TASK-RELATED MODULATION OF CEREBELLAR BRAIN INHIBITION IS MAINTAINED IN OLDER ADULTS

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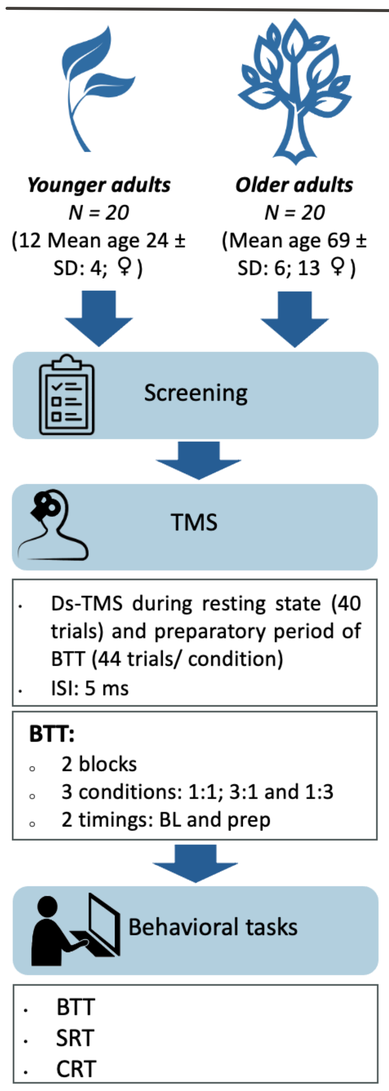
INTRODUCTION

With the global increase in life expectancy but the rise in healthy life expectancy lagging behind (WHO), it has become crucial to understand the neural processes associated with age-related changes in motor function. While age-related impairments in motor functioning and learning involve various structural (1), functional (2), and biochemical (3) changes in the brain, the integrity of the cerebellum emerges as a key factor influencing motor function in older adults. Consequently, investigating cerebellar neural interactions presents a unique opportunity to comprehend the underlying mechanisms that contribute to age-related deficits in motor control.

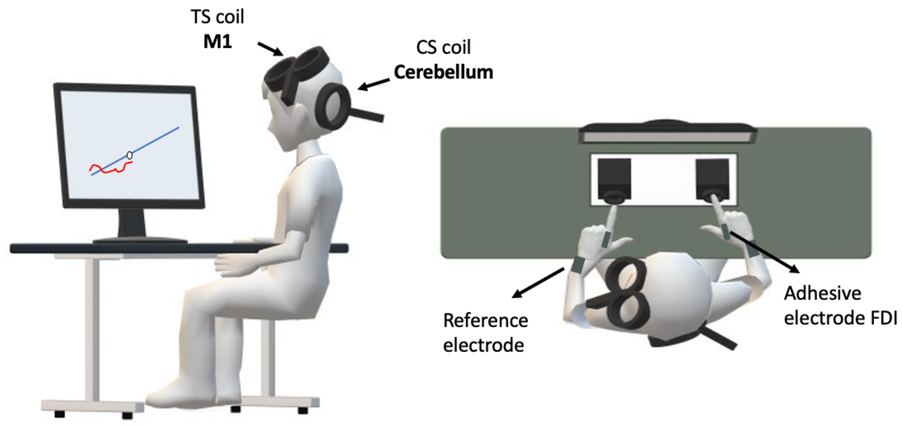
OBJECTIVE

The primary aim of this study was to shed light on age-related alterations in cerebellar-M1 interactions in the context of bimanual coordination. To this end, a dual-site transcranial magnetic stimulation (ds-TMS) paradigm was employed to measure cerebellar brain inhibition (CBI), both in a resting state and during the preparation phase of a bimanual motor task.

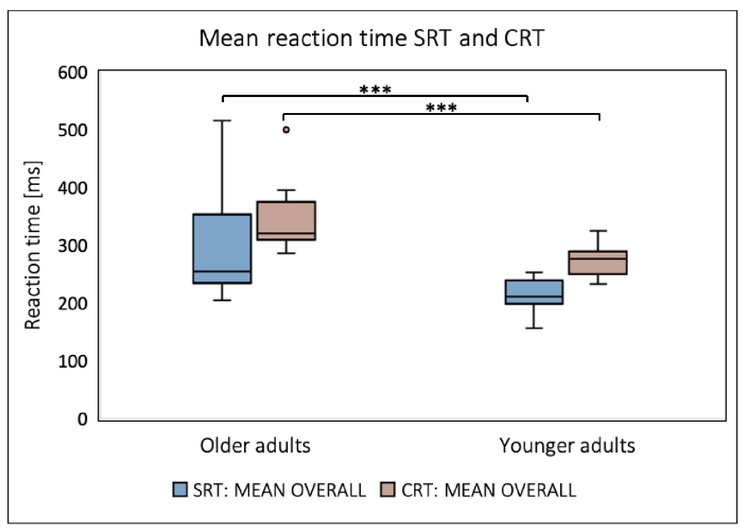
METHODOLOGY

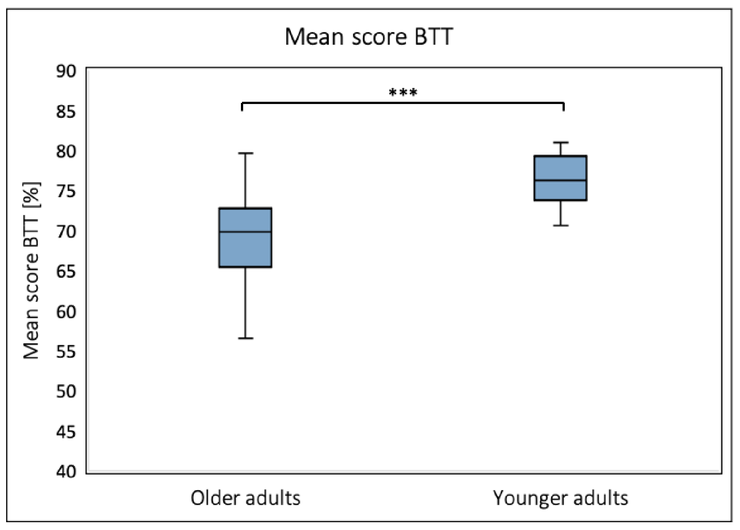


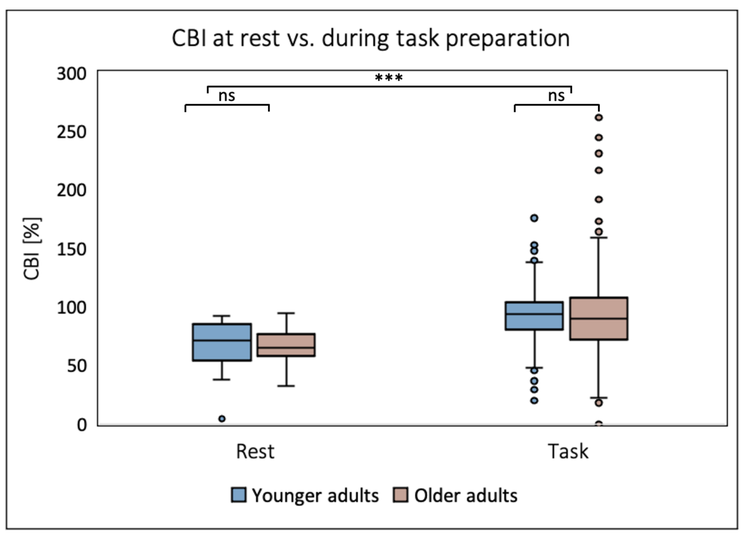
- **Participants**: 40 right-handed adults aged 20-40 (younger) or 60-80 (older).
- **Protocol**: Dual-site transcranial magnetic stimulation (ds-TMS).
- **Stimulation Parameters**:
  - CS (DC-coil): 65% MSO
  - TS (fig8-coil): MEPs of 1 mV
  - ISI: 5 ms
- **Experimental Design**: One block of 40 trials (20 TS and 20 CS+TS) at rest, and 6 task blocks of 45 trials (20 TS, 20 CS+TS and 5 no TMS) performed in a pseudo-randomized order.
- **Tolerability Assessment**: Visaual analogue scale (VAS) used after completion of all experimental blocks.

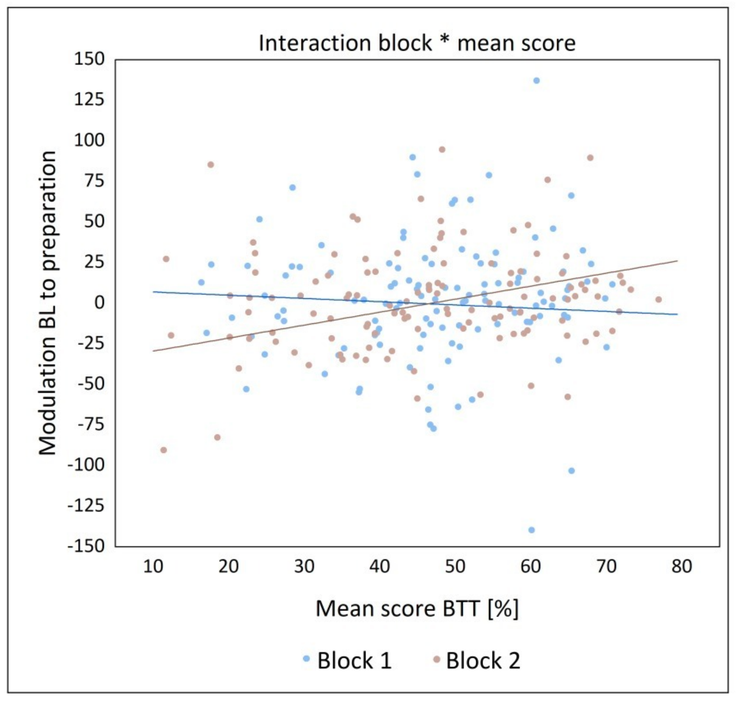


RESULTS









CONCLUSION

- Younger adults perform better relative to older adults on all motor tasks
- No age-related difference in the amount of CBI at rest
- Task-related modulation of CBI (from rest towards task preparation) was maintained in older adults
- Our analysis revealed a significant block*mean BTT score interaction effect, indicating that participants with a low BTT score demonstrated more preparatory inhibition (as compared to BL) in block 2 relative to block 1, while participants with high BTT scores demonstrated little inhibition in block 1 and a strong disinhibition/facilitation from baseline towards the preparatory period
- Perceived discomfort was mild
- Preservation of CBI modulation in older adults might suggest the presence of neural mechanisms (i.e., cerebellar reserve) that counteract the effects of aging on the cerebellum to maintain dexterous movement control (4)

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