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Perceived stress and cognitive decline: the moderating role of emotion regulation

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Abstract

Background and Objectives: Perceived stress is associated with poor health outcomes, including accelerated cognitive decline and increased risk for dementia. Prior research suggests that emotion regulation may determine the extent to which stress impairs cognition with age. This study extends this work by examining the moderating role of two emotion regulation strategies (cognitive reappraisal; expressive suppression) on the relationship between perceived stress and cognitive decline over 10 years in a sample of older adults.

Research Design and Methods: The sample was drawn from the Midlife in the United States Study (MIDUS; $N = 468$; Mean age at baseline = 60.24), providing measures of perceived stress, emotion regulation, and cognition at baseline and follow-up (episodic memory; executive functioning). Moderation analyses with 5,000 bootstrapped samples were conducted in the PROCESS Macro and statistically adjusted for age, sex, education, household income, medications, and baseline cognition.

Results: Results revealed that perceived stress interacted with expressive suppression to predict later episodic memory performance. As stress levels increased, only individuals endorsing regular use of expressive suppression exhibited significant memory decline. By contrast, cognitive reappraisal did not significantly moderate relationships between stress and later cognition.

Discussion and Implications: Findings highlight that habitual suppression of emotional expression may amplify the consequences of perceived stress on memory decline in late life. Promotion of adaptive emotion regulation may play a role in mitigating the effects of stress on cognitive outcomes among older adults.

Keywords: Episodic memory, Psychosocial stress, Expressive suppression, Longitudinal study

Innovation and Translational Significance: Research suggests that perceived stress may accelerate cognitive decline. Yet, few studies have investigated factors that may influence this relationship. This study examined whether emotion regulation strategies modify associations between perceived stress and cognitive decline in older adults. We found that expressive suppression determined the strength of the relationship between perceived stress and later episodic memory, such that higher levels of stress were associated with memory decline only among individuals who engage in habitual suppression. Encouragingly, this indicates that emotion regulation training could serve as a promising intervention to support cognitive health and well-being in late life.

Background and objectives

Cognitive decline is a natural consequence of aging, yet the trajectory of this process is highly variable across individuals. With the aging population expected to increase dramatically in the coming decades (United States Census Bureau, 2023), there is a growing need to identify risk and protective factors that can be leveraged to preserve cognitive functioning and prolong independent living in late life. Perceived stress, or one's global appraisal of stress (Cohen, 1988), warrants additional research in this regard, as it is associated with a broad range of cognitive outcomes and amenable to intervention.

Prior work has demonstrated that higher levels of perceived stress predict more rapid cognitive decline (Aggarwal et al., 2014; Christensen et al., 2023) and increased risk for pathological aging, including mild cognitive impairment and dementia (Franks et al., 2021). These findings are thought to be explained by the allostatic load framework, which posits that chronic stress leads to poor health through repeated or

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prolonged physiological activations that induce "wear and tear" on the body over time (McEwen, 2017). In the context of cognitive aging, stress is associated with maladaptive neuroendocrine and immune responses (Kiecolt-Glaser et al., 2003; Sapolsky et al., 1986), which may erode the structural and functional integrity of the brain via overexposure to glucocorticoids and inflammation (Lupien et al., 1998; Warren et al., 2018). Over the long term, these alterations to neural tissues and pathways may accelerate impairment in cognitive functioning (McEwen, 2017).

Despite evidence supporting a link between perceived stress and cognitive aging, few studies have examined factors that may influence this association. Recent interest has emerged in the role of emotion regulation in stress–health relationships, defined as the processes and strategies individuals use to modify or manage emotional experiences (Walden & Smith, 1997). Conceptually, emotion regulation may influence the availability of cognitive and emotional resources to guide coping efforts (Lazarus & Folkman, 1984), subsequently determining the course of stress recovery and ensuing impact on health (McEwen, 2017).

Two commonly studied facets of emotion regulation include cognitive reappraisal, which alters the emotional impact of a situation by changing the way one thinks about it, and expressive suppression, described as efforts to inhibit or hide emotionally expressive behavior (Gross & John, 2003). In general, cognitive reappraisal and expressive suppression are considered adaptive and maladaptive strategies, respectively. Momentary use of reappraisal has been shown to reduce negative affect and support regulation of the physiological stress response, while suppression has been found ineffective at downregulating negative effect and linked to heightened physiological reactivity (Cutuli, 2014; Jentsch & Wolf, 2020; Raymond et al., 2019). Accordingly, this suggests that reappraisal use may promote stress recovery by increasing the availability of cognitive and emotional resources for problem-focused coping. By contrast, suppression may deplete these reserves and enable maladaptive coping, in turn exacerbating the experience and consequences of stress (Lazarus & Folkman, 1984).

With regards to cognitive aging, a large body of research has established a link between emotion regulation and cognition (see for review: Ochsner & Gross, 2005). More recently, several studies suggest that emotion regulation and cognitive functioning may interact to shape psychosocial outcomes. For example, Toh and Yang (2022) found that executive functioning moderated the positive association between cognitive reappraisal and life satisfaction in young adults, such that this relationship strengthened with increasing levels of executive functioning performance. Conversely, Rompilla et al. (2023) examined whether two emotion regulation strategies—acceptance and reappraisal—influenced the relationship between executive functions and mental health symptoms in older adults. This study reported that lower levels of executive functioning predicted greater anxiety and depression symptoms, but only among individuals endorsing low levels of acceptance.

To date, only one cross-sectional study has explored whether emotion regulation influences stress-cognition relationships within the context of aging. Novotný et al. (2024) reported a moderating effect of emotion regulation, conditional upon age and sex, on the relationship between perceived stress and global cognitive performance. Specifically, the study reported a negative relationship between stress and cognitive performance in older men, but found that this association emerged at an earlier age among men endorsing emotion regulation difficulties. These novel findings indicate that maladaptive emotion regulation may accelerate the onset of stress-related cognitive impairment (Novotný et al., 2024), highlighting a potential target for interventions that aim to promote healthy cognitive aging.

Notably, interventions that enhance cognitive reappraisal and reduce reliance on expressive suppression are both accessible and effective. Thus, scalable training of these strategies has the potential to address an increasing need to support functional independence and well-being among older adults. Given the potential implications of this work, additional longitudinal research is warranted to examine whether emotion regulation strategies determine the extent to which psychosocial stress predicts cognitive outcomes over time.

This study investigated whether trait-level measures of two emotion regulation strategies (cognitive reappraisal; expressive suppression) moderate the effect of perceived stress on cognitive decline over 10 years in a sample of adults aged 50+ years. We included two cognitive domains as outcomes: episodic memory and executive functions. We hypothesized that individuals endorsing habitual cognitive reappraisal would show a weaker relationship between stress and cognitive decline, as regular engagement in this strategy may facilitate a pattern of adaptive coping and recovery efforts. By contrast, we expected that individuals reporting more frequent suppression would exhibit a stronger relationship between stress and cognitive decline, due to maladaptive coping styles that are presumed to accompany regular use of this strategy and inhibit stress recovery.

Research design and methods

Participants and procedures

This research was conducted using data from the Midlife in the United States (MIDUS) study. MIDUS is a large-scale, longitudinal cohort study aimed at understanding biopsychosocial determinants of health in mid-to-late life (https://midus.wisc.edu/index.php). Participants eligible for the initial MIDUS survey (MIDUS 1; 1995–96; $N = 5,895$) were English-speaking, non-institutionalized adults aged 25–74 years and residing in the continental United States. Recruitment was conducted via random-digit-dialing to generate a nationally representative sample. Data collection was approved by the Institutional Review Board at participating sites (University of Wisconsin–Madison, University of California, Los Angeles, and George Town University), and informed consent was obtained from all participants.

Multiple waves of data have been collected from the MIDUS cohort. Beginning at the second wave (MIDUS 2; 2004–2006; $N = 5,555$), a subsample of survey respondents was invited to participate in the Cognitive Project ($N = 4,512$), which involved a telephone-delivered cognitive assessment. An additional subsample of MIDUS 2 respondents was recruited for the Biomarkers Project ($N = 1,254$), which included assessments of perceived stress and emotion regulation. At the third wave of data collection (MIDUS 3; 2013–2014; $N = 3,294$), respondents were invited to complete a cognitive reassessment ($N = 3,291$). Data used in preparation of this article were pulled from the MIDUS 2 Survey, Cognitive, and Biomarkers Projects, and the MIDUS 3 Cognitive Project. For this study, we refer to baseline cognition as performance at MIDUS 2 and follow-up cognition

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as performance at MIDUS 3, with a lag of approximately 10 years between visits.

Of the 5,555 participants enrolled in the MIDUS 2 Survey, 859 participants provided complete data on baseline cognition, self-report questionnaires, and follow-up cognition.

Participants aged less than 50 at baseline ($N = 327$), missing demographic data (baseline age, sex, education, household income, number of medications; $N = 10$), or meeting other exclusion criteria (self-reported history of stroke, serious head injury, neurodegenerative disease, chemotherapy, radiation treatment; $N = 54$) were removed, resulting in a final sample of 468 participants (see Supplementary Figure 1 [see online supplementary material] for data flow chart).

Of note, our analytic sample consisted of a small subset of MIDUS 2 survey respondents. Although reasons for attrition among longitudinal study participants could not be derived here, updated information regarding mortality rates and causes within the MIDUS cohort is available at: https://www.icpsr.umich.edu/web/NACDA/studies/37237/datadocumentation. For descriptive comparisons between our analytic sample and all MIDUS 2 respondents aged 50+ years, please see Supplementary Table 1 (see online supplementary material).

Measures

Perceived stress

The Perceived Stress Scale, 10-item version (PSS-10; Cohen, 1988) was administered at the MIDUS 2 Biomarkers Project. The PSS-10 is a self-report measure assessing recent (i.e., past month) perceptions of global stress (e.g., "In the past month, how often have you felt that you were unable to control the important things in your life?"). Participants responded to items on a 5-point Likert scale ranging from "*Never*" (1) to "*Very Often*" (5). Total scores were obtained by summing items and ranged from 10 to 50, with higher scores indicating greater levels of stress.

Emotion regulation

At the MIDUS 2 Biomarkers Project, a shortened version of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) was administered. Participants responded to four items assessing how frequently they engaged in cognitive reappraisal ("*I control my emotions by changing the way I think about the situation I'm in*"; "*When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm*") and expressive suppression ("*When I am feeling negative emotions, I make sure not to express them*"; "*I keep my emotions to myself*"). Items were rated on a 7-point Likert scale (*1 = strongly disagree, 7 = strongly agree*), with higher scores reflecting more frequent use of either strategy. In the current study, responses on both sets of items were summed to represent how frequently participants reported engaging in reappraisal and suppression, respectively. Scores for each emotion regulation strategy ranged from 2 to14.

Cognition

At the MIDUS 2 and 3 Cognitive Projects, participants completed the Brief Test of Adult Cognition by Telephone (BTACT; Tun & Lachman, 2006). The BTACT is a telephone-administered cognitive battery that includes seven subtests assessing immediate and delayed recall, working memory span, verbal fluency, inductive reasoning, processing speed, and attention-switching. Composite measures representing executive functions and episodic memory were provided through MIDUS. The Word List Immediate and Word List Delayed tasks were used to obtain the episodic memory composite score, and the Digits Backward, Category Fluency, Number Series, and Backward Counting tasks were included in the executive functions composite score.

Covariates

Participants self-reported their status on sociodemographic variables as part of the MIDUS 2 Survey. Analyses statistically adjusted for baseline age, sex (0 = male; 1 = female), years of education, household income, and number of medications. Educational attainment was indexed on a 12-point scale, ranging from "some grade school" to "professional degree." Household income was represented as the summed value of estimated earnings from wages, pensions, social security, and other sources. Number of medications was included as a continuous variable to account for comorbid conditions. These demographic and health factors have shown independent associations with both perceived stress and cognition and thus were covaried for to adjust for confounding influences. Additionally, baseline cognitive performance was covaried for to allow for quantification of cognitive decline over time.

Statistical analyses

Statistical analyses were conducted using R statistical software (version 4.2.3). All analyses adjusted for baseline cognition, age, sex, education, household income, and number of medications. First, multiple linear regression analyses were conducted to examine the main effects of baseline perceived stress and emotion regulation on follow-up cognitive performance. To assess whether emotion regulation moderates the effect of stress on cognition over 10 years, simple moderation analyses were performed using Model 1 of the PROCESS Macro (Hayes, 2013). Multiple iterations were conducted, with baseline perceived stress as the independent variable, baseline emotion regulation as the moderator (cognitive reappraisal or expressive suppression), and follow-up cognitive performance as the dependent variable (episodic memory or executive functions). The PROCESS Macro was used to divide individuals among low (16th percentile), moderate (50th percentile), and high (84th percentile) groups for cognitive reappraisal and expressive suppression. Shapiro–Wilk tests of normality were significant for measures of stress, emotion regulation, and cognition ($p < .05$). Therefore, bootstrapping with 5,000 samples was used to account for non-normality in the dataset. Bootstrapped confidence intervals that did not include zero were considered statistically significant.

Results

Demographics and sample characteristics

Table 1 provides sociodemographic characteristics and descriptive statistics for the final sample ($N = 468$) of older adults ($M = 60.24$; $SD = 7.28$; *range* = 50–81). The majority of the sample was female (56.62%) and predominantly White (85.47%). Approximately 51.49% of participants had attained an advanced degree, including associate's (8.33%), bachelor's (19.44%), and graduate or professional degrees (23.72%). On average, there was a lag of 9.52 years between baseline and follow-up visits. See Supplementary Table 1 (see online

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Table 1. Demographics and sample characteristics ($N = 468$).

Characteristics	*M* (*SD*)	*N* (%)
Age at baseline (years)	60.24 (7.28)	
Age at follow-up (years)	69.65 (7.27)	
Sex		
Male		203 (43.38)
Female		265 (56.62)
Race		
Asian		2 (0.43)
Black		50 (10.68)
Native American or Alaskan Islander		4 (0.85)
White		400 (85.47)
Other		12 (2.57)
Education		
Less than a high school diploma		16 (3.42)
High school diploma or GED		108 (23.08)
Some college (no degree)		103 (22.01)
Associate's degree		39 (8.33)
Bachelor's degree		91 (19.44)
Some graduate school		22 (4.70)
Masters or professional degree		89 (19.02)
Household income	$73,031.63 ($57,509.64)	
Number of medications	6.35 (4.87)	
Perceived stress total score	20.93 (6.18)	
Emotion regulation scores		
Cognitive reappraisal	10.04 (2.20)	
Expressive suppression	7.94 (2.61)	
Baseline cognition		
Episodic memory	0.08 (0.88)	
Executive functions	0.12 (0.81)	
Follow-up cognition		
Episodic memory	−0.11 (0.94)	
Executive functions	−0.25 (0.81)	
Time between cognitive visits (years)	9.52 (0.78)	

Note. Descriptive statistics for cognitive variables are based on standardized scores derived from the full MIDUS sample.

supplementary material) for the intercorrelation matrix between observed variables.

Main effects of perceived stress and emotion regulation on follow-up cognition

We first examined the independent, main effects of perceived stress and emotion regulation on follow-up cognitive performance. There was a significant, negative effect of stress on later episodic memory [β = −0.013; $p = .029$] and executive functions [β = −0.011; $p = .001$]. These results suggest that higher levels of stress were associated with episodic memory and executive functioning decline over 10 years. There were no main effects of either emotion regulation strategy on measures of follow-up cognition (all ps > .086).

Simple moderation analyses: interactive effects of perceived stress and emotion regulation

Episodic memory

The interaction between perceived stress and cognitive reappraisal did not demonstrate a statistically significant effect on later episodic memory [β = −0.002; 95% CI (−0.008, 0.003)]. By contrast, the interaction of stress with expressive suppression was significant [β = −0.004; 95% CI (−0.009, −0.000); see Figure 1]. Results demonstrated that higher levels of stress were significantly associated with memory decline among individuals endorsing moderate [β = −0.013; 95% CI (−0.024, −0.001)] and high [β = −0.025; 95% CI (−0.042, −0.008)] expressive suppression. Among individuals reporting low suppression, this relationship was not significant [β = 0.000; 95% CI (−0.0167, 0.0168)]. See Table 2 for all moderation model estimates.

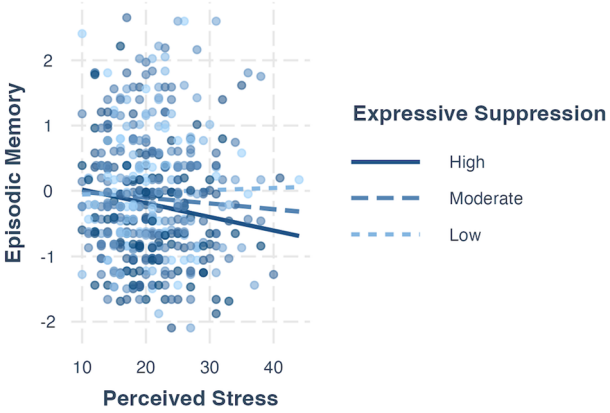

Figure 1. The moderating effect of expressive suppression on the relationship between perceived stress and episodic memory decline over 10 years. Expressive suppression moderates the association between perceived stress and episodic memory performance over 10 years [β = −0.004; 95% CI (−0.009, −0.000)]. Analyses statistically adjusted for age, sex, education, household income, self-reported number of medications, and baseline memory performance. At increasing levels of expressive suppression, the relationship between stress and memory decline strengthened.

Executive functioning

The interaction between perceived stress and cognitive reappraisal was not significantly associated with executive functioning at follow-up [β = 0.000; 95% CI (−0.003, 0.005)]. Similarly, the interaction between stress and expressive suppression was not significant [β = −0.000; 95% CI (−0.003, 0.003)]. Overall, interactions between perceived stress and emotion regulation did not predict executive functions over time (see Table 2).

Exploratory analyses: sex- and age-related differences

In line with past work (Novotný et al., 2024), and to examine whether sex- or age-related differences condition the moderating effect of emotion regulation on stress-cognition relationships in our sample, we conducted exploratory three-way moderation analyses. We followed the same analytic approach as described for our main analyses but included sex (0 = male; 1 = female) or age (divided into 16th, 50th, and 84th percentiles) as additional interaction terms. Results from these three-way interactions were nonsignificant for both sex and age in all iterations of our analyses.

Discussion and implications

This study examined the moderating role of two emotion regulation strategies on the relationship between perceived stress and cognitive decline in a sample of older adults aged 50+ years. Results demonstrated that stress interacted with expressive

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Table 2. Moderation models examining the interactive effects of perceived stress and emotion regulation strategies on cognitive performance over 10 years.

	Cognitive reappraisal			Expressive suppression		
Variable	β	*SE*	95% CI	β	*SE*	95% CI
Episodic memory						
Perceived stress	0.011	0.026	−0.039, 0.064	0.021	0.020	−0.019, 0.061
Emotion regulation	0.066	0.057	−0.049, 0.181	0.065	0.051	−0.035, 0.164
Interaction	−0.002	0.003	−0.008, 0.003	**−0.004**	**0.002**	**−0.009, −0.000**
Executive functions						
Perceived stress	−0.015	0.023	−0.063, 0.023	−0.009	0.013	−0.036, 0.015
Emotion regulation	−0.009	0.044	−0.102, 0.067	−0.006	0.031	−0.057, 0.065
Interaction	0.000	0.002	−0.003, 0.005	−0.000	0.002	−0.003, 0.003

Note. Bolded values indicate statistical significance at $p < .05$. All analyses adjusted for baseline cognitive performance (either episodic memory or executive functions), age, sex, educational attainment, household income, and number of current medications. β = standardized regression coefficient.

suppression to predict episodic memory decline over 10 years. Specifically, higher levels of stress were negatively associated with later memory performance among individuals endorsing moderate to high, but not low, suppression use. This finding was significant even when adjusting for baseline memory. Our findings support and extend prior work (Novotný et al., 2024) by demonstrating that maladaptive emotion regulation strategies may play a role in determining the extent to which psychosocial stress accelerates cognitive decline with age.

Broadly speaking, individuals who engage in frequent expressive suppression may exhibit reduced ability to cope with and recover from stressors, subsequently strengthening relationships between perceived stress and episodic memory decline. Observational studies confirm this notion, as habitual use of expressive suppression has been linked to physiological profiles that are indicative of chronic stress, including heightened levels of inflammation and neuroendocrine alterations (Lopez et al., 2020; Otto et al., 2018). These maladaptive physiological states are thought to be particularly damaging to the hippocampus, the brain area traditionally associated with memory (Tulving & Markowitsch, 1998). Relative to other regions, the hippocampus is highly dense with glucocorticoid receptors (Mirescu & Gould, 2006) and neural immune cells (Barrientos et al., 2015), making it especially vulnerable to outputs associated with the stress response. Together, this suggests that habitual suppression may relate to greater stress-related physiological burden, leading to hippocampal alterations in structure and function that underlie memory impairment (Lupien et al., 1998).

Social functioning may represent an additional relevant pathway through which expressive suppression amplifies the long-term effect of stress on episodic memory. Meta-analytic work suggests that regular use of suppression is linked to social and interpersonal impairment, including reduced social support, social satisfaction, and poor marital relationship quality (Chervonsky & Hunt 2017). Of note, both cross-sectional and longitudinal studies have demonstrated the benefits of social well-being on a broad range of cognitive domains, including episodic memory (Kelly et al., 2017). As social support is theorized to buffer against the negative effects of stress on health (Cohen et al., 2000), it is possible that individuals who regularly engage in suppression may experience more intense or prolonged responses to stress due to reduced access to social resources (Chervonsky & Hunt, 2017). These consequences may be particularly harmful in late life, as older adults face unique barriers in meeting their social needs due to reduced opportunity for interactions and shrinking support networks (Cornwell & Waite, 2009).

Contrary to our hypothesis, cognitive reappraisal was not found to weaken relationships between stress and cognitive functioning over time. This may be explained, in part, by age-related preferences in emotion regulation strategies. Relative to younger individuals, older adults endorse less frequent use of reappraisal (Oriyama et al., 2024) and are less effective at downregulating negative affect with this strategy, potentially due to its high demand on cognitive resources (Opitz et al., 2012). Thus, cognitive reappraisal may not have emerged as a significant determinant of stress-cognition relationships in this sample because of its reduced use and effectiveness with age. However, this strategy may still represent an important target for future research, as some work suggests that reappraisal buffers against adverse outcomes associated with habitual use of suppression, including mental health symptoms (Eftekhari et al., 2009) and neuroendocrine reactivity (Raymond et al., 2019). An important question for future research may be how these two strategies interact within the context of late-life stress, as this may inform intervention approaches that more effectively meet the distinct needs of this population.

Although this study offers methodological strengths in its longitudinal design and large sample size, several limitations warrant consideration. First, we were unable to examine the possibility of multidirectional relationships between stress, emotion regulation, and cognition here. Although reappraisal and suppression did not independently predict cognitive outcomes in this sample, such associations are documented in the broader literature. Previous research has demonstrated that reappraisal manipulations enhance memory encoding and retention, whereas suppression impairs memory recall (Cutuli, 2014). Executive functions also appear to be closely linked to cognitive reappraisal, as a recent meta-analysis reported that higher executive functioning ability relates to more frequent and successful use of this strategy (Toh et al., 2024). Together, this work suggests an alternate possible interpretation of these findings. Namely, that habitual engagement in cognitively demanding regulation strategies (i.e., cognitive reappraisal) may protect against stress-related cognitive decline. Due to the frequency and temporal spacing of assessments in MIDUS (i.e., two waves of data collection over 10 years), our study design did not support analyses of dynamic change amongst these variables, such as latent change score modeling. To this end, within-person designs—with repeated assessments over shorter time scales—would be better positioned to examine how and when stress, emotion regulation, and cognitive functioning interact to shape trajectories of cognitive aging.

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The measure of emotion regulation used here was also quite limited in scope and length. The ERQ only partially captures the emotion-generating process theorized by Gross (2015), notably missing other key aspects of emotion regulation, such as situation selection, situation modification, and attentional deployment. Research exploring how earlier stages of the process model relate to perceived stress and cognitive outcomes remains limited. However, comprehensive assessments of the process model should be a priority for future studies on this topic and research on emotion regulation more broadly. Relatedly, the ERQ captures general, self-reported tendencies in emotion regulation strategies, which may be influenced by one's own awareness of their emotional responses and their ability to accurately recall these experiences in retrospect. Future work may consider incorporating ecological momentary assessment to examine how these relationships operate in real-time and account for contextual influences on these processes.

Finally, our sample consisted of predominantly White, highly educated individuals living in the U.S. Preferences for emotion regulation strategies have been differentially observed across racial/ethnic groups (Weiss et al., 2022), and the benefits of emotion regulation strategy use appear to vary by socioeconomic status (Troy et al., 2017). Therefore, these findings may have limited generalizability to other backgrounds and countries.

Conclusions

The current study suggests that emotion regulation strategies determine the extent to which perceived stress is related to cognitive decline in older adults. Specifically, results demonstrate that higher levels of stress are associated with episodic memory decline only among individuals who report habitual suppression of emotional expression. These findings highlight that expressive suppression may be a viable target for prevention and intervention efforts that aim to reduce stress and promote healthy cognitive aging.

Supplementary material

Supplementary data are available at *Innovation in Aging* online.

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Conflict of interest

None declared.

Data availability

Data were obtained from a nationally representative sample of participants enrolled in the Midlife in the United States (MIDUS) study. The data underlying for MIDUS in this article are available in the University of Michigan's Inter-University Consortium of Political and Social Research at https://www.icpsr.umich.edu/icpsrweb/ICPSR/series/203. Data analytic procedures and materials are described in the Method section. Statistical code can be given by request to the corresponding author (J.P.H.).

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Data used in preparation of this article were provided by the Midlife in the United States (MIDUS) study (https://www.midus.wisc.edu/index.php). As such, investigators within the MIDUS study contributed to the design and implementation of MIDUS and/or provided data but did not participate in the analysis or writing of this report. This research did not preregister study design, hypotheses, or analytic plan.

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