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Cognitive Activity Engagement Predicts Future Memory and Executive Functioning in Older Adults

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This study examined cognitive activity engagement, depression, executive functioning, and memory in a sample of older adults. Participants were assessed at baseline and 15 months later. Depression and activity level were significantly correlated at baseline, such that increased depressive symptoms were associated with decreased cognitive activity. Higher baseline activity scores, particularly on a measure of participation in cognitively challenging activities, predicted higher scores on memory and executive functioning tests at follow up. Findings highlight the benefits of activity engagement in later life, such that activity engagement is associated with reduced cognitive decline in older adults.

KEYWORDS memory, executive functioning, cognitive activity, engagement, older adults aging

Several studies have suggested that higher levels of cognitive and social activity are associated with reduced rates of cognitive decline and dementia in older individuals (Fratiglioni, Pallard-Borg, & Winblad, 2004; Hertzog,

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Kramer, Wilson, & Lindenberger, 2009; Marioni et al., 2011; Verghese et al., 2003, 2006; Wilson et al., 2010). Some studies offer evidence of differential preservation (in which cognitively active individuals show fewer declines in old age than those who are less active) whereas other findings show evidence of preserved differentiation (whereby active individuals have always showed higher cognitive performance) with this relationship being maintained into old age. An extensive literature also exists supporting an association between depression and cognitive decline in older adults, such that the presence of depression places one at risk for the development of dementia in the future after controlling for age and education effects (Geerlings et al., 2000; Green et al., 2003; Jorm, 2000, 2001; Ownby, Crocc, Acevedo, John, & Loewenstein, 2006; Rapp et al., 2011; Royall, Palmer, Chiodo, & Polk, 2011; Wilson, Mendes de Leon, Bennett, Bienias, & Evans, 2004). Despite the evidence supporting an association between cognitive activity and cognitive decline and depression and cognitive decline, few studies have examined relationships between cognitive activity, depression, and cognitive abilities in older adults (Verghese et al., 2003, 2006).

There exist several limitations of the current research on cognitive activity, cognitive decline, and depression in later life. First, there is a lack of a unified conceptualization of cognitive activity (Hertzog et al., 2009), in part because few activities are purely cognitive in nature (Schinka et al., 2005). There is little use of standardized measures of cognitive activity across studies, with authors selecting various constellations of activities based on differing criteria or limiting the number of activities assessed, which can lead to a lack of reliability and potentially skewed response distributions (Schinka et al., 2005). Second, assessment of cognitive functioning is often limited. Some studies (Geerlings et al., 2000; Marioni et al., 2011) have assessed cognitive ability using only the Mini Mental State Exam (Folstein, Folstein, & McHugh, 1975), which may not be sensitive to more subtle differences in cognitive abilities (Li, Ng, Kua, & Ko, 2006; O'Sullivan, Morris, & Markus, 2005; Trenkle, Shankle, & Azen, 2007). Despite the prominent role of executive functioning in the diagnosis of dementia (McKhann et al., 2011), established measures of executive functioning have not been extensively used (Bielak, Anstey, Christensen, & Windsor, 2012; Gow, Corley, Starr, & Deary, 2012; Marioni et al., 2011; Wilson et al., 2010). Third, studies (e.g., Landau et al., 2012) often rely on retrospective accounts of activity level, which can be problematic due to the fallible nature of retrospective frequency estimation (Hertzog et al., 2009). Fourth, many studies (e.g., Rapp et al., 2011; Salthouse, Berish, & Miles, 2002) have not accounted for baseline cognitive functioning. Finally, the majority of studies have examined the impact of cognitive activity on the development of dementia or mild cognitive impairment without examining the impact of cognitive activity on subsyndromal cognitive decline.

The purpose of this pilot study was to examine the relationships among cognitive activity, depression, and cognitive functioning in the domains of memory and executive functioning in a sample of community-dwelling older adults. The aforementioned limitations were addressed in several ways. First, we used the Florida Cognitive Activities Scale (FCAS; Schinka et al., 2005) to measure cognitive activity level. The FCAS is a measure of cognitive activities with adequate psychometric properties (Schinka et al., 2005). The scale includes everyday activities and more cognitively demanding activities, allowing for the investigation of which types of cognitive activities are most related to cognitive functioning and whether complex cognitive activities and everyday cognitive activities differ in their relationship with cognition. Second, this study used a comprehensive assessment of memory and executive functioning with measures sensitive to subtleties in cognitive abilities. Third, we used a longitudinal design to prevent biases associated with retrospective recall and controlled for baseline cognitive functioning in the prediction of Time 2 cognitive functioning. Additionally, this study examined the impact of cognitive activity on cognitive functioning in general, without limiting analyses to the development of dementia or mild cognitive impairment (MCI) at follow-up.

The following predictions were made:

Hypothesis 1. Depression and cognitive activity level would be significantly related at baseline, such that those with more depressive symptoms would be less cognitively active.

Hypothesis 2. Cognitive activity at baseline would predict performance on tasks of memory and executive functioning at follow up, such that higher activity at baseline would predict better performance on these tasks at follow up after controlling for baseline performance on these tasks. However, the reverse would not be true; that is, baseline memory and executive functioning would not predict follow-up cognitive activity.

Hypothesis 3. Past research (Royall et al., 2011; Thomas et al., 2009; Wilson et al., 2004) led to the hypothesis that depression at baseline would predict poorer performance on measures of memory and executive functioning at follow up.

METHOD

Participants

Time 1 data were collected from 62 community-dwelling adults age 60 and older, recruited from a university registry. Of these, 44 participants returned for follow-up assessment, resulting in a 29% attrition rate. All participants

TABLE 1 Time 1 and Time 2 Sample Demographics and FCAS, GDS, CVLT-II, and D-KEFS Performance

	Time 1 Variables		Time 2 Variables		Mean Change in Score
	Mean (*SD*)	Range	Mean (*SD*)	Range	
Age	75.3 (5.9)	65–87	76.7 (5.9)	66–88	
Years of education	15.2 (2.8)	12–20	15.2 (2.8)	12–20	
GDS	4.3 (5.1)	0–29	3.9 (4.5)	0–19	
FCAS (cognitive activity)	45.1 (10.4)	21–67	47.6 (9.2)	27–64	
FCAS (higher cognition)	15.2 (6.0)	4–28	15.9 (5.6)	6–28	
FCAS (frequent activity)	25.7 (4.0)	11–31	26.6 (3.3)	17–31	
FCAS (activity maintenance)	0.2 (0.1)	0.0–0.5	0.2 (0.1)	0.0–0.5	
CVLT-II (Trials 1–5)	45.4 (10.7)	28–74	47.8 (10.4)	25–72	2.4
CVLT-II (long delay free recall)	9.7 (3.2)	3–16	10.5 (3.3)	4–16	0.8
D-KEFS (trail making, number-letter switching condition)	97.9 (36.6)	32–202	96.5 (35.7)	38–189	−1.4
D-KEFS (20 questions, initial abstraction)	28.9 (13.4)	4–60	29.6 (11.2)	12–60	0.7
D-KEFS (20 questions, total questions asked)	30.6 (9.7)	16–73	26.1 (6.4)	16–47	−4.5
D-KEFS (20 questions, weighted achievement)	13.8 (3.1)	3–19	14.9 (2.5)	8–19	1.1

$N = 44$; female = 31 (70.5%); male = 13 (29.5%).
GDS = Geriatric Depression Scale; FCAS = Florida Cognitive Activities Scale; CVLT-II = California Verbal Learning Test, Second Edition; D-KEFS = Delis-Kaplan Executive Function System.

were of European American ethnicity, and 71% of the participants were female. Demographic information is presented in Table 1.

Measures

Florida Cognitive Activities Scale

The FCAS contains 25 cognitively based activities and examinees indicate how often they have participated in each activity, ranging from 0 (*Never did this activity* or *Used to do, but not in the past year*) to 4 (*Everyday*).

The sum of all 25 FCAS items comprises the cognitive activity (CA) score, with higher scores indicating greater engagement in cognitive activities. Possible scores range from 0 to 100. The FCAS yields three additional scores: frequent activity (FA), higher cognition (HC), and activity maintenance (AM). The FA scale contains eight activities (e.g., walking or driving in familiar places, watching TV, or listening to the radio). Possible scores on the FA subscale range from 0 to 32, with higher scores indicating more engagement in these specific activities. Other activities (e.g., painting, preparing new recipes, writing friends or relatives) involve a more demanding amount of cognition, and these 10 activities comprise the HC score. Possible scores range from 0 to 40, with higher scores indicating more frequent engagement in cognitively demanding tasks. The AM score is a measure of decrease in activity engagement during the past year, calculated by dividing the number of activities stopped in the past year by the total number of activities ever performed. Possible AM scores range from 0 to 1.0. Lower scores indicate more maintenance of activities and higher scores indicate the cessation of activities within the past year.

The FCAS has been found to be a reliable and valid measure of cognitive activity in European (Schinka et al., 2005) and African American populations (Dotson, Schinka, Brown, Mortimer, & Borenstein, 2008). It has been validated in samples including individuals with MCI and early stage Alzheimer's disease (Schinka et al., 2010).

Geriatric Depression Scale

The Geriatric Depression Scale (GDS) is a 30-item self-report measure of depressive symptoms (Yesavage et al., 1983). Possible scores range from 0 to 30, with higher scores indicating more severe depressive symptoms. The GDS has adequate internal consistency, test-retest reliability, and concurrent validity with measures of depression in diverse populations (Marty, Pepin, June, & Segal, 2011; Yesavage et al., 1983).

California Verbal Learning Test (2nd ed.)

The California Verbal Learning Test (2nd ed.; CVLT-II) is a highly reliable measure of verbal learning and memory with demonstrated validity (Delis, Kramer, Kaplan, & Ober, 2000). Examinees are read a word list five times, and after each trial are asked to freely recall as many of the words as possible. After a 20-minute delay, they are asked to freely recall the words again. This study utilized the total number of words recalled in Trials 1–5 and the total number of words recalled after a 20-minute delay as measures of memory.

Trail Making Subtest Of The Delis-Kaplan Executive Function System

The Trail Making subtest of the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001a) contains five conditions. The fourth condition involves the executive skill of set-switching and was used in the current study. In this condition, the participant draws a line connecting dots, alternating between dots containing numbers and dots containing letters. This is a commonly used measure of set-switching, or cognitive flexibility with high reliability (Delis, Kaplan, & Kramer, 2001b) and validity (Yochim, Baldo, Nelson, & Delis, 2007). For this study, the total completion time was used as a measure of set-switching, with lower scores indicating better performance.

THE D-KEFS 20 QUESTIONS SUBTEST

The D-KEFS 20 Questions subtest (Delis et al., 2001a) is a measure of abstraction, a component of executive functioning. Participants are shown a sheet containing illustrations of 30 items and are instructed to ask the fewest number of yes-or-no questions to identify a predetermined item. The items can be placed into categories (e.g., animals, kitchen items), which presumably involves abstraction skills; placing the items into categories enables the participant to guess the target item with fewer questions. Three scores are obtained, all of which were used in this study: initial abstraction, weighted achievement, and total questions asked. The total questions asked is the total number of questions the examinee asked on all four items. The weighted achievement score reflects how well the examinee uses categorization ability to identify items. Examinees who use an effective strategy can typically guess the correct item within 4–7 questions, leading to a high weighted achievement score. The first question an examinee asks (e.g., "Is it an animal?") often eliminates a number of items, and the number of items eliminated is the initial abstraction score, which reflects how well the examinee is able to engage in abstract thought or place things into categories. As a demonstration of validity, scores on the 20 Questions subtest were significantly lower among patients with frontal lobe lesions than in age- and education-matched controls (Baldo, Delis, Wilkins, & Shmamura, 2004).

Procedure

Participants were tested individually in a quiet room on a university campus or in an off-campus gerontology research center. Testing was conducted by four randomly assigned members of a university research laboratory who were unaware of Time 1 performance on measures when they administered and scored Time 2 measures. At Time 1, participants completed the FCAS, GDS, CVLT-II, and D-KEFS measures. They completed all measures again an average of 15 months after the initial assessment. The study was approved by the institutional review board of the University of Colorado at Colorado Springs.

Statistical Analyses

Correlations were calculated among all variables. Raw scores on the cognitive measures were used for analyses. Multiple regressions were conducted to predict Time 2 performance on the CVLT-II (trail making test), and 20 Questions subtest. In Step 1 of the regressions, age and Time 1 performance on the cognitive measures predicted Time 2 performance on the same measures. In Step 2, Time 1 FCAS scores were added as a predictor to assess the degree to which participation in cognitively stimulating activities predicted Time 2 memory and executive functioning after controlling for baseline performance on these measures. In another set of regressions, baseline FCAS scores were entered as predictors of Time 2 performance on the same measure in Step 1. In Step 2, Time 1 CVLT-II (trail making test) and 20 Questions subtest scores were added as predictors to assess the degree to which baseline memory and executive functioning predicted follow-up cognitive activity after controlling for baseline cognitive activity.

RESULTS

Sample demographics and mean scores on the FCAS, GDS, CVLT-II, and D-KEFS measures at Time 1 and Time 2 are presented in Table 1. Correlations among age, years of education, sex, GDS scores (Times 1 and 2), FCAS scores (Time 1), and CVLT-II and D-KEFS scores (Time 1) are presented in Table 2. At Time 1, GDS scores correlated significantly with CA ($r = -.30$, $p < .05$) and FA ($r = -.50$, $p < .001$), such that participants with more depressive symptoms were less cognitively active overall and in common activities, but GDS scores were not significantly related to HC scores ($r = -.15$, $p = .32$) or AM scores ($r = .24$, $p = .11$). GDS scores at Time 1 did not correlate with any of the cognitive variables assessed at Time 1 or Time 2. Likewise, GDS scores at Time 2 did not correlate with any of the Time 1 or Time 2 cognitive variables, nor did they correlate with the measure of cognitive activity at Time 1.

Pearson correlations between Time 1 GDS and FCAS scores and the primary measures at Time 2 are displayed in Table 3. As can be seen in Table 3, the CA score was related to the CVLT-II Trials 1–5 score ($r = .39$, $p < .01$), the CVLT-II Long Delay Free Recall score ($r = .43$, $p < .01$), the Trail Making Number-Letter Switch score ($r = -.36$, $p < .05$), and the 20 Questions Total Questions Asked score ($r = -.43$, $p < .01$). The HC score was also related to the CVLT-II Trials 1–5 score ($r = .36$, $p < .05$), the CVLT-II Long Delay Free Recall score ($r = .41$, $p < .01$), the Trail Making Number-Letter Switch score ($r = -.38$, $p < .05$), and the 20 Questions Total Questions Asked score ($r = -.43$, $p < .01$).

Next, to determine the degree to which baseline FCAS scores predicted Time 2 CVLT-II and D-KEFS scores after controlling for Time 1 performance on these measures, a series of hierarchical multiple regression analyses were performed (see Table 4). In all regression analyses, age and Time 1 performance on the cognitive measure were entered in Step 1, and the Time 1 FCAS measure of interest was entered in Step 2. The HC score significantly predicted CVLT-II Trials 1–5 scores ($\beta = .23$, $p < .05$), such that more participation in activities requiring higher cognition predicted better ability to learn and recall new information when assessed 15 months later. HC

TABLE 2 Correlations Among Time 1 Age, Sex, Education, and Time 1 and Time 2 GDS, and Time 1 FCAS scores, and Time 1 CVLT-II and D-KEFS Measures

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	–													
2. Education	.03	–												
3. Sex	.20	.25	–											
4. GDS Time 1	−.07	−.04	−.10	–										
5. GDS Time 2	.06	−.07	−.04	.76**	–									
6. CA	−.19	.12	−.30*	−.30*	−.09	–								
7. HC	−.11	.08	−.34*	−.15	.07	.93**	–							
8. FA	.06	.01	−.23	−.50**	−.27	.68**	.66**	–						
9. AM	.40**	.05	.20	.24	.06	−.79**	−.69**	−.41**	–					
10. CVLT-II Trials 1–5	−.36*	.33*	−.14	−.04	−.08	.28	.20	.05	−.04	–				
11. CVLT-II LDFR	−.41**	.36*	−.11	.02	.07	.37*	.32*	.17	−.17	.78**	–			
12. Trail Making NLS	.26	−.21	−.08	.22	.05	−.23	−.23	−.25	.15	−.25	−.34*	–		
13. 20 Q IA	−.45**	.07	−.01	.01	.13	.31*	.29	.26	−.33*	.35*	.45**	−.37*	–	
14. 20 Q WA	−.18	.19	.23	−.01	.06	.22	.23	.14	−.24	.10	.13	−.15	.50**	–
15. 20 Q TQ	.27	−.20	−.10	.03	−.05	−.25	−.28	−.27	.26	−.20	−.19	.35*	−.49**	−.82**

N = 44 GDS = Geriatric Depression Scale; CA = FCAS cognitive activity; HC = FCAS higher cognition; FA = FCAS frequent activity; AM = FCAS activity maintenance; CVLT-II = California Verbal Learning Test (2nd ed.); CVLT-II LDFR = California Verbal Learning Test (2nd ed.) Long Delay Free Recall; D-KEFS = Delis-Kaplan Executive Function System; Trail Making NLS = Number-Letter Switching; 20 Q = 20 Questions; 20 Q IA = 20 Questions initial abstraction; 20 Q WA = 20 Questions weighted achievement; 20 Q TQ = 20 Questions total questions.

$^{*}p < .05$. $^{**}p < .01$.

TABLE 3 Correlations Among Time 1 Age, Education, and Sex; Time 1 and 2 GDS; Time 1 FCAS scores, and Time 2 CVLT-II and D-KEFS Measures

	CVLT-II Trials 1–5	CVLT-II Long Delay Free Recall	Trail Making Number-Letter Switching	20 Q Initial Abstraction	20 Q Weighted Achievement	20 Q Total Questions
Age	−.28	−.28	.34*	−.06	.19	.10
Education	.33*	.36*	−.21	.07	.19	−.20
Sex	−.14	−.11	−.08	−.01	.23	−.10
Time 1 GDS	−.02	−.02	−.04	−.04	−.06	.10
Time 2 GDS	.07	.03	−.14	−.13	−.11	.16
Time 1 CA	.39**	.43**	−.36*	−.10	.19	−.43**
Time 1 HC	.36*	.41**	−.38*	−.16	.14	−.43**
Time 1 FA	.21	.26	−.21	−.01	.20	−.33*
Time 1 AM	−.11	−.10	.33*	.15	.06	.19

N = 44. GDS = Geriatric Depression Scale; CA = Cognitive Activity; HC = Higher Cognition; FA = Frequent Activity; AM = Activity Maintenance; CVLT-II = California Verbal Learning Test (2nd ed.); D-KEFS = Delis-Kaplan Executive Function System; 20 Q = Twenty Questions.
*$p < .05$. **$p < .01$.

TABLE 4 Multiple Regression Results Predicting Time 2 Variables

	β	ΔR^2	p
DV: CVLT-II Trials 1–5			
Age	−.02		.89
Time 1 CVLT-II Trials 1–5	.62**		.00
Cognitive Activity	.22	.04	.07
DV: CVLT-II Trials 1–5			
Age	−.03		.79
Time 1 CVLT-II Trials 1–5	.63**		.00
Higher Cognition	.23*	.05	.04
DV: CVLT-II Long-Delay Free Recall			
Age	.06		.62
Time 1 CVLT-II Long-Delay Free Recall	.77**		.00
Higher Cognition	.17	.03	.08
DV: Trail Making Number-Letter Switching			
Age	.17		.16
Time 1 Trail Making Number-Letter Switching	.59**		.00
Higher Cognition	−.23*	.05	.04
DV: 20 Questions, Total Questions Asked			
Age	.05		.71
Time 1 20 Questions, Total Questions Asked	−.12		.42
Cognitive Activity	−.46**	.19	.00
DV: 20 Questions, Total Questions Asked			
Age	.09		.50
Time 1 20 Questions, Total Questions Asked	−.14		.34
Higher Cognition	−.46**	.19	.00

Note. *$p < .05$; **$p < .01$.

scores also predicted D-KEFS Trail Making Number-Letter Switching scores at follow-up ($\beta = -.23$, $p < .05$), such that those with more participation in activities requiring higher cognition performed better on a measure of set-switching abilities at follow up. CA scores predicted D-KEFS 20 Questions Total Questions Asked scores ($\beta = -.45$, $p < .01$), as did HC scores ($\beta = -.46$, $p < .01$), such that those with more overall cognitive activity and those with more involvement in activities requiring higher cognition asked fewer questions to arrive at a target object.

Additional regressions were run to test the reverse hypothesis that Time 1 CVLT-II Trials 1–5, CVLT-II Long-Delay Free Recall, D-KEFS Trail Making Number-Letter Switching, or D-KEFS 20 Questions (Initial Abstraction, Total Questions Asked, and Weighted Achievement) scores might predict Time 2 CA and HC scores, after controlling for Time 1 CA and HC scores. Neither the CVLT-II Trials 1–5 or Long-Delay Free Recall, D-KEFS Trail Making Number-Letter Switching, nor any D-KEFS 20 Questions scores predicted CA after controlling for baseline CA. In the prediction of HC scores, neither the CVLT-II Trials 1–5 or Long-Delay Free Recall, D-KEFS Trail Making Number-Letter Switching, D-KEFS 20 Questions Initial Abstraction, nor D-KEFS 20 Questions Weighted Achievement scores predicted HC scores after controlling for baseline HC scores. However, Time 1 D-KEFS 20 Questions Total Questions Asked significantly predicted Time 2 HC scores after controlling for Time 1 HC scores ($\beta = .19$, $p < .05$). Thus, there is more evidence for cognitive activity predicting memory and executive functioning than there is for higher memory and executive functioning predicting higher cognitive activity.

DISCUSSION

The purpose of this pilot study was to examine the longitudinal relationships among cognitive activity, depression, and two domains of cognitive functioning in a sample of older, healthy, community-dwelling individuals. As hypothesized, baseline scores on a depression measure were significantly correlated with baseline cognitive activity level (Hypothesis 1), but were not significantly related to Time 1 or Time 2 performance on the cognitive measures, which did not support Hypothesis 3. In support of Hypothesis 2, higher levels of cognitive activity, as measured by the FCAS, predicted better performance on tasks of memory and executive functioning 15 months later even after controlling for age and Time 1 performance on these variables. Specifically, increased participation in cognitive activities was associated with higher immediate verbal memory, set-switching, and abstraction. When testing the reverse of this hypothesis, results indicated that higher performance on cognitive measures at Time 1 was not predictive of increased cognitive activity levels at Time 2, aside from one measure of executive functioning. These results are consistent with other studies that have noted the relationship between higher cognitive activity level and delayed memory decline (Hall et al., 2009), adding support to the differential preservation hypothesis but inconsistent with other studies (Bielak et al., 2012; Gow et al., 2012). This is also consistent with findings that activities requiring a higher cognitive demand as measured by the HC subscale were the most highly related to neuropsychological measures (Schinka et al., 2005).

Depressive symptoms were significantly related to levels of cognitive activity at baseline. This is consistent with one other study (Verghese et al., 2003) that found that participants who were more depressed were less cognitively active. The relationship between depression and cognitive activity should be explored further, as it may be that individuals who experience depression may be less cognitively active, thereby increasing their risk of cognitive decline. We were not able to explore any possible mediating or moderating relationships in the current study as depression was not significantly related to performance on memory or executive functioning tests, but future studies should explore this potential model.

This study is not without limitations. The majority of participants were not experiencing clinically significant depression; however, these results are consistent with two prior studies (Verghese et al., 2003, 2006) that found that baseline cognitive leisure activities, but not depression, predicted the development of MCI or dementia. In addition, the study demographic was homogenous in nature. Participants were volunteers from a university database who may have been more motivated and active than other populations. Future studies should replicate analyses in more diverse samples. An additional limitation is the small sample size, raising the possibility of Type 2 error. The sample size did not permit us to investigate other contributors to cognitive decline (i.e., medical illnesses), and potentially limited the statistical power available to detect significant relationships among depression and measures of memory and cognitive functioning at Time 2. However, medium effects (Cohen, 1992) were found among Time 1 FCAS scores and Time 2 cognitive variables. An additional limitation is that the FCAS contains many items that are multidimensional in nature; some of the items could be considered physical, social, and/or leisure in nature in addition to being classified as cognitive. This reflects the challenge of measuring cognitive activities in late life.

This pilot study addressed several existing limitations of the literature. This study used an in-depth assessment of memory and executive functioning, using measures that are sensitive to subtleties in cognitive functioning. Additionally, a standardized, validated measure of cognitive activity was used. We used longitudinal data, which helps prevent biases associated with retrospective recall of activity level, and controlled for baseline performance on the cognitive measures.

Overall, this study suggests that participation in cognitively stimulating activities is associated with less cognitive decline in late life. Specifically, this study suggests that general cognitive activity as well as activities involving a higher level of cognition have the strongest relationships with verbal memory, set-switching abilities, and abstraction. This has important implications for the aging population, as cognitive impairment is a significant problem worldwide. The results of this study suggest that future cognitive decline may be associated with decreased participation in activities that are cognitively challenging, such as completing crafts, cooking, or writing to friends or relatives. Encouraging older adults to engage in such activities may help them maintain their cognitive functioning over time and possibly prevent or delay the onset of dementia. Future studies should determine whether cognitive engagement may mediate a relationship between significant depressive symptoms and cognitive decline. All in all, it appears that cognitive engagement has many benefits for adults in later life.

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