



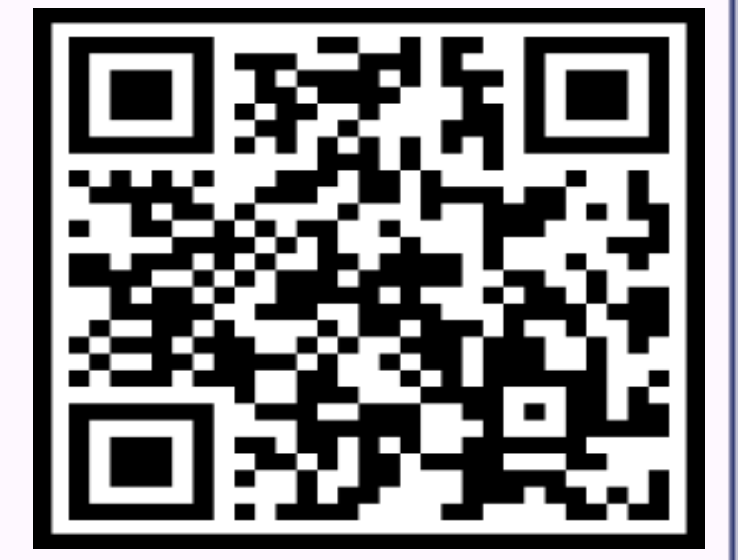
Neuroimaging Evidence Of Social Cognition Impairment In Mild Cognitive Impairment: A Systematic Review

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Background

Social cognition, including emotion recognition and theory of mind, is essential for interpreting social cues and effective interpersonal interaction. Mild cognitive impairment (MCI) is a transitional stage between normal aging and dementia, making early identification of subtle cognitive changes critical. While memory impairment has traditionally been emphasized, growing evidence suggests that social cognition deficits may emerge early and contribute to functional decline. These impairments may precede or occur independently of global cognitive deterioration, indicating their potential as early markers of disease progression. Neuroimaging studies have explored neural correlates of these deficits, but findings remain heterogeneous and lack systematic integration. This study aimed to systematically review neuroimaging evidence related to social cognition impairments in older adults with MCI.

Methods

Following PRISMA guidelines, studies published between January 2010 and August 2024 were retrieved from PubMed Central, EMBASE, and Web of Science. Studies were included if they involved individuals with MCI, assessed social cognition using validated tasks (e.g., emotion recognition, theory of mind, or empathy), and reported neuroimaging findings based on structural or functional MRI. Key search terms included MeSH terms such as “Neuroimaging,” “MCI,” “older adults,” “social cognition,” “task,” and “evaluation.” Six studies met inclusion criteria, encompassing seven distinct social cognition tasks. Six studies met inclusion criteria, encompassing seven distinct social cognition tasks. Data were extracted on participant characteristics, diagnostic criteria, social cognition domains and tasks, neuroimaging methods, and key findings. Methodological quality was evaluated using established appraisal frameworks.

Results

All six studies involved older adults (≥ 65 years) with MCI and employed both social cognition assessments and neuroimaging. The studies were categorized into ToM ($n = 2$) and emotion recognition ($n = 4$) domains. The assessment tools used included the Reading the Mind in the Eyes Test (RMET), the Eye Direction Detection Task, and the Facial Emotion Recognition Task (FERT). Most studies reported significant associations between decreased brain activation in the medial prefrontal cortex (mPFC), right temporoparietal junction (rTPJ), and precuneus, or structural changes in regions such as the amygdala, hippocampus, and anterior cingulate cortex (ACC). Significant correlations between social cognition performance and neuroimaging metrics were consistently observed, supporting a neurobiological basis for social cognitive decline in MCI.

Conclusions

Social cognitive deficits in MCI are closely associated with structural and functional alterations in brain regions involved in emotion processing and mentalizing. Integrating neuroimaging-based assessments with conventional social cognition tasks may enhance early identification of individuals at high risk for dementia. Despite limitations such as task heterogeneity, small sample sizes, and the lack of multiple comparison corrections, findings suggest that social cognition represents an independent cognitive domain in MCI and may serve as a valuable target for early diagnosis and personalized intervention strategies.

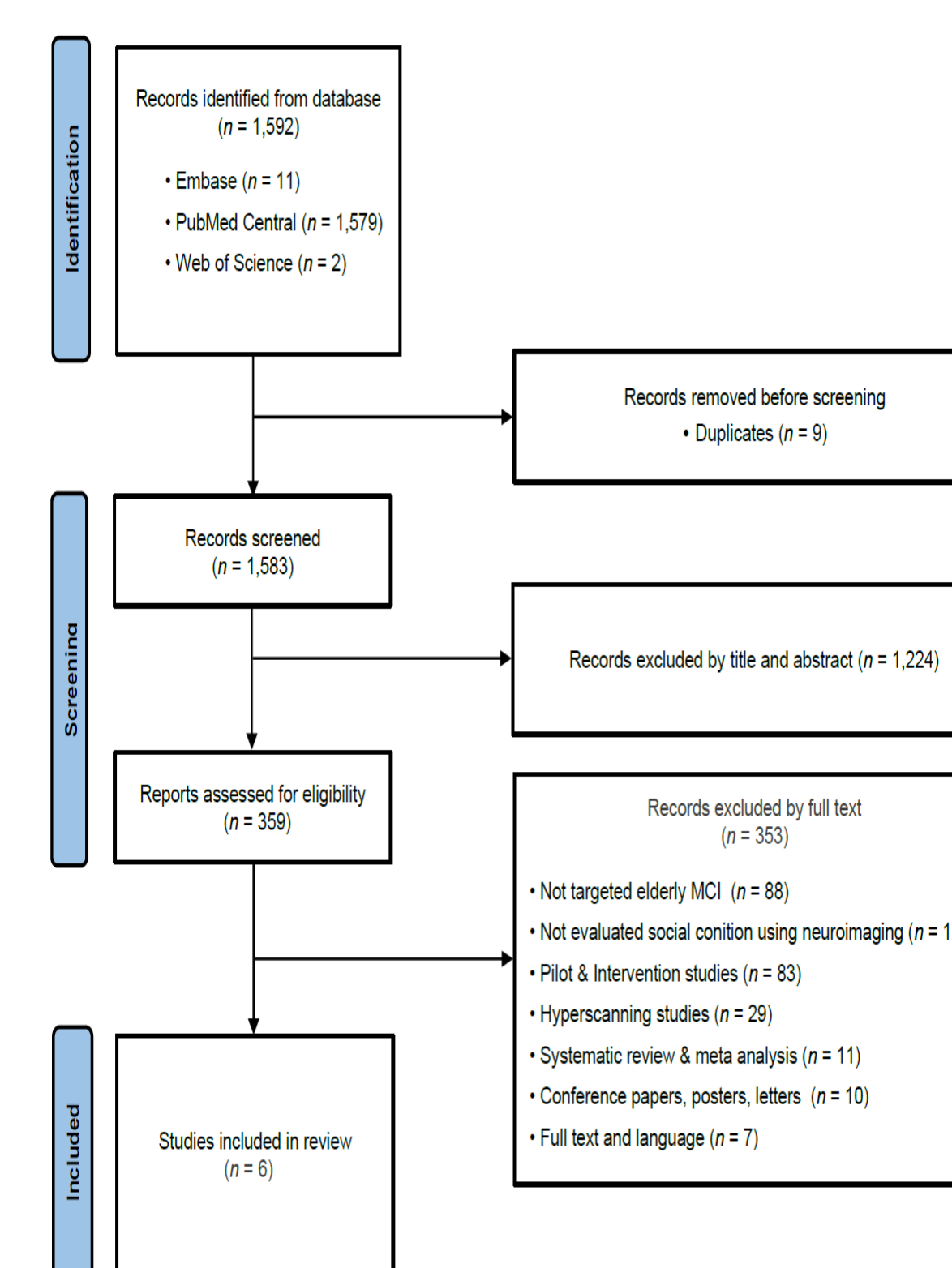


Figure 1. PRISMA 2020 Flow Diagram of the Study Selection Process

Table 1. Characteristics of Included Studies in MCI

No.	Author (Year)	Participants		Domain	Diagnosis Criteria	Country
		Group	N	M/SD		
1	Amlerova et al. (2022)	MCI	43	74.7 ± 6.1	Emotion	Czech Republic
		AD	36	74.7 ± 6.5		
		HC	23	67.0 ± 6.7		
2	Baglio et al. (2011)	aMCI	16	71.0 ± 5.8	ToM	Italy
		HC	15	66.9 ± 6.4		
3	Burhan et al. (2016)	Female MCI	10	72.7 ± 9.3	Emotion	Canada
		Female HC	12	65.8 ± 6.5		
4	Park et al. (2017)	MCI	32	74.3 ± 4.6	Emotion	Korea
		AD	32	76.7 ± 8.5		
		FTD	13	71.9 ± 3.6		
		HC	33	71.0 ± 6.5		
5	Sapey-Triomphe et al. (2015)	MCI	39	77.9 ± 4.7	Emotion	France
		HC	39	70.2 ± 7.2		
6	Valera-Bermejo et al. (2021)	MCI	37	75.3 ± 7.0	ToM	Spanish
		mild AD	9	75.3 ± 7.0		
		HC	34	74.7 ± 6.9		

AD: Alzheimer's disease, aMCI: amnesic mild cognitive impairment, FTD: Frontotemporal dementia, HC: Healthy Control, M: Mean, MCI: Mild cognitive impairment, NIA-AA: National Institute on Aging-Alzheimer's Association, NINCDS-ADRDA: National Institute of Neurological and Communicative Disorders and Stroke-Alzheimer's Disease and Related Disorders Association, SD: Standard deviation, ToM: Theory of mind.

Table 2. Neuroimaging Findings Associated With Social Cognition Tasks in MCI

No.	Author (Year)	Instrument(s)	Imaging	Brain Region(s)	Neural findings	Behavioral outcomes	Reported significance
1	Amlerova et al. (2022)	EPRT	MRI	TP, STS, ACC	Cortical thinning	↓ Prosody accuracy	$p < 0.001$
2	Baglio et al. (2011)	RMET	fMRI	mPFC, TPJ	↓ Activation	↓ RMET accuracy	$p < 0.001$
3	Burhan et al. (2016)	WM-FD	fMRI	Amygdala, ACC	↑ Activation	No significant group differences in WM performance	$p < 0.05$
4	Park et al. (2017)	K-FER	MRI	Frontal, Temporal	GM volume loss	↓ Recognition accuracy	$p < 0.001$
5	Sapey-Triomphe et al. (2015)	FER-4E	MRI	Amygdala, fusiform gyrus, pallidum	Emotion-specific ROI-volume correlations	↓ Negative emotion recognition	$p < 0.001$
6	Valera-Bermejo et al. (2021)	Ek-60F, RMET	Multimodal (MRI + fMRI)	ACC, OFC, TPJ, superior temporal cortex, cerebellum, DMN-related networks	GM volume loss, ↓ Connectivity	↓ ToM & empathy scores	$p < 0.05$

Data synthesized from Amlerova et al. (2022); Baglio et al. (2011); Burhan et al. (2016); Park et al. (2017); Sapey-Triomphe et al. (2015); Valera-Bermejo et al. (2021). ACC: Anterior cingulate cortex, DMN: Default mode network, Ek-60F: Ekman 60 Faces Test, EPRT: Emotional Prosody Recognition Test, FER-4E: Facial Emotion Recognition-4 Emotions, fMRI: functional magnetic resonance imaging, GM: Gray matter, K-FER: Korean Facial Emotion Recognition Test, mPFC: medial prefrontal cortex, MRI: Magnetic resonance imaging, OFC: Orbitofrontal cortex, RMET: Reading the Mind in the Eyes Test, ROI: Region of Interest, RT: Reaction time, STS: Superior temporal sulcus, ToM: Theory of mind, TP: Temporal pole, TPJ: Temporoparietal junction, WM: Working Memory, WM-FD: Working Memory with Emotional Face Distractors.

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