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Cognitivo-postural behaviour assessments in over 65-year-olds: Linking Adaptability Indicators to Perceptual Style

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Context

Among the intrinsic factors to the risk of falling in the elderly, the alteration of visual capacities is central. Paradoxically, this modality remains preferentially used for their postural control as proved their high field dependence. This perceptual style is known to reduce sensorimotor adaptability¹.

Many studies consider that increased postural variability is a marker of aging. In addition, the entropy-based complexity metrics that relate to the information content of a signal by quantifying the degree of regularity allowed detecting an exacerbated degradation of complexity in postural sway in aged people, thus indicating a failure in the dynamic re-organization of control². These metrics may provide a window on the interactions across scale supporting engaged cognitive processes and might offer an original approach to the concept of adaptability³.

The aim of this study was twofold: i) to analyze the variability and complexity of the cognitivo-postural behaviour during different suprapostural tasks in young and over 65-y.o adults, and ii) to explore how field dependence level and behavioural adaptation ability are linked in elderly.

Method



Two 12-healthy-subject groups :

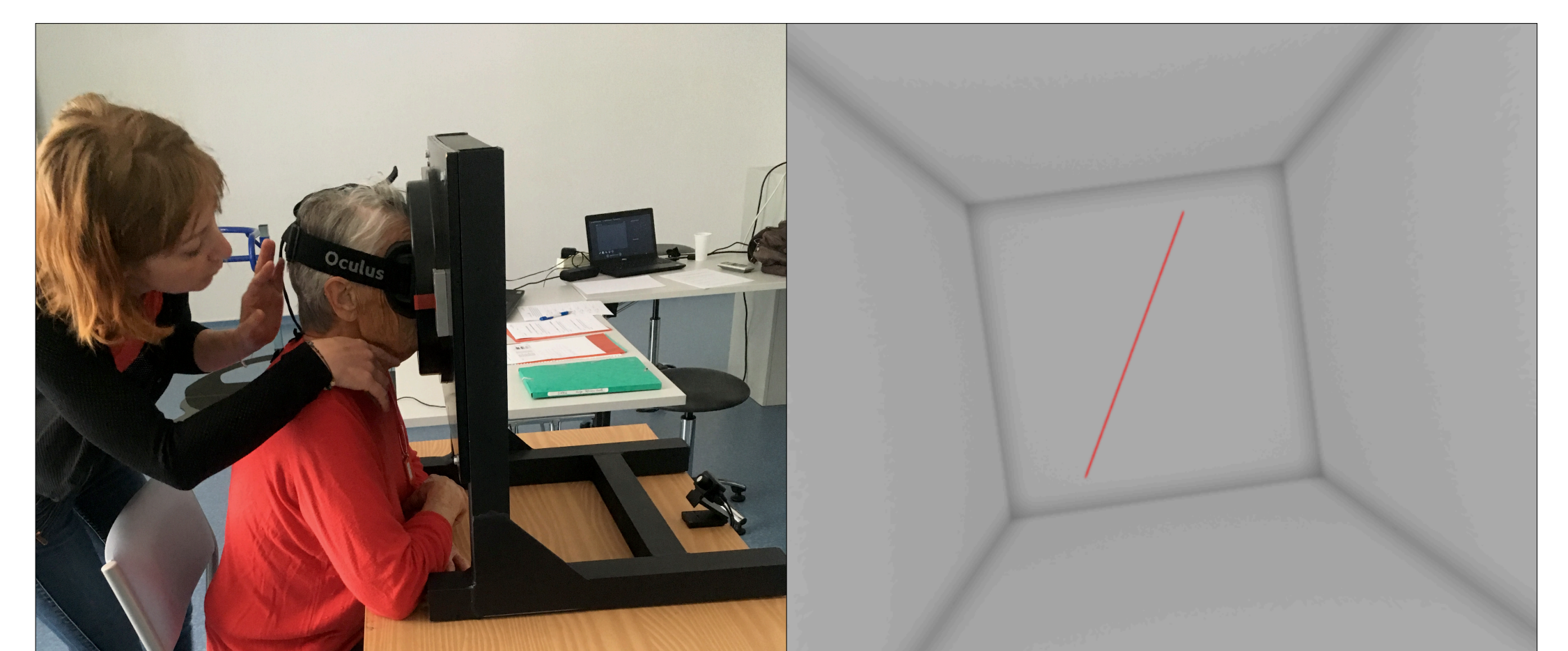
- Adult over 65 ($75,4 \pm 5,1$)
- Young Adult ($21,9 \pm 2,4$)

Four 51.2s-suprapostural tasks

- Visual Fix: • To focus a dot (VFix)
 Visual Disc: • To mentally count C-letters projected in front of them as fast and as efficiently as possible (VDis_Lev1) ...
 • ... with added A-letters (VDis_Lev2)
 • ... with added A- and G-letters (VDis_Lev3)

Rod and Frame Test (Adult over 65 group)

- To roll-adjust an initially tilted rod in a 18deg roll-tilted frame to the direction of gravity



Linear and non-linear analysis methods of kinetic data acquired via force platform (SATEL®, 100Hz):

- Standard deviation of CoP signal (SD),
- Entropy index (EI) calculated from the refined composite multiscale entropy curves (RCMSE).

Results & Discussion

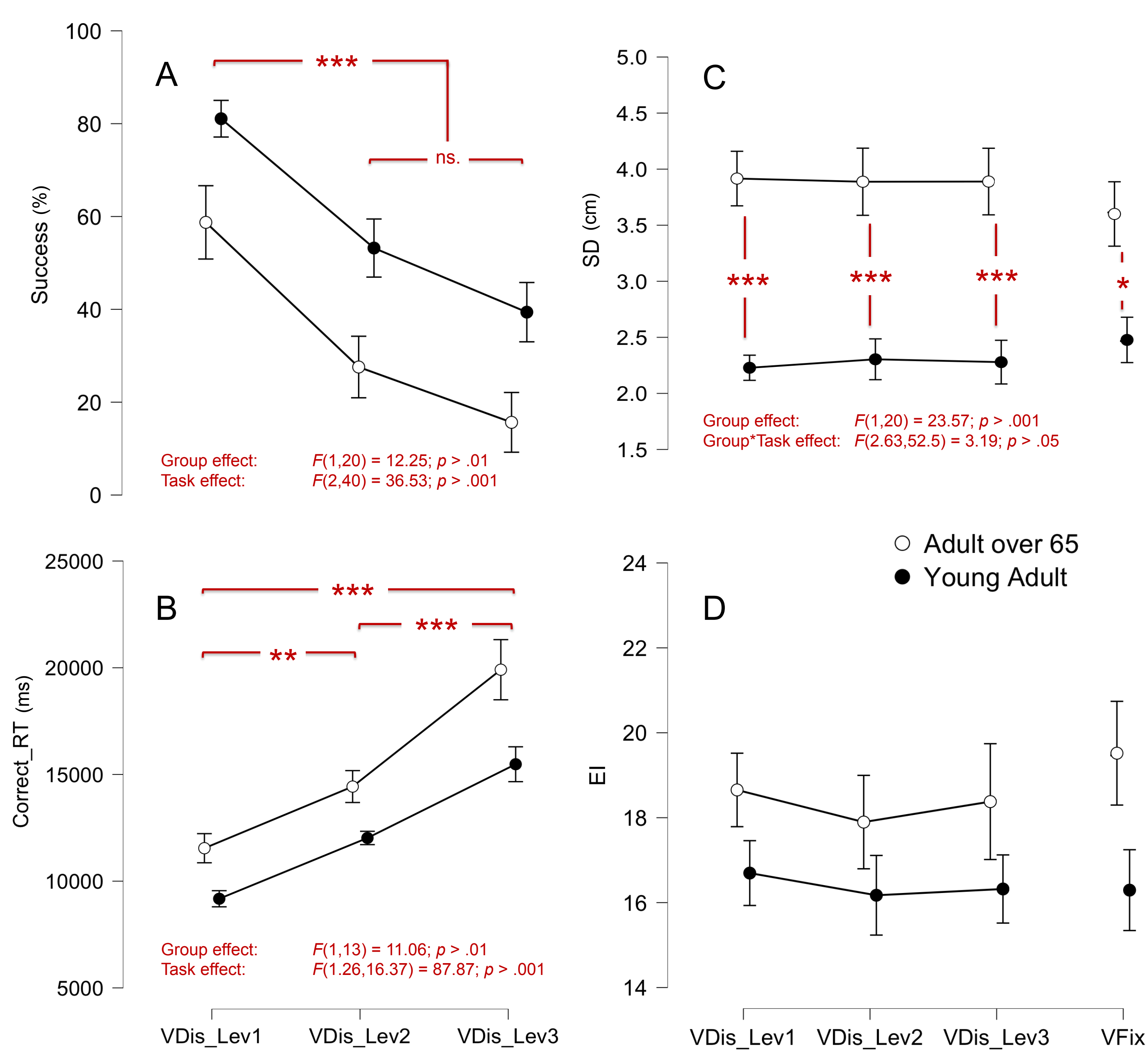


Fig.1 Success rate (A) and time of correct responses (B) in VDis tasks, and SD (C) and EI (D) during the four tasks in Adult over 65 and Young Adult groups.

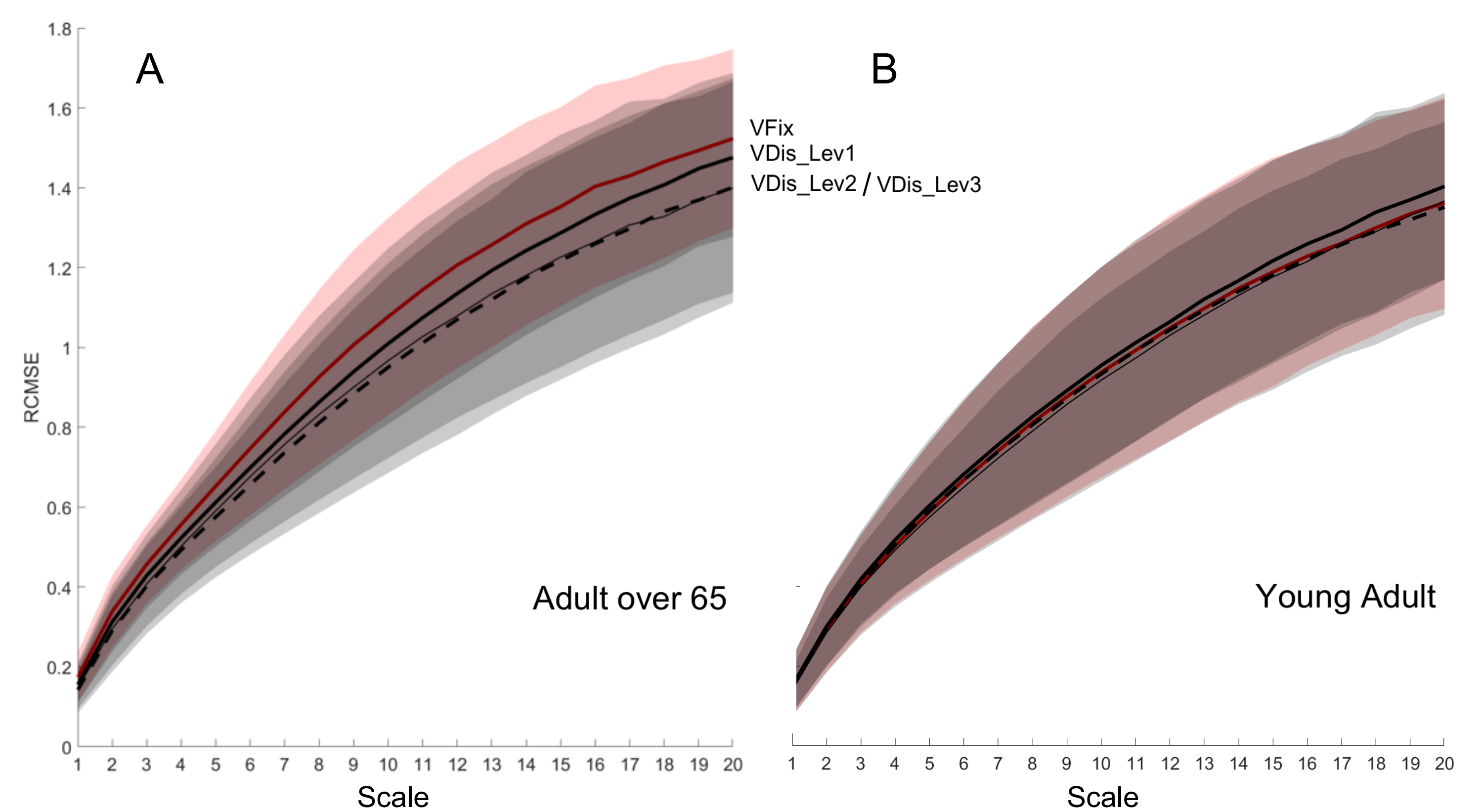


Fig.2 RCMSE at each scale for the four tasks in Adult over 65 (A) and Young Adult (B) groups.

- Regardless of group, the significant decrease in cognitive performance in the two highest difficulty levels (VDis_Lev2 / VDis_Lev3) is not associated with a decrease in complexity. The significant differences in cognitive and postural performances between groups suggest that:
 - standing is easy for young adults despite the difficulty of the cognitive task,
 - cognitivo-postural tasks are too difficult for older adults.
- The behavioral adaptability of older adults is not related to their level of visual field dependence.

References

- 1 Brady, R. A. et al. Gait adaptability training is affected by visual dependency. *Exp. Brain Res.* 220, 1–9 (2012).
- 2 Costa, M. et al. Noise and poise: Enhancement of postural complexity in the elderly with a stochastic-resonance-based therapy. *Europhys. Lett.* EPL 77, 68008 (2007).
- 3 Goldberger, A. L. Non-linear dynamics for clinicians: chaos theory, fractals, and complexity at the bedside. *The Lancet* 347, 1312–1314 (1996).

