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Relationship of Apathy with Depressive Symptom Severity and Cognitive Functions in Geriatric Depression

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ABSTRACT

Introduction: Apathy which is known as loss of primary motivation is observed more frequently in elderly depression in comparison with younger adults. It is put forth that apathy is related with depressive symptom severity and cognitive functions, that the existence of apathy may be a predictor of neurocognitive impairment. The objective of this study was to examine the apathy levels in elderly patients with major depression as well as the relationship between depressive symptom severity and cognitive functions.

Methods: The study was carried out with 40 major depressive disorder patients (MDD) aged 60 and above, 40 healthy controls aged 60 and above. Sociodemographic data form, structured psychiatric interview (SCID-I), Hamilton Depression Rating Scale (HAM-D), Hamilton Anxiety Rating Scale (HAM-A), Montgomery-Asberg Depression Rating Scale (MADRS), Standardized Mini Mental State Examination (SMMSE), Montreal Cognitive Assessment Scale (MoCA), Apathy Evaluation Scale (AES) and Sheehan Disability Scale (SDS) were applied to the participants.

Results: In our study, HAM-D, HAM-A and MADRS scale scores of MDD group was determined to be higher in comparison with those of the healthy control group. A positive correlation was determined in the MDD groups between the AES scores and depressive symptom severity, whereas a negative correlation was determined between the AES scores and cognitive functions. The SMMSE and MoCA scores of the geriatric MDD group were determined to be lower in comparison with healthy control group. Low performance was observed in the geriatric MDD group especially in the fields of orientation, visual/spatial functions, memory and language. Functionality was found to be lower in MDB group than in the control group, and functionality decreased as the level of apathy increased.

Conclusion: Our results indicate that the apathy levels in geriatric depression are higher in comparison with the control group. Cognitive functions are affected adversely in geriatric patients in major depressive disorder, depressive symptom severity, impairment in cognitive functions and functionality are observed to be related with apathy level.

Keywords: Apathy, cognitive function, depression, geriatric depression

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INTRODUCTION

Apathy was first named by Marin as "primary motivation loss syndrome" and was defined as the loss of motivation not attributed to emotional stress, intellectual deterioration or decrease of consciousness level. Apathy, which may be explained as flatness in affect, indifference or being isolated from the world, is the lack of spontaneous or reactive emotional expression and the decrease of target-driven behaviors and cognitive functions. Decreased emotional expression is accompanied by lack of insight, abulia (loss of will, reduction of the impulse to act and think, indifference to the consequences of the action) and a lack of empathy (1, 2). Apathy is frequently observed with many neuropsychiatric disorders such as Alzheimer's Disease, Parkinson's Disease, frontotemporal dementia and subcortical vascular dementia. On the other hand; apathy can be seen in the senile depressions, especially in vascular-induced types (3). Clinical, neuropathological and neuroimaging studies indicate that apathy is a reflection of the functional disorder in frontal-subcortical circuits. and especially the circuits that connect the ventromedial prefrontal cortex to the related regions in the basal ganglion. It is stated that dysfunctions of neural networks between the prefrontal cortex and the related regions of the basal ganglia are associated with emotional, cognitive, and impulse related parts of apathy. It is emphasized that frontal cortex disorders should be taken into consideration for the definitive diagnosis in the clinical existence of apathy (2-4).

Apathy is defined as "masked depression" or "depression without sadness" and is frequently encountered in elderly individuals diagnosed with unipolar major depression and during the first episode (4, 5). Similarities between apathy and depressive symptoms make it difficult to recognize apathy in depression. The presence of symptoms that can be considered as both depression and apathy syndrome such as decrease of target-driven behaviors, lack of intellectual interest, flatness in affect and indifference, make the differential diagnosis difficult. Studies have shown that apathy is a neuropsychiatric syndrome other than depression;

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and sadness, pessimism, desperation, worthlessness can help to diagnose depression (6). It is known that there may be loss of cognitive functions in depression such as reduction in data processing speed, distractibility, decrease in concentration and impairment in memory processes such as recall (4, 7). It is put forth that the treatment response to antidepressants as well as remission ratios are low in the presence of apathy in depression, whereas executive function disorders and disability are higher (5, 8). It is suggested that, functional and structural connection disorders between the prefrontal cortex and limbic structures has adverse effects on cognitive functions in geriatric depression accompanied by apathy (3, 4, 9).

Apathy is observed frequently during geriatric depression and accompanies with cognitive function impairments, especially executive function impairments. The objective of this study was to determine the apathy level in elderly depression, as well as the relationship between apathy levels and depressive symptom severity and cognitive functions.

METHODS

Sample group

The study was included 40 patients applied to the Pamukkale University Department of Psychiatry aged 60 and above, diagnosed with MDD according to the DSM-IV diagnosis criteria, without medication; and 40 healthy controls aged 60 and above with similar level of education. The DSM-IV diagnostic criteria (SCID-I) were applied to the patients and the current diagnoses and depressive disorder history were evaluated. Sociodemographic data form, Hamilton Depression Rating Scale (HAM-D), Hamilton Anxiety Rating Scale (HAM-A), Montgomery-Asperg Depression Rating Scale (MADRS), Standardized Mini-Mental State Examination (SMMSE), Montreal Cognitive Assessment Scale (MoCA), Apathy Evaluation Scale (AES) and Sheehan Disability Scale (SDS) were applied to all participants. In our study, both HAM-D and MADRS were used to determine the severity of depressive symptoms. There are psychomotor and somatization symptoms in HAM-D, and it is recommended to use MADRS to determine the level of depression in the presence of somatic symptoms or somatic complaints (10). Our study group consisted of elderly and considering that somatic diseases and somatic complaints might be high, two scales were used to determine depressive symptom levels.

Ethical Council approval was taken from the Pamukkale University Council of Ethics (dated 06.02.2014 and numbered 7762) for the study. All participants were informed about the study in detail, and volunteers were included in the study after taking written approvals.

The inclusion criteria for the patient group were determined as; being diagnosed with MDD according to DSM-IV diagnosis criteria, being aged 60 and above, being literate, providing approval for participation after being told the objective and process of the study. Inclusion criteria for the control group were; being aged 60 and above, having similar gender and education level with the patient group, having no diagnosis according to DSM IV diagnosis criteria. Criteria for exclusion from the study were determined as; existence of a neurological disease that may affect the cognitive functions (such as multipl sclerosis, serebrovascular disorders, dementia..etc), having mental retardation, having a story of head trauma/accident and having other psychiatric disorders such as psychotic disorders, bipolar disorder or anxiety disorders.

DATA COLLECTION

DSM-IV Structured Clinical Interview Form (SCID-I)

It is an interview tool applied by the interviewer in order to examine the axis I mental disorder diagnoses according to DSM-IV (11). The "current" and "life long" Axis I psychiatric disorder diagnoses of the individuals are examined via a semi-structured interview. It has been adopted into Turkish and the reliability study has been completed (12). Current psychiatric diagnoses and depressive disorder history of the cases were evaluated in our study.

Hamilton Depression Rating Scale (HAM-D)

It is a 17 question scale used for measuring the severity of depression (13). Scores varying between 0 and 53 are acquired from the scale and high scores indicate an increase in depression severity. Scores of 0-7 indicate no depression, 8-15 indicate mild, 16-28 indicate moderate, 29 and above indicate severe depression. Turkish reliability and validity studies of the scale have been carried out (14).

Hamilton Anxiety Rating Scale (HAM-A)

Prepared for determining the anxiety level and symptom distribution as well as the severiry (15). Comprised of 14 items that question the psychic and physical symptoms of anxiety. Highest score that can be obtained is 56. Scores of between 0-4 indicate no anxiety, below 17 indicate mild, 18-24 indicate moderate, above 25 indicate severe and high anxiety. Turkish reliability and validity studies of the scale have been carried out (16).

Montgomery-Asberg Depression Rating Scale (MADRS)

MADRS has been developed for determining the intensity of the depressive symtoms and to measure the changes that occur with treatment (17). "Motor retardation", which is one of the core symptoms of depression, is not included. MADRS focuses on the cognitive symptoms of depression, and is preferred in the presence of somatic symptoms and in the presence of physical illness (10). The scale scores of between 9 -29 indicate the existence of mild, 30-36 of moderate and above 36 of severe depression. Turkish reliability and validity studies of the scale have been carried out (10).

Standardized Mini Mental State Examination (SMMSE)

SMMSE is a short, useful and standardized scale used for determining the global cognitive level (18). It is comprised of five sub-sections: orientation to time and place, record memory, attention, recall and language. The highest score that can be obtained from SMMSE is 30. Scores of between 24 -30 in SMMSE indicate normal, between 20-23 indicate mild, between 10-19 indicate moderate, whereas betwen 0-9 indicate severe neurocognitive deficit (10).

Montreal Cognitive Assessment Test Kognitif Değerlendirme Testi (MoCA)

MoCA has been developed for distinguishing healthy individuals from mild cognitive impairments (20). It is a short and easy to apply scale. Translation and adaptation studies have been carried out to 24 different language including Turkish. The scale has items that evaluate attention and concentration, executive functions, memory, language, visual-spatial skills, abstract thinking, calculation and orientation dimensions. The lowest score that can be obtained from the scale is 0, whereas the highest score is 30. Turkish standardization study has been carried out. Cut-off score for distinguishing healthy individuals from those with mild cognitive ones has been determined as 21 (21).

Apathy Evaluation Scale (AES)

AES focuses on the hobbies and occupations of the patients in their daily lives as well as their enjoyments and measures the losses in these areas. The scale has 18 items with scores that vary between 18 -72 to evaluate the indifference in behavioral, cognitive and emotional areas in the past 4 weeks (22). Turkish reliability and validity studies of the scale have been carried out (23). The scale has both self-report form and clinician form. The self-report form of the scale was used in our study. When needed, the interviewer helped patients fill the scale (such as reading questions and answers).

Sheehan Disability Scale (SDS)

The scale includes the subscale of "Work", "social life / leisure time" and "family life / home responsibilities" and used for determining the disabilities in these areas. It ıs a self report scale scored 0 to 10. In this scale, different levels of deficits are graded such as [0] not at all, [1, 2, 3] mildly, [4, 5, 6] moderately, markedly [7, 8, 9] and extremely [10]. Rise in scores indicates deterioration in functionality (24). As our research population consists of elderly and non-working individuals, "social life / leisure time" and "family life / home responsibilities" subscales were evaluated.

STATISTICAL ANALYSES

The data were analyzed via SPSS 22.0 (Statistical Package for the Social Sciences version Inc., Chicago, IL, USA) package software. The data were first subject to Shapiro-Wilk test for controlling their accordance with normal distribution. The Mann-Whitney U test was used to make comparisons between the two groups because the data were found to be non-conforming to the normal distribution. Spearman's correlation analysis was used to examine the relationship between variables

RESULTS

Sociodemographic data

Forty patients with MDD (aged between 60 to 81), and 40 healthy controls (aged between 60 to 81) were included in the study. Majority of the study group was comprised of women (ratio of women in both groups were 60%, n:24). Age, education year averages and comparison of the scale scores have been shown in Table 1. There were no significant differences between the groups in terms of physical disease and continuous drug use (p>0.05, chi-square test). Depressive episode history was determined as 60 % (n:24) in the MDD group, and 2,5 % (n:1) as in the healthy controls.

Clinical data

HAM-D, HAM-A, MADRS, AES and SDS scores were found to be higher in MDB group compared with healthy controls (Table1). Significant differences were found between MDD group and healthy control group in SMMSE total score, MoCA total, visual / spatial executive function and orientation; additionally memory and language subscales differences were found to be nearly close to significance (Table1). In the patient group, AES scores were not significantly difference between the first episode MDB and those with the history of MDD (respectively 43.31 ± 8.97, 42.08 ± 9.36, p> 0.05).

Correlation analyses

The correlations between the AES scores and the other scales for the MDD group have been given in Table 2. A negative correlation was determined in the MDD group between the AES scores and SMMSE total score and MoCA total score; whereas a positive correlation was determined between the AES scores and HAM-A, HAM-D and MADRS total scores. A negative correlation was determined between the AES scores and MoCA orientation sub-scale score (r=0.372, p=0.018)

The correlations for healthy control group between the AES scores and other scales have been given in Table 3. A negative correlation was determined between the AES scores and SMMSE total scores and MoCA total scores. Negative correlations were found between AES and SMMSE orientation sub-scale scores (r = 0.329, p = 0.038), recall sub-scale scores (r = 0.484, p = 0.002), and language sub-scale scores (r = 0.356, p = 0.024).

Table 1. Sociodemographic data and measurements

Variables and Scales	Old MDD Mean±SD	Healty Control Mean±SD	z	P*
Age	65.0±5.8	64.8±5.5	0.93	0.926
Year of Education	5.7±3.2	5.6±3.0	0.448	0.654
HAM-D total	20.9±4.0	0.0±0.2	8.121	<0.001
HAM-A total	11.1±4.3	0.1±0.3	8.118	<0.001
MADRS total	31.0±4.5	0.1±0.3	8.145	<0.001
AES total	42.5±9.1	24.2±6.2	7.105	<0.001
SMMSE				
Total	27.2±1.8	28.0±1.6	2.043	0.041
Orientation	9.5±0.9	9.7±0.5	1.583	0.113
Recording Memory	2.9±0.1	3.0±0.0	1.000	0.317
Attention and account	4.2±1.2	4.5±0.6	0.364	0.716
Recall	2.0±0.7	1.9±0.6	0.479	0.632
Language	8.4±0.5	8.6±0.5	1.656	0.098
MoCA				
Total	21.1±3.1	23.1±3.5	2.887	0.004
Visual/spatial-Executive Functions	2.8±1.2	3.5±1.2	2.334	0.020
Naming	2.4±0.5	2.3±0.4	0.821	0.412
Memory	2.7±1.1	3.2±1.1	1.904	0.057
Attention	4.7±1.2	4.8±1.2	0.776	0.438
Language	1.4±1.0	1.8±0.7	1.899	0.058
Abstract Thinking	1.0±0.6	1.3±0.6	1.626	0.104
Orientation	5.7±0.5	6.0±0.0	2.961	0.003
SDS				
Social life / leisure time	5.7±1.7	0.0±0.0	8.266	<0.001
Family life / home responsibilities	5.9±1.8	0.0±0.0	8.090	<0.001

*Mann-Whitney U (p<0.05 significant)
MDD: Major Depressive Disorder, HAM-D: Hamilton Depression Rating Scale, HAM-A:Hamilton Anxiety Scale, MADRS: Montgomery- Asberg Depression Scale, AES: Apathy Evaluation Scale, SMMSE: Standardized Mini-Mental State Examination, MoCA: Montreal Cognitive Assessment, SDS: Sheehan Disability Scale

DISCUSSION

Depressive symptom severity was at a moderate level in our study in the MDD group and depression and anxiety scale scores were higher than the control group. It was determined that apathy level was higher in MDD group compared with the control group; and apathy levels were found to be increased as the severity of depression increased. It is known that apathy accompanies cognitive disorders and various psychiatric disorders and this relationship is strong especially in geriatric depression. However, recognition of apathy and distinction from depressive symptoms is not easy, even ıt is controversial (3). Studies have shown that, as the severity of depressive symptoms increases, apathy levels increase in all age groups (25, 26). It is also reported that apathy is more common in senile depression compared to early-onset depression and the relationship

Table 2. Correlations between scales in MDD group

	Scales		1	2	3	4	5	6	7	8
1	AES	r p		-0.398 0.011	-0.325 0.041	0.553 0.000	0.386 0.014	0.556 0.000	0.558 0.000	0.730 0.000
2	SMMSE	r p			0.421 0.000	-0.210 0.193	0.089 0.583	-0.132 0.418	-0.206 0.201	-0.284 0.076
3	MoCA	r p				-0.158 0.330	-.020 0.902	-0.143 0.377	-0.146 0.368	-0.237 0.140
4	HAM-D	r p					0.380 0.016	0.647 0.000	0.658 0.000	0.571 0.000
5	HAM-A	r p						0.413 0.008	0.326 0.040	0.441 0.004
6	MADRS	r p							0.589 0.000	0.677 0.000
7	SDS 1	r p								0.809 0.000
8	SDS 2	r p								

Spearman's correlation analyse (p<0.05 significant)
MDD: Major Depressive Disorder, AES: Apathy Evaluation Scal, SMMSE: Standardized Mini-Mental State Examination, MoCA: Montreal Cognitive Assessment, HAM-D: Hamilton Depression Rating Scale, HAM-A:Hamilton Anxiety Scale, MADRS: Montgomery- Asberg Depression Scale, SDS 1: Sheehan Disability Scale (Social life / leisure time), SDS 2: Sheehan Disability Scale (Family life / home responsibilities)

Table 3. Correlation between scales in healty control group

	Scales		1	2	3	4	5	6
1	AES	r p		-0.455 0.003	-0.305 0.056	-0.071 0.663	-0.068 0.678	-0.068 0.678
2	SMMSE	r p			0.631 0.000	-0.220 0.173	-0.222 0.170	-0.222 0.170
3	MoCA	r p				-0.372 0.018	-0.369 0.019	-0.369 0.019
4	HAM-D	r p					0.999 0.000	0.999 0.000
5	HAM-A	r p						1.000
6	MADRS	r p						

Spearman's correlation analyse (p<0.05 significant)
AES: Apathy Evaluation Scal, SMMSE: Standardized Mini-Mental State Examination, MoCA: Montreal Cognitive Assessment, HAM-D: Hamilton Depression Rating Scale, HAM-A:Hamilton Anxiety Scale, MADRS: Montgomery- Asberg Depression Scale

between apathy and depression increases with aging (9, 25, 26). It is put forth that there are differences in brain functional connections in depressed patients with and without apathy in old age and apathy is an indicator of chronicity and bad response to antidepressant treatments (4, 5). In our study, the majority of patients had previously experienced a depressive episode. There was no difference in terms of apathy levels between patients with the first episode MDD and those with the history of previous episode. In our study, correlation of both depression scales with AES led us to think that, in the elderly, there is a positive relationship between the severity of depressive symptoms and the level of apathy.

It was found that apathy levels were increased as the depression and anxiety symptoms increased in patients with MDD. On the other hand, it was found that cognitive performance was decreased, especially there was a negative correlation between apathy level and SMMSE total, MoCA total and orientation subscales. Strong relationship was found between apathy levels and impaired functioning. Negative correlations were found between apathy levels and SMMSE scores (total and subscales of orientation, recall and language) in healthy group. There are conflicting results regarding the relationship between apathy levels and cognitive functions in depression. In a study by Korten et al. (2014), ıt is emphasized that geriatric depression shows heterogeneity in terms of some clinical features and cognitive functions. In geriatric depression, high apathy levels and severity of depression / anxiety symptoms were found to be associated with low performance in episodic memory and data processing speed (27). Similarly, ın another study depressive symptom severity and impaired cognitive functions were found to be associated with apathy in geriatric depression (28). Lampe and Heeren (2004) carried out a study on 29 geriatric depression patients in which the relationships between apathy level and depressive symptom severity, cognitive functions and vascular risk factors in MDD and dysthymia cases were examined. It has been put forth that apathy was one of the fundamental negative symptoms of depression, but that there was no relationship between apathy and depressive symptom severity, cognitive functions and vascular risk factors (29).

Apathy can be seen as a part of many central nervous system diseases such as Alzheimer's disease, frontotemporal dementia or Parkinson's disease. Studies have shown that apathy is a reflection of the functional disorders in frontal-subcortical cycles and dysfunctions of the connections between the ventromedial prefrontal cortex and basal ganglia (3). It has been reported that Fronto-limbic gray and white matter abnormalities are associated with apathy, and this deterioration also continues after antidepressant treatment (9). It is emphasized that, ın geriatric depression, there are functional and structural abnormalities in the anterior cingulate cortex (ACC) as a part of dysfunction of froto-limbic neuronal networks. Anterior cingulate cortex is a functional intersection point in terms of emotion, cognition, executive and motor functions; and it has been found that apathy level was correlated with the accumulation of amyloid and tau protein in the ACC in patients with geriatric depression (30). There are studies supporting this; and it is also reported that in cognitive disorder

patients with apathy, Alzheimer type dementia occurrence rates were higher than those without apathy, and these patients should be followed in terms of neurocognitive disorders (31, 32). In our study, apathy levels were found to be related with low cognitive performance in both patients with depression and control group. Our results indicate that, in the presence of apathy, evaluation and follow-up of cognitive functions are necessary in the elderly whether or not they have depression. Studies on re-evaluation of apathy and cognitive functions after depression episode can be helpful to elucidate the relationship between depression, apathy and cognitive functions.

The vascular depression hypothesis has contributed to the clinical and etiological understanding of geriatric depression that has heterogeneous features. This hypothesis is based on the fact that vascular risk factors predispose the elderly to depression, and are effective in the occurrence and progress of depression (33). So, subcortical ischemic depression and depression-executive dysfunction syndrome were defined associated with this hypothesis. It has remarked that Depression-executive dysfunction syndrome occurs in the context of frontostriatal dysfunction and causes to executive dysfunction, psychomotor retardation, indifference, impairment in activities of daily living, disability, limited insight and poor response to antidepressants. It is suggested that this syndrome occurs with vascular diseases, age-related changes, degenerative brain diseases, or in most cases, the cumulative effect of all these. On the other hand, it is stated that subcortical ischemic depression is caused by the deterioration of subcortical structures due to cerebrovascular diseases. Subcortical ischemic depression is defined as a disorder that impairment of cognitive functions especially in areas such as verbal fluency and naming, manifest disability, apathy, psychomotor retardation can be seen more frequently; however agitation and guiltiness are less (34). The presence of apathy in geriatric depression may point at vascular risk factors or neurodegenerative processes. In this subject, new studies are needed to evaluate apathy and cognitive functions as well as vascular risk factors by using neuro imaging methods.

The total score of SMMSE and MoCA in MDD group was found to be lower than the control group in our study. MDD group showed low performance especially in orientation, visual spatial-executive functions, memory and language. In the studies, it is reported that there were impairments in geriatric depression especially in executive functions, also in visual spatial functions, episodic memory, data processing processes and language (9, 35). There are studies showing that there is a relationship between disease severity and cognitive functions in MDD (27). It was concluded in a meta-analysis study carried out in this subject that, symptom severity and cognitive functions are in correlation in geriatric depression, especially that episodic memory, executive functions and processing speed are affected, that semantic memory and visual-spatial memory is not effected; however, it is also stated that there are conflicting results in this area and stronger studies are required (36). In our study, no correlation was found between cognitive function performance and depression severity in MDD group. However, due to the lack of detailed neuropsychological tests, limited comments can be made on this subject.

In our study, cognitive functions were evaluated both by SMMSE which is a screen test, and the MoCA test which was developed to distinguish healthy individuals from mild cognitive impairments. These tests are useful in differentiating neurocognitive disorders and they show the general cognitive function levels of individuals. However, the fact that more detailed and comprehensive neuropsychological tests have not been used in our study for determining cognitive function level is one of the limitations of our study. Another limitation of our study is that physical diseases such as diabetes mellitus or hypertension and using of other medications have not been excluded in the MDD patients and control group. Already existing physical diseases and the medications used might have affected our results. However, when it is considered that physical diseases and medication use increases with increasing age, our study group represents the patient population that we encounter in our daily clinical practice.This should not be neglected while evaluating our results.

Our results suggest that apathy level is related with depressive symptom severity and cognitive function impairment in major depressive disorder. Our results also indicate that the presence of apathy especially with depression in the elderly should be follow-up in terms of neurocognitive impairment.

Ethics Committee Approval: The study was approved by the Ethics Committee of Pamukkale University (letter no. 7762 dated 06,02,2014).

Informed Consent: Patients were informed about the study in detail, and volunteers were included in the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - GSV, CB, YE; Design - GSV, CB, YE; Supervision - GSV, CB; Resource - GSV, CB, YE; Materials - GSV, CB, YE; Data Collection and/ or Processing - GSV, CB, YE; Analysis and/or Interpretation - GSV, CB, OZT, OÖ; Literature Search - GSV, CB, OZT, OÖ; Writing - GSV, CB, OZT, OÖ, YE; Critical Reviews -GSV, OZT, OÖ.

Conflict of Interest: The authors do not have any conflict of interest.

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REFERENCES

1. Alexopoulos GS, Hoptman MJ, Yuen G, Kanellopoulos D, Seirup JK, Lim KO, Gunning FM. Functional connectivity in apathy of lite life depression: A preliminary study. J Affect Disord 2013;149:398–405. [CrossRef]
2. Moretti R, Signori R. Neural Correlates for Apathy: Frontal-Prefrontal and Parietal Cortical- Subcortical Circuits. Front Aging Neurosci 2016;8:1–13. [CrossRef]
3. Chase TN. Apathy in Neuropsychiatric Disease: Diagnosis, Pathophysiology, and Treatment. Neurotox Res 2011;19:266–278. [CrossRef]
4. Marin RS. Apathy: A neuropsychiatric syndrome. J Neuropsychiatry Clin Neurosci 1991;3:243–254. [CrossRef]
5. Yuen GS, Bhutani S, Lucas BJ, Gunning FM, AbdelMalak B, Seirup JK, Klimstra SA, Alexopoulos GS. Apathy in late-life depression: common, persistent, and disabling. Am J Geriatr Psychiatry 2015;23:488–494. [CrossRef]
6. Levy ML, Cummings JL, Fairbanks LA, Masterman D, Miller BL, Craig AH, Paulsen JS, Litvan I. Apathy Is Not Depression. J Neuropsychiatry Clin Neurosci 1998;10:314–319. [CrossRef]
7. Butters MA, Whyte EM, Nebes RD, Begley AE, Dew MA, Mulsant BH, Zmuda MD, Bhalla R, Meltzer CC, Pollock BG, Reynolds CF 3rd, Becker JT. The nature and determinants of neuropsychological functioning in late- life depression. Arch Gen Psychiatry 2004;61:587–595. [CrossRef]
8. Feil D, Razani J, Boone K, Lesser I. Apathy and cognitive performance in older adults with depression. Int J Geriatr Psychiatry 2003;18:479–485. [CrossRef]
9. Yuen GS, Gunning FM, Woods E, Klimstra SA, Hoptman MJ, Alexopoulos GS. Neuroanatomical correlates of apathy in late-life depression and antidepressant treatment response. J Affect Disord 2014;166:179–186. [CrossRef]
10. Torun F, Önder E, Torun SD, Tural U, Şişmanlar ŞG. The reliability and validity of Montgomery-Asberg Depression Rating scale for Turkish version. Journal of Psychopharmacology Psychiatry Psychology 3P;2002;10:319–330.
11. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). Washington, DC, American Psychiatric Association, 1994.
12. Özkürkçügil A, Aydemir Ö, Yıldız M, Esen Danacı A, Köroğlu E. Adaptation and reliability study of the structured clinical interview for DSM-IV axis I disorders. Journal of Medicine and Treatment 1999;12:233–236.
13. Hamilton MA. A rating scale for depression. J Neurol Neurosurg Psychiatry 1960;23:56–62.
14. Akdemir A, Türkçapar MH, Örsel SD, Demirergi N, Dag I, Ozbay MH. Reliability and validity of the Turkish version of the Hamilton Depression Rating Scale. Compr Psychiatry 2001;42:161–165. [CrossRef]
15. Hamilton M. The assessment of anxiety states by rating. Br J Med Psychol 1959;32:50–55. [CrossRef]

16. Yazıcı MK, Demir B, Tanrıverdi N, Karaağaoğlu E, Yolaç P. Hamilton anxiety rating scale: interrater reliability and validity study. Turkish Journal of Psychiatry 1998;9:114–117.
17. Montgomery SA, Åsberg M. A new depression scale designed to be sensitive to change. Br J Psychiatry 1979;134:382–389. [CrossRef]
18. Folstein MF, Folstein SE, McHugh PR. 'Mini-Mental State': a practical method for grading the mental state of patients for clinician. J Psychiatr Res 1975;12:189–198. [CrossRef]
19. Güngen C, Ertan T, Eker E, Yaşar R, Engin F. The reliability and validity of the Standardized Mini Mental Test Examination in the diagnosis of moderate dementia in Turkish population. Turk Psikiyatri Derg 2002;13:273–281.
20. Nasreddine ZS, Philips NA, Bedirian V, Charbonneau S, Whitehead V, Collin I, Cummings JL, Chertkow H. The Montreal Cognitive Assesment, MOCA. A brief screening tool for mild cognitive impairment. J Am Geriatr Soc 2005;53:695–699. [CrossRef]
21. Selekler K, Cangöz B, Uluc S. Power of discrimination of Montreal Cognitive Assessment (MoCA) Scale in Turkish patients with mild cognitive ımpairement and Alzheımer's Disease. Turkish Journal of Geriatrics 2010;13:166–171.
22. Marin RS, Biedrzycki RC, Firinciogullari S. Reliability and validity of the Apathy Evaluation Scale. Psychiatry Res 1991;38:143–162. [CrossRef]
23. Gülseren Ş, Atun Ç, Erol A, Aydemir Ö, Çelebisoy M, Kültür S. Validity and reliability study of the Turkish version of the Apathy Evaluation Scale. Arch Neuropsychiatry 2001;38:142–150.
24. Sheehan DV, Harnett-Sheehan K, Raj BA. The measurement of disability. Int Clin Psychopharmacol 1996;11:89–95. [CrossRef]
25. Groeneweg-Koolhoven I, Ploeg M, Comijs HC, BWJH Penninx, van der Mast RC, Schoevers RA, Rhebergen D, van Exel E. Apathy in early and late-life depression. J Affect Disord 2017;223:76–81. [CrossRef]
26. Mehta M, Whyte E, Lenze E, Hardy S, Roumani Y, Subashan P, Huang W, Studenski S. Depressive symptoms in late life: associations with apathy, resilience and disability vary between young-old and old-old. Int J Geriatr Psychiatry 2008;3:238–243. [CrossRef]
27. Korten NCM, Penninx BWJH, Kok RM, Stek ML, Oude Voshaar RC, Deeg DJH, Comijs HC. Heterogeneity of late-life depression: relationship with cognitive functioning. Int Psychogeriatr 2014;26:953–963. [CrossRef]
28. Funes CM, Lavretsky H, Ercoli L, St Cyr N, Siddarth P. Apathy Mediates Cognitive Difficulties in Geriatric Depression. Am J Geriatr Psychiatry 2018;26:100–106. [CrossRef]
29. Lampe IK, Heeren TJ. Is apathy in late-life depressive illness related to age-at-onset, cognitive function or vascular risk? Int Psychogeriatr 2004;16:481–486. [CrossRef]
30. Eyre HA, Siddarth P, van Dyk K, St Cyr N, Baune BT, Barrio JR, Small GW, Lavretsky H. Psychogeriatrics. Neural correlates of apathy in late-life depression: a pilot [18 F]FDDNP positron emission tomography study. Psychogeriatrics 2017;17:186–193. [CrossRef]
31. Robert PH, Berr C, Volteau M, Bertogliati C, Benoit M, Mahieux F, Legrain S, Dubois B; PréAL Study. Apathy in patients with mild cognitive impairment and the risk of developing dementia of Alzheimer's disease: a one-year follow-up study. Clin Neurol Neurosurg 2006;108:733–736. [CrossRef]
32. Palmer K, Di Iulio F, Varsi AE, Gianni W, Sancesario G, Caltagirone C, Spalletta G. Neuropsychiatric predictors of progression from amnestic-mild cognitive impairment to Alzheimer's disease: the role of depression and apathy. J Alzheimers Dis 2010;20:175–183. [CrossRef]
33. Alexopoulos GS. The vascular depression hypothesis: 10 years later. Biol Psychiatry 2006;60:1304–1305. [CrossRef]
34. Alexopoulos GS. Depression in the elderly. Lancet 2005;365:1961–1970. [CrossRef]
35. Dybedal GS, Tanum L Sundet K, Gaarden TL, Bjølseth TM. Neuropsychological functioning in late-life depression. Front Psychol 2013;4:1–10. [CrossRef]
36. McDermott LM, Ebmeier KP. A meta-analysis of depression severity and cognitive function. J Affect Disord 2009;119:1–8. [CrossRef]