)	-0.038 (0.033)	-0.041 (0.033)	-0.020 (0.033)
Bachelor's degree	0.018 (0.036)	0.014 (0.037)	0.004 (0.036)	0.034 (0.036)
Graduate degree	0.001 (0.041)	-0.015 (0.042)	-0.007 (0.042)	0.003 (0.042)
Episodic memory (d-prime)	-0.020 (0.008)*	-0.019 (0.009)*	-0.021 (0.008)*	-0.019 (0.008)*

Notes.

*** $p < 0.001$.** $p < 0.01$.* $p < 0.05$.

regarding cognitive function and SCD. We found, however, that the magnitude of the effects identified were quite similar, although physical health expectations were related to slightly smaller differences in both current subjective cognition ($d = 0.23$) and SCD ($d = 0.22$) when compared to mental health and cognitive function expectations (both $d_s = 0.32$ for current subjective cognition, $d = 0.29$ and $d = 0.32$ for SCD, respectively). However, these differences are small, suggesting that other factors play important roles, including in a relatively homogenous (i.e. healthy) sample. Overall, our findings suggest that expectations regarding aging, across domains, are consistently associated with older adults' perceptions of

current cognitive performance as well perceived decline over the past decade, requiring additional examination for improving the precision of measures of subjective cognition.

Based on our findings, it is possible that older adults' aging expectations may complicate the assessment of SCD and should be further considered in research examining the symptomatic trajectory of AD. As SCD may be a prodromal stage of objective cognitive decline including MCI and AD (Pike et al., 2022), extending our understanding of factors that influence this somewhat heterogenous construct is important to more precisely determine the risk for cognitive decline in persons with SCD. Many people with SCD will not go on to develop MCI or

AD. Individual factors such as dementia exposure (i.e. experience with dementia in a close friend of family member) have been identified as potential confounders to examinations of SCD and cognitive decline risk (Turner et al., 2023). Similarly, older adults' expectations regarding the aging process may influence how they perceive cognitive changes they experience, whether these are viewed through a lens of age- or dementia-related stigma or negative aging stereotypes, and ultimately, whether and how they choose to report their experiences with memory or other cognitive problems. This holds important implications for efforts to improve earlier identification of cognitive decline since this often relies on patients disclosing symptoms (Fowler et al., 2015).

Our results extend previous work examining associations between subjective cognition and other domains of self-perceptions of aging, most notably subjective age and attitudes toward one's own aging. The Expectations Regarding Aging (ERA) scale (in this study, the ERA-12) is differentiated from other aging self-perceptions measures by its comprehensive structure that captures future expectations in physical health, mental health, and cognitive function (Sarkisian et al., 2005) as well as its sensitivity in capturing social assumptions related to ageism and understanding of aging (Ayalon et al., 2019; Faudzi et al., 2019; Levy & Leifheit-Limson, 2009). In addition, previous systematic reviews on aging self-perceptions measures found that ERA scales demonstrated stronger psychometric properties than many other measures (Ayalon et al., 2019; Faudzi et al., 2019). For example, older adults' reports of subjective age may be biased by their perceptions of peers who have certain physical conditions (Stephan et al., 2014). Several studies have examined older adults' attitudes toward their own aging, finding that more negative attitudes are associated with poorer subjective cognition cross-sectionally (Sindi et al., 2012) as well as longitudinally (Robertson et al., 2016). Our findings suggest that in addition to older adults' perceptions of their own aging process, their expectations for physical, mental, and cognitive aspects of aging are associated with perceptions of their own cognitive functioning. Given the substantial evidence supporting links between aging expectations and a wide variety of health and well-being outcomes in aging, our study suggests that subjective cognition (both perceptions of current performance as well as perceived decline) may be an important factor to consider in initiatives targeted at improving individuals' expectations about the aging process. Particularly among older adults with no evidence of objective cognitive impairment, poorer subjective cognition could negatively affect these expectations. Indeed, several longitudinal studies examining the temporality of associations between older adults' subjective memory and affective symptoms consistently found that poorer subjective memory predicted future depressive and anxiety symptoms, rather than vice versa (Hill et al., 2021; Hill et al., 2019; Mogle et al., 2020).

Limitations & strengths

There are several limitations that should be considered alongside our study findings. First, our use of an online survey does introduce the potential for inaccurate responses due to fraudulent responses (Andrade, 2020). However, we implemented rigorous quality and attention checks to maximize the validity of responses. Second, although we purposively sampled for a range of demographic characteristics to maximize sample

diversity, representativeness is limited to individuals who have access to the internet, are able to read English, and are registered with the Qualtrics platform. Importantly, our sample did not include a representative sample of cultural perspectives that may hold different expectations for aging trajectories. Third, without the inclusion of a full cognitive assessment, we cannot determine to what extent cognitive status may play a role in the relationships identified; for example, our sample may have included older adults with MCI. However, in addition to excluding older adults with a self-reported diagnosis of cognitive impairment, our inclusion of an assessment of episodic memory performance did enhance our ability to control for these potential effects, even within the limitations of the online survey format. Based on correlational analysis, our survey-based measure of episodic memory aligned with both measures of subjective cognition: higher episodic memory scores were correlated with lower SCD (i.e. less perceived decline) as well higher current subjective cognition (i.e. better current cognitive performance). Finally, although our analytic approach also considered the potential confounding effects of several demographic characteristics, subjective cognition is known to be associated with other individual characteristics, such as personality traits (Koller et al., 2019), which were not assessed in this study.

This study also had several strengths. There is evidence that participants completing online surveys may report more complete information compared to paper and pencil surveys due to lowered levels of social desirability responding, as the social distance between participants and researchers is larger (Booth-Kewley et al., 2007). This may be particularly beneficial when potentially sensitive topics are assessed, such as cognition and stigmatized beliefs in the current sample. Furthermore, this study assessed several aspects of both aging expectations and subjective cognition, providing the opportunity to better understand relationships between these two heterogeneous constructs.

Future research

Expectations regarding aging are dynamic across the lifespan (Diehl et al., 2014; Kornadt et al., 2020; Levy & Leifheit-Limson, 2009) and measurement at a single time point may miss complex interactions with health- or age-related changes (Klusmann et al., 2020; Sargent-Cox et al., 2012b). In addition, our cross-sectional approach does not provide evidence on the temporality or potential causality in the relationships examined. Therefore, future longitudinal research across middle and older ages is important to determine: 1) whether changes in aging expectations as one ages influences subjective cognition, 2) whether older adults' perceptions of cognitive performance and/or cognitive decline influences their aging expectations, and 3) how these relationships may influence health and well-being in aging. Furthermore, sociodemographic characteristics, health status (e.g. comorbidities), or environmental factors (e.g. living alone) may pose challenges in sustaining positive expectations regarding aging, leading to accumulated effects on health behaviors and perspectives (Kotter-Grühn et al., 2015; Miche et al., 2014). Future research can further investigate experiential and cultural factors that relate to different aging expectations and how these expectations relate to current subjective cognition and/or SCD. A better understanding of which factors are more predictive of negative or positive aging expectations can lead to more tailored dissemination of accurate and relevant

information for different aging populations. Finally, qualitative or mixed methods research would support deeper examination of the psychosocial mechanisms that underlie the relationships identified in this study and support considerations of novel interventions to promote cognitive health.

Conclusion

We found that older adults' aging expectations were associated with two aspects of self-perceptions of cognitive functioning: current subjective cognition and SCD. In addition, all three domains of aging expectations (physical health, mental health, and cognitive function) demonstrated associations such that more positive aging expectations in each domain were related to better current subjective cognition as well as lower SCD. Given that older adults with SCD are at a greater risk for future cognitive decline and AD compared to their counterparts without SCD (Jessen et al., 2014), improving our understanding of the factors that relate to perceptions of cognitive functioning may hold important implications for cognitive health.

Ethics approval and consent to participate

This study and all of its data collection protocols were approved by the Penn State Human Research Protection Program, the Institutional Review Board of the Pennsylvania State University (STUDY00018173). The study's methods were carried out in accordance with all relevant guidelines and regulations. Informed consent was obtained from all participants.

Disclosure statement

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Data availability statement

The dataset generated and analyzed during the current study is not publicly available in compliance with the consent for data use provided by study participants.

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