

**Table S1. Original Studies on Cognitive Deficits in Late-Life Depression (2011–2019).**

Author, Year	Country	Setting, Design	Objectives of the Study	Age Group, Sample Size	Diagnosis of Depression	Cognitive Assessments	Main Results
Novaretti et al., <sup>13</sup> 2011	Brazil	Hospital-based study Cross-sectional	To compare the profiles of language abilities in late-onset depression and mild AD groups.	LOD—25 Mild AD—30 Controls—30	<i>DSM-IV</i>  NINCDS-ADRDA	Arizona Battery for Communication Disorders of Dementia (ABCD)	Depressed patients' scores were similar to AD in confrontation naming, concept definition, following commands, repetition, and reading comprehension (sentence). Episodic memory and mental status subtests were useful in differentiating depressed patients from AD.
Jungwirth et al., <sup>28</sup> 2011	Austria	Prospective study	Investigated the influence of depression on processing speed and executive function in older adults.	LOD ( $n = 287$ )	<i>DSM-IV</i>	Trail making test (A and B), verbal fluency	On regression analysis, education has a positive influence and cerebral comorbidity had negative influence of executive function. Depression had only minor influence.
Tam CW et al., <sup>14</sup> 2012	China	Cross-sectional Hospital-based	To investigate the relationship between cognitive performance and severity of depression in Chinese elderly subjects with late-onset depression	LOD ( $n = 105$ ) MCI ( $n = 175$ ) HC ( $n = 149$ )	<i>DSM-IV</i>	MMSE Chinese version of ADAS-Cog, neuropsychological tests	The depression group had significantly poorer performance in all cognitive assessments compared to the normal elderly control group. The depression group had a similar cognitive profile to those with mild cognitive impairment, except that its subjects had slightly better performance in the Categorical

							Verbal Fluency Test, delayed recall testing.
Sachs-Ericsson et al., <sup>23</sup> 2013	Florida, USA	Prospective, Outpatient based	To determine if LOD, compared with EOD, would demonstrate more cognitive and neuroimaging changes.	Age >60 years EOD ( $n = 65$ ) LOD ( $n = 70$ )	<i>DSM-IV</i>	MMSE MADRS	The LOD group exhibited a greater decline in cognitive scores during the 4-year follow-up. There is decreased right cerebral gray matter in LOD group.
Richard-Devantoy et al., <sup>16</sup> 2013	Canada	Cross-sectional study Hospital-based	To compare cognitive inhibition performance between people with early-onset (EOD) or late-onset depression (LOD) and controls, and between women and men with LOD	Women EOD ( $n = 10$ ) Women LOD ( $n = 10$ ) Women HC ( $N = 10$ ) Men LOD ( $n = 10$ )	<i>DSM-IV</i>	Neuropsychological tests Mainly, Stroop test	Older depressed women, irrespective of the age of onset of depression, had greater cognitive inhibition impairments (attention and verbal component) compared with healthy women. No executive function differences were found between EOD and LOD and across the genders.
Dybedal et al., <sup>15</sup> 2013	Norway	Hospital-based Cross-sectional	determine the characteristics of neuropsychological functioning in nondemented LLD patients	LOD ( $n = 39$ ) controls ( $n = 18$ )	DSM-IV	Neuropsychological tests	Relative to HC subjects, LLD patients performed significantly poorer in the domains of information processing speed and executive function. Nearly half of the patients had a clinically significant cognitive impairment in at least one neurocognitive domain

Mackin RS et al., <sup>21</sup> 2014	California, USA	Cross-sectional Hospital-based	To compare patterns of cognitive performance in older adults with late-onset depression to that of older adults with early-onset depression	Age>65 EOD ( $n = 99$ ) LOD ( $n = 72$ )	<i>DSM-IV</i>	Test for verbal learning, memory, and executive function	The LOD group demonstrated poorer performance on measures of verbal learning, $F(1,161) = 4.28$ , $P = 0.04$ and memory $F(1,160) = 4.65$ , $P = 0.03$ , than the EOD. Linear regression analysis demonstrated that LOD and fewer years of education were significant predictors of poorer verbal learning, $F(7,114) = 6.25$ , $P < 0.001$ and memory, $F(7,113) = 7.24$ , $P < 0.001$
Disabato et al., <sup>24</sup> 2014	USA	Hospital-based Prospective observational study	Compare cortical thicknesses, white matter hyperintensities, neuropsychological factors, treatment outcomes between LOD and EOD	LOD—66 EOD—60 Older adults	<i>DSM-IV</i>	Neuropsychological test at 12 weeks	No differences were found in neuropsychological factor scores or treatment outcome between early-onset and late-onset LLD subjects. The late-onset group also had more hyperintensities than the EOD subjects. Left anterior cingulate thickness was significantly smaller in the late-onset depressed group than in the EOD
Dillon et al. <sup>22</sup> , 2014	Argentina	Hospital-based  Outpatient clinic Cross-sectional	To investigate subtypes of geriatric depression associated with cognitive impairment	Major depression disorder (MDD) ( $n: 31$ ), Dysthymia Disorder (DD) ( $n: 31$ ), subsyndromal depression disorder	SCAN ( <i>DSM-IV</i> )	MMSE, neuropsychological tests	DdD group showed a cortical profile in memory (impairment in learning and recognition) while the other depressive groups (MDD, DD, SSD) had a subcortical profile in memory (impairment in memory with

				(SSD) ( <i>n</i> : 29), depression due to dementia (DdD) ( <i>n</i> : 27)			good recognition).
Dzierzewski et al., <sup>27</sup> 2015	USA	Prospective study (8.5 years), community based	Examined the chronic, acute, and longitudinal relationships between depressive symptoms and cognitive functioning in older adults in an ongoing treatment study of major depressive disorder (MDD)	<i>N</i> = 453 Age (mean)—70 years	Clinical interview, MADRS	CERAD battery	Increasing age, lower literacy, and chronic levels of depressive symptoms were related to lower cognitive functioning.
Klein et al., <sup>17</sup> 2015	Germany	Cross-sectional Hospital-based	To compare clock test deficits in elderly patients with early-onset depression (EOD) and late-onset depression (LOD)	EOD ( <i>N</i> = 26) LOD ( <i>N</i> = 27) HC ( <i>N</i> = 32)	<i>ICD-10</i>	Clock drawing tests, clock reading test, clock setting test, Tubingen clock questionnaire	LOD had lower scores on clock drawing tests than EOD and HC.
Callahan et al., <sup>18</sup> 2015	Canada	Cross-sectional Hospital Based	systematically compare object-based semantic memory performance between individuals with aMCI, aMCI/D+, and LLD	aMCI ( <i>n</i> = 17) aMCI+ Dep ( <i>n</i> = 18) LLD ( <i>n</i> = 15) HC ( <i>n</i> = 29)	<i>DSM-IV-TR</i>	Semantic battery	The performance of aMCI/D+ participants was significantly worse than the three other groups
Zembaty et al., <sup>20</sup> 2016	Poland	Cross-sectional study	Assessment of Executive dysfunction in LLD	LLD ( <i>n</i> = 87) HC ( <i>n</i> = 100)	<i>DSM-5</i> , <i>GDS</i>	Trail making test, verbal fluency test, and go/no-go test	Depression group had poor psychomotor speed, cognitive flexibility, semantic fluency, and inhibition.

Hashem et al., <sup>1</sup> 2017	Egypt	Hospital-based Cross-sectional	To compare cognitive functions between late-onset (age: 60 years) and early-onset (<60 years) depression in elderly patients	Late-onset vs. early-onset elderly N = 80	NA	ACE-III	Late-onset had worse performance in memory, fluency, language, and visuospatial skills compared to early-onset.
Riddle et al., <sup>11</sup> 2017	USA	Prospective study Community	to determine whether clinical characteristics could serve as phenotypes informative of subsequent cognitive decline	Depressed (N = 273) and non-depressed (n = 164)	<i>DSM-IV</i>	Neuropsychological assessment	Depressed older adults performed in episodic memory and working memory at 3 months and 12 months compared to non-depressed even after remission. Early-onset depressed older adults had greater decline compared to late-onset.
Victoria et al., <sup>26</sup> 2017	USA	DBRCT Hospital-based (secondary analysis of STOP-PD study)	To characterize cognitive function at baseline and investigate the relationship between change in cognition, depression, and psychosis after treatment among older adults with major depressive disorder with psychotic features	Young old (n = 71) Older old (n = 71)	Psychotic depression ( <i>DSM-IV</i> )	MMSE Stroop word and color tasks, initiation/perseveration sub-scale of dementia rating scale, Stroop word interference task	Improvement in depressive symptoms was significantly associated with improvement in global cognitive function in young old participants but not in older participants.
Ranjan et al., <sup>19</sup> 2017	India (Mumbai)	Cross-sectional Outpatient	To assess neuropsychological deficits in older adults with depression	LLD—30 HC—30	<i>ICD-10</i> <i>GDS</i>	Luria–Nebraska battery	Depressive patients showed significant deficits in receptive speech, arithmetic, memory, reading, writing, and expressive speech as compared to normal controls
Olaya B et al., <sup>25</sup> 2019	Spain	Prospective (3 years) Community-based	determined whether the course of depression was associated with accelerated decline or deficits in verbal episodic memory and verbal fluency in depressed older	Age >60 years N = 1027	<i>DSM-IV</i> <i>TR</i>	Word list recall, animal naming test	Compared to controls, those with lifetime, remittent, incident, persistent depression were observed to have worse verbal fluency. Remitted and incident depression

			adults				patients had worse verbal episodic memory.
LOD: late-onset depression, EOD: early-onset depression, DEDS: depression-executive dysfunction syndrome, BBRC-Edu: Brief Cognitive Battery-Edu, LLD: late-life depression.							