Reliability of the MIND Diet Screener in Older Adults: A Brief Tool to Assess Adherence to a Brain-Healthy Dietary Pattern

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Abstract

This study tested the reliability of telephone administration of the validated MIND (Mediterranean-DASH diet Intervention for Neurodegenerative Delay) Diet Screener in older adults, a demographic at risk of dementia and compromised recall. Adults aged 75–101 years completed the 15-item MIND Diet Screener by telephone interview at two timepoints. Participants (n=60; 86±6 years, 67% female) scored 9.4±1.8 and 9.2±1.8 out of 15 points, with an intra-class correlation coefficient of 0.71. Telephone administration of the MIND Diet Screener was feasible with good reliability, supporting its suitability for Extension program evaluation. Reliability testing of face-to-face and self-administration in older adults is needed.

Introduction

Adherence to a healthful dietary pattern versus a Western diet supports an overall reduced risk of chronic disease, including neurodegeneration (Arnoldy et al., 2023) and the risk of mild cognitive impairment and Alzheimer's disease (Fu et al., 2022). Specifically, diets comprised of vegetables, fruits, unsaturated vegetable oils, nuts, legumes, and fish during adulthood decrease the risk of cognitive impairment and dementia (Boushey et al., 2020) and continue to support cognitive health into older adulthood (Munoz-Garcia et al, 2020). Although the Mediterranean dietary pattern has long been associated with reduced risk of cognitive decline (Scarmeas et al., 2009) and dementia (Scarmeas et al., 2006), the MIND (Mediterranean-DASH diet Intervention for Neurodegenerative Delay) dietary pattern is specifically tailored for brain health. The MIND dietary pattern is strongly associated with better cognitive function in older adults and is superior to the Mediterranean dietary pattern (Kheirouri et al., 2022), particularly for North American populations (van Soest et al., 2024). The MIND dietary pattern, in accordance with the Mediterranean diet, emphasizes plant-based foods and olive oil with moderate-to-high consumption of fish and seafood, moderate-to-low intake of dairy products, low intake of meat, and with particular emphasis on green leafy vegetables and fruits high in antioxidants such as berries as well as limiting foods high in saturated fat (Marcason, 2015). Most recently, green leafy vegetable intake has been associated with less amyloid plaque, the hallmark of Alzheimer's disease pathology (Agarwal et al., 2023).

Dietary assessment methodologies for determining adherence to healthful dietary patterns are burdensome, particularly for older adults (Mueller, 2015), making them less feasible for routine use in Extension nutrition education evaluation or community-based research. In contrast, dietary screeners may offer quick yet valid and reliable indicators of adherence to healthful dietary patterns (Bailey, 2021). The MIND Diet Screener is a 15-item questionnaire that estimates adherence to the MIND dietary pattern associated with better cognitive function (Mueller et al., 2020). Although the MIND Diet Screener is validated in adults (57.7 ± 6.4 and 69.8 ± 4.3 years of age) (Mueller et al., 2020; Tangney et al., 2023), its reliability has not yet been established in older adults, a cohort at higher risk of dementia (CDC, 2019) and compromised recall (Handing et al., 2023). Additionally, as food insecurity, inadequate access to healthful foods due to social and economic circumstances, is inversely associated with cognitive function (Gao et al., 2009; Wong et al., 2016), it may contribute to poor recall and reliability of dietary screening and assessment.

Objective

Family and Consumer Sciences (FCS) Extension programming promoting healthful dietary patterns requires valid and reliable tools for pre- and post-evaluation. The primary aim of this study was to determine the test-retest reliability and internal consistency of the MIND Diet Screener in middle-old (75 to 84 years) and oldest-old (≥ 85 years) adults. An exploratory aim was to assess whether food security status affected the reliability of the screener.

Method

In this cross-sectional study, a convenience sample of community-dwelling older adults (75-105 years of age) was recruited in Florida, U.S., through word of mouth, flyers, and social media posts by collaborating Family and Consumer Sciences educators. Age and English-speaking ability were the only inclusion criteria. Participants were not assessed for cognitive function. Following written informed consent, participants completed the 15-item MIND Diet Screener (Mueller et al., 2020) and the U.S. Adult Food Security Survey Module (Blumberg et al., 1999) by telephone interview at two timepoints, at least 1 week apart. All interviews were conducted by a dietetic student research assistant trained by a faculty researcher and registered dietitian/nutritionist. Data were collected between December 2022 and May 2024.

The 15-item MIND Diet Screener assessed the frequency of intake of a given amount of olive oil, leafy greens, other vegetables, berries, red meat, fish (not fried), chicken (not fried), whole-fat cheese, butter and cream, beans, whole grains, sweets, nuts, fast food, and alcohol (Mueller et al., 2020). The Morris et al. (2015) coding scheme was used with the revised interpretation of the coding scheme used for the Wisconsin Registry for Alzheimer's Prevention (WRAP) study (Mueller et al., 2020). Point values assigned to each of the 15 screener items were 0, 0.5, or 1, for a possible range from 0 to 15 points. The 10-item short form of the original U.S. Household Food Security Survey Module reliably assesses food security status of older adults (mean age 74.6 ± 9.5) (Lee et al., 2011). Food security status is categorized as "highly food secure" (no food access problems), "marginally food secure" (anxiety over food access), "low food security" (reduced diet quality and variety), and "very low food security" (multiple indications of disrupted eating patterns and reduced food intake) and scored as per U.S. Department of Agriculture guideline (0, high; 1-2, marginal; 3-5, low; 6-10, very low). Ethics approval was granted by the University of Florida Institutional Review Board 2 (#IRB202202266).

Sample size was estimated based on a systematic review of test-retest reliability of patient-reported outcomes in older adults (Park et al., 2018). A sub-sample of 16 per age group (75-84 and 85-105 years) was needed to demonstrate test-retest reliability using an estimated correlation coefficient of 0.75, type I error = 0.05, type II = 0.10, and 25% attrition. Test-retest reliability was assessed by intra-class correlation coefficient (ρ) – the consistency or agreement of repeated measurements using the R-4.4.2 statistical software. Internal consistency reliability – how closely related screener items are as a group was assessed by Cronbach's alpha (a), and item correlations by Spearman's correlation (ρ) using JMP v17.

Results

Of the 76 older adults who consented to participate in the study, 60 completed both telephone-administered surveys. The repeated values for the MIND Diet Screener indicated good reliability when compared to common thresholds of 0.75–1.00, considered excellent; 0.60–0.74, good; 0.40–0.59, moderate; and < 0.40, considered poor (Cicchetti, 1994), with no apparent decrease with age. Participants (n = 60; 86 ± 6 years, 67% female, 93% White) scored 9.4 ± 1.8 (mean ± standard deviation) and 9.2 ± 1.8 at the first and second administration of the MIND Diet Screener, respectively, giving an intra-class coefficient of ρ = 0.71 (confidence intervals (CI): 0.56, 0.81) overall. In a subgroup analysis of the oldest-old (n = 39), test-retest reliability by intra-class coefficient was estimated to be ρ = 0.73. (CI: 0.54, 0.85) compared to those younger (ρ = 0.69; CI: 0.39, 0.86). Intra-class coefficient values range from 0 to 1, where higher values indicate better reliability.

Most study participants were food secure, with three indicating marginal food security, and thus, analysis of the impact of food insecurity on test-rest reliability was precluded. Internal consistency reliability for the MIND Diet Screener was a = 0.44; items ranged from a = 0.35 (olive oil) to a = 0.51 (cheese). There were significant correlations between individual MIND Diet Screener items; generally, animal-sourced food items clustered, as did plant-sourced food items

(Table 1). The strongest correlation was between nuts and berries. Cheese intake was negatively correlated with olive oil, leafy greens, berries, chicken, and nuts. Additionally, whole grains were negatively correlated with red meat, as was alcohol, whereas fast food was positively correlated with red meat and sweets.

Discussion

Reliable dietary screeners are needed to assess the effectiveness of food and nutrition Extension education and community-based trials, such as Food as Medicine interventions promoting dietary patterns for brain and cardiometabolic health. The findings support the test-retest reliability of the MIND Diet Screener for use in assessing the brain-health dietary patterns of community-dwelling older adults, suggesting that diet recall may not be compromised in this aged cohort, i.e., the older adults who participated in this study reliably responded to the MIND Diet Screener. All survey items contributed to the general MIND diet construct, including the alcohol item. Additionally, telephone administration typically required 8-10 minutes per participant to complete, supporting its feasibility. However, due to the impaired hearing of some participants, a family member or friend proxy was required.

A secondary outcome assessed was the effect, if any, of food insecurity on the reliability of the MIND Diet Screener, as food insecurity is inversely associated with cognitive function (Gao et al., 2009; Wong et al., 2016). In middle-aged and older adults, food insecurity is associated with lower global cognitive function, executive function, and memory (Na et al., 2020). In adults aged 40-75 years, those experiencing food insecurity had a greater decline in cognitive function than their food-secure peers, and those with very low food security exhibited the steepest decline in cognitive function (Wong et al., 2016). In the present study, most study participants reported being White and food secure, which may have supported the good reliability of the MIND tool. Lacking a racially and ethnically representative sample was a major limitation of the study. Future research is needed to test the reliability of the MIND Diet Screener in food-insecure cohorts and in a more racially and ethnically representative

sample, specifically seeking out the inclusion of Hispanic and Black/African American individuals. Furthermore, future studies that include an assessment of cognitive function, such as the Montreal Cognitive Assessment, would inform the relationships between the reliability of dietary recall, food insecurity, and cognitive status in older adults.

Telephone administration of the MIND Diet Screener exhibited good test-retest reliability in older adults for assessing adherence to a brain-health dietary pattern. Thus, the tool may be appropriate for evaluating adherence to the MIND dietary pattern and the effectiveness of Food as Medicine interventions and educational programs promoting the adoption of brain-health dietary patterns. A strength of the study was that the MIND Diet Screener was administered to all participants by the same trained individual. However, this strength may also affect the generalizability of the findings, as it is possible that the reliability of the screener may be lower if multiple or less trained individuals administer the tool. As Extension programming and evaluation often take place in person or virtually, future research to determine the reliability of face-to-face interviews and self-administration (paper and online applications) of the MIND Diet Screener in older adult populations is needed.

The MIND dietary pattern, developed purposely to optimize brain health, is differentiated from the Mediterranean dietary pattern by emphasizing leafy greens and berries (Marcason, 2015). Adherence to the MIND dietary pattern is associated with better cognitive performance (Huang et al., 2023; Kheirouri & Alizadeh, 2022), slower cognitive decline (Cherian et al., 2019; Huang et al., 2023), and a lower risk of dementia (Chen et al., 2023). Extension programming promoting such a brain-health dietary pattern is needed to reduce the disease and economic burdens of cognitive decline and neurodegenerative disease in our aging population. The results of this study suggest that the MIND Diet Screener may be a reliable and, thus, very useful tool to assess Extension programming promoting a brain-health dietary pattern. Participants can be reliably assessed with the MIND Diet Screener at baseline, i.e., prior to brain-health dietary education or Food as Medicine intervention, and at short- and long-term follow-up to determine if participants

have improved their adherence to the MIND dietary pattern. Such Extension programming should focus on the cornerstones of the MIND dietary pattern, promoting the consumption of olive oil, leafy greens and other vegetables, whole grains, beans, chicken and fish, nuts, and berries of all sorts, while reducing intakes of red meat, fried foods, whole-fat cheese, butter and cream, commercial sweets, and fast food.

Adopting a brain-health dietary pattern, such as the evidence-based MIND diet, is an important Extension program outcome to evaluate. However, there is increasing emphasis on the delivery of evidence-based food and nutrition programs, specifically, those that result in improvement in objective clinical outcome markers such as blood pressure and blood cholesterol. Thus, in addition to collecting data on improvements in adherence to the MIND dietary pattern, program evaluation of brain-health diet education or Food as Medicine interventions for older adults should also include a long-term assessment of cognitive function with the goal of improvement. If this can be achieved, quality of life and significant economic outcomes will follow.

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References

Agarwal, P., Leurgans, S. E., Agrawal, S., Aggarwal, N. T., Cherian, L. J., James, B. D., Dhana, K., Barnes, L. L., Bennett, D. A., & Schneider, J. A. (2023). Association of Mediterranean-DASH Intervention for Neurodegenerative Delay and Mediterranean Diets with Alzheimer disease pathology. *Neurology,* 100(22), e2259-e2268. https://doi.org/10.1212/wnl.0000000000207176

Arnoldy, L., Gauci, S., Young, L. M., Marx, W., Macpherson, H., Pipingas, A., Civier, O., & White, D. J. (2023). The association of dietary and nutrient patterns on neurocognitive decline: A systematic review of MRI and PET studies. *Ageing Research Reviews*, 87, 101892. https://doi.org/10.1016/j.arr.2023.101892

Bailey, R. L. (2021). Overview of dietary assessment methods for measuring intakes of foods, beverages, and dietary supplements in research studies. *Current Opinion in Biotechnology,* 70, 91-96. https://doi.org/10.1016/j.copbio.2021.02.007

Barnes LL, Dhana K, Liu X, et al. (2023). Trial of the MIND diet for prevention of cognitive decline in older persons. *New England Journal of Medicine,* 389(7), 602-611. https://doi.org/10.1056/NEJMoa2302368

Blumberg, S. J., Bialostosky, K., Hamilton, W. L., & Briefel, R. R. (1999). The effectiveness of a short form of the Household Food Security Scale. *American Journal of Public Health,* 89(8), 1231-1234. https://doi.org/10.2105/ajph.89.8.1231

Boushey, C., Ard, J., Bazzano, L., Heymsfield, S., Mayer-Davis, E., Sabaté, J., ... & Obbagy, J. (2022). *Dietary patterns and neurocognitive health: a systematic review.*

CDC. (2019). *About Dementia.* Retrieved August 16, 2025 from https://www.cdc.gov/alzheimers-dementia/about/

Chen, H., Dhana, K., Huang, Y., Huang, L., Tao, Y., Liu, X., Melo van Lent, D., Zheng, Y., Ascherio, A., Willett, W., & Yuan, C. (2023). Association of the Mediterranean Dietary Approaches to Stop Hypertension Intervention for Neurodegenerative Delay (MIND) Diet with the risk of dementia. *JAMA Psychiatry,* 80(6), 630-638. https://doi.org/10.1001/jamapsychiatry.2023.0800

Cherian, L., Wang, Y., Fakuda, K., Leurgans, S., Aggarwal, N., & Morris, M. (2019). Mediterranean-Dash Intervention for Neurodegenerative Delay (MIND) diet slows cognitive decline after stroke. *Journal of Prevention of Alzheimer's Disease,* 6(4), 267-273. https://doi.org/10.14283/jpad.2019.28

Cicchetti, D. V. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and s tandardized assessment instruments in psychology. *Psychological Assessment,* 6(4), 284. https://doi.org/10.1037/1040-3590.6.4.284

Fu, J., Tan, L. J., Lee, J. E., & Shin, S. (2022). Association between the Mediterranean diet and cognitive health among healthy adults: A systematic review and meta-analysis. *Frontiers in Nutrition,* 9, 946361. https://doi.org/10.3389/fnut.2022.946361

Gao, X., Scott, T., Falcon, L. M., Wilde, P. E., & Tucker, K. L. (2009). Food insecurity and cognitive function in Puerto Rican adults. *American Journal of Clinical Nutrition,* 89(4), 1197-1203. https://doi.org/10.3945/ajcn.2008.26941

Handing, E. P., Jiao, Y., & Aichele, S. (2023). Age-related trajectories of general fluid cognition and functional decline in the Health and Retirement Study: A bivariate latent growth analysis. *Journal of Intelligence,* 11(4). https://doi.org/10.3390/jintelligence11040065

References

Huang, L., Tao, Y., Chen, H., Chen, X., Shen, J., Zhao, C., Xu, X., He, M., Zhu, D., Zhang, R., Yang, M., Zheng, Y., & Yuan, C. (2023). Mediterranean-Dietary Approaches to Stop Hypertension Intervention for Neurodegenerative Delay (MIND) Diet and cognitive function and its decline: A prospective study and meta-analysis of cohort studies. *American Journal of Clinical Nutrition.* *https://doi.org/10.1016/j.ajcnut.2023.04.025*

Kheirouri, S., & Alizadeh, M. (2022). MIND diet and cognitive performance in older adults: A systematic review. *Critical Reviews in Food Science and Nutrition,* 62(29), 8059-8077. https://doi.org/10.1080/10408398.2021.1925220

Lee, J. S., Johnson, M. A., Brown, A., & Nord, M. (2011). Food security of older adults requesting Older Americans Act Nutrition Program in Georgia can be validly measured using a short form of the U.S. Household Food Security Survey Module. *Journal of Nutrition,* 141(7), 1362-1368. *https://doi.org/10.3945/jn.111.139378*

Marcason, W. (2015). What Are the Components to the MIND Diet? *Journal of the Academy of Nutrition and Dietetics,* 115(10), 1744. https://doi.org/10.1016/j.jand.2015.08.002

Morris, M.C., Tangney C.C., Wang Y., Sacks, F.M., Barnes, L.L., Bennett, D.A., Aggarwal, N.T. (2015). MIND diet slows cognitive decline with aging. *Alzheimer's & Dementia,* 11(9), 1015-22. https://doi.org/10.1016/j.jalz.2015.04.011

Mueller, C. M. (2015). Nutrition assessment and older adults. *Topics in Clinical Nutrition,* 30(1), 94-102. https://doi.org/10.1097/TIN.0000000000000022

Mueller, K. D., Norton, D., Koscik, R. L., Morris, M. C., Jonaitis, E. M., Clark, L. R., Fields, T., Allison, S., Berman, S., Kraning, S., Zuelsdorff, M., Okonkwo, O., Chin, N., Carlsson, C. M., Bendlin, B. B., Hermann, B. P., & Johnson, S. C. (2020). Self-reported health behaviors and longitudinal cognitive performance in late middle age: Results from the Wisconsin Registry for Alzheimer's Prevention. *PLoS One,* 15(4), e0221985. https://doi.org/10.1371/journal.pone.0221985

Munoz-Garcia, M.I., Toledo, E., Razquin, C., Dominguez, L.J., Maragarone, D., Martinez-Gonzalez, J., Martinez-Gonzalez, M.A. (2020). "A priori" dietary patterns and cognitive function in the SUN Project. *Neuroepidemiology,* 54(1), 45-57. https://doi.org/10.1159/000502608

Na, M., Dou, N., Ji, N., Xie, D., Huang, J., Tucker, K. L., & Gao, X. (2020). Food insecurity and cognitive function in middle to older adulthood: A systematic review. *Advances in Nutrition,* 11(3), 667-676. https://doi.org/10.1093/advances/nmz122

Park, M. S., Kang, K. J., Jang, S. J., Lee, J. Y., & Chang, S. J. (2018). Evaluating test-retest reliability in patient-reported outcome measures for older people: A systematic review. *International Journal of Nursing Studies,* 79, 58-69. https://doi.org/10.1016/j.ijnurstu.2017.11.003

Scarmeas N, Stern Y, Mayeux R, Manly JJ, Schupf N, Luchsinger JA. (2009). Mediterranean diet and mild cognitive impairment. *Archives of Neurology,* 66(2), 216-225. https://doi.org/10.1001/archneurol.2008.536

Scarmeas N, Stern Y, Tang MX, Mayeux R, Luchsinger JA. (2006). Mediterranean diet and risk for Alzheimer's disease. *Annals of Neurology,* 59(6), 912-921. https://doi.org/10.1002/ana.20854

Tangney, C. C., Agarwal, P., Ventrelle, J., Aggarwal, N. T., Dhana, K., Arfanakis, K., & Barnes, L. L. (2023). Relative validity of the revised RUSH Food Frequency Questionnaire and MIND diet screener: Capturing the Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) dietary pattern. *Alzheimer's & Dementia,* 19, e074843.

References

van Soest, A.P.M., Beers, S., van de Rest, O., de Groot, L. (2024) The Mediterranean-Dietary Approaches to Stop Hypertension Intervention for Neurodegenerative Delay (MIND) diet for the aging brain: A systematic review. *Advances in Nutrition,* 15(3), 100184. https://doi.org//10.1016/j.advnut.2024.100184

Wong, J. C., Scott, T., Wilde, P., Li, Y. G., Tucker, K. L., & Gao, X. (2016). Food insecurity is associated with subsequent cognitive decline in the Boston Puerto Rican Health Study. *Journal of Nutrition,* 146(9), 1740-1745. https://doi.org/10.3945/jn.115.228700

Tables

Table 1.

Spearman's correlations of statistically significant (p > 0.05) scores of the 15 items of the MIND Diet Screener among older adults 70 years of age and older.

MIND Screener Item	MIND Screener Item	Spearman ρ
Leafy greens	Olive oil	0.1917
Other vegetables	Leafy greens	0.3074
Cheese	Olive oil	-0.212
Cheese	Leafy greens	-0.1872
Cheese	Berries	-0.3746
Cheese	Chicken	-0.1893
Butter and cream	Olive oil	0.354
Beans	Olive oil	0.1913
Beans	Other vegetables	0.2058
Whole grains	Leafy greens	0.2174
Whole grains	Other vegetables	0.21
Whole grains	Red Meat	-0.3039
Nuts	Berries	0.4253
Nuts	Cheese	-0.3099
Nuts	Butter and cream	0.1904
Fast food	Red meat	0.2315
Fast food	Sweets	0.2157
Alcohol	Red meat	-0.1977