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Research Article

COGNITIVE IMPAIRMENT PREDICTION IN MCI AND EARLY-STAGE ALZHEIMER'S DISEASE: THE ROLE OF MMSE AND FACE RECOGNITION DEFICITS

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ABSTRACT

Objective: Mild Cognitive Impairment (MCI) and Alzheimer's disease (AD) are two forms of cognitive impairment with less impact on daily functioning compared to advanced dementia. This study aims to investigate and compare facial recognition performance, cognitive functions, and depressive symptom severity, along with their interrelations, in individuals with MCI, AD, and in healthy controls.

Materials and Methods: Neuropsychological records of individuals between 65 and 80 years of age were retrospectively reviewed. Participants were categorized as healthy controls, MCI, or AD. The study included individuals who had completed the Mini-Mental State Examination (MMSE), Benton Face Recognition Test (BFRT), and Geriatric Depression Scale (GDS).

Results: Significant group differences were observed in MMSE scores and in the BFRT long form (age- and education-adjusted), short form, and Part A scores. No significant differences were found in GDS scores or in BFRT Part B. The control group outperformed both the MCI and AD groups on all tasks, particularly in basic face matching (BFRT Part A). Individuals with AD had the most significant impairment. Regression analysis identified the MMSE as the strongest predictor of cognitive impairment. Facial recognition impairments were observed in both the MCI and AD groups.

Conclusion: The MMSE is a valid and easy-to-use clinician-rated tool for identifying cognitive impairment. The BFRT may be used in addition to the MMSE to help differentiate between these two forms of cognitive impairment. Combining global and domain-specific assessments may enhance early detection strategies.

Keywords: Alzheirmer's disease, Mild Cognitive ımpairment, Benton Face recognition test, Standardized mini mental test

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INTRODUCTION

Mild Cognitive Impairment (MCI) is a transitional stage between normal aging and dementia. It is characterized by subtle cognitive impairments that do not meet the criteria for dementia. This condition is marked by a noticeable cognitive decline, which can be identified through objective tests and subjective reports. Despite these changes, individuals retain their ability to perform essential daily activities with little to no significant disruption.

Individuals who later develop Alzheimer's disease (AD) often show early decline in various cognitive domains, including memory, attention, language, visuospatial skills, perceptual speed, and executive function. However, there is ongoing debate about the best methods to assess and define MCI. There are no standardized tests or universal cutoff scores for differentiating MCI from the early stages of AD. In clinical practice, neuropsychological assessments help in understanding impairment, but the diagnosis of MCI ultimately relies on clinical judgment, which integrates test results with other diagnostic tools (1). Functional neuroimaging studies have established that bilateral occipitotemporal structures are specialized for human facial perception and recognition (2). These regions include the fusiform gyrus, the lingual gyrus, and a more posterior region in the inferior occipital cortex. These structures form an extensive neural network for efficient face processing and are also implicated in AD and MCI (3). Consequently, impairments in face recognition can be an early marker of cognitive decline, even in the absence of overt memory deficits (4,5).

The Mini-Mental State Examination (MMSE) is a widely used tool for the rapid assessment of cognitive function in adults. It is primarily employed to screen for cognitive impairment and to monitor cognitive changes over time, especially in individuals with dementia. The MMSE evaluates several cognitive domains, including orientation, memory, attention, language, and praxis. While it is useful for detecting moderate to severe cognitive decline, its sensitivity is limited in identifying mild dementia and MCI. Although it performs reasonably well in distinguishing MCI in otherwise healthy individuals, comprehensive neuropsychological assessments offer greater accuracy for early detection (6).

Face recognition ability is consistently linked to the quality of social relationships, helping individuals form stronger social bonds. This ability appears to be more closely tied to the depth and quality of relationships rather than simply the number of social contacts or level of extraversion. While face recognition deficits have been studied in various neurological conditions, relatively few studies have focused on how these deficits manifest in individuals with MCI and AD, particularly concerning cognitive status and psychological variables such as depression (7).

In this study, we aim to investigate facial recognition performance in individuals with MCI, AD, and in healthy controls. This study also aims to determine whether facial recognition performance, when considered alongside cognitive assessments, depressive symptoms, and demographic factors, can help in distinguishing levels of cognitive deterioration.

MATERIALS AND METHODS

The neuropsychological test records of individuals over the age of 65, who had previously undergone testing for any reason, were retrospectively reviewed. Individuals with no neuropsychiatric diagnosis, those diagnosed with mild AD, and those diagnosed with MCI were included in the study. Patients who had completed the Geriatric Depression Scale (GDS), Benton Face Recognition Test (BFRT), and Mini-Mental State Examination (MMSE) were selected for evaluation. Individuals who had not undergone one of these tests or had an unclear diagnosis were excluded. Due to the retrospective nature of the study, informed consent was not obtained.

Statistical analysis

Categorical variables were described as frequencies and percentages (n, %) and analyzed using the Chi-square test. Continuous variables were described as mean ± standard deviation and compared between groups using a one-way ANOVA (analysis of variance). Additionally, we performed a multinomial logistic regression analysis.

RESULTS

The study consisted of three groups: control, MCI, and AD. The ages of the individuals ranged from 65 to 80 years. Data from a total of 184 individuals were initially collected; however, only 92 participants had fully completed the required scales and were included in the final analysis. The final sample consisted of 41 women and 51 men. No significant difference was found between the groups in terms of gender (χ^2=2.388, p=0.303).

A significant difference was found between the groups in MMSE scores, BFRT adjusted long form scores, BFRT short

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Tablo 1. Comparison of groups in terms of scale scores and social demographics

	Control (34)		MCI (23)		AD (35)		Statistical analysis		
	Mean	SD	Mean	SD	Mean	SD	X^2	df	p
Age	69.21	4.611	70.35	4.488	72.03	4.502	7.357	2	0.025
Education	10.21	4.198	7.87	3.841	6.77	3.623	12.733	2	0.002
MMSE	27.79	0.946	25.13	0.869	21.49	1.483	81.056	2	<0.0001
GDS	11.29	7.388	13.61	8.044	12.89	7.764	1.219	2	0.544
Part A	5.56	0.613	5.00	1.348	4.49	1.292	14.219	2	0.029
Part B	13.68	1.838	12.87	2.418	12.89	2.139	2.554	2	0.279
Short form score	19.23	2.132	17.86	2.616	17.37	2.613	9.726	2	0.008
BFRT	42.38	3.939	39.04	5.209	38.66	4.399	212.842	2	0.002

form total score, BFRT Part A score, age, and years of education. However, no difference was found between the groups in GDS scores.

In the multinomial logistic regression analysis, we evaluated the effects of BFRT Part A, MMSE, and BFRT short form scores on diagnosis while controlling for age and education. The model showed a good fit (Goodness of fit=0.977, Pseudo R-square (McFadden)=0.554). According to the regression results, the MMSE was the only significant predictor of an MCI or early dementia diagnosis. A one-point decrease in the MMSE score increased the odds of an MCI diagnosis by approximately 5.8 times (B= -17.878, SE: 1.772, Wald=78.333, p<0.001, Exp(B)=5.813) and the odds of an early-phase dementia diagnosis by approximately 3.1 times (B= -35.684, SE: 1.426, Wald=170.374, p<0.001, Exp(B)=3.143).

DISCUSSION

In this study, we found a significant age difference among the groups, driven primarily by the difference between the control group and the early dementia group. There was no significant age difference between the MCI and dementia groups. This contrasts with a previous study of ours, where MCI patients were younger than dementia patients (8); however, that study included a wider age range (50 to 92 years), which may account for the different finding. Other studies have also found no age difference between AD and MCI patients (9,10).

Cognitive impairment, particularly affecting executive function and attention, is a core feature of depression and is linked to psychosocial functioning (11). These cognitive deficits can persist even when mood symptoms improve and place geriatric individuals with depression at a higher risk of developing dementia (12)(13). In our study, however, no significant difference was found in the severity of depressive symptoms among patients with AD, MCI, and healthy older adults. This suggests that the cognitive deficits in our AD and MCI groups were not related to depressive symptoms and may instead result from the degeneration of different neuronal circuits.

A significant difference was found between the groups in years of education. A shorter duration of education is a known risk factor for dementia and MCI (14,15). Higher education may build cognitive reserve, which helps delay the onset of dementia symptoms (16). Early life education may directly enhance cognitive abilities or provide indirect benefits through more stimulating environments and better healthcare access (17).

Prosopagnosia, or the difficulty in recognizing familiar faces, can be acquired, with AD serving as an example. It has two subtypes: apperceptive and associative. Apperceptive prosopagnosia involves a failure to form a coherent perception of a face, while associative prosopagnosia involves a failure to link a correctly perceived face with stored identity information. These subtypes are associated with damage to the posterior and anterior occipitotemporal regions, respectively (18). Temporal lobe atrophy was identified in both conditions (19). Face recognition deficit in MCI and AD seem to be related with temporal lobe involvement. Although neuroimaging results are not involved in our study, impairment in face recognition ability may be the consequence of neurodegeneration of temporal regions.
Significant differences were found among the groups on the BFRT, including the age- and education-adjusted long form, the short form, and Part A scores. This indicates that patients with MCI and early AD exhibit impairments in

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matching faces. Patients with AD have difficulties in visual cognitive tests due to tau accumulaitionan and subsequent atrophy (20). After controlling age and education, individuals with MCI have weaker memory for unfamiliar faces compared to healthy controls. Lower scores correlated with cognitive and functional decline but did not indicate a higher likelihood of developing dementia (21). In Part A of the BFRT, which assesses basic face matching, the control group performed significantly better than the AD group. This suggests that facial recognition deficits may become more pronounced in the early stages of AD rather than in MCI. The lack of a significant difference between the MCI and AD groups might be due to overlapping characteristics at these early stages. While age and education are known to affect face recognition, the greater impairment in AD patients can still likely be attributed to disease-specific cognitive decline. Impairment of face recognition in patients with AD is typically subtle in the early stages and becomes prominenent as the disease progresses (22). The soft signs of prosopagnosia during the early stage AD may resemble those observed in individuals with MCI. Therefore, the lack of a significant difference between the MCI and early AD might be due to these overlapping characteristics. Older age and lower education are known to affect cognitive and perceptual abilities, including face recognition (23,24). The greater impairment in AD patients can be attributed to the cognitive decline.

Conversely, we found no significant differences in Part B of the BFRT across groups. Part B is a more complex task requiring recognition of faces from different angles. The similar performance across groups could be due to several factors. Participants may have used compensatory strategies. Furthermore, the test format, which gives a 50% chance of a correct answer and does not impose a time limit, may have influenced the results (25).

Significant differences are observed in the short-form total score. The differences are primarily between AD and controls, but not between MCI and other groups. The total score is derived from the sum of Part A and Part B. The observed difference between AD and controls may indicate early-stage cognitive decline that specifically impairs the ability to recognize faces, even when factors like age and education are taken into account.

The mean MMSE score of healthy individuals was significantly higher than that of both the MCI and AD groups, supporting its effectiveness in detecting cognitive impairment. However, the MMSE was not sensitive enough to distinguish early AD from MCI in group comparisons. This is consistent with literature suggesting MMSE scores decline gradually, making differentiation between adjacent stages difficult. Despite this, our regression analysis indicated that the MMSE was the best predictor of cognitive impairment. Its broad assessment of multiple cognitive domains makes it more sensitive to general cognitive decline compared to a domain-specific test like the BFRT.

This study has several limitations. First, its retrospective design may introduce selection bias and limits control over confounding variables. Missing data also reduced the sample size and may limit the generalizability of the findings. This limits the sample size and limits the generalizability of the findings. However, besides the limitations, retrospective studies are cheaper, quicker, easier and do not need follw up. Second, the sample size may not have been large enough to detect subtle effects, especially for Part B of the BFRT. Third, the groups were not matched for age and education, and residual effects may remain despite using adjusted scores. Fourth, the regression analysis showed that only the MMSE was a significant predictor, indicating the model has limited explanatory power and that other variables should be explored in future research. Lastly, the study did not include neuroimaging or biomarker data, which could provide objective evidence to support the observed link between cognitive status and face recognition deficits.

CONCLUSION

In conclusion, the MMSE effectively detects general cognitive decline in MCI and AD but lacks sensitivity in differentiating early-stage AD from MCI in group-level analyses. Face recognition deficits, particularly in basic face matching (BFRT Part A), are more pronounced in AD and may serve as an early marker of cognitive decline.

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Authorship contributions
The authors contributed equally to this study.

Data availibity statement
The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Declaration of competing interest
The authors declare that there is no conflict of interest related to the study.

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Ethics

The study was approved by Non-Interventional Clinical Research Ethics Committee of Aydın Adnan Menderes University Faculty of Medicine. Approval number is 2025/103.

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REFERENCES

1. Winblad B, Palmer K, Kivipelto M, Jelic V, Fratiglioni L, Wahlund LO, et al. Mild cognitive impairment - Beyond controversies, towards a consensus: Report of the International Working Group on Mild Cognitive Impairment. J Intern Med. 2004;256:240–6.
2. Pelak VS. Disorders of Higher Cortical Visual Function. Third Edit. Liu, Volpe, and Galetta's Neuro-Ophthalmology: Diagnosis and Management. 2018. 341–364 p.
3. Zhao R, Wang P, Liu L, Zhang F, Hu P, Wen J, et al. Whole-brain structure–function coupling abnormalities in mild cognitive impairment: a study combining amplitude of low-frequency fluctuations and voxel-based morphometry. Front Neurosci. 2023;17:1–12.
4. Troyer AK, Murphy KJ, Anderson ND, Craik FIM, Moscovitch M, Maione A, et al. Associative recognition in mild cognitive impairment: Relationship to hippocampal volume and apolipoprotein E. Neuropsychologia. 2012;50:3721–8.
5. Strijkert F, Huitema RB, Van Munster BC, Spikman JM. Impaired Emotion Recognition: A Potential Marker for Social Behavioral Problems in Patients With Amnestic Mild Cognitive Impairment and Early Alzheimer Disease? Alzheimer Dis Assoc Disord. 2023;37:189–94.
6. Mitchell AJ. The Mini-Mental State Examination (MMSE): An Update on Its Diagnostic Validity for Cognitive Disorders. In: Cognitive Screening Instruments. London: Springer London; 2013. p. 15–46.
7. Engfors LM, Wilmer J, Palermo R, Gignac GE, Germine LT, Jeffery L. Face recognition's practical relevance: Social bonds, not social butterflies. Cognition. 2024;250:105816.
8. Şair A, Şair YB, Ayar S. Differentiating Mild Forms of Cognitive Impairment and Dementia: Where Other Tests Fail, Verbal Memory Assessment May Prove Critical. Meandros Medical and Dental Journal. 2021;22:187–95.
9. Cui Y, Liu B, Luo S, Zhen X, Fan M, Liu T, et al. Identification of Conversion from Mild Cognitive Impairment to Alzheimer's Disease Using Multivariate Predictors. PLoS One. 2011;6:e21896.
10. Batum K, Çınar N, Şahin Ş, Çakmak MA, Karşıdağ S. The connection between MCI and Alzheimer disease: neurocognitive clues. Turk J Med Sci. 2015;45:1137–40.
11. Gelonch O, Garolera M, Valls J, Castellà G, Varela O, Rosselló L, et al. The effect of depressive symptoms on cognition in patients with fibromyalgia. PLoS One. 2018 Jul;13:e0200057.
12. Rock PL, Roiser JP, Riedel WJ, Blackwell AD. Cognitive impairment in depression: a systematic review and meta-analysis. Psychol Med. 2014;44:2029–40.
13. Mukku SSR, Dahale AB, Muniswamy NR, Muliyala KP, Sivakumar PT, Varghese M. Geriatric Depression and Cognitive Impairment—An Update. Indian J Psychol Med. 2021;43:286–93.
14. Klee M, Aho VTE, May P, Heintz-Buschart A, Landoulsi Z, Jónsdóttir SR, et al. Education as Risk Factor of Mild Cognitive Impairment: The Link to the Gut Microbiome. J Prev Alzheimers Dis. 2024;11:759–68.
15. Maccora J, Peters R, Anstey KJ. What does (low) education mean in terms of dementia risk? A systematic review and meta-analysis highlighting inconsistency in measuring and operationalising education. SSM Popul Health. 2020;12:100654.
16. Ngandu T, von Strauss E, Helkala EL, Winblad B, Nissinen A, Tuomilehto J, et al. Education and dementia. Neurology. 2007;69:1442–50.
17. Soh Y, Whitmer RA, Mayeda ER, Glymour MM, Eng CW, Peterson RL, et al. Timing and level of educational attainment and late-life cognition in the KHANDLE study. Alzheimer's & Dementia. 2024;20:593–600.
18. Barton JJS. Prosopagnosia associated with a left occipitotemporal lesion. Neuropsychologia. 2008;46:2214–24.
19. Dhikav V, Sethi M, Anand KS. Medial temporal lobe atrophy in Alzheimer's disease/mild cognitive impairment with depression. Br J Radiol. 2014 Oct;87:20140150.
20. Putcha D, Brickhouse M, Touroutoglou A, Collins JA, Quimby M, Wong B, et al. Visual cognition in non-amnestic Alzheimer's disease: Relations to tau, amyloid, and cortical atrophy. Neuroimage Clin. 2019;23:101889.
21. Nguyen VQ, Gillen DL, Dick MB. Memory for unfamiliar faces differentiates mild cognitive impairment from normal aging. J Clin Exp Neuropsychol. 2014;36:607–20.
22. Greene JDW, Hodges JR. Identification of famous faces and famous names in early Alzheimer's disease. Brain. 1996;119:111–28.
23. Connolly HL, Young AW, Lewis GJ. Face perception across the adult lifespan: evidence for age-related changes independent of general intelligence. Cogn Emot. 2021;35:890–901.
24. Le Carret N, Rainville C, Lechevallier N, Lafont S, Letenneur L, Fabrigoule C. Influence of education on the benton visual retention test performance as mediated by a strategic search component. Brain Cogn. 2003;53:408–11.
25. Wang LAL, Herrington JD, Tunç B, Schultz RT. Bayesian regression-based developmental norms for the Benton Facial Recognition Test in males and females. Behav Res Methods. 2020;52:1516–27.