

## Researching the correlation between clock drawing test outcomes and depression severity in patients with forgetfulness, mild cognitive impairment, and depression

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### ABSTRACT

**Aims:** Depression and mild cognitive impairment (MCI) are syndromes that impair cognitive functions and negatively affect both patients and caregivers. This study aimed to compare Clock Drawing Test (CDT) results in patients with MCI and depression presenting with subjective memory complaints (SMC).

**Methods:** A total of 96 patients with SMC were retrospectively reviewed. MCI diagnosis was determined using the Standardized Mini-Mental Test (SMMT) administered by a neurologist. Patients with high Beck Depression Inventory (BDI) scores were referred to the psychiatry outpatient clinic and diagnosed with depression. CDT performance was evaluated across diagnostic groups. Statistical analyses were performed to examine differences according to depression status and cognitive assessment scores.

**Results:** Significant differences were observed between diagnostic groups regarding depression status ( $p=0.001$ ) and SMMT results ( $p=0.001$ ). No significant differences were found in relation to CDT results ( $p>0.05$ ). The findings indicate that depression negatively influences cognitive performance in individuals with SMC, and that SMC is frequently observed in elderly patients.

**Conclusion:** SMC is common among older adults in tertiary care and should not be overlooked. Depression is associated with both subjective and objective cognitive impairment and represents a risk factor for dementia. Close monitoring of patients with SMC and depression may facilitate early detection of cognitive decline and timely interventions.

**Keywords:** Dementia, depression, forgetfulness, mild cognitive impairment, clock drawing test, subjective memory complaints

### INTRODUCTION

Memory is a cognitive process that defines the perception, organization, encoding, storage, and recall of information. The term “forgetfulness” is a cognitive complaint that describes a perceived subjective impairment.<sup>1</sup> The concept of subjective memory complaints (SMC) is also used instead of the concept of forgetfulness. The memory performance of a person with SMC can be assessed using neuropsychological tests, and the results may indicate that their memory is intact or impaired.<sup>2</sup> SMC is also seen in cognitive disorders such as mild cognitive impairment (MCI) and depression.<sup>3</sup>

MCI is characterized by objectively measurable cognitive deficits on neuropsychological testing, with daily functioning largely preserved or only minimally affected, and it is often accompanied by SMC.<sup>4,5</sup> Nevertheless, the annual conversion rate of MCI cases to dementia has been reported as 6.7%, and the total 5-year conversion rate to dementia as 38.2%.<sup>6</sup>

Similarly, SMC is frequently seen in depression. It is known that cognitive losses secondary to depression, along with SMC, create a dementia-like picture, and this picture is called pseudodementia.<sup>7-9</sup> Recent studies have shown that depression, especially in the elderly, accelerates cognitive decline and doubles the risk of Alzheimer’s dementia (AD). It is also thought that the pseudodementia picture that develops may actually be a precursor to a developing dementia picture.<sup>10-12</sup>

Neuropsychological assessment plays an important role in evaluating cognitive functions. The clock drawing test (CDT) is one of the neuropsychological tests used to assess visual-motor functions, planning, sequencing, and abstract thinking skills.<sup>13</sup> During the application of the CDT, cortical areas including the frontal, parietal, and temporal regions are active.<sup>14,15</sup> It is known that cognitive functions such as

executive function, working memory, episodic memory, attention, and psychomotor processing speed are affected in individuals diagnosed with depression.<sup>16,17</sup>

Both depression and MCI are syndromes that impair cognitive functions and can have significant negative effects on both patients and caregivers. The aim of this study is to present and compare the results of CDT in patients diagnosed with MCI and depression who have SMC.

## METHODS

### Ethics

This study was conducted with the approval of the Clinical Researches Ethics Committee of Alanya Alaaddin Keykubat University (Date: 20.07.2022, Decision No: 06-06). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

### Purpose and Type of Study

The purpose of this study is to evaluate depression and MCI diagnoses in patients presenting with SMC, to compare the SMC characteristics of the diagnostic groups, and to examine their CDT performances and the relationship between them.

### Study Population and Sample

This study retrospectively examined 96 patients who presented with SMC at the neurology outpatient clinic of a teaching and research hospital between 2020 and 2022. Patients who were literate, presented to the neurology outpatient clinic with complaints of forgetfulness, and had no mental retardation, known neurological disease, psychiatric illness, or medication use were included in the study.

### Data Collection and Analysis

This study retrospectively examined the data of patients who presented to a neurology outpatient clinic with SMC. Patients who met the inclusion criteria for the study were included. In the study, patients examined by a neurology specialist were diagnosed with MCI based on the results of the Standardized Mini-Mental Test (SMMT). Patients with high Beck Depression Inventory (BDI) scores were referred to the psychiatry outpatient clinic and diagnosed with depression. The CDT scores of these three groups were evaluated.

### Standardized Mini-Mental Test (SMMT)

This is a 30-item measure used to assess various cognitive functions such as orientation, immediate memory, recall, attention, calculation, and language.<sup>18</sup> Low scores indicate cognitive impairment. The validity and reliability study of the Turkish version of the form for educated individuals was conducted by Güngen and colleagues.<sup>19</sup>

### Clock Drawing Test (CDT)

This scale is used to assess many different cognitive functions, including executive functions, memory, and attention, primarily visual-spatial functions, and there are many different applications and scoring methods.<sup>20</sup> In a study comparing three different CDT scoring systems, the newly developed algorithm for dementia diagnosis was reported to provide higher specificity and similar or better sensitivity than these three systems, and the scoring method of Shulman and colleagues<sup>13</sup> was described in a meta analysis as one of

the most frequently investigated and highly sensitive systems for the CDT. Accordingly, participants are asked to place the numbers and hands of the clock inside a pre-drawn circle to show 10 minutes past 11 o'clock, and scoring is done on a scale of 0 (uncertain) to 5 (perfect clock). The aforementioned application method of the CDT was used in this study.<sup>22</sup>

### Beck Depression Inventory (BDI)

Developed by Beck et al.<sup>23</sup> in 1961 to measure the behavioral symptoms of depression in adolescents and adults. Severity is interpreted as follows: 0-9=minimal, 10-16=mild, 17-29=moderate, 30-63=severe. The validity and reliability of the scale have been studied.<sup>24</sup>

### Statistical Analysis

The data collected for the study were analyzed using the SPSS (Statistical Program in Social Sciences) 25 program. The Kolmogorov-Smirnov and Shapiro-Wilk tests were used to check whether the data collected for the study followed a normal distribution. The significance level ( $p$ ) for comparison tests was set at 0.05. Since the variables did not follow a normal distribution ( $p>0.05$ ), the analysis was continued using nonparametric test methods. The Mann-Whitney analysis was used for comparisons between independent pairs of groups. Cross-tabulations were created, and Chi-square analysis was applied for the comparison of categorical data. Descriptive values such as mean, standard deviation, median, number, and percentages were used.

## RESULTS

In this study, the data of 96 patients who visited a neurology outpatient clinic with SMC were retrospectively examined. The study included 54 patients diagnosed with depression and 42 patients diagnosed with MCI.

No statistically significant differences were observed in the diagnostic groups (depression and MCI) among participants when analyzed by age, gender, and education level ( $p>0.05$ ), (Table 1).

Statistically significant differences were found in diagnostic groups (depression and MCI) according to depression status ( $p=0.001$ ). Statistically significant differences were also found in diagnostic groups (depression and MCI) according to SMMT results ( $p=0.001$ ). However, no statistically significant differences were found in diagnostic groups (depression and MCI) according to clock drawing status ( $p>0.05$ ), (Table 2).

No statistically significant relationship was found between the SMMT and CDT results in either the depression or MCI groups ( $p>0.05$ ). Additionally, since SMMT scores were consistently between 28 and 30 for all participants in the depression group, no differences were observed (Table 3).

## DISCUSSION

This study aimed to investigate the prevalence of MCI and depression in patients presenting to the neurology outpatient clinic with SMC, as well as to examine the relationship between these conditions. Tests that can be quickly administered in clinical practice were given to the subjects, and their cognitive performance was assessed objectively.

**Table 1.** Comparison of demographic variables according to diagnosis groups

|           |        | n/%              | Groups       |             | Total               | $\chi^2$ | p     |
|-----------|--------|------------------|--------------|-------------|---------------------|----------|-------|
|           |        |                  | Depression   | MCI         |                     |          |       |
| Gender    | Male   | n                | 27           | 19          | 46                  | 0.066    | 0.797 |
|           |        | %                | 50.0%        | 45.2%       | 47.9%               |          |       |
|           | Female | n                | 27           | 23          | 50                  |          |       |
|           |        | %                | 50.0%        | 54.8%       | 52.1%               |          |       |
| Education | 0      | n                | 1            | 1           | 2                   | 0.849    | 0.838 |
|           |        | %                | 1.9%         | 2.4%        | 2.1%                |          |       |
|           | 1-5    | n                | 10           | 7           | 17                  |          |       |
|           |        | %                | 18.5%        | 16.7%       | 17.7%               |          |       |
|           | 6-11   | n                | 29           | 26          | 55                  |          |       |
|           |        | %                | 53.7%        | 61.9%       | 57.3%               |          |       |
|           | ≥12    | n                | 14           | 8           | 22                  |          |       |
|           |        | %                | 25.9%        | 19.0%       | 22.9%               |          |       |
| Age       |        |                  | Depression   | MCI         | Mann-Whitney U test |          | p     |
|           |        | Mean±SD          | 62.46±14.04  | 67.38±11.18 | 919.000             |          | 0.112 |
|           |        | Median (min-max) | 61.5 (27-88) | 69 (44-88)  |                     |          |       |

n: frequency, %, percent, MCI: Mild cognitive impairment, SD: Standard deviation, Min: Minimum, Max: Maximum, \*p&lt;0.05; There is a statistically significant difference between the groups

**Table 2.** Comparison of variables by diagnostic groups

|            |                       | n/%              | Groups       |             | Total               | $\chi^2$ | p      |
|------------|-----------------------|------------------|--------------|-------------|---------------------|----------|--------|
|            |                       |                  | Depression   | MCI         |                     |          |        |
| Depression | No                    | n                | 5            | 21          | 26                  | 21.617   | 0.001* |
|            |                       | %                | 9.3%         | 50.0%       | 27.1%               |          |        |
|            | Mild                  | n                | 32           | 16          | 48                  |          |        |
|            |                       | %                | 59.3%        | 38.1%       | 50.0%               |          |        |
|            | Moderate              | n                | 12           | 4           | 16                  |          |        |
|            |                       | %                | 22.2%        | 9.5%        | 16.7%               |          |        |
|            | Severe                | n                | 5            | 1           | 6                   |          |        |
|            |                       | %                | 9.3%         | 2.4%        | 6.3%                |          |        |
| SMMT       | 28-30                 | n                | 54           | 2           | 56                  | 114.324  | 0.000* |
|            |                       | %                | 100.0%       | 4.8%        | 58.3%               |          |        |
|            | 24-27                 | n                | 0            | 36          | 36                  |          |        |
|            |                       | %                | 0.0%         | 85.7%       | 37.5%               |          |        |
|            | 19-23 mild (demantia) | n                | 0            | 4           | 4                   |          |        |
|            |                       | %                | 0.0%         | 9.5%        | 4.2%                |          |        |
| CDT        | Severe                | n                | 3            | 4           | 7                   | 1.077    | 0.783  |
|            |                       | %                | 5.6%         | 9.5%        | 7.3%                |          |        |
|            | Moderate              | n                | 10           | 6           | 16                  |          |        |
|            |                       | %                | 18.5%        | 14.3%       | 16.7%               |          |        |
|            | Mild                  | n                | 8            | 8           | 16                  |          |        |
|            |                       | %                | 14.8%        | 19.0%       | 16.7%               |          |        |
|            | Normal                | n                | 33           | 24          | 57                  |          |        |
|            |                       | %                | 61.1%        | 57.1%       | 59.4%               |          |        |
| Variable   |                       |                  | Depression   | MCI         | Mann-Whitney U test |          | p      |
| SMMT       |                       | Mean±SD          | 62.46±14.04  | 67.38±11.18 | 903.000             |          | 0.001* |
|            |                       | Median (min-max) | 61.5 (27-88) | 69 (44-88)  |                     |          |        |

n: frequency, %, percent, MCI: Mild cognitive impairment, SMMT: Standardized Mini-Mental Test, CDT: Clock Drawing Test, SD: Standard deviation, Min: Minimum, Max: Maximum, \*p&lt;0.05; There is a statistically significant difference between the groups

Given the limited number of studies evaluating complaints of forgetfulness in the Turkish population, this research is expected to offer helpful information regarding the characteristics of these complaints.<sup>25</sup>

In our study, 96 patients presented to the neurology outpatient clinic with SMC. Among these patients, 42 (43.75%) were diagnosed with MCI, while 54 (56.25%) were diagnosed with depression. Notably, none of these patients had previously sought care from the psychiatry outpatient clinic. This

Table 3. Comparison of SMMT and clock drawing status in groups

| Groups     |               |            | n/% | CDT    |          |        |        | Total  | $\chi^2$ | p     |
|------------|---------------|------------|-----|--------|----------|--------|--------|--------|----------|-------|
|            |               |            |     | Severe | Moderate | Mild   | Normal |        |          |       |
| Depression | SMMT interval | 28-30      | n   | 3      | 10       | 8      | 33     | 54     | 5.918    | 0.432 |
|            |               |            | %   | 100.0% | 100.0%   | 100.0% | 100.0% | 100.0% |          |       |
|            |               | 28-30      | n   | 0      | 0        | 0      | 2      | 2      |          |       |
|            |               |            | %   | 0.0%   | 0.0%     | 0.0%   | 8.3%   | 4.8%   |          |       |
| MCI        | SMMT interval | 24-27      | n   | 4      | 6        | 6      | 20     | 36     |          |       |
|            |               |            | %   | 100.0% | 100.0%   | 75.0%  | 83.3%  | 85.7%  |          |       |
|            |               | 19-23 mild | n   | 0      | 0        | 2      | 2      | 4      |          |       |
|            |               |            | %   | 0.0%   | 0.0%     | 25.0%  | 8.3%   | 9.5%   |          |       |

n: Frequency, %, percent, SMMT: Standardized Mini-Mental Test, MCI: Mild cognitive impairment

finding suggests a need to enhance public awareness about the concepts of forgetfulness, depression, and dementia among these individuals.

SMC can also manifest in psychiatric disorders such as depression in older adults; however, whether SMC should be used as a criterion for diagnosing MCI remains a topic of debate. Among patients diagnosed with MCI, there exists a subgroup that is unaware of their cognitive impairment, exhibiting low insight, and has been shown to progress more rapidly to dementia.<sup>26</sup> Thus, while the necessity of SMC for diagnosing MCI is contentious, it is important to evaluate SMC separately in all elderly individuals, given that MCI is a recognized risk factor for dementia progression.

In our study, the depression levels of patients diagnosed with MCI and depression were examined using the BDI, and a statistically significant difference was found between them ( $p=0.001$ ). The depression levels of patients diagnosed with depression were found to be higher than those in the MCI group. In a study evaluating MCI, depression diagnosis, and healthy elderly individuals, depression levels were found to be high in the depression group, similar to our study. Unlike our study, this study also included a healthy elderly group, and it was found that the MCI group had statistically higher depression levels than healthy elderly individuals.<sup>27</sup> This finding is consistent with the studies by Hwang and colleagues<sup>28</sup> on the association between depressive symptoms and MCI. It has been determined that depressive symptoms can also be seen in MCI patients, but they are not as severe as in patients diagnosed with depressive disorder.

Studies have shown that there may be a relationship between depression and SMC, and it has also been reported that depression may be one of the early symptoms of dementia.<sup>29-31</sup> Large-scale meta-analyses and longitudinal cohort studies have consistently demonstrated that older adults with depression have a 1.5- to 2.5-fold increased risk of developing dementia. These findings highlight depression not only as a prevalent psychiatric condition in later life, but also as a significant and potentially modifiable risk factor for subsequent cognitive decline.<sup>32,33</sup>

In our study, the CDT was applied to the depression and MCI groups. Our study found no statistically significant difference in the CDT between the depression and MCI groups. In contrast to our study, another study found that the CDT scores of the MCI group were significantly lower than

those of the control group of healthy elderly individuals and the depression group ( $p=0.013$  and  $p=0.012$ , respectively), while no significant difference was observed between the depression group and the control group ( $p=0.977$ ) (27). Due to the limited number of studies on this subject and the inconsistency of these data, a general assessment cannot be made. The heterogeneity in studies on the diagnostic accuracy of the CDT is likely due to significant heterogeneity in the underlying study populations (community samples and tertiary care samples). We believe that not evaluating subgroups of patients diagnosed with MCI and depression in our study may also have affected the results.

### Limitations

There are limitations that may have affected our study. First, our study did not include a third healthy control group in addition to patients diagnosed with MCI and depression. Second, when evaluating SMC in our patients, their laboratory parameters were not assessed. Patients were given the BDI when evaluating their depression level. Since the patient groups were over 55 years of age, the geriatric depression scale could have been administered to the patients.

### CONCLUSION

As a result, SMC is common among elderly individuals receiving tertiary healthcare services. However, the public needs to be made aware of the significance of this complaint. There is also a relationship between SMC and depression, and depression negatively affects individuals' objective performance. Depression is a risk factor for complaints of forgetfulness. Considering that depression is also a risk factor for dementia, it is thought that close monitoring of these individuals may also be beneficial in terms of early diagnosis of dementia.

### ETHICAL DECLARATIONS

#### Ethics Committee Approval

This study was conducted with the approval of the Clinical Researches Ethics Committee of Alanya Alaaddin Keykubat University (Date: 20.07.2022, Decision No: 06-06).

#### Informed Consent

As this was a retrospective study, formal written informed consent was not required and was therefore not obtained. This retrospective study used pre-existing anonymized patient data. No additional intervention was performed, and

there was no direct patient contact. The study was approved by the Ethics Committee, and the requirement for written informed consent was waived by the ethics committee.

### Peer Review Process

This manuscript was subject to external peer review.

### Conflict of Interest

The authors declare no conflicts of interest related to this study.

### Financial Disclosure

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### Author Contributions

Concept: ŞÇ, EPZ; Design: ŞÇ, EPZ; Control: EZ, AB; Data Collection and/or Processing: ŞÇ, EPZ; Analysis and/or Interpretation: EPZ; Literature Review: EPZ; Article Writing: EPZ; Critical Review: All Authors.

## REFERENCES

- Ponds RW, Commissaris KJ, Jolles J. Prevalence and covariates of subjective forgetfulness in a normal population in The Netherlands. *Int J Aging Hum Dev.* 1997;45(3):207-221. doi:10.2190/MVQ1-WB58-875H-Y4X0
- Abdulrab K, Heun R. Subjective memory impairment: a review of its definitions indicates the need for a comprehensive set of standardised and validated criteria. *Eur Psychiatry.* 2008;23(5):321-330. doi:10.1016/j.eurpsy.2008.02.004
- Mitchell AJ. The clinical significance of subjective memory complaints in the diagnosis of mild cognitive impairment and dementia: a meta-analysis. *Int J Geriatr Psychiatry.* 2008;23:1191-1202. doi:10.1002/gps.2053
- Petersen RC. Mild cognitive impairment as a diagnostic entity. *J Intern Med.* 2004;256(3):183-194. doi:10.1111/j.1365-2796.2004.01388.x
- Winblad B, Palmer K, Kivipelto M, 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(3):240-246. doi:10.1111/j.1365-2796.2004.01380.x
- Mitchell AJ, Shiri-Feshki M. Rate of progression of mild cognitive impairment to dementia-meta-analysis of 41 robust inception cohort studies. *Acta Psychiatr Scand.* 2009;119(4):252-265. doi:10.1111/j.1600-0447.2008.01326.x
- Sadavoy C, Jarvik LF, Grossberg GT, Meyers BS. Comprehensive Textbook of Geriatric Psychiatry. 1st ed. New York, NY: American Association for Geriatric Psychiatry; WW Norton & Company; 2004.
- Lahr D, Beblo T, Hartje W. Cognitive performance and subjective complaints before and after remission of major depression. *Cogn Neuropsychiatry.* 2007;12(1):25-45. doi:10.1080/13546800600714791
- Spar EJ, LaRue A. Clinical Manual of Geriatric Psychiatry. 3rd ed. Arlington, VA: American Psychiatric Publishing Inc; 2006:67-126.
- Auning E, Selnes P, Grambaite R, et al. Neurobiological correlates of depressive symptoms in people with subjective and mild cognitive impairment. *Acta Psychiatr Scand.* 2015;131:139-147. doi:10.1111/acps.12352
- Brendel M, Pogarell O, Xiong G, et al. Depressive symptoms accelerate cognitive decline in amyloid-positive MCI patients. *Eur J Nucl Med Mol Imaging.* 2015;42:716-724. doi:10.1007/s00259-014-2975-4
- Marano CM, Workman CI, Lyman CH, et al. The relationship between fasting serum glucose and cerebral glucose metabolism in late-life depression and normal aging. *Psychiatry Res Neuroimaging.* 2014;222:84-90. doi:10.1016/j.pscychresns.2014.01.009
- Shulman KI. Clock-drawing: is it the ideal cognitive screening test? *Int J Geriatr Psychiatry.* 2000;15(6):548-561. doi:10.1002/1099-1166(200006)15:6<548::aid-gps242>3.0.co;2-u
- Spenciore B, Alves H, Charchat-Fichman H. Scoring systems for the Clock Drawing Test: a historical review. *Dement Neuropsychol.* 2017;11(1):6-14. doi:10.1590/1980-57642016dn11-010003
- Eknoyan D, Hurley RA, Taber KH. The clock drawing task: common errors and functional neuroanatomy. *J Neuropsychiatry Clin Neurosci.* 2012;24(3):260-265. doi:10.1176/appi.neuropsych.12070180
- Ballard C, Bannister C, Solis M, Oyeboode F, Wilcock G. The prevalence, associations and symptoms of depression amongst dementia sufferers. *J Affect Disord.* 1996;36(3-4):135-144. doi:10.1016/0165-0327(95)00072-0
- Nilsson J, Thomas AJ, Stevens LH, McAllister-Williams RH, Ferrier IN, Gallagher P. The interrelationship between attentional and executive deficits in major depressive disorder. *Acta Psychiatr Scand.* 2016;134(1):73-82. doi:10.1111/acps.12570
- Shilyansky C, Williams LM, Gyurak A, Harris A, Usherwood T, Etkin A. Effect of antidepressant treatment on cognitive impairments associated with depression: a randomised longitudinal study. *Lancet Psychiatry.* 2016;3(5):425-435. doi:10.1016/S2215-0366(16)00012-2
- Güngen C, Ertan T, Eker E, Yaşar R, Engin F. Standardize Mini Mental Test'in Türk toplumunda hafif demans tanısında geçerlik ve güvenilirliği [Reliability and validity of the standardized mini mental state examination in the diagnosis of mild dementia in Turkish population]. *Türk Psikiyatri Derg.* 2002;13(4):273-281.
- Folstein M, Folstein S, Folstein J. The Mini-Mental State Examination: a brief cognitive assessment. In: Abou-Saleh MT, Katona C, Kumar A, eds. Principles and Practice of Geriatric Psychiatry. 3rd ed. John Wiley & Sons; 2010:145-146. doi:10.1002/9780470669600.ch27
- Lessig MC, Scanlan JM, Nazemi H, Borson S. Time that tells: critical clock-drawing errors for dementia screening. *Int Psychogeriatr.* 2008;20(3):459-470. doi:10.1017/S1041610207006035
- Yuan J, Libon DJ, Karjadi C, et al. Association between the digital clock drawing test and neuropsychological test performance: large community-based prospective cohort (Framingham Heart Study). *J Med Internet Res.* 2021;23(6):e27407. doi:10.2196/27407
- Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry.* 1961;4:561-571. doi:10.1001/archpsyc.1961.01710120031004
- Hisli N. Beck Depresyon Envanteri'nin üniversite öğrencileri için geçerliği, güvenilirliği. *Psikoloji Derg.* 1989;7(23):3-13.
- Açıköz M, Özen Baru TB, Emre U, Taşçılar N, Atalay A, Köktürk F. Assessment of relation between subjective memory complaints and objective cognitive performance of elderly over 55 years of age. *Noro Psikiyatr Ars.* 2014;51(2):57-62. doi:10.4274/npa.y6719
- Roberts JL, Clare L, Woods RT. Subjective memory complaints and awareness of memory functioning in mild cognitive impairment: a systematic review. *Dement Geriatr Cogn Disord.* 2009;28(2):95-109. doi:10.1159/000234911
- Duman B, Kızıl ETÖ, Baran ZP, Kırıcı PS, Turan E. Discrepancy between subjective memory complaints and objective memory deficits in elderly patients with depression compared to mild cognitive impairment. *Türk Psikiyatri Derg.* 2016;27(1):1-7.
- Hwang TJ, Masterman DL, Ortiz F, Fairbanks LA, Cummings JL. Mild cognitive impairment is associated with characteristic neuropsychiatric symptoms. *Alzheimer Dis Assoc Disord.* 2004;18(1):17-21. doi:10.1097/00002093-200401000-00004
- Brigola AG, Manzini CSS, Oliveira GBS, Ottaviani AC, Sako MP, Vale FAC. Subjective memory complaints associated with depression and cognitive impairment in the elderly: a systematic review. *Dement Neuropsychol.* 2015;9(1):51-57. doi:10.1590/S1980-57642015DN91000009
- Balash Y, Mordechovich M, Shabtai H, Giladi N, Gurevich T, Korczyn AD. Subjective memory complaints in elders: depression, anxiety, or cognitive decline? *Acta Neurol Scand.* 2013;127(5):344-350. doi:10.1111/ane.12038
- Sousa M, Pereira A, Costa R. Subjective memory complaint and depressive symptoms among older adults in Portugal. *Curr Gerontol Geriatr Res.* 2015;2015:296581. doi:10.1155/2015/296581
- Jang YJ, Park JY, Kim SY, et al. Variation in depression's impact on dementia risk by age in adults aged ≥75 years. *Alzheimers Dement (Amst).* 2025;17(4):e70185. doi:10.1002/dad2.70185
- Holmquist S, Nordström A, Nordström P. The association of depression with subsequent dementia diagnosis: a Swedish nationwide cohort study from 1964 to 2016. *PLoS Med.* 2020;17(1):e1003016. doi:10.1371/journal.pmed.1003016