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Cerebellar Structural Capacity Differentially Supports Postural Control in Healthy Aging and Mild Cognitive Impairment

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INTRODUCTION:

Mild cognitive impairment (MCI) is associated with increased fall risk and disrupted motor–cognitive integration [1,2]. Postural control under cognitive load depends on cortical–subcortical interactions. The cerebellum contributes to postural regulation and motor–cognitive networks in aging [3]. It remains unclear whether cerebellar volume is differentially related to postural control in healthy aging and MCI. This study examined associations between cerebellar volume and dual-task postural dynamics in older adults with and without MCI.

METHODS:

Fifty-five community-dwelling older adults (19 MCI;36 healthy) underwent 3T structural MRI and posturography. Cerebellar volumes were normalized to intracranial volume. Postural control under dual-task conditions was assessed in double stance (eyes open, eyes closed) and tandem stance, from which centre of pressure velocity (Vcop) and postural entropy were derived.

RESULTS:

In healthy older adults, larger cerebellar volumes were associated with lower entropy during dual-task tandem stance with eyes open (DT-REO). Negative correlations were observed for left cerebellar cortex volume (LCbCx: $r = -.392$; $p < .05$), right cerebellar cortex volume (RCbCx: $r = -.398$; $p < .05$), and total cerebellar volume (CbTot: $r = -.352$; $p < .05$). In contrast, in the MCI group, larger cerebellar volumes were positively associated with Vcop and entropy. During dual-task double stance with eyes open (DT-EO), RCbCx was associated with Vcop ($r = .556$, $p < .05$) and entropy ($r = .578$, $p < .05$), with similar associations observed for CbTot (Vcop: $r = .475$; entropy: $r = .549$; $p < .05$). During DT-REO, RCbCx ($r = .655$, $p < .01$) and CbTot ($r = .590$, $p < .05$) were positively associated with entropy. Significant group differences were observed for both Vcop (DT-EO, RCbCx: $z = 2.4$, $p = .016$) and entropy (DT-REO, RCbCx: $z = 3.96$, $p < .01$; CbTot: $z = 3.49$, $p < .01$).

CONCLUSION:

Cerebellar volume shows opposite associations with dual-task postural control in healthy aging and MCI. In healthy adults, larger cerebellar volumes were linked to lower entropy, consistent with more structured postural regulation under cognitive load. In MCI, larger cerebellar volumes were associated with higher sway velocity and entropy, indicating altered control dynamics. These findings suggest reorganization of motor–cognitive regulation in MCI.

REFERENCES

1. Hopkins J, Hill K, Jacques A, Burton E. Prevalence, risk factors and effectiveness of falls prevention interventions for adults living with mild cognitive impairment in the community: A systematic review and meta-analysis. *Clin Rehabil.* 2023;37(2):215–243.
2. Drozdova-Statkevičienė M, Česnaitienė VJ, Pukėnas K, Levin O, Masiulis N. Sway regularity and sway activity in older adults' upright stance are differentially affected by dual task. *Neurosci Lett.* 2018;666:153–157.
3. Bernard JA. Don't forget the little brain: A framework for incorporating the cerebellum into the understanding of cognitive aging. *Neurosci Biobehav Rev.* 2022;137:104639.

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