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Memory Self-Efficacy and Beliefs about Memory and Aging in Oldest-Old Adults in the Louisiana Healthy Aging Study (LHAS)

Katie E. Cherry[a], Bethany A. Lyon[a], Emily O. Boudreaux[a], Alyse B. Blanchard[a], Jason L. Hicks[a], Emily M. Elliott[a], Leann Myers[b], Sangkyu Kim[c], and S. Michal Jazwinski[c]

[a]Department of Psychology, Louisiana State University, Baton Rouge, LA, USA; [b]Department of Global Biostatistics and Data Science, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA, USA; [c]Department of Medicine and Tulane Center for Aging, Tulane University School of Medicine, New Orleans, LA, USA

ABSTRACT
Background/Study Context. Adaptation to normative age-related declines in memory is an important but understudied aspect of successful aging. The purpose of the present study was to shed new light on memory self-efficacy and beliefs about memory and aging as two integral aspects of adult cognition with relevance to successful aging.
Methods. Young (19 to 27 years) and community-dwelling older adults (60 to 94 years) from the Louisiana Healthy Aging Study (LHAS) completed an adapted Memory Functioning Questionnaire (MFQ) which includes a memory self-efficacy subscale, the Memory Controllability Inventory (MCI), and the Aging Concerns Scale (ACS).
Results. Nonagenarians' self-reported memory and beliefs about memory and aging were of central interest. We compared their responses to three younger reference groups to examine hypothesized differences in self-reported memory and beliefs about memory and aging in very late life. Results yielded age effects for most of the MFQ and MCI subscales demonstrating more positive subjective views about memory functioning and control over memory for the young adults. Correlation and regression analyses were conducted to isolate factors that may be associated with memory self-efficacy. Age, symptoms of depression, and memory control beliefs accounted for approximately half of the variance in memory self-efficacy ratings.
Conclusion. These data indicate that although memory self-efficacy may be age sensitive, we detected no differences in subjective views across the three older groups. Implications for cognitive adaptability and successful aging are considered.

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Many older adults rely on subjective views of health and well-being to gauge how successfully they believe they are aging (Cherry, Marks, Benedetto, Sullivan, & Barker, 2013; Strawbridge, Willhagen, & Cohen, 2002). Other evidence has shown that self-perceived forgetfulness was associated with lower quality of life and that this relationship persisted over time for middle-aged and young-old adults (Mol, van Bostel, Willems, Verhey, & Jolles, 2009). Understanding older adults' beliefs about memory functioning

CONTACT Katie E. Cherry pskatie@lsu.edu Department of Psychology, Louisiana State University, Baton Rouge, LA 70803-5501

and their concerns about independence and cognitive health has implications for their cognitive adaptability – or how they manage cognitive challenges and adapt to normative age-related declines in everyday life. The link between subjective memory assessments and people's self-assessments of how successfully they are adapting to changes brought on with age is not yet well established. The purpose of the present research was to use self-reports of memory functioning as a tool to understand cognitive adaptability – a core aspect of successful aging across the adult lifespan.

Two theories of cognitive adaptability help to explain this construct across the adult lifespan. These two theories of cognitive adaptation in later life are relevant to the study of successful aging and speak to the importance of memory control beliefs for everyday living in late adulthood (Lachman, Neupert, & Agrigoroaei, 2011; Scheibner & Leathem, 2012; also see Fredriksen-Goldsen, Kim, Shiu, Goldsen, & Emlet, 2015, for successful aging despite adversity). The Selective Optimization with Compensation (SOC) model for lifespan development (Baltes & Baltes, 1990; Baltes, Staudinger, & Lindenberger, 1999) holds that as people age, their goals change from growth to maintenance. In order to maintain previously acquired skills when faced with obstacles, people become more selective in what is important and find ways to minimize functional losses. In other words, people adapt to changes presented with increased age. Similarly, Heckhausen and Schultz's (1995) Lifespan Theory of Control assumes that people are motivated to gain control over their environment. They can do this via directly altering their environment or by changing themselves to be better fitted to the environment. This theory of control is therefore relevant to how much control people believe they have over their own cognitive abilities. These two theories highlight the importance of control processes in maximizing successful aging.

In the present research, we address two issues with respect to the study of cognitive adaptability in later life. Our first objective was to examine self-reported memory in the oldest-old adults, defined as persons aged 90 years and older and how their scores relate to younger adult comparison groups. The Memory Functioning Questionnaire (MFQ; Gilewski, Zelinski, & Schaie, 1990) has been widely used to assess self-reported memory capabilities in everyday life. An adapted version of the original MFQ was chosen for inclusion here because it yields memory self-evaluations in four subscales: Frequency of Forgetting, Seriousness of Forgetting, Retrospective Memory Functioning, and Mnemonics Usage. Of central interest is the MFQ Frequency of Forgetting subscale, which has been interpreted as a measure of memory self-efficacy (Cherry, Brigman, Reese-Melancon, Burton-Chase, & Holland, 2013; Zelinski & Gilewski, 2004). We expected that the nonagenarians would have the lowest self-rated memory compared to three younger reference groups – young, young-old, and old-old adults. Finding a significant age difference favoring the young and young-old adults would replicate prior research (Cherry et al., 2013), and extend the literature to document age sensitivity in self-reported memory in very old adults, including nonagenarians for whom little data currently exist.

The second objective of the present research was to examine adult age differences in beliefs about memory and aging. The Memory Controllability Inventory (MCI; Lachman, Bandura, Weaver, & Elliott, 1995) has been previously used to gauge how much control individuals believe they have over their own memory abilities. The MCI has four subscales – Present Ability (PA), Potential Improvement (PI), Effort Utility (EU), and Inevitable Decrement (ID). Previously, Lachman et al. (1995) examined relationships among the subscales of the MCI and the Aging Concerns Scale (ACS) which has two subscales: Independence (manage their memory without relying on others) and Alzheimer's Likelihood (having Alzheimer's disease is inevitable with age). Lachman et al. (1995) found that those who scored higher on the ACS Independence subscale also tended to score higher on MCI subscales of PA, PI, and EU while seeming to reject the idea of the inevitability of memory decrement in later life. Individuals who showed more concerns about the likelihood of Alzheimer's Disease showed higher scores on the ID subscale (reflecting a weaker view of memory controllability) and lower scores for the PA subscale (indicating a poorer view of current memory functioning). Other evidence has shown that older adults report more cognitive fears for their future than younger adults do, suggesting that fears of reduced memory capabilities increase with age (Dark-Freudeman, West, & Viverito, 2006). Based on theory and prior research (Dark-Freudeman et al., 2006), we expected that the MCI and ACS scores would be lower for the nonagenarians than those in the young, young-old, and old-old age groups.

Method

Participants

One hundred ninety individuals participated in the study. Young adults were 89 undergraduate Louisiana State University students (19 to 27 years of age) who received extra credit for a psychology course in exchange for their voluntary participation. All older adults – young-old (60–74 years), old-old (75–89 years), oldest old (90+ years) – were enrolled in the Louisiana Healthy Aging Study (LHAS), a multidisciplinary study of the determinants of longevity (Kim, Welsh, Cherry, Myers, & Jazwinski, 2013). LHAS participants age 65 years and older were sampled randomly from the Medicare Beneficiary Enrollment Data file of the Center for Medicare and Medicaid Services (CMS) for the eight parishes (counties) constituting the greater Baton Rouge community. Those who scored a 25 or higher on the MMSE during an initial screening completed cognitive testing at the Pennington Biomedical Research Center in Baton Rouge, LA, which is reported elsewhere (Cherry et al., 2008, 2012). LHAS participants in this study were re-contacted by the first author and completed the present subjective memory assessment in the laboratory on the LSU campus or in their home, if desired. All were free of known neurologic impairment due to stroke or dementia at the time of testing and were paid for their participation in this study. IRB approval was granted through Louisiana State University and the Pennington Biomedical Research Center in Baton Rouge, Louisiana. Informed consent was obtained for all participants according to protocols approved by the respective institutional review boards.

Demographic and health characteristics of the groups appear in Table 1. We used a short-form of the Wechsler Adult Intelligence Scale Vocabulary subtest (Jastak & Jastak, 1964) as a proxy for verbal intelligence. We used the Mini-Mental State Exam (MMSE; Folstein, Folstein, & McHugh, 1975) to assess cognitive status. Affective status was

Table 1. Cognitive, demographic, and health characteristics.

	Young (n = 89)	Young-old (n = 21)	Old-old (n = 30)	Oldest-old (n = 50)		
	M (SD)				*F*	*p*
Age	21.60 (1.81)	66.48 (4.50)	82.70 (4.56)	91.00 (1.09)		
Vocabulary[a]	25.46 (5.71)	22.62 (8.57)	25.03 (6.58)	23.76 (7.10)	1.454	0.229
Cognitive status[b]	–	28.81 (1.40)	28.37 (1.47)	27.30 (1.97)	6.999	0.001
GDS[c]	2.49 (2.65)	0.71 (0.96)	1.47 (1.93)	1.58 (1.69)	5.040	0.002
	N (%)				χ^2	*p*
Gender					5.399	0.145
Male	24 (27.3)	9 (42.9)	13 (43.3)	22 (44.0)		
Female	64 (72.7)	12 (57.1)	17 (56.7)	28 (56.0)		
Marital status					151.741	< 0.001
Single	86 (96.6)	1 (4.8)	2 (6.7)	1 (2.0)		
Married	2 (2.3)	16 (76.2)	10 (33.3)	11 (22.0)		
Divorced	1 (1.1)	1 (4.8)	4 (13.3)	1 (2.0)		
Widowed	0 (0.0)	3 (14.2)	14 (46.7)	37 (74.0)		
Education					4.060	0.255
high school or less	3 (3.4)	9 (42.9)	5 (16.7)	15 (30.0)		
Some college/specialized training	57 (64.0)	5 (23.8)	11 (36.7)	14 (28.0)		
College degree	29 (32.6)	6 (28.6)	10 (33.3)	13 (26.0)		
Graduate degree	0 (0.0)	1 (4.8)	4 (13.3)	8 (16.0)		
Self-perceived health					3.817	0.282
Excellent	32 (36.0)	10 (47.6)	8 (26.7)	14 (28.0)		
Good	50 (56.2)	7 (33.3)	15 (50.0)	29 (58.0)		
Fair	7 (7.8)	3 (14.3)	7 (23.3)	6 (12.0)		
Poor	0 (0.0)	1 (4.8)	0 (0.0)	1 (2.0)		
Health troubles stand in the way					18.200	< 0.001
Not at all	59 (66.3)	12 (57.1)	10 (33.3)	22 (44)		
A little/some	29 (32.6)	8 (38.1)	12 (40.0)	21 (42)		
A great deal	1 (1.1)	1 (4.8)	8 (26.7)	7 (14)		
Health compared to others					67.150	< 0.001
Better	20 (22.5)	14 (66.7)	25 (83.3)	43 (87.8)		
Same	57 (64.0)	7 (33.3)	5 (16.7)	4 (8.2)		
Worse	12 (13.5)	0 (0.0)	0 (0.0)	2 (4.1)		

Notes. [a]Vocabulary based on the Wechsler Adult Intelligence Scale Vocabulary subtest (Jastak & Jastak, 1964). [b]Cognitive status entries reflect scores on the Mini-Mental State Exam (Folstein et al., 1975). [c]Geriatric Depression Scale (Sheikh & Yesavage, 1986).

indexed by the Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986). We assessed self-perceived health with questions from the Older American Resources and Services Multidimensional Functional Assessment Questionnaire (Salek, 1999). Although use of these measures in younger adults is uncommon, they were used in our younger adult population for direct comparison purposes and have previously shown reliability for use in younger populations (Ferraro & Chelminski, 1996).

Materials and Procedure

We administered two revised, briefer MFQ subscales (Frequency of Forgetting subscale – FoF-R, and Seriousness of Forgetting subscale – SoF-R) and two standard MFQ subscales (Retrospective Functioning and Mnemonics Usage). All four subscales use a 7-point Likert scale with lower scores indicating more negative memory self-appraisals or greater adoption of mnemonics. We interpreted the FoF-R as an index of memory self-efficacy after Zelinski and Gilewski (2004). The FoF-R score was calculated by averaging a subset of nine questions from the MFQ. Higher scores suggest a more positive perception of one's memory functioning (i.e., less forgetting). The SoF-R score was calculated by averaging the five items that correspond to the same FoF-R items for the question stem, "How often do these present a problem for you" after Cherry et al. (2013). Higher scores suggest a less serious view of forgetting when it occurs. For the Retrospective Memory subscale, higher scores indicate positive views of one's current memory ability as compared to past ability. The Mnemonics Usage subscale covers participants' use of various memory techniques; higher scores indicate less mnemonic use.

Participants also completed the four MCI subscales and the two ACS subscales (Lachman et al., 1995). For both the MCI and ACS, items are rated on a 7-point scale (*1 = strongly disagree, 4 = neutral, 7 = strongly agree*) with higher scores indicating a greater endorsement of the measured construct. Lachman et al. (1995) reported that the MCI and ACS possess adequate psychometric qualities (the four MCI subscales had Cronbach's alphas range: 0.58–0.77; two ACS subscales had Cronbach's alphas range: 0.49–0.73). We calculated Cronbach's alpha values here for comparison purposes and to provide further evidence on the psychometric qualities of the MCI and ACS. The values we obtained were remarkably similar to Lachman et al.'s for the MCI subscales (range: 0.64 to 0.72) and ACS subscales (0.51 to 0.57), although all of these estimates fell below the 0.80 standard convention.

Statistical Analyses

We conducted multivariate analyses of variance (MANOVAs, using Wilks' Lambda criteria) as a function of age group to address the two objectives of the study. Follow-up univariate analyses of variance (ANOVAs) were conducted separately for each subscale to aid in interpretation. Bonferroni adjusted alpha rates were applied to correct for multiple univariate analyses. All pairwise comparisons were made using Tukey's HSD test to correct for inflated familywise alpha values with multiple comparisons. Correlations and regression analyses were conducted to test the hypothesis that memory self-efficacy may be associated with core beliefs about memory controllability. We ran all statistical analyses using IBM SPSS Statistics Version 22.

Results

Self-Reported Memory in Oldest-Old Adults

Table 2 presents the means and statistical findings for the MFQ, MCI and ACS subscales by age group. A MANOVA on the four MFQ subscale ratings yielded a significant age group effect, $F(12, 484.46) = 5.96$, $p < 0.001$, although the strength of this relationship was modest with $\eta_p^2 = 0.114$. Follow-up ANOVAs were conducted using a Bonferroni adjusted alpha to guard against the possible inflation of Type I error rates with multiple univariate assessments. To be conservative in our analyses, we divided alpha by the number of univariate tests conducted across subscales (e.g., alpha = .0125 for each of the MFQ subscales). Univariate analyses revealed significant age effects favoring the younger adults on two MFQ subscales: FoF-R and Retrospective Functioning. For SoF-R and Mnemonics Usage, the age main effects were non-significant. Pairwise comparisons on the FoF-R subscale showed that the younger

Table 2. Self-rated memory.

	Young (n = 89)	Young-old (n = 21)	Old-old (n = 30)	Oldest-old (n = 50)	Follow-Up ANOVA Statistics		
MFQ[a]	*M (SD)*				*F*	*P*	η_p^2
Frequency of forgetting[d,e]	5.21 (0.89)	5.03 (0.70)	4.71 (0.70)	4.79 (0.86)	4.248	0.006	0.064
Seriousness of forgetting[d]	5.27 (1.13)	5.01 (0.93)	4.58 (1.33)	4.79 (1.27)	3.290	0.02	0.050
Retrospective functioning[c,d,e]	4.53 (0.96)	3.61 (0.82)	3.09 (0.71)	3.55 (1.05)	23.605	< 0.001	0.276
Mnemonics usage	3.40 (1.41)	3.24 (0.93)	3.07 (1.05)	3.48 (1.30)	< 1.0	0.528	0.012
MCI[b]							
Present ability[d]	5.52 (1.14)	5.60 (0.75)	4.79 (1.14)	5.13 (1.31)	3.895	0.010	0.059
Potential improvement[e]	5.44 (1.02)	5.40 (1.00)	4.92 (1.20)	4.89 (1.30)	3.376	0.020	0.052
Effort utility	5.32 (0.93)	5.44 (1.10)	5.28 (0.96)	5.18 (1.06)	< 1.0	0.746	
Inevitable decrement	3.24 (1.33)	3.22 (1.23)	3.79 (1.24)	3.79 (1.38)	2.707	0.047	0.042
ACS[b]							
Independence	4.41 (1.03)	4.54 (1.22)	3.98 (1.23)	4.33 (1.18)	1.366	0.255	0.022
Inevitability of AD	2.82 (0.91)	3.11 (0.96)	2.76 (0.83)	3.06 (0.87)	1.376	0.251	0.022

Notes. [a]Memory Functioning Questionnaire (Zelinski & Gilewski, 2004) with revised frequency and seriousness scales (Cherry, Brigman, et al., 2013). [b]Memory Controllability Inventory and Aging Concerns Survey (Lachman et al., 1995). [c] Significant difference between the young adults and young old. [d]Signficant difference between the young adults and the old-old. [e]Significant difference between the young adults and oldest-old.

adults' mean was significantly greater than old-old and oldest-old adults, but did not differ from the young-old. Importantly, nonagenarians' ratings on the FoF-R subscale were not significantly different from the young-old and old-old groups. For the SoF-R, younger adults' mean was numerically greater that of the three older reference groups, but not significantly so. On the Retrospective Functioning subscale, younger adults reported better current memory functioning relative to years passed than did young-old, old-old, and oldest-old adults who did not differ from each other. On the Mnemonics Usage subscale, nonagenarians reported using memory aids as often as did the three younger reference groups, as the means in Table 2 indicate.

A MANOVA on the MCI scores yielded a non-significant age group effect, $F(12, 484.46) = 1.62$, $p = 0.08$, $\eta_p^2 = 0.034$. This finding is at odds with Dark-Freudeman et al. (2006) who reported a significant age group effect in multivariate analyses on MCI responses when they compared younger (18–33 years old) and older adults (53–87 years old). Consequently, we conducted follow-up univariate analyses where we divided alpha by the number of univariate tests conducted across subscales (e.g., alpha = .0125 for each of the MCI subscales). These analyses yielded a small but significant age effect on the PA subscale with younger adults having significantly higher scores indicating a stronger belief in current memory ability than the old-old age group, which replicates Dark-Freudeman et al.'s (2006) univariate follow-up results. There were no significant age group differences for the PI, EU, or ID subscales.

A MANOVA on the ACS scores yielded a non-significant age group effect, $F(6, 370) = 1.63$, $p = 0.14$, $\eta_p^2 = 0.026$. This result also conflicts with Dark-Freudeman et al.'s (2006) multivariate analyses on younger and older adults' ACS responses. Univariate analyses with a corrected familywise alpha level (.025) yielded non-significant age group effects for the Independence subscale, replicating Dark-Freudeman et al.'s (2006) univariate findings. However, the non-significant age group difference for the Inevitability of AD obtained conflicts with Dark-Freudeman et al.'s (2006) univariate results. We suggest caution when interpreting these findings due to the non-significant MANOVA.

The results just reported indicate that nonagenarians' memory self-efficacy and beliefs about memory and aging ratings were remarkably similar to those of young-old and old-old adults. This aspect of the data implies that nonagenarians' ratings reflect cognitive health and adaptation in everyday life rather than ageist presumptions of failing memory skills in later adulthood. We suspect that memory self-efficacy perceptions may be associated with core beliefs about the controllability of memory and symptoms of depression, given the known role of depression in self-reported memory (Zelinski & Gilewski, 2004). Therefore, we conducted correlations and regression analyses with age treated as a continuous variable to provide greater insight into these possibilities.

Relationships Among Individual Difference Variables and Memory-Self-Efficacy

We examined relationships among demographic characteristics, MCI, ACS, and MFQ scores to provide new evidence concerning variables that may be associated with memory self-efficacy in later life. Table 3 presents means collapsed across the group variable for age, vocabulary, GDS, MFQ, MCI, and ACS ratings and correlation coefficients. Inspection of Table 3 indicates that age, GDS and the MCI and ACS subscales were all significantly correlated with memory self-efficacy (FoF-R), the criterion variable of central interest (all p's ≤ 0.01). Consequently, we included these variables in the regression analyses presented next.

A series of regressions were carried out to assess the contribution of age, symptoms of depression (indexed by GDS), aging concerns (ACS subscales) and beliefs about memory and aging (MCI subscales) to memory self-efficacy (FoF-R). In the first step of the model, we entered age and symptoms of depression (GDS scores) to determine the amount of variance in memory self-efficacy ratings accounted for by

Table 3. Correlations among individual difference variables and self-reported memory.

		Correlations with MFQ subscales			
Variables	*M (SD)*	FoF-R	SoF-R	Retrospective	Mnemonics
Demographic characteristics					
Age	54.64 (31.79)	−0.244 **	−0.200 **	−0.491 **	−0.010
Vocabulary[a]	24.60 (6.60)	0.108	0.086	0.143	−0.060
Depression symptoms[b]	2.10 (2.27)	−0.327 **	−0.133	−0.101	0.121
MCI					
Present ability	5.31 (1.18)	0.625 **	0.255 **	0.422 **	0.061
Potential improvement	5.21 (1.15)	0.473 **	0.291 **	0.281 **	−0.239 **
Effort utility	5.29 (0.98)	0.266 **	0.112	0.125	−0.083
Inevitable decrement	3.47 (1.33)	−0.318 **	−0.185 *	−0.223 **	−0.009
ACS					
Independence	4.33 (1.13)	0.265 **	0.062	0.249 **	0.261 **
Inevitability of AD	2.90 (0.90)	−0.249 **	−0.153 *	−0.093	−0.029

* $p < 0.05$ ** $p < 0.01$

Notes. MFQ = Memory Functioning Questionnaire (Gilewski et al., 1990) with revised frequency and seriousness scales (cf. Cherry, Brigman, et al., 2013). MCI and ACS = Memory Controllability Inventory and Aging Concerns Survey (Lachman et al., 1995).
[a]Vocabulary scores are based on a short-form of the Wechsler Adult Intelligence Scale Vocabulary subtest (Jastak & Jastak, 1964). [b]Depression symptoms are based on the Geriatric Depression Scale (Sheikh & Yesavage, 1986).

Table 4. Multiple regressions with memory self-efficacy (FoF-R scores) as a criterion variable.

	Unstandardized coefficients		Standardized coefficients			
	B	SE B	β	p	R^2	ΔR^2
Step 1 (demographics)					.201	
Age	−0.008	0.002	−0.288	< 0.001***		
Depression symptoms	−0.148	0.026	−0.376	< 0.001***		
Step 2 (ACS subscales, demographics)					.257	.057***
Independence	0.144	0.051	0.188	0.005**		
Inevitability of AD	−0.107	0.065	−0.112	0.10		
Age	−0.007	0.002	−0.261	< 0.001***		
Depression symptoms	−0.131	0.026	−0.333	< 0.001***		
Step 3 (MCI and ACS subscales, demographics)					.493	.236***
Present ability	0.323	0.048	0.440	< 0.001***		
Potential improvement	0.172	0.059	0.227	0.004**		
Effort utility	−0.018	0.060	−0.020	0.770		
Inevitable decrement	0.030	0.045	0.046	0.502		
Independence	0.044	0.046	0.057	0.341		
Inevitability of AD	−0.062	0.056	−0.065	0.267		
Age	−0.004	0.002	−0.133	0.020*		
Depression symptoms	−0.070	0.023	−0.178	0.002**		

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

these variables for comparison purposes with later steps. In the second step, we added the ACS subscales, Independence and Inevitability of AD. In the third and final step, we added the memory controllability (MCI) subscales as hypothesized predictors of memory self-efficacy.

The results of the regressions on the FoF-R scores appear in Table 4. Age and GDS accounted for a significant 20.1% of the variance in FoF-R responses, $F(2, 186) = 232.09$, $p < 0.001$. This result was expected based on prior research where age and depressive symptoms were associated with self-rated memory (Crane, Bogner, Brown, & Gallo, 2007; Zelinski & Gilewski, 2004). Our second model showed that age and GDS were still predictive of FoF-R scores and only one of the ACS subscales (Independence) was significant. Together, Independence, age, and GDS accounted for 25.7% of the variance, $F(4, 186) = 15.76$, $p < 0.001$.

In the final step, the four MCI subscales, Present Ability (PA), Potential for Improvement (PI), Effort Utility (EU), and Inevitable Decrement (ID), were added to test the hypothesis that memory self-efficacy would be associated with core beliefs about memory controllability. These variables, along with variables in prior steps, accounted for nearly half (49.3%) of the variance, $F(8, 186) = 21.65$, $p < 0.001$. Of the MCI subscales, only PA and PI were significant, which partially supports our hypothesis concerning memory controllability and memory self-efficacy. The Independence ACS subscale lost its significance after adding the four MCI subscales to the model. However, age and GDS remained significant in the final model, a noteworthy finding which aligns with prior research and extends the literature on subjective memory assessment to include nonagenarians. Taken together, results of the regressions show the significant contributions of PA and PI to FoF-R scores, confirming that these aspects of memory controllability contribute to memory self-efficacy. Importantly, age and GDS were still significant predictors of memory self-efficacy with the inclusion of MCI and ACS subscales, confirming the role that age and symptoms of depression play in memory self-efficacy across the adult lifespan.

Discussion

We examined self-reported memory and beliefs about memory and aging in younger and older adults from the LHAS to shed new light on cognitive adaptability as a core aspect of successful aging in later life. The inclusion of nonagenarians and three younger reference groups is a strength of this study that permitted novel insight into the developmental course of memory self-efficacy and memory control beliefs in late adulthood. The principle new findings that emerged from the analyses and their relevance for cognitive adaptability and successful aging are discussed next.

The first finding of interest was the significant age effect favoring younger adults on two of the four MFQ subscales. The finding that younger adults and young-old adults' ratings were similar on both the FoF-R and SoF-R subscales of the MFQ replicates Cherry et al. (2013), confirming the reliability and generality of their findings. Of greater interest was the finding that nonagenarians' responses on both the FoF-R and SoF-R were not at floor nor did they significantly differ from their young-old and old-old counterparts, implying that memory self-efficacy and perceived seriousness of forgetting remain stable after 60 years of age. Alternatively, this finding may mean that older adults adjust their expectations for memory in a uniform way in later adulthood, although further research is necessary.

Interestingly, all age groups' levels of mnemonic usage were similar. This is an important finding which can be interpreted to suggest that even the oldest-old endorse mnemonic aids to promote retention in everyday life. Use of mnemonic aids to support everyday remembering in oldest-old adults is a novel finding. This result implies that nonagenarians adapt to cognitive changes with advancing age through the self-reported use of mnemonics as do their younger counterparts (Baltes & Baltes, 1990; Cherry & Smith, 1998). Whether self-reported mnemonic usage translates to improved memory performance in everyday situations is an important challenge that awaits future research.

The second interesting finding was actually the null effects we found on the overall MCI and ACS MANOVA analyses. We had expected to see less favorable scores for the nonagenarians suggesting a weaker belief in memory ability and controllability, which would replicate and extend Dark-Freudeman et al. (2006) who reported significant age effects favoring younger adults in separate multivariate analyses of MCI and ACS subscales, but we did not see this pattern here. Our findings suggest that beliefs about memory controllability and concerns about aging are similar across the adult lifespan, although interpretative caution is warranted. As is the case with all null results in cross-sectional research, the reason for no apparent age differences may be due to cohort effects, or possibly that older adults establish different reference points to assess their own memory abilities. Additional longitudinal research in metamemory in late adulthood is warranted to examine why subjective assessments of memory controllability, memory independence and Alzheimer's Disease concerns do not appear to differ with increased age. The null effects of age group on the two ACS subscales – quantifying memory independence and concerns about contracting Alzheimer's Disease – are remarkable in that they represent a stark counter example to ageist presumptions of cognitive frailty and a universal decrementalist view of adult cognition (Cherry, Blanchard, Walker, Smitherman, & Lyon, 2014).

The third finding was the outcome of the regressions that examined the influence of age, symptoms of depression, memory control beliefs (MCI), and aging concerns (ACS) in memory self-efficacy. Based on theory and on previous research, we had expected that memory controllability would be associated with memory self-efficacy perceptions. Our results partially supported this hypothesis in that our final model accounted for nearly half of the memory self-efficacy variance (49.3%), confirming the role of Present Ability (MCI subscale), Potential Improvement (MCI subscale), age, and symptoms of depression in memory self-efficacy. Interestingly, age and symptoms of depression held their significance after accounting for variance attributable to memory control beliefs and aging concerns variables (see Table 4). This result joins others in the literature on metamemory in later life, highlighting the role of depression symptoms in memory self-assessment (Crane et al., 2007; Zelinski & Gilewski, 2004). The majority of the current sample of college students and community-dwelling older adults (92.6%) had GDS scores that fell below the cutoff for clinically significant depression, however. Nonetheless, Jeste, Depp, and Vahia (2010) have made the point that depression symptoms may negatively impact other determinants of successful aging including lifestyle and social factors (see also Jeste et al., 2013), so future research on emotional health in later life would be valuable.

The present results have theoretical and applied implications that warrant brief mention. From a theoretical point of view, the finding that nonagenarians did not differ from the three younger comparison groups on the mnemonics usage subscale of the MFQ and the effort utility subscale of the MCI is compatible with Heckhausen and Schultz (1995) lifespan theory of control. Moreover, the present results confirm the generality and relevance of this theoretical framework for understanding cognitive adaptability in oldest-old adults. From an applied perspective, the FoF-R and SoF-R subscales of the MFQ offer researchers condensed assessment tools to estimate memory self-efficacy and ratings concerning the seriousness of forgetting. The results of this study support the use of these briefer versions as they capture the same level of detail and construct validity as the original subscale versions (Zelinski & Gilewski, 2004). The FoF-R and SoF-R still retain the variability between individuals across the age groups sampled for this research.

These implications should be interpreted in light of at least four methodological limitations. First, a potential sampling bias may exist, because LHAS participants were physically active and socially engaged (Cherry, Jackson Walker, et al., 2013). Many older adults are not as healthy or highly involved as the current sample. People in worse health may not be as optimistic in their self-assessments of memory, especially if they are comparing themselves to their healthier, more active peers. Our nonagenarian sample had less age variability than the younger comparison groups which may also limit the generalizability of our findings. Future studies should explore the subjective memory views held by those older adults in worse health and social conditions to determine whether the patterns found here still persist. Additionally, younger adults were college students and the older adults also had high levels of education, so the findings reported here may not generalize well to those with less education. Cohort effects may also play a role in participants' beliefs about aging, which could be the underlying cause behind the null effects across these metamemory measures. Future research to explore this possibility concerning what various generations believe about memory abilities would be valuable.

Second, carrying out univariate analyses after non-significant MANOVA results limits the interpretations of our findings for the MCI and ACS subscales. However, we planned these analyses as a comparison with Dark-Freudeman et al. (2006) who found reduced MCI (Present Ability) and ACS (Inevitability of Alzheimer's) scores for older adults compared to young adults on two subscales. We also controlled statistically for increased familywise Type I error probability. We partially replicated their findings in that our follow-up analyses yielded age differences on the MCI Present Ability subscale between the younger adults and the old-old. However, we did not find a significant MANOVA overall, and the difference on the Present Ability subscale did not extend to the nonagenarian group. We also did not replicate Dark-Freudeman et al.'s (2006) ACS subscale findings. Additionally, many of our conclusions were based on null findings, which warrant interpretative caution (cf. Dark-Freudeman et al., 2006). A third methodological limitation pertains to the psychometric qualities of the MCI and ACS subscales. The Cronbach's alpha values obtained here were quite similar to Lachman et al.'s (1995), but also fell short of the standard convention (0.80). The present findings should be interpreted in light of this concern[1].

Fourth, we did not examine self-rated memory and beliefs about memory controllability in relation to objective memory performance in this study. Lachman's (2000) connection between self-reported memory and objective memory places increasing importance on memory self-efficacy as a major factor to consider when designing memory boosting interventions, especially for those interested in taking control of their own aging (Lachman et al., 2011). Addressing the role of memory self-efficacy and memory control in adaptive behaviors in daily life, such as compensatory strategies (Lachman, 2006) and remembering to carry out future planned activities, appear to be promising directions for further research.

In closing, the ways we think about and believe in our memory capabilities may not drastically change in late life, even into ages ninety and older for those that have intact cognitive abilities. The older adults surveyed here retained a comparable view of their memory and how much control they have over changes in memory abilities, which may positively impact their confidence or persistence to complete memory tasks in everyday life (e.g. taking a newly prescribed medication, or remembering to do their physical therapy exercises). Older adult's subjective assessments of memory abilities may guide our understanding of cognitive adaptability and the role it plays in successful aging (Kim & Park, 2017; Mol et al., 2009). Future research to examine the generality of the present results and to further investigate why these strong beliefs about memory persist despite gradual memory declines throughout older adulthood is warranted.

Note

1. Hutchens et al. (2013) created a total control beliefs score by collapsing across the four MCI subscales (after having reversed the Inevitable Decrement subscale so that a higher score indicates a stronger control belief). The internal consistency reliability estimate for the total score (Cronbach's alpha = 0.78) exceeded the estimates obtained for the individual scale scores reported here. A potentially useful direction for future research would be to examine older adults' beliefs using the Hutchens et al. composite MCI score.

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