

# Parkinson's disease and normal aging

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A new research perspective titled "[Cholinergic centro-cingulate network in Parkinson disease and normal aging](#)" has been published in *Aging*.

In their new perspective, researchers Nicolaas I. Bohnen, Sygrid van der Zee and Roger Albin from University of Michigan, Veterans

Administration Ann Arbor Healthcare System, University of Groningen, and the University Medical Center Groningen discussed Parkinson's disease (PD).

Decreased cholinergic binding within the recently identified centro-cingulate brain network has been shown to robustly correlate with the severity of cognitive impairment in PD. This network with key hubs within the cingulum, operculum and peri-central cortical regions also correlates with elements of Parkinsonian motor impairments, including postural instability and gait difficulties, such as falls or freezing.

"We recently reported novel data-driving findings suggesting that cholinergic innervation deficits in centro-cingulate brain regions may be an important contributor to cognitive impairments in PD," write the authors.

MRI neuroimaging studies have shown that the anterior midcingulate cortex is a key node for cognitive aspects of movement generation, i.e., intentional motor control. Recent evidence also suggests a novel aspect of organization of primary motor cortex, describing "effector" regions for fine movement control intercalated with interlinked "inter-effector" regions devoted to whole-body control.

A distinguishing feature of inter-effector regions is tight linkage to the cingular and opercular regions. Such inter-effector regions have been proposed to be part of a greater somato-cognitive action network necessary for integration of goals and movement.

Recent evidence also points to vulnerabilities of cholinergic nerve terminals in the centro-cingulate network in older non-PD adults. These features of normal aging underscore that cortical cholinergic terminal losses in age-associated neurodegenerative disorders are likely not exclusively the result of disease-specific etiologies but also related to

otherwise normal aging.

"Practical implications of this overlap are that addressing disease-specific and general aging etiologies involved in neurodegeneration, may be of benefit in age-associated neurodegenerative disorders where significant cholinergic systems degeneration is present," the authors conclude.

**More information:** Nicolaas I. Bohnen et al, Cholinergic centro-cingulate network in Parkinson disease and normal aging, *Aging* (2023). [DOI: 10.18632/aging.205209](https://doi.org/10.18632/aging.205209)

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