Aging is associated with a decline in:

→ bilateral motor control
→ quantity and quality of white matter integrity
→ functional connectivity between motor areas

Supplementary motor area (SMA) – primary motor cortex (M1) is an important network for bilateral motor control. [1, 3]

SMA-M1 connectivity can be measured using dual-site transcranial magnetic stimulation (TMS).

**Aims**

1. Is the dual-site TMS measure of SMA-M1 connectivity reliable?
2. Are there age-related differences in SMA-M1 connectivity?
3. Is SMA-M1 connectivity associated with bimanual control in older adults?

**Methods**

Participants completed two identical sessions ~7 days apart

→ Younger adults: n = 30 (18 – 35 years)
→ Older adults: n = 30 (60 – 84 years)

**Transcranial magnetic stimulation (TMS)**

**Single-pulse TMS**

**Dual-site TMS**

**Dual-site TMS:** conditioning stimulus to SMA followed by a test stimulus to M1

Conditioning stimulus to SMA
→ Site: 4 cm anterior to Cz
→ Intensity: 140% active motor threshold

Test stimulus to M1
→ Site: hand representation of M1
→ Intensity: Evoke ~1 mV MEP

Dual-site MEP is facilitated compared to the single-pulse MEP [2, 3]

→ Activation of direct facilitatory connections between SMA-M1
→ Dual-site MEP is expressed as a ratio of the single-pulse MEP
→ Ratio > 1.0 indicate facilitation

**Bimanual control: Purdue Pegboard**

Assembly subtest
→ Pick up and insert 4 items to assemble an object on a pegboard
→ Number of items placed in 60 s recorded

**Results**

1. Moderate test re-test reliability in younger and older adults

Moderate test re-test reliability of supplementary motor area-primary motor cortex connectivity measured using dual-site TMS in younger and older adults

1. SMA-M1 ratio Session 1

2. Greater SMA-M1 connectivity in younger than older adults

3. Greater SMA-M1 connectivity is associated with better bimanual control performance in older adults

**Key findings**

1. SMA-M1 connectivity can be reliably measured using dual-site TMS
2. Greater SMA-M1 connectivity in younger than older adults
3. SMA-M1 connectivity might be functionally important

The decline in SMA-M1 connectivity might be a neural correlate of age-related decline in bimanual control

→ Cortical paired associative stimulate (cPAS) is a plasticity-inducing protocol
→ cPAS could be used to strengthen SMA-M1 connectivity in older adults to potentially improve bimanual control

**References**