# Walking while Talking: Relationships among Motor-Cognitive Dual-Tasks, Functional Performance and Structural MRI

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## Introduction

- Greater than 45% of individuals with multiple sclerosis (MS) report cognitive dysfunction and 85% report gait dysfunction that interferes with daily functioning. (Kelleher et al. 2010; Amato et al. 2010)
- Impairments in mobility and cognition contribute to declines in everyday activities that require simultaneous motor and cognitive functioning (e.g. **motor-cognitive dual-tasks (MCDT)**). (Fritz et al. 2015a)
- Our lab has previously shown relationships among dynamic posturography and walking measures and among tract-specific measures of the brain corticospinal tract (CST) and walking measures in MS. (Fritz et al. 2015b; Fritz et al. 2015c)

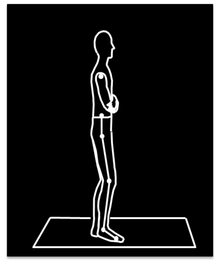
## Objective

To explore the relationships among motor function (i.e., posturography, walking), cognitive function, MCDT ability and tract-specific MRI measures.

## Methods

| RRMS | Age | Gender | Symptom Duration | EDSS |
|---|---|---|---|---|
| N=9 | 47.9 ± 14.9 years | 7F; 2M | 11.1 ± 6.1 years | 2.5 [1-4] |

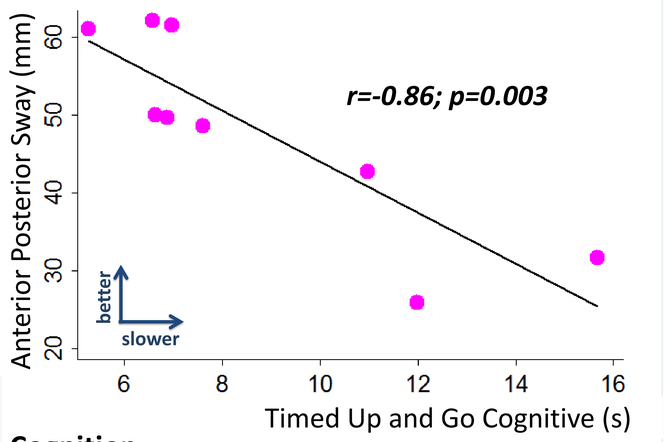
- *Walking Measures :* Timed Up & Go (TUG), Timed 25 Foot Walk (T25FW), Walk Velocity
- *Static Balance Measures:* Eyes Open, Feet Together (EOFA, EOFT)
- *Dynamic Balance Measures:* Anterior-Sway (AP-Sway); Medial-Lateral Sway (ML-Sway)
- *Cognitive Measures:* Symbol Digit Modality Test (SDMT)
- *Dual-Task Measures:* TUG Cognitive, Walking While Talking Test (WWTT); EOFA-Cognitive; EOFT-Cognitive
- *MRI Measures:* 3T MRI with Diffusion Tensor Imaging for Fractional Anisotropy (FA) and Mean Diffusivity (MD) and Magnetization Transfer Imaging for Magnetization Transfer Ratio (MTR) (Reich et al. 2006 & 2007; Zackowski et al. 2009)



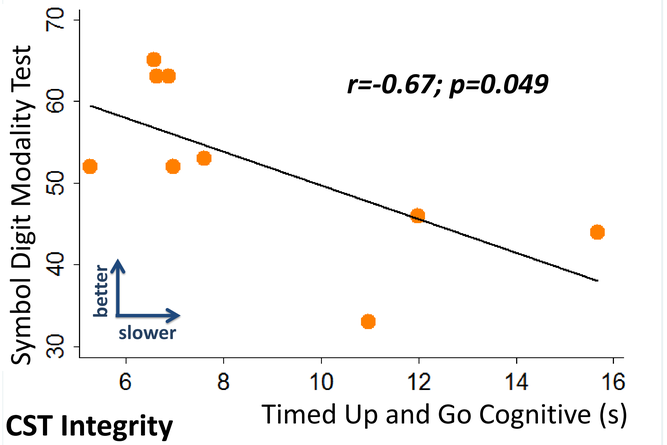
## Results

**Better MCDT performance is associated with improved:**

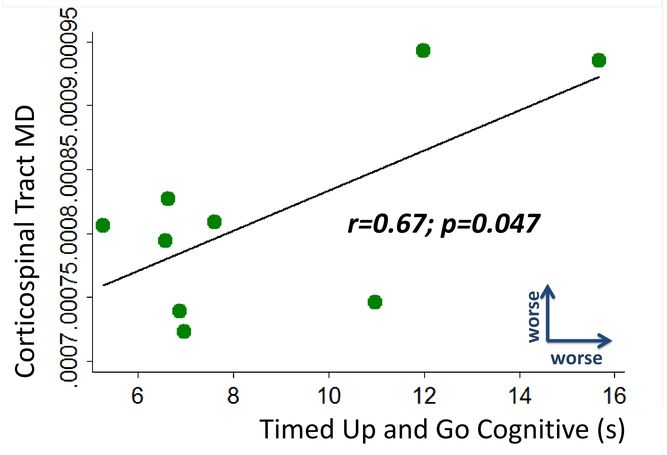
**A. Dynamic Balance**




**B. Cognition**




**C. CST Integrity**




*Motor Relationships to MCDT:*

- Individuals with less AP sway perform poorer on:
  - **TUG Cognitive (Figure A)**
  - WWTT-Complex (r=-0.76; p=0.02)

*Cognitive Relationships to MCDT:*

- Poorer performance on SDMT was associated with:
  - **Slower TUG Cognitive (Figure B)**
  - Increased TUG DTC (r=-0.67; p=0.07)

*MRI Relationships to MCDT:*

- **Increased CST MD was associated with poorer TUG Cognitive (r=0.67; p=0.047) (Figure C)** and WWTT Complex (r=0.72; p=0.0286) performance.
- Poor performance on EOFA-Cognitive was associated with reduced CST MTR

## Conclusion

- Assessment of MCDT may be a useful addition to the clinical exam as it provides information on both structural integrity and functional performance.
- This work:
  - Highlights the specificity of AP sway as a marker for walking function
  - Provides new evidence of the relationship of dynamic posturography to MCDT performance and CST integrity.

*References*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