

RESEARCH ARTICLE

Managing money matters: Managing finances is associated with functional independence in MCI

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Email: courtney.berezuk@mail.utoronto.ca**Objective:** Previous research suggests that overall experience participating in instrumental activities of daily living (IADLs) is associated with reduced IADL impairment in individuals with mild cognitive impairment, possibly because of an increased functional reserve. Given that difficulties managing finances tend to occur with mild cognitive impairment, this study explores whether experience managing one's finances is associated with independence across various IADLs.**Methods:** Participants with a screen or baseline diagnosis of mild cognitive impairment ($n = 862$) were taken from the Alzheimer's Disease Neuroimaging Initiative study. Functional dependence and experience were quantified from the Functional Activities Questionnaire.**Results:** No group differences between those with and without financial management experience existed in Mini-Mental State Examination scores, age, and years of education, although women were more likely to have experience managing finances ($P < .001$). Final chi-square analyses suggest that financial management experience is significantly associated with greater independence in the ability to follow TV, books, or magazines ($P = .009$) and remember appointments and important dates ($P = .002$).**Conclusions:** Individuals who are rated as having experience in managing their finances were also rated as being less dependent in their ability to follow and understand TV and books and in their ability to remember appointments and important dates. Neither causation nor the mechanisms underlying this relationship can be discerned from these analyses. Therefore, further research is needed to investigate whether engaging in financial tasks protects against early financial impairment, potentially through an increased functional reserve.**KEYWORDS**

activities of daily living, financial capacity, functional reserve, instrumental activities of daily living, mild cognitive impairment

1 | INTRODUCTION

A diagnosis of dementia due to Alzheimer disease (AD) requires that there be impairment in activities of daily living (ADLs),¹ which are commonly divided into basic ADLs and instrumental ADLs (IADLs).²

Basic ADLs involve everyday self-care, such as eating, bathing, and dressing, whereas IADLs are more complex and include activities such as cooking, shopping, and managing finances.² It is unclear how early ADL impairment occurs in the AD course. Traditionally, all ADLs were thought to be preserved in patients with mild cognitive impairment

Courtney Berezuk and Sandra E. Black are Senior Authors.

Data used in preparation of this article were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database (adni.loni.usc.edu) on 24 June 2016. As such, the investigators within the ADNI contributed to the design and implementation of ADNI and/or provided data but did not participate in the analysis or writing of this report. A complete listing of ADNI investigators can be found at http://adni.loni.usc.edu/wp-content/uploads/how_to_apply/ADNI_Acknowledgement_List.pdf. This paper was presented at the International Neuropsychological Society Conference 2017, New Orleans, LA.

(MCI), a disease state that typically represents a prodromal form of dementia.³ However, research has now shown that IADL impairment does exist early in MCI.^{4,5} Furthermore, it has been reported that individuals who have greater functional impairment are at a greater risk for later converting to dementia.⁶ This is particularly true of IADLs that require a higher degree of cognitive processing, such as financial management, remembering appointments, and the ability to complete tasks quickly and accurately.⁷ Financial management in particular was found to be an IADL that was consistently impaired in MCI relative to normal controls.⁷ Griffith and colleagues⁸ found that individuals with MCI showed greater impairments in financial conceptual knowledge, management of bank statements, and bill payment skills using the Functional Capacity Instrument. Furthermore, one study found that of all IADLs examined, the ability to manage finances was a strong predictor of incidence of dementia and was diminished 10 years before a diagnosis of AD.⁹

Given that dementia-related disability is a major economic burden, there has been increased focus towards developing tools that can accurately measure early IADL impairment.¹⁰ However, research is also needed to better identify those at risk for functional decline. For instance, our recent cross-sectional study found that patients with MCI who had greater IADL experience also showed greater functional independence.¹¹ Although further research is still needed, in that study, it was hypothesized that increased experience participating in IADLs may result in a resiliency to functional decline via a functional reserve. Similar to the theory of cognitive reserve,¹² it was also hypothesized that IADL experience may also be nonspecific in its protective effects. In other words, participating in one IADL may protect against disability across other IADLs.¹¹

Given that the ability to manage one's finances is important for functional independence, the purpose of this study was to examine whether financial management experience is associated with independence across various IADLs. On the basis of our functional reserve hypothesis,¹¹ we hypothesize that financial management *experience* will be associated with greater functional independence across several other IADLs.

2 | METHODS

Data were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database (adni.loni.usc.edu; accessed on 24 June 2016). The ADNI was launched in 2003 as a public-private partnership, led by principal investigator Michael W. Weiner, MD. The primary goal of ADNI has been to test whether serial magnetic resonance imaging, positron emission tomography, other biological markers, and clinical and neuropsychological assessment can be combined to measure the progression of MCI and early AD. For up-to-date information, see www.adni-info.org

2.1 | Participants

Of the 1737 participants enrolled in ADNI-1, ADNI-GO, and ADNI-2 at the time of this study, only individuals with a baseline diagnosis of MCI and complete Functional Assessment Questionnaire (FAQ) data were included ($n = 862$). Detailed information about inclusion and exclusion

Key points

- Experience managing finances was associated with greater independent remembering important dates and understanding TV, books, or magazines.
- Although more research is needed, we argue that these findings further support to our previous research proposing the presence of a functional reserve.

criteria across ADNI phases can be found within the procedure manuals.¹³ Demographic information is reported in Table 1.

2.2 | ADL assessment

The FAQ is a 10-item assessment tool¹⁴ that is administered to the participant's study partner to assess experience and dependency across different IADLs. Each IADL item is scored from 0 to 3: 0 = normal, 1 = independent with some difficulty, 2 = requires assistance, and 3 = dependent. However, if the participant does not have experience with that particular IADL, he/she can instead receive a score of 0 = never did but could hypothetically perform now or 1 = never did but would have difficulty now. These scores are typically summed across IADLs to provide a total score ranging from 0 to 30, with higher scores indicating greater dependence on a caregiver. With the informant responses outlined above and the scoring methodology proposed by Berezuk and colleagues,¹¹ managing finances (operationalized as writing checks, paying bills, and balancing checkbooks) was dichotomized as a history of experience or inexperience.

2.3 | Statistical analysis

Firstly, group differences between individuals with and without experience managing finances were compared using independent-samples *t* tests (age, years of education, and Mini-Mental State Examination [MMSE]) and chi-square (sex). Secondly, a total of 10 chi-square analyses were conducted, comparing financial management experience (dichotomous) with IADL dependence (categorical). Eight chi-square analyses were conducted using multiple 2×4 designs, comparing financial experience with the 4-level dependency score for each other IADL. One chi-square (understanding TV, books, or magazines) was conducted using a 2×3 design, as none of the participants were fully dependent on his/her caregiver for this IADL. As this is an MCI sample with relatively few participants receiving a score of "dependent," the likelihood ratio chi-square statistic was reported instead of Pearson chi-square if the percentage of cells with less than 5 expected cases was greater than 20% of the total number of cells—an assumption of chi-square. Cramer *V* is reported as the effect size for significant results. Thirdly, post hoc analyses were conducted for significant IADLs using *z* scores.

Follow-up analyses were conducted for significant IADLs, whereby chi-square was used to examine the relationship between experience managing finances and experience on other ADLs. The

TABLE 1 Bivariate comparisons of individuals with and without experience managing finances

	Experience Managing Finances	Inexperience Managing Finances	Statistic	P Value
n (% male) ^a	719 (55.4)	143 (80)	29.36	<.001
Age (y)	73.07 ± 7.75	73.13 ± 6.79	0.09	.93
Education (y)	15.91 ± 2.85	15.83 ± 2.8	-0.31	.75
Mini-Mental State Examination (/30)	27.63 ± 1.8	27.41 ± 1.82	-1.37	.17

All data are presented in mean ± SD and compared using independent-samples *t* test unless otherwise specified.

^aCompared using chi-square.

reasoning was that it may be argued that individuals with experience managing finances are also more likely to have experience on other ADLs, which may explain the relationship between financial experience and impairment on other ADLs. For instance, if experience managing finances is associated with less shopping impairment, this may be explained by the fact that individuals with financial experience are also more likely to shop alone. If true, the original analyses would be repeated with the inexperienced shoppers excluded.

3 | RESULTS

Demographics and bivariate comparisons between individuals with and without experience managing finances are reported in Table 1. Independent-samples *t* tests revealed no significant group differences on age, years of education, and disease severity using the MMSE.

However, Pearson chi-square results showed a significant sex difference, with women showing a significantly greater likelihood of managing finances.

Chi-square results (see Table 2) revealed that experience managing finances was significantly associated with sustained ability to assemble tax forms and other important business papers ($P < .001$); play a game of skill or participate in a hobby ($P = .047$); understand and pay attention to television, books, or magazines ($P = .009$); and remember appointments and important dates ($P < .002$). Financial management experience was not significantly associated with shopping alone, preparing a hot beverage or balanced meal, keeping track of current events, or travelling out of the neighborhood. Post hoc analyses of significant IADLs (see Table 3) revealed that individuals with financial management experience were more likely to be fully independent (a score of 0) in assembling forms ($P < .001$), understanding

TABLE 2 Chi-square results comparing individuals with experience and inexperience on managing finances across instrumental activities of daily living included on the Functional Assessment Questionnaire

Instrumental Activities of Daily Living	Chi-Square	df	P Value	Cramer V
Assembling forms	41.68	3	<.001	0.22
Shopping alone	7.07	3	.07	-
Playing a game or hobby ^a	6.68	3	.047	0.09
Preparing a hot beverage ^a	1.49	3	.69	-
Preparing a balanced meal ^a	5.23	3	.16	-
Keeping track of current events ^a	4.64	3	.20	-
Watching/understanding TV/magazines/books	9.44	2	.009	0.11
Remembering appointments and important dates	14.87	3	.002	0.13
Travelling out of the neighborhood	6.85	3	.08	-

Cramer V: small = 0.10; medium = 0.30; large = 0.50. Significant results at $P < .05$ are bolded.

^aStatistic and *P* value based on likelihood ratio as the sample size assumption of chi-square was violated.

TABLE 3 Post hoc analyses examining how many z scores of individuals with experience managing finances deviate from chance

	Score = 0 Normal Never Did But Could Do		Score = 1 Completes With Difficulty Never Did But Would Have Difficulty		Score = 2 Requires Assistance		Score = 3 Dependent	
	z Score	P Value	z Score	P Value	z Score	P Value	z Score	P Value
	Assembling forms	4.62	<.001	-6.35	<.001	0.26	.79	1.74
Game/hobby	1.69	0.09	-1.73	.08	-1.29	.20	1.42	.16
TV/magazines/books ^a	2.81	.005	-3.07	.002	0.17	.87	-	-
Remembering appointments/dates	3.70	<.001	-1.85	.06	-2.51	.012	-0.91	.36

Significant results at $P < .05$ are bolded.

^aCrosstabs based on a 2×3 design as no individuals were dependent on this IADL.

TV/magazines/books ($P < .005$), and remembering important dates ($P < .001$). Alternatively, individuals without financial management experience were more likely to receive a dependency score of 1 (ie, patient completes with some difficulty or patient never did this task but would have difficulty performing) in assembling forms ($P < .001$) and understanding TV/magazines/books ($P = .002$). Additionally, individuals without financial management experience had a higher probability of receiving a score of 2 (requires assistance) in remembering appointments and other important dates ($P = .012$). Post hoc analyses were trending for performing a game of skill or hobby ($P = .08-.09$), demonstrating a potential effect that was not statistically significant. As a result, participating in hobbies or a game of skill was not analyzed further.

When comparing experience managing finances with experience on these significant ADLs, financial experience was significantly associated with experience assembling important forms with a medium effect size ($\chi^2_1 = 186.34$, $N = 862$, $P < .001$, $\phi = 0.47$). For this reason, the association between experience managing finances and impairment on the ability to assemble important documents was rerun, but excluding those without experience assembling important forms ($n = 175$). With the exclusion of these individuals, experience managing finances was no longer associated with impairment assembling forms ($\chi^2_3 = 6.35$, $N = 687$, $P = .09$, $\phi = 0.1$).

Experience managing finances was not significantly associated with experience remembering important dates or experience watching TV. However, the robustness of our findings was tested by excluding individuals without experience watching TV ($n = 8$) and those without experience remembering important dates/appointments ($n = 21$). We found that despite the exclusion of these subjects, financial experience was still associated with problems watching TV ($\chi^2 = 9.66$, $P = .008$) and remembering appointments ($\chi^2 = 14.56$, $P = .002$).

4 | DISCUSSION

These results support the notion that financial management experience is associated with greater independence in terms of watching and following TV/books/magazines and in remembering important dates and appointments in persons with MCI. Post hoc analysis did not reveal a significant effect of participating a hobby or game of skill. Experience managing finances was significantly associated with the ability to assemble important forms; however, this may be explained by the fact that those with experience managing finances are also more likely to have experience assembling important forms.

Although causation cannot be inferred from these cross-sectional analyses, we hypothesize that experience managing finances may provide some resiliency to functional decline in MCI. Taking from the cognitive reserve literature,¹⁵ financial management experience may increase neural efficiency and neural compensation, possibly increasing one's capacity to maintain independence despite the presence of neurodegenerative processes. In other words, performing financial management activities may strengthen the neural networks associated with this task or other networks that may be called upon if the original

networks are disturbed in keeping with the course and neuropathology of a neurodegenerative disorder. As a result, these IADLs may become more resilient to the effects of neurodegeneration. To test this hypothesis, further research is needed.

When considering the influence of practice effects, it is fairly intuitive that regularly performing a task may increase an individual's procedural memory for that specific activity. Furthermore, it may be argued that it is irrelevant if you are unable to manage finances if you have never needed to perform this task prior to disease onset. For instance, the final score on the Disability Assessment for Dementia¹⁶ only takes into account ADLs that an individual has experience performing. However, in our study, we found that financial management experience was associated with independence in IADLs that appear conceptually unrelated to managing finances: (1) understanding TV/magazines/books and (2) remembering important dates and appointments.

We propose that financial management activities might result in an increased functional reserve in MCI, which may be associated with increased independence across activities. Given that managing finances is highly multifaceted in terms of cognitive demand, shared neural networks may exist between managing finances and other IADLs. A study by Okonkwo and colleagues¹⁷ found that in MCI, attention and executive functioning were significantly associated with an individual's ability to perform financial activities. Interestingly, this study found no significant effect of memory, suggesting that early IADL decline in MCI might be more reliably related to executive dysfunction, rather than memory impairment.¹⁷ This interpretation is consistent with our findings, where financial management experience is related to independence in the ability to follow, understand, and discuss entertainment (eg, TV and books). Although we can only speculate, as specific details are not obtained through the FAQ, this activity likely requires sustained attention and executive functioning. However, we found that experience managing finances was also related to the ability to remember appointments and important dates. Although this activity may rely heavily on memory, successful performance may also require the ability to plan ahead, organize a schedule, and/or use reminders. Furthermore, although both of these samples include primarily amnesic MCI participants, individuals included in our study may be more impaired than those included in the study of Okonkwo et al¹⁷ (average MMSE scores of 27.6 ± 1.8 vs 28.5 ± 1.5 , respectively). Therefore, memory decline may also have a greater impact on IADL performance in our sample.

There are several limitations to this study. Firstly, the measure of financial management experience used in this study was dichotomous. Therefore, significant variability may exist within the experienced group in terms of which aspects of financial experience have been undertaken, as well as the duration and frequency of task experience. Developing and validating a more specific measure of financial management experience may allow for more accurate assessment of functional reserve. Secondly, this analysis was cross-sectional; therefore, causality cannot be inferred from these results. It is possible that extraneous factors may account for the relationship found between experience managing finances and impairment in other IADLs. Thirdly, significant sex differences were identified between the experienced and inexperienced groups. However,

Berezuk and colleagues¹¹ report that after adjusting for IADL experience, no sex differences appear to exist in functional independence. Nevertheless, it is possible that our findings may be partially explained by gender.

In summary, having experience performing tasks specific to managing one's finances may have implications for independence in understanding and following TV, books, or magazines and remembering appointments and important dates in MCI. These results support the notion that inexperience on IADLs that are not required for everyday functioning, prior to disease onset for a particular individual, may have important implications for disability in other IADLs that are required for independence. Moreover, our findings may have implications in clinical settings. For example, knowing whether a cognitively intact individual who is at risk for dementia has experience managing finances may be useful for identifying risk for functional decline in other activities. However, it is important to underscore that longitudinal analyses of individuals at risk for dementia are needed to further validate and examine the potential protective effects of functional reserve. Furthermore, it would be of interest to study the impact that experience in other IADLs, such as shopping and cooking, has on functional disability.

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CONFLICT OF INTEREST

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AUTHOR CONTRIBUTIONS

All authors contributed significantly to the conception of the work. C. B. contributed to the analysis of the data and interpretation of findings. All authors contributed to critically reviewing the manuscript for important intellectual content and gave approval for the final version to be published.

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