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The Measurement of Everyday Cognition (ECog): Revisions and Updates

Sarah Tomaszewski Farias, Ph.D.¹, Alyssa Weakley, Ph.D.¹, Danielle Harvey, Ph.D.², Julie Chandler, Ph.D.³, Olivia Huss¹, Dan Mungas, Ph.D.¹

¹University of California, Davis Departments of Neurology

²University of California, Davis Departments of Public Health

³University of California, Davis Departments of Eli Lilly Pharmaceuticals

Abstract

INTRODUCTION: The Everyday Cognition scale (ECog), a measure of everyday functioning developed in 2008, is sensitive to early detection and progression of neurodegenerative disease. The goal was to update ECog item content to ensure relevancy to contemporary older adults from diverse backgrounds.

METHODS: Participants included 44 culturally diverse older adults (18 with normal cognition, 11 with Mild Cognitive Impairment) and their study partners. Item understandability and relevance was evaluated using iterative interviewing methods that were analyzed using standard qualitative methods. Based on this information, items were modified, deleted, or developed as needed.

RESULTS: Of the 39 original items, 19 were revised, 3 new items were added (primarily to cover contemporary activities such as use of technology), and 1 was deleted. The revised version (ECog-II) includes 41 items.

DISCUSSION: To ensure strong psychometric properties, and to facilitate harmonization of previously collected data, we preserved well over half of the items. Future work will validate the revised ECog by measuring associations with neuropsychological performance, external measures of disease, and other functional measures. Overall, the revised ECog will continue to be a useful tool for measuring cognitively relevant everyday abilities in clinical settings and intervention clinical trials.

The assessment of everyday functioning among older adults has a number of important applications. Dementia is a syndrome defined by both cognitive and functional deficits and therefore accurate functional assessment aids in diagnosis. However, even very early in the disease process subtle changes in function occur¹⁻² and greater difficulty predicts faster conversion to dementia³. Further, even among older adults without clear cognitive impairment, those with subtle functional difficulties are at elevated risk for progressing to mild cognitive impairment⁴ (MCI). Mild functional difficulties, therefore, are an early marker and/or risk for neurodegenerative disease. Identifying individuals with functional

Corresponding author: Alyssa Weakley, PhD, aweakley@ucdavis.edu.

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difficulties is also important to implement needed support. From a research perspective, the measurement of everyday function is an important outcome in both observational studies and treatment trials.

While a number of instruments measure functional abilities, many have limitations including over-reliance on global indices that lump potentially disparate functional abilities, as well as poor sensitivity to *mild* functional impairment and to change over time⁵. The Everyday Cognition questionnaire (ECog⁶) was developed with two explicit goals. The first was to create a psychometrically rigorous instrument to assess functional abilities in older adults across a wide range of ability, particularly those with early manifestations of functional changes. The second was to measure everyday/real-world functioning relevant to specific neuropsychological domains: Everyday Memory, Everyday Language, Everyday Visuospatial abilities, and three everyday executive domains including Everyday Planning, Everyday Organization, and Everyday Divided Attention. Initial validation studies supported its proposed factor structure⁶, and showed the ECog is sensitive to early functional changes⁶⁻⁷ and predicts disease progression from normal cognition to MCI⁸ and MCI to dementia⁹. The ECog also demonstrated good discrimination between diagnostic groups^{6,10} and is sensitive to different rates of change across diagnostic groups¹¹.

The ECog was developed and validated over a decade ago and, as such, some items may not be as relevant to contemporary activities and/or reflect activities involving the use of technology. Re-assessment and possible revision of the ECog to reflect these updates seemed prudent to ensuring the scale's continued relevance. Additionally, the ECog was designed primarily to be an informant-based questionnaire. However, we have now shown that a self-report version (used to assess subjective concerns) is as equally or more predictive of the development of MCI as the informant version⁸. As such, we sought to draw upon knowledge and insights of both informants and older adults themselves in updating the ECog.

In updating the ECog, we also sought to ensure its cultural applicability to older adults from diverse backgrounds. This is important because the U.S. aging population is becoming increasingly racially and ethnically diverse¹². Additionally, there is evidence that older adults of minority groups may be disproportionately affected by Alzheimer's disease (AD) and related disorders¹³. Therefore, it is critical that functional outcome measures used in observational studies and clinical trials be culturally relevant and have similar psychometric properties across diverse populations. In recent work examining potential measurement bias using differential item function analysis (DIF), the ECog showed some degree of DIF across African American and Hispanic individuals in select ECog domains, although overall effects were small and did not change relationship between the ECog and other disease indicators¹⁴. In the present study, we explicitly sought to include a diverse group of participants to ensure a broad spectrum of perspectives to help ensure the scale's cultural relevance. The goal of the current study was to update and refine the ECog to ensure item relevancy to contemporary older adults from diverse backgrounds.

Methods

Participants

Participants included older adults enrolled in the University of California, Davis Alzheimer's Disease Research Center (UCD ADC) longitudinal cohort¹⁵⁻¹⁷ as well as informants/study partners of cohort enrollees. In order to be eligible, older adults had to be cognitively normal or have MCI (those with dementia were excluded because of the focus on early functional changes as well as reduced reliability of self-report in dementia). Participants also had to be able to read, speak, and understand English or Spanish and able to provide written informed consent. The study was approved by the UC Davis Institutional Review Board and all participants provided informed consent to participate in this study.

Interview Procedure

Interviews were conducted in-person either at the UCD ADRC or in the person's home. A trained, bilingual research assistant conducted the interviews. First, individuals completed the ECog. The original ECog was comprised of 39 questions rated on a Likert scale ranging from: 1= better or no change; 2 = questionable/occasionally worse; 3 = consistently a little worse; 4 = consistently much worse. There was also an option to indicate that the rater cannot respond ("don't know"). The ECog was completed first in order to serve as the basis of the semi-structured interview questions.

Next, standardized semi-structured interviews were conducted following a guide and using standard, well documented procedures¹⁸⁻²¹. The "think aloud" technique was used to reveal the thought process involved in providing a response, followed by additional verbal probes/specific questions. The interviews began by assessing the respondent's understanding of test instructions and response options. The majority of the interview consisted of reviewing each ECog item. For each item, probes were designed to assess the respondent's understanding of each question, this included having them paraphrase the question in their own words, asking about any difficulty understanding particular words/phrases, and eliciting any suggestions for enhancements or clarifications. Respondents were then asked whether they viewed the ability assessed by each item as applicable and important to a typical older adult's everyday life (relevance). Finally, at the end of each ECog domain, individuals were asked whether they could think of other examples of similar abilities that were not included in order to potentially generate new items.

All interviews were audio-recorded and transcribed. Two rounds of interviews were conducted with two separate groups of participants. The primary purpose of the first round of interviews was to collect initial data on content relevance and understandability of items, and solicitation of suggestions for improvements and/or new items. The purpose of the second round of interviews was to pilot the revised and new items based on the initial interviews.

Data Analysis

Interviews were analyzed using ATLAS.ti qualitative data analysis software version 8.0. ATLAS.ti software was designed for the qualitative analysis of textual, graphical, audio, and

video data; in the current study the data was textual (i.e., transcribed audio recordings). It is fundamentally a concept database that allows the researcher to create and enter names of concepts, or “codes,” to be used for conceptualizing large amounts of qualitative data. The program allows the analyst to organize and relate these concepts to each other in order to evaluate the underlying structure of the qualitative data. Using ATLAS.ti, qualitative data can be systematically analyzed, coded, and compared. Transcripts were reviewed and quality checked before being analyzed. Data was analyzed in line with best practice; a sample was coded by two research staff and assessed for reliability during a consolidation meeting. The research team reviewed coding, discussed results, and determined if revisions or refinements to the coding dictionary needed to be made. If any of the ECog items was deemed to be problematic, they were reviewed for possible modification.

Results

Demographic characteristics

A total of 44 individuals were recruited and interviewed (Round 1: N=26, Round 2: N=18). Interviewing was discontinued with one MCI participant found to be too impaired. Of the entire sample in both interview rounds, 29 older adults (18 with normal cognition and 11 with MCI) and 15 informants were interviewed (see Table 1 for participant characteristics broken down by interview Round 1 and 2 and by older adult and informant). The majority of interviews were conducted in English; however, interviews with native Spanish speaking participants were also conducted (N = 6). Results presented in this manuscript reflect feedback collected from all participants regardless of their language and any updates/changes to the ECog were made to both the English and Spanish (available upon request) versions.

Evaluation of instructions and response options

Table 2 provides the original and revised instructions based on interview feedback. The first round of interviews revealed that most participants (88%) understood the instrument instructions as intended. Clarification of the recall period was recommended by 23% of the participants. To address this feedback, updated instructions add an emphasis on judging how a person is currently functioning compared to their *own baseline level of ability*, which was the intent of the original instructions. In the second round of interviews, the revised instructions were considered to be understandable and no further changes were made.

No participants endorsed issues regarding response options ranging from 1–4. A small minority (17%) commented that the ‘don’t know’ category needed to be expanded/clarified to encompass items that were not applicable (e.g., a person never engaged in a particular activity). The category was modified to read: “don’t know/*not applicable*.” In the second round of interviews, participants reported good understanding of the response options and were able to accurately respond and no further changes were made.

Evaluation of individual items

Table 3 presents the original 39 items of the ECog, the rationale for any changes made, additions/deletion of items across the two rounds of interviews, and the final version of each

item (table based on the Informant version, self-report version reflects the same content). Of the original 39 items, half (19 items) were determined to require no change because they were both well understood and judged to be relevant to the lives of most older adults. A total of 19 items were revised, most of which reflected minor wording changes to improve understandability without substantially modifying the content. Three new items were added, and one item was deleted entirely. The revised version (ECog-II) contains 41 items.

In the Everyday Memory domain, 6 of the original 8 items remained unchanged. Two items underwent minor edits to improve the clarity/understandability. One new item was added to reflect prospectively remembering to take medications or pay bills as these were noted as important tasks for older adults among several interviewees in Round 1 and confirmed to be well understood and highly relevant in round two interviews. In the Everyday Language domain, 6 of the original 9 items remained unchanged. Three items underwent minor revisions for increased clarity/ understandability. Of the ECog domains, the Everyday Visuospatial domain underwent the most revisions based on interview feedback and largely reflected changes in relevant daily activities of older adults. Feedback during the interviews indicated that older adults no longer utilize traditional maps, and now rely primarily on electronic navigational tools. As a result, the original item assessing following a map to find a new location was revised to measure increased reliance on or difficulty using navigational aids like GPS, and the item referring to reading a map to help someone else navigate was deleted entirely. Three items were revised to clarify the intent or meaning with the general content remaining essentially the same and another item was revised to increase the relevance of the content. Two new items were added, 1 to assess alternative navigational approaches (e.g., use of landmarks to find locations) and the other to judge distances while driving. Within the Planning domain, 2 of the original 5 items remained unchanged. For the other 3 items, greater detail and/or examples were provided to increase understanding and decrease ambiguity. Within the Everyday Organization domain, 2 of the original 6 items remained unchanged and 4 items were revised for clarity/understanding. Finally, within the Divided Attention domain, 2 items were revised for increased clarity and 2 items remain unchanged.

Discussion & Implications

The ECog was developed over a decade ago to measuring early and subtle changes in everyday functional abilities, and since then there have been a number of sociocultural shifts in how older adults regularly engage in common everyday activities. For example, the proliferation of smart phones and other GPS devices have changed how people navigate in their environment, making use of traditional maps rare now. Additionally, online banking has reduced the need to pay bills through the mail and has changed how people track financial transactions. We sought to re-evaluate and revise, where appropriate, the content of the ECog to ensure items are contemporaneously relevant. This revision was also undertaken within the context of recognizing that the older adult population is becoming increasingly diverse in terms of ethnic and racial background¹³ and it was also important to ensure the comprehension and relevance of items among a diverse group of older adults.

Overall, participants provided positive feedback and found the items easy to understand and highly relevant. The majority of the original items were not modified or underwent only slight wording changes to enhance understandability. The two domains that underwent the least revisions were the Everyday Memory and Everyday Language where only 2–3 items in each domain required slight modifications to improve understandability. The Everyday Memory domain has been previously shown to be particularly important in predicting likelihood of disease progression⁹ and measuring response to behavioral interventions²². It is expected that the revised memory domain should retain similar psychometric properties. One new memory item was added to assess prospective memory related to remembering to pay bills or take medications. This addition was mentioned by several informants who reported this type of ability as an early functional change. Previous work has showed reduced prospective memory in individuals who go on to develop dementia within 1–5 years²³ and in individuals already diagnosed with MCI and dementia^{23–26}. Further, prospective memory has been found to be a key predictor of functional independence and partially mediates the relationship between older age and poor everyday functioning²⁷.

There were relatively few items from the original ECog that were judged to have poor relevance to the everyday activities of most older adults. However, as anticipated, within the Everyday Visuospatial domain, the content of two items pertaining to map usage were judged by a considerable percent of interviewees (44%) to be no longer highly relevant as reflected by such statements as ‘no one uses a map now... I don’t carry a map.’ Thus, questions about using a map were modified or deleted. Despite this, navigational ability was still recognized as important. Based on interview feedback and a review of the literature^{28–30}, one of the original items assessing map use was changed to reflect increased reliance on or difficulty using GPS to navigate around town. Additionally, two new items were added, the first focusing on the use of landmarks to navigate, an ability shown in previous research to decline with age^{31–32} and to be associated with increased risk for developing AD³³. Informants also noted difficulty judging distance between cars while driving as an important ability, a skill previously shown to be reduced in individuals with MCI³⁴.

The original ECog contained three domains assessing everyday executive functions, related to planning, organization, and divided attention and this structure remains the same in the revised version. In the Everyday Planning domain, 2 items remained unchanged, the other 3 items continued to evaluate similar content, but participant feedback supported providing further elaboration in order to decrease the ambiguity. Within the Everyday Organization domain, most items also only underwent minor wording change. The exception was that the item measuring balancing a checkbook was no longer endorsed as highly relevant; a finding also consistent with recent literature³⁵. As such, the content of that item was revised to reflect the broader ability to manage bill payments without specific reference to a checkbook. Finally, the items of the Everyday Divided Attention domain were largely unchanged (2 were left completely unchanged and the other 2 underwent very minor wording edits). Executively-based abilities are known to be particularly important to functional independence^{9,36–37} and performance in the various ECog executive domains are associated with subsequent loss of independence and conversion to dementia⁹ and

development of MCI³. Given minimal content change, it is likely this domain will retain similar psychometric properties.

Feedback indicated that the instructions and response options were well understood. It was recommended by roughly a quarter of the sample to clarify or provide further instruction regarding the recall period of 10 years. As a result, we added explicit reference to an individual's own baseline and results of round two interviews support good understandability with this modification. The general intent of both the original and revised version is to measure whether there has been a *change* in one's everyday abilities compared to an individual's own customary level of performance that may indicate the presence of a neurodegenerative disease or other acquired cause of dysfunction. Using the original format, the ECog has been shown to be sensitive to change over time¹¹ and to measuring change in intervention outcomes²². Response options remain largely unchanged in the revised ECog with the exception that "not applicable" was added to the "don't know" option to cover a broader range of reasons the responder is unable to provide a response to an item.

We explicitly set out to recruit participants from diverse backgrounds to ensure content relevance to a wide range of individuals and that the items were well understood. As a result, roughly two-thirds of the study sample was African American and Latino/a, reflecting the largest minority groups in the U.S.¹³ Very few studies have examined differences in functional abilities across ethnic/racial groups. However, recently we published evidence of some degree of measurement bias among select minorities, although the degree of DIF was small and did not appear to influence the association between the ECog and cognitive or brain variables¹⁴. Regardless, measurement bias is an important concern because valid inferences about individual differences in functional abilities of persons from diverse groups cannot be made unless the attributes relate to observed test scores in the same way across the different groups³⁸. In future work, it will be important to evaluate whether updates made have reduced evidence of the small DIF previously demonstrated in select ECog domains.

As with any study, there are strengths and weaknesses. As noted, the sample of participants was diverse. We also interviewed individuals who were Spanish speaking. We did not find that content of the items needed to be altered in the Spanish language version as compared to the English language version. However, the total sample of Spanish speakers was small (N = 6) and so further validation work with this population is important. While we strove to have a representative sample, we focused on the two largest minority groups in the U.S.. Future work should examine the ECog among other ethnorracial groups.

In summary, the original ECog has good reliability as well as concurrent, discriminative and predictive validity^{6,39}. Further, it is sensitive to very early functional difficulties⁶⁻⁷, to longitudinal change across diagnostic categories¹¹, and is associated with other disease markers such as the presence of amyloid and tau³⁹, neurodegeneration on structural imaging, and objective measures of cognition⁴⁰. Overall, the ECog has proven to be a useful tool for measuring cognitively relevant everyday abilities that has been widely used in numerous large observation studies as well as an outcome in many pharmacological and behavioral intervention clinical trials. To ensure similarly strong psychometric properties in the revised ECog, and to facilitate harmonization of previously collected data using the original version,

we have preserved well over half of the items in either their original form or with only minor changes to increase readability while retaining the content. Major item revisions and newly generated items were limited but were deemed important to ensure that the content of the revised ECog remains relevant and applicable to the lives of older adults from diverse backgrounds. Future work will re-examine and confirm some of the original ECog validation work to ensure the ECog-II demonstrates similar relationships with external variables such as cognition and disease biomarkers as its predecessor.

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References

1. Gold DA (2012). An examination of instrumental activities of daily living assessment in older adults and mild cognitive impairment. *Journal of clinical and experimental neuropsychology*, 34(1), 11–34. [PubMed: 22053873]
2. Jekel K, Damian M, Wattmo C, Hausner L, Bullock R, Connelly PJ, Dubois B, Eriksdotter M, Ewers M, Graessel E, Kramerberger MG, Law E, Mecocci P, Molinuevo JL, Nygård L, Olde-Rikkert MG, Orgogozo JM, Pasquier F, Peres K, Salmon E, Sikkes SA, Sobow T, Spiegel R, Tsolaki M, Winblad B, Frölich L: Mild cognitive impairment and deficits in instrumental activities of daily living: a systematic review. *Alzheimers Res Ther* 2015; 7: 17. [PubMed: 25815063]
3. Farias ST, Lau K, Harvey D, Denny KG, Barba C, & Mefford AN (2017). Early functional limitations in cognitively normal older adults predict diagnostic conversion to mild cognitive impairment. *Journal of the American Geriatrics Society*, 65(6), 1152–1158. [PubMed: 28306147]
4. Farias ST, Giovannetti T, Payne BR, Marsiske M, Rebok GW, Schaie KW, ... & Gross AL (2018). Self-perceived difficulties in everyday function precede cognitive decline among older adults in the ACTIVE study. *Journal of the International Neuropsychological Society*, 24(1), 104–112. [PubMed: 28797312]
5. Sikkes SAM, De Lange-de Klerk ESM, Pijnenburg YAL, & Scheltens P. (2009). A systematic review of Instrumental Activities of Daily Living scales in dementia: room for improvement. *Journal of Neurology, Neurosurgery & Psychiatry*, 80(1), 7–12.
6. Farias ST, Mungas D, Reed BR, Cahn-Weiner D, Jagust W, Baynes K, & DeCarli C. (2008). The measurement of everyday cognition (ECog): scale development and psychometric properties. *Neuropsychology*, 22(4), 531. [PubMed: 18590364]
7. Farias ST, Mungas D, Reed BR, Harvey D, Cahn-Weiner D, & DeCarli C. (2006). MCI is associated with deficits in everyday functioning. *Alzheimer disease and associated disorders*, 20(4), 217. [PubMed: 17132965]
8. Farias ST, Lau K, Harvey D, Denny KG, Barba C, & Mefford AN (2017). Early functional limitations in cognitively normal older adults predict diagnostic conversion to mild cognitive impairment. *Journal of the American Geriatrics Society*, 65(6), 1152–1158. [PubMed: 28306147]
9. Lau KM, Parikh M, Harvey DJ, Huang CJ, & Farias ST (2015). Early cognitively based functional limitations predict loss of independence in instrumental activities of daily living in older adults. *Journal of the International Neuropsychological Society*, 21(9), 688–698. [PubMed: 26391766]
10. Park LQ, Harvey D, Johnson J, & Farias ST (2015). Deficits in everyday function differ in AD and FTD. *Alzheimer disease and associated disorders*, 29(4), 301. [PubMed: 25590940]
11. Farias ST, Chou E, , Harvey DJ, Mungas D, Reed B, DeCarli C, Park LQ, and Beckett L. (2013) Longitudinal trajectories of everyday function by diagnostic status. *Psychology and aging* 28, 4, 1070–1075. [PubMed: 24364409]
12. U.S. Census Bureau (2018). Retrieved from <https://www.prb.org/aging-unitedstates-fact-sheet/> on 5/24/2020.

13. Matthews KA, Xu W, Gaglioti AH, Holt JB, Croft JB, Mack D, & McGuire LC (2019). Racial and ethnic estimates of Alzheimer's disease and related dementias in the United States (2015–2060) in adults aged 65 years. *Alzheimer's & Dementia*, 15(1), 17–24.
14. Filshtein T, Chan M, Mungas D, Whitmer R, Fletcher E, DeCarli C, & Farias S. (2020). Differential item functioning of the everyday cognition (ECoG) scales in relation to racial/ethnic groups. *Journal of the International Neuropsychological Society*, 1–12.
15. Early DR, Widaman KF, Harvey D, Beckett L, Park LQ, Farias ST, ... & Mungas D. (2013). Demographic predictors of cognitive change in ethnically diverse older persons. *Psychology and Aging*, 28(3), 633. [PubMed: 23437898]
16. Hinton L, Carter K, Reed BR, Beckett L, Lara E, DeCarli C, & Mungas D. (2010). Recruitment of a community-based cohort for research on diversity and risk of dementia. *Alzheimer disease and associated disorders*, 24(3), 234. [PubMed: 20625273]
17. Mungas D, Beckett L, Harvey D, Tomaszewski Farias S, Reed B, Carmichael O, ... & DeCarli C. (2010). Heterogeneity of cognitive trajectories in diverse older persons. *Psychology and aging*, 25(3), 606. [PubMed: 20677882]
18. Harris-Kojetin LD, Fowler FJ, Brown JA. The use of cognitive testing to develop and evaluate CAHPS 1.0 core survey items. *Consumer Assessment of Health Plans Study. Medical Care*1999; 37:MS10-MS21.
19. Napoles-Springer A, Santoyo-Olsson J, O'Brien H, Stewart AL. Using cognitive interviews to develop surveys in diverse populations. *Medical Care*2006;44:S21–S30. [PubMed: 17060830]
20. Oksenberg L, Cannell C, Kalton G. New strategies for retesting survey questions. *J Off Stat*1991;3:349–365.
21. Rosal MC, Carbone ET, & Goins KV (2003). Use of cognitive interviewing to adapt measurement instruments for low-literate Hispanics. *The Diabetes Educator*, 29(6), 1006–1017. [PubMed: 14692374]
22. Greenaway MC, Duncan NL, & Smith GE (2013). The memory support system for mild cognitive impairment: randomized trial of a cognitive rehabilitation intervention. *International journal of geriatric psychiatry*, 28(4), 402–409. [PubMed: 22678947]
23. Boraxbekk Carl-Johan, Lundquist Anders, Nordin Annelie, Nyberg Lars, Nilsson Lars-Göran, and Adolfsson Rolf. "Free recall episodic memory performance predicts dementia ten years prior to clinical diagnosis: findings from the betula longitudinal study." *Dementia and geriatric cognitive disorders extra* 5, no. 2 (2015): 191–202. [PubMed: 26078750]
24. Costa A, Caltagirone C, & Carlesimo GA (2011). Prospective memory impairment in mild cognitive impairment: An analytical review. *Neuropsychology Review*, 21(4), 390–404. [PubMed: 21773811]
25. Tse CS, Chang JF, Fung AW, Lam LC, Hau KT, Leung GT, & Balota DA (2015). The utility of a non-verbal prospective memory measure as a sensitive marker for early-stage Alzheimer's disease in Hong Kong. *International psychogeriatrics*, 27(2), 231–242.
26. van den Berg E, Kant N, & Postma A. (2012). Remember to buy milk on the way home! A meta-analytic review of prospective memory in mild cognitive impairment and dementia. *Journal of the International Neuropsychological Society*, 18(4), 706–716. [PubMed: 22595831]
27. Sheppard DP, Matchanova A, Sullivan KL, Kazimi SI, & Woods SP (2019). Prospective memory partially mediates the association between aging and everyday functioning. *The Clinical Neuropsychologist*, 1–20.
28. Dickerson A. (2019). Evidence to Support the Older Adult's Driving and Community Mobility Through the Use of GPS. *American Journal of Occupational Therapy*, 73.
29. Thomas FD, Dickerson AE, Graham LA, Coleman MC, Finstad KA, Blomberg RD, & Wright TJ (2020). Teaching older drivers to navigate GPS technology. *Journal of safety research*, 72, 165–171. [PubMed: 32199559]
30. Yi J, Lee HCY, Parsons R, & Falkmer T. (2015). The effect of the global positioning system on the driving performance of people with mild Alzheimer's disease. *Gerontology*, 61(1), 79–88. [PubMed: 25342271]
31. Liu I, Levy RM, Barton JJ, Iaria G. 2011. Age and gender differences in various topographical orientation strategies. *Brain Res*1410:112–119. [PubMed: 21803342]

32. Zhong JY, & Moffat SD (2016). Age-related differences in associative learning of landmarks and heading directions in a virtual navigation task. *Frontiers in Aging Neuroscience*, 8, 122. [PubMed: 27303290]
33. Lithfous S, Dufour A, & Després O. (2013). Spatial navigation in normal aging and the prodromal stage of Alzheimer's disease: insights from imaging and behavioral studies. *Ageing research reviews*, 12(1), 201–213. [PubMed: 22771718]
34. Wadley VG, Okonkwo O, Crowe M, Vance DE, Elgin JM, Ball KK, & Owsley C. (2009). Mild cognitive impairment and everyday function: an investigation of driving performance. *Journal of geriatric Psychiatry and Neurology*, 22(2), 87–94. [PubMed: 19196629]
35. Schuh S. & Stavins J. (2010). Why are (some) consumers (finally) writing fewer checks? The role of payment characteristics. *Journal of Banking & Finance*, 34(8), 1745–1758.
36. Lahav O, & Katz N. (2020). Independent Older Adult's IADL and Executive Function According to Cognitive Performance. *OTJR: Occupation, Participation and Health*, 40, 183–189.
37. Overdorp EJ, Kessels RP, Claassen JA, & Oosterman JM (2016). The combined effect of neuropsychological and neuropathological deficits on instrumental activities of daily living in older adults: a systematic review. *Neuropsychology review*, 26(1), 92–106. [PubMed: 26732392]
38. Gregorich SE (2006). Do self-report instruments allow meaningful comparisons across diverse population groups? Testing measurement invariance using the confirmatory factor analysis framework. *Medical care*, 44(11 Suppl 3), S78. [PubMed: 17060839]
39. Rueda AD, Lau KM, Saito N, Harvey D, Risacher SL, Aisen PS, ... & Alzheimer's Disease Neuroimaging Initiative. (2015). Self-rated and informant-rated everyday function in comparison to objective markers of Alzheimer's disease. *Alzheimer's & Dementia*, 11(9), 1080–1089.
40. Farias ST, Park LQ, Harvey DJ, Simon C, Reed BR, Carmichael O, & Mungas D. (2013). Everyday cognition in older adults: Associations with neuropsychological performance and structural brain imaging. *Journal of the International Neuropsychological Society*, 19(4), 430–441. [PubMed: 23369894]

Table 1.

Sociodemographic Results

	Interview Round				Total
	1		2		
	Older Adult Total	Informant Total	Older Adult Total	Informant Total	
<i>N</i>	17	9	12	6	44 (100%)
English	15	9	10	6	40 (91%)
Spanish	2	0	2	0	4 (9%)
MCI	7 (27%)	NA	4 (22%)	NA	11 (38%)*
Normal Cognition	10 (38%)	NA	8 (44%)	NA	18 (62%)*
Average Age in Years (SD)	75 (5.5)	70 (16.7)	81 (6.7)	78 (12.3)	76.2 (12.5)
Male	10 (59%)	3 (33%)	3 (16%)	2 (33%)	18 (41%)
Female	7 (41%)	6 (67%)	9 (84%)	4 (66%)	26 (59%)
Average Education in Years (SD, range)	16 (2.8, 10–21)	16 (2.6, 12–20)	14 (4.6, 4–20)	15 (2.0, 12–18)	15 (3.4, 4–21)
Latino**	7	3	5	4	19 (43%)
White	7	5	6	2	20 (45%)
Black/African American	4	2	2	0	8 (18%)
American Indian/Alaska Native	1	0	0	2	3 (7%)
Other	5	2	4	2	13 (30%)

Note. Numbers represent raw data unless otherwise indicated.

* Total is for older adult non-informant participants only.

** Latino was asked separately from the other categories below (e.g., individuals could identify as Latino and White)

Table 2.

Original and revised ECog instructions and response options.

Original ECog	Rationale for Revision	Final Version
Please rate his/her ability to perform certain everyday tasks NOW , <u>as compared to his/her ability to do these same tasks 10 years ago</u> . In other words, try to remember how they were doing 10 years ago and indicate any change in their level of ability. Rate the amount of change on a five-point scale ranging from: 1) there has been no change in their ability compared to 10 years ago, 2) they occasionally perform the task worse but not all the time, 3) they consistently perform the task a little worse than 10 years ago, 4) they perform the task much worse than 10 years ago or, 9) I don't know. Circle the one that fits your response.	To clarify the intention of the recall period as a comparison with the person's baseline level of ability.	Please rate his/her ability to perform certain everyday tasks NOW , <u>as compared to his/her own baseline (for example you could compare the individual's ability to do these same tasks 10 years ago)</u> . In other words, try to remember how they were doing 10 years ago and indicate any change in their level of ability. Rate the amount of change on a five-point scale ranging from: 1) there has been no change in their ability compared to 10 years ago, 2) they occasionally perform the task worse but not all the time, 3) they consistently perform the task a little worse than 10 years ago, 4) they perform the task much worse than 10 years ago or, 9) I don't know. Circle the one that fits your response.
Response Options		
1) Better or not change 2) Questionable/Occasionally worse 3) Consistently a little worse 4) Consistently much worse 9) Don't know	1) Better or not change 2) Questionable/Occasionally worse 3) Consistently a little worse 4) Consistently much worse 9) Don't know/Not applicable	

Table 3.

Original and Revised ECog Questions

Original Version	Rationale for Change	Final Version
Memory Domain		
Remembering a few shopping items without a list.	No change; understandable and relevant.	Remembering a few shopping items without a list.
Remembering things that happened recently (such as outings, events in the news). Recalling conversations a few days later.	No change; understandable and relevant. No change; understandable and relevant.	Remembering things that happened recently (such as outings, events in the news). Recalling conversations a few days later.
Remembering where he/she has placed objects.	Updated to clarify the intent of the item as asking about personal items.	Remembering where he/she has placed personal items or objects.
Repeating stories and/or questions.	Updated to clarify that this item was asking about unknowingly repeating stories/questions.	Unknowingly repeating stories and/or questions multiple times.
Remembering the current date or day of the week.	No change; understandable and relevant.	Remembering the current date or day of the week.
Remembering he/she has already told someone something.	No change; understandable and relevant.	Remembering he/she has already told someone something.
Remembering appointments, meetings, or engagements.	No change; understandable and relevant.	Remembering appointments, meetings, or engagements.
Language Domain		
Forgetting the names of objects.	NEW ITEM: This item was added as participants felt this was an important ability in older adults.	Remembering to do important tasks like pay bills or take medications.
Verbally giving instructions to others.	Updated and provided examples to clarify the intent of the item.	Coming up with the right names of commonly used everyday objects (e.g., telephone, toothbrush). Verbally giving instructions to others.
Finding the right words to use in conversation.	No change; understandable and relevant.	Finding the exact right words to use in conversation.
Communicating thoughts in a conversation.	Updated to ensure understanding. Updated to clarify the distinction between finding the right words (above item) and more broadly communicating thoughts.	Communicating or expressing ideas in a conversation.
Following a story in a book or on TV.	No change; understandable and relevant.	Following a story in a book or on TV.
Understanding the point of what other people are trying to say.	No change; understandable and relevant.	Understanding the point of what other people are trying to say.
Remembering the meaning of common words.	No change; understandable and relevant.	Remembering the meaning of common words.
Describing a program he/she has watched on TV.	No change; understandable and relevant.	Describing a program he/she has watched on TV.
Understanding spoken directions or instructions.	No change; understandable and relevant.	Understanding spoken directions or instructions.
Visual, Spatial and Perceptual Abilities Domain		
Following a map to find a new location.	Updated to include technological devices which are commonly used for navigation in place of a map.	Increased reliance on using navigational aids (like GPS or smartphone) to find your way around town.

Original Version	Rationale for Change	Final Version
Reading a map and helping with the directions when someone else is driving.	Removed: This item was removed as participants did not feel reading a map was relevant to their everyday lives.	
Finding his/her car in a parking lot.	No change; understandable and relevant.	Finding his/her car in a parking lot.
Finding the way back to a meeting spot in the mall, or other location	Updated as many people do not frequent a mall so added new example.	Finding the way back to a familiar location (e.g., a long-term friend's home).
Finding his/her way around a familiar neighbourhood.	Updated to clarify intent of the item as asking about their own neighbourhood, some participants were unsure of what a 'familiar' neighbourhood was.	Finding his/her way around their own neighbourhood.
Finding his/her way around a familiar store.	Updated to include other buildings as some participants rarely went to the store.	Finding his/her way around a familiar store or other building.
Finding his/her way around a house visited many times.	Updated to clarify intent as asking about a familiar home.	Finding his/her way around a familiar home.
NEW ITEM	This item was added as participants mentioned increased reliance on landmarks for navigation.	Use of landmarks in the environment to find locations (e.g., turn left after the grocery store).
NEW ITEM	Participants mentioned having difficulty judging distances whilst driving. This was thought to be an important ability in older adults.	Difficulty calculating distances when driving or driving too close to another vehicle.
Executive Functioning - Planning		
Planning the sequence of stops on a shopping trip.	No change; understandable and relevant.	Planning the sequence of stops on a shopping trip.
The ability to anticipate weather changes and plan accordingly (i.e., bring a coat or umbrella).	No change; understandable and relevant.	The ability to anticipate weather changes and plan accordingly (i.e., bring a coat or umbrella).
Developing a schedule in advance to anticipated events.	Updated to clarify the intent of the item as there was some confusion. The word planning was also included to ensure this was understood as an activity relating to planning.	Planning and sticking to a schedule for the day when there are several things to be done.
Thinking things through before acting.	Updated in order to clarify the intent: 'before making a major decision' was included in the item to ensure correct understanding.	Thinking things through before making a major decision (e.g., making a big purchase).
Thinking ahead.	Updated as participants were unsure of the intent of this item and thought it was too vague.	Planning a trip, vacation or outing.
Executive Functioning - Organization		
Keeping living and work space organized.	Updated to include examples of areas which were likely to remain organized.	Keeping living and work space (such as a home office, garage or pantry) organized.
Balancing the check book without error.	Updated as participants felt that balancing a check book was outdated.	Managing bill payments.
Keeping financial records organized.	Updated as some participants didn't feel organising financial records was relevant to them. Other documents was considered to be relevant to the older adult population.	Keeping financial records or other documents organized so they are easy to find when needed.
Prioritizing tasks by importance.	Updated to include an explanation/example of the intent, 'doing the most important things first' was added to improve understanding.	Prioritizing tasks by importance (doing the most important things first).
Keeping mail and papers organized.	No change; understandable and relevant.	Keeping mail and papers organized.

Original Version	Rationale for Change	Final Version
Using an organized strategy to manage a medication schedule involving multiple medications.	No change; understandable and relevant.	Using an organized strategy to manage a medication schedule involving multiple medications.
Executive Functioning – Divided Attention		
The ability to do two things at once.	No change; understandable and relevant.	The ability to do two things at once.
Returning to a task after being interrupted.	No change; understandable and relevant.	Returning to a task after being interrupted.
The ability to concentrate on a task without being distracted by external things in the environment.	Updated as some participants were unsure what ‘environment’ meant in the context of the item.	The ability to concentrate on and complete a task without being distracted by other things.
Cooking or working and talking at the same time.	Updated to clarify the intent. Some participants understood this item as only applying to cooking or working and not other tasks.	Working on a particular task while talking to someone at the same time.