Project A: Isometric Force Assessment of the Upper Extremity in Multiple Sclerosis vs. Healthy Subjects

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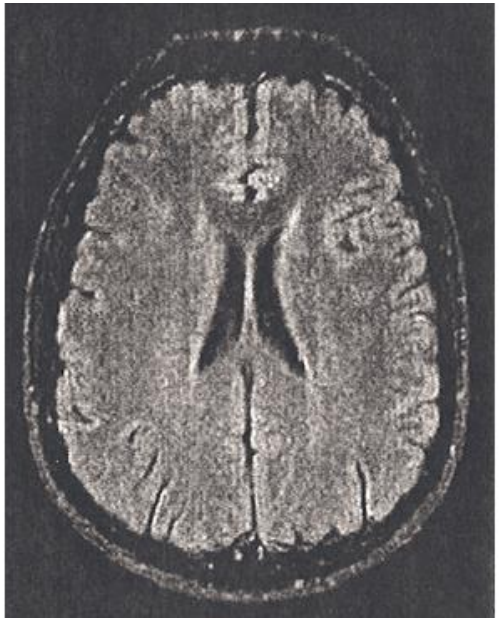
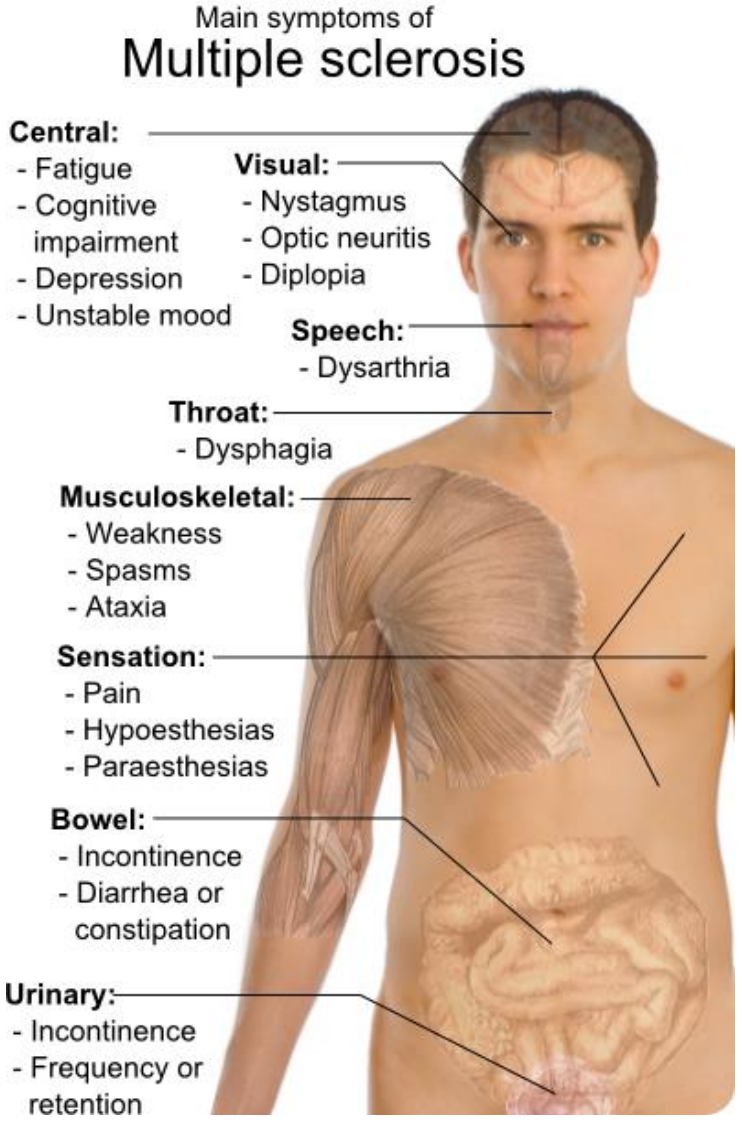
Hussain, A., et al., Investigation of isometric strength and control of the upper-extremity in Multiple Sclerosis (Submitted), 2013.

Multiple Sclerosis

Damage to myelin in brain and spinal cord disrupts ability of parts of the NS to communicate and as a consequence causes loss of sensory and motor function.



Healthy vs MS



Sensorimotor Assessment

Isometric force assessment:

- Simple and objective way to measure force
- To explore force control and strength

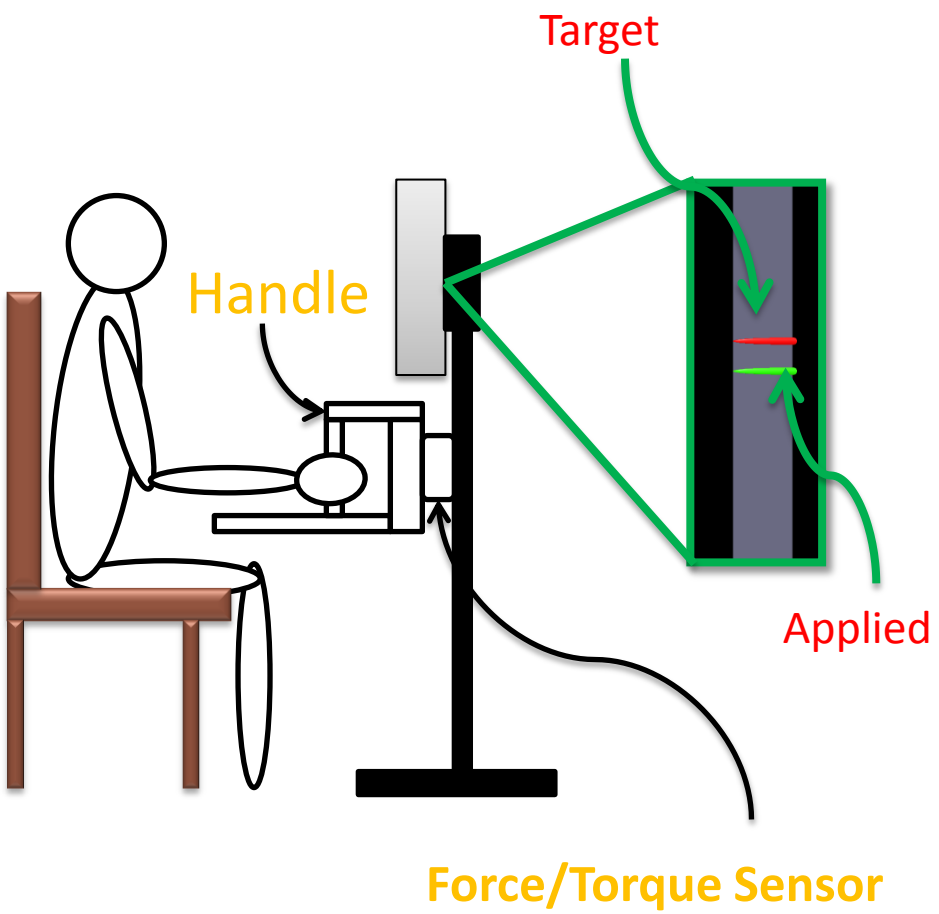
Participants:

- 2 MS subjects (ARAT scores: 32 and 57)
- 2 Semi-healthy subjects

Setup

maintain 25% of maximum force/torque in the specified directions

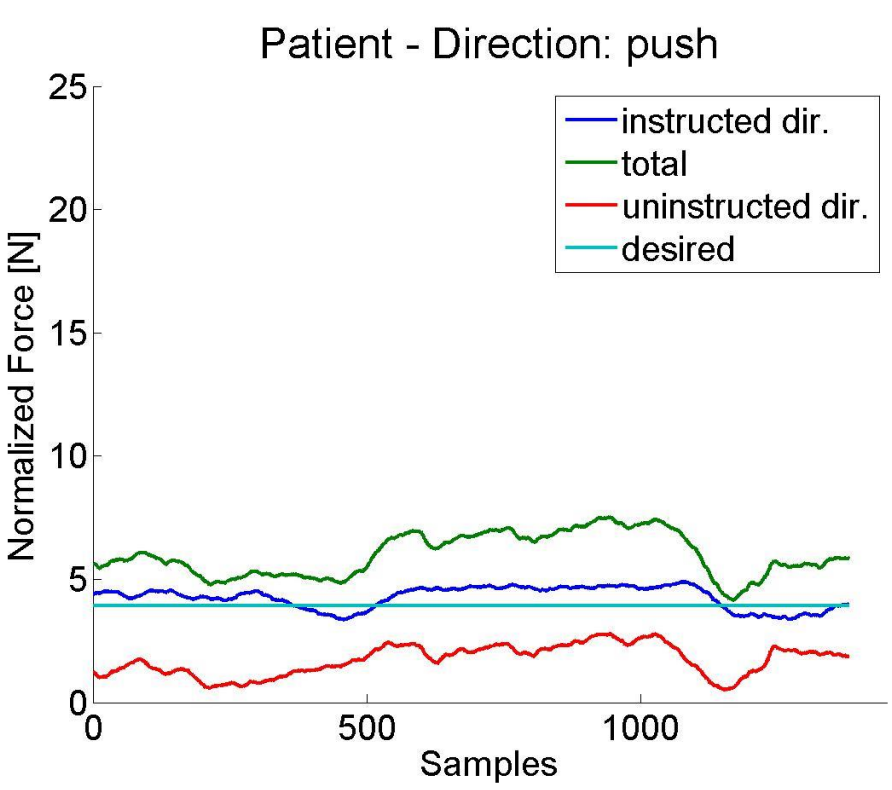
Conditions:
Up
Down
Push
Pull
Pronation
Supination

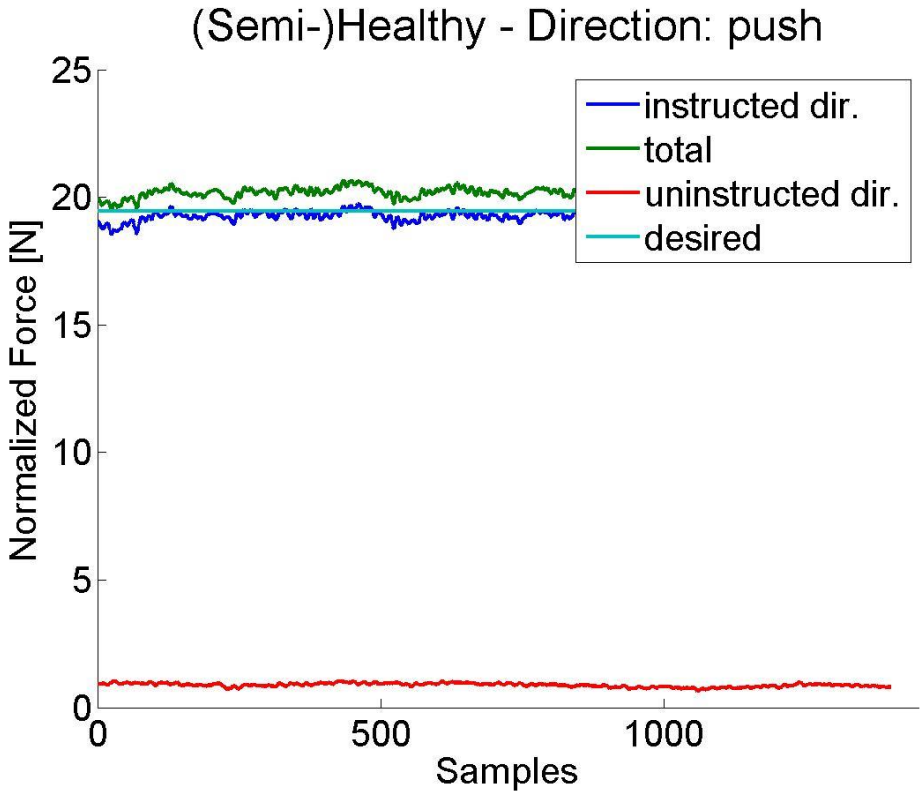


Measures

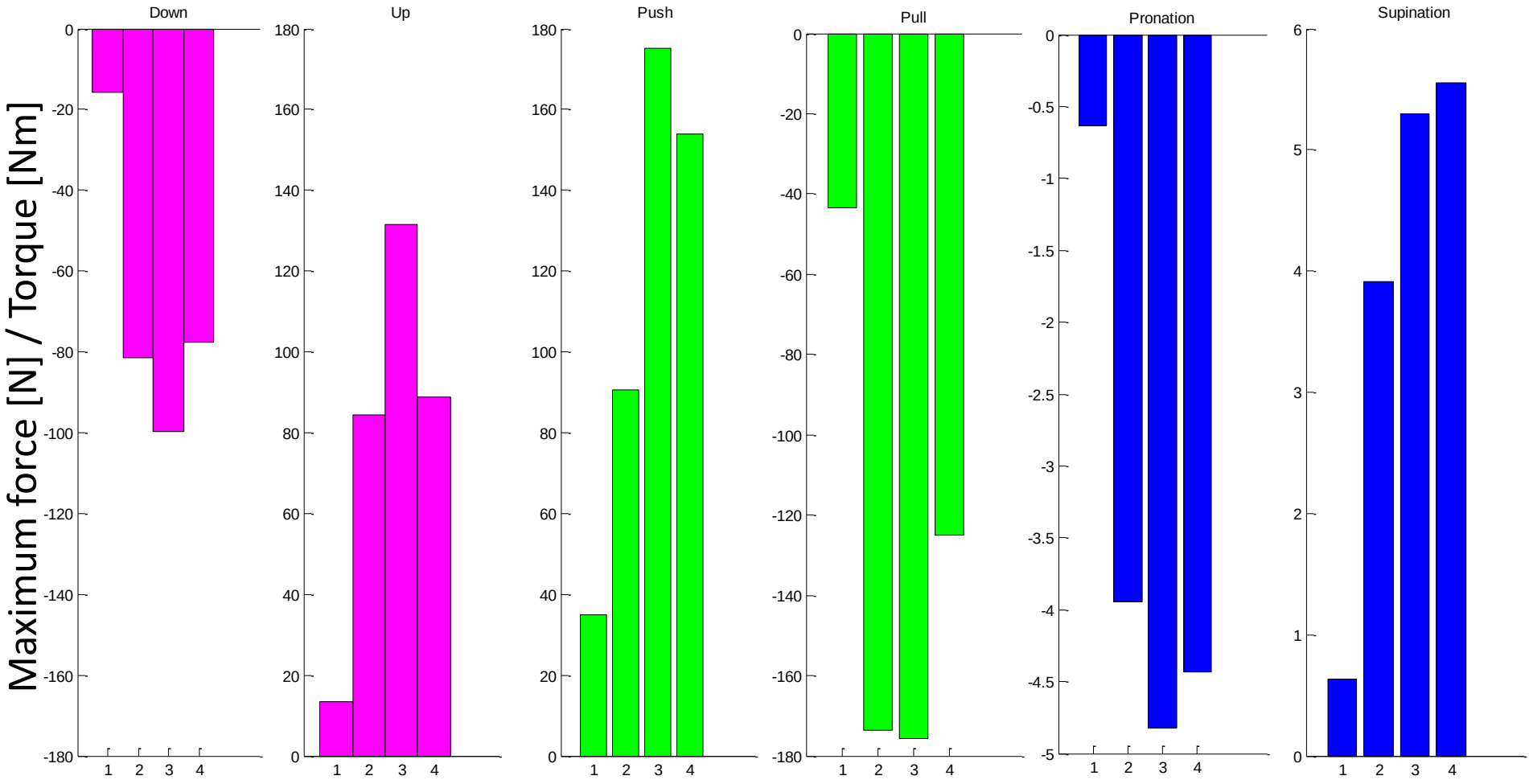
- Maximum Force
- Performance (Force Error RMS)
- Aiming dexterity (Force directional error, Torque error)
- “Control frequency” (Spectral bandwith)
- Regularity (Multiscale entropy, Costa et al. 2005)

Forces over time, healthy vs MS

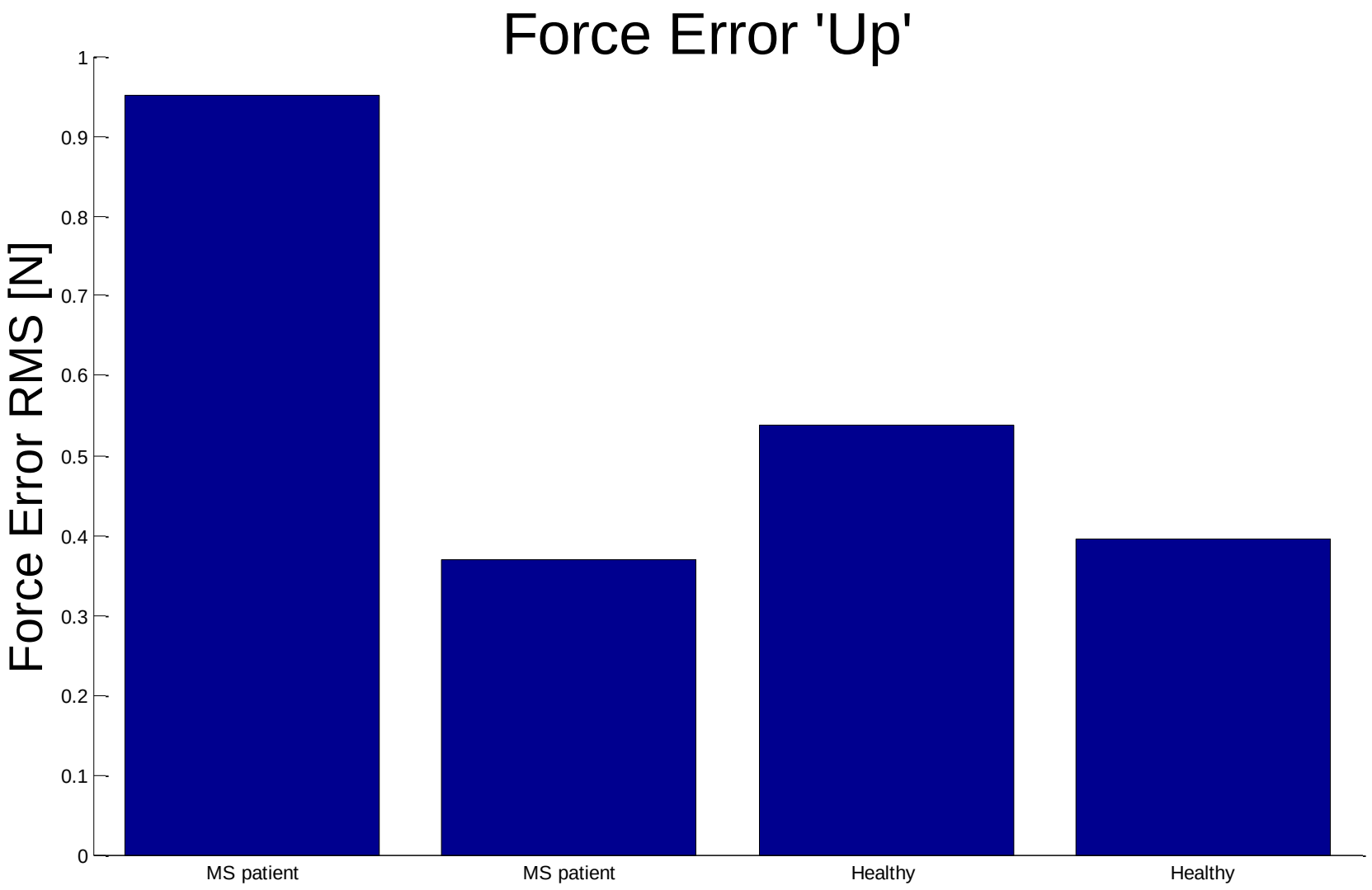




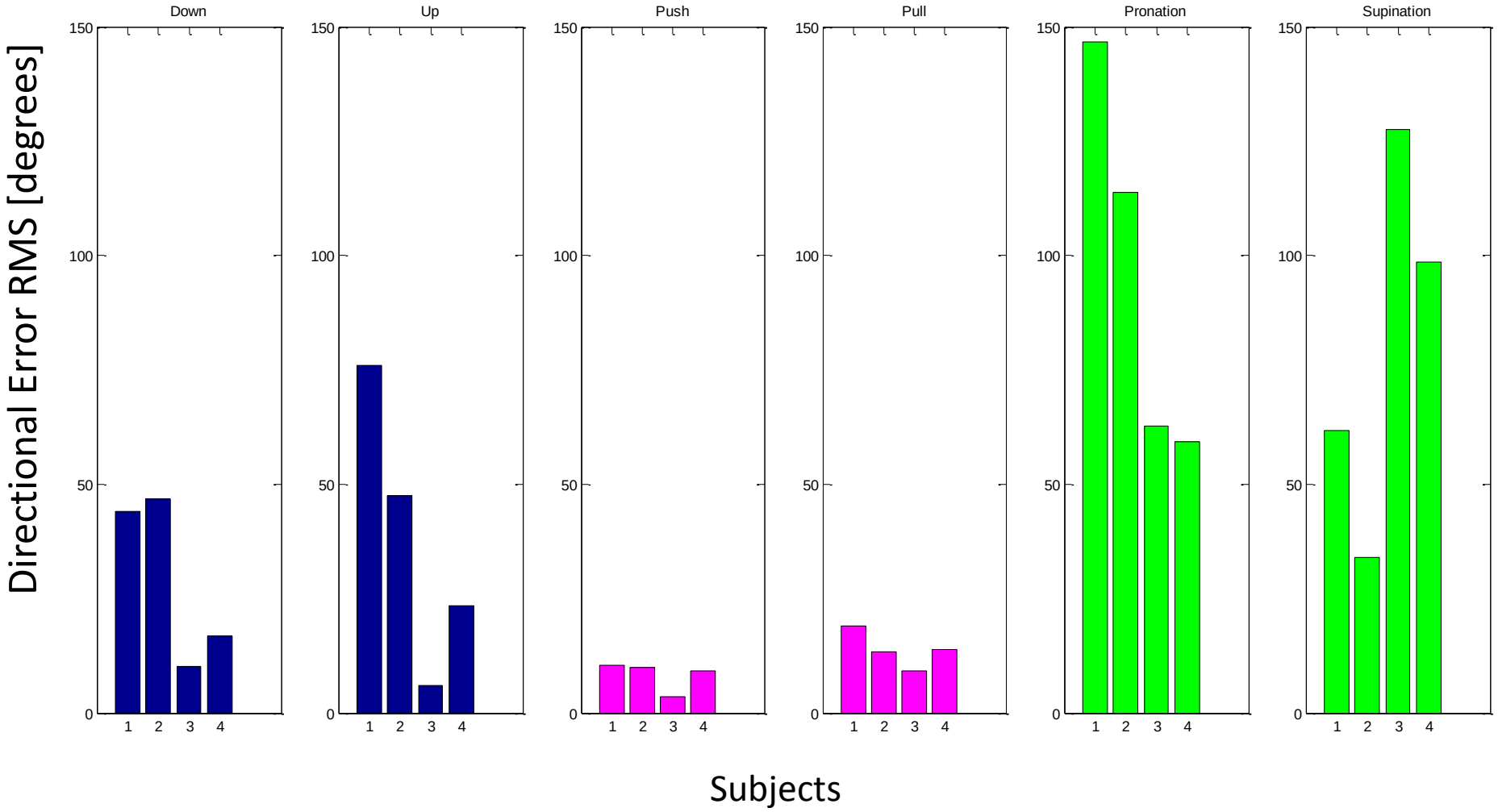
Maximum Force



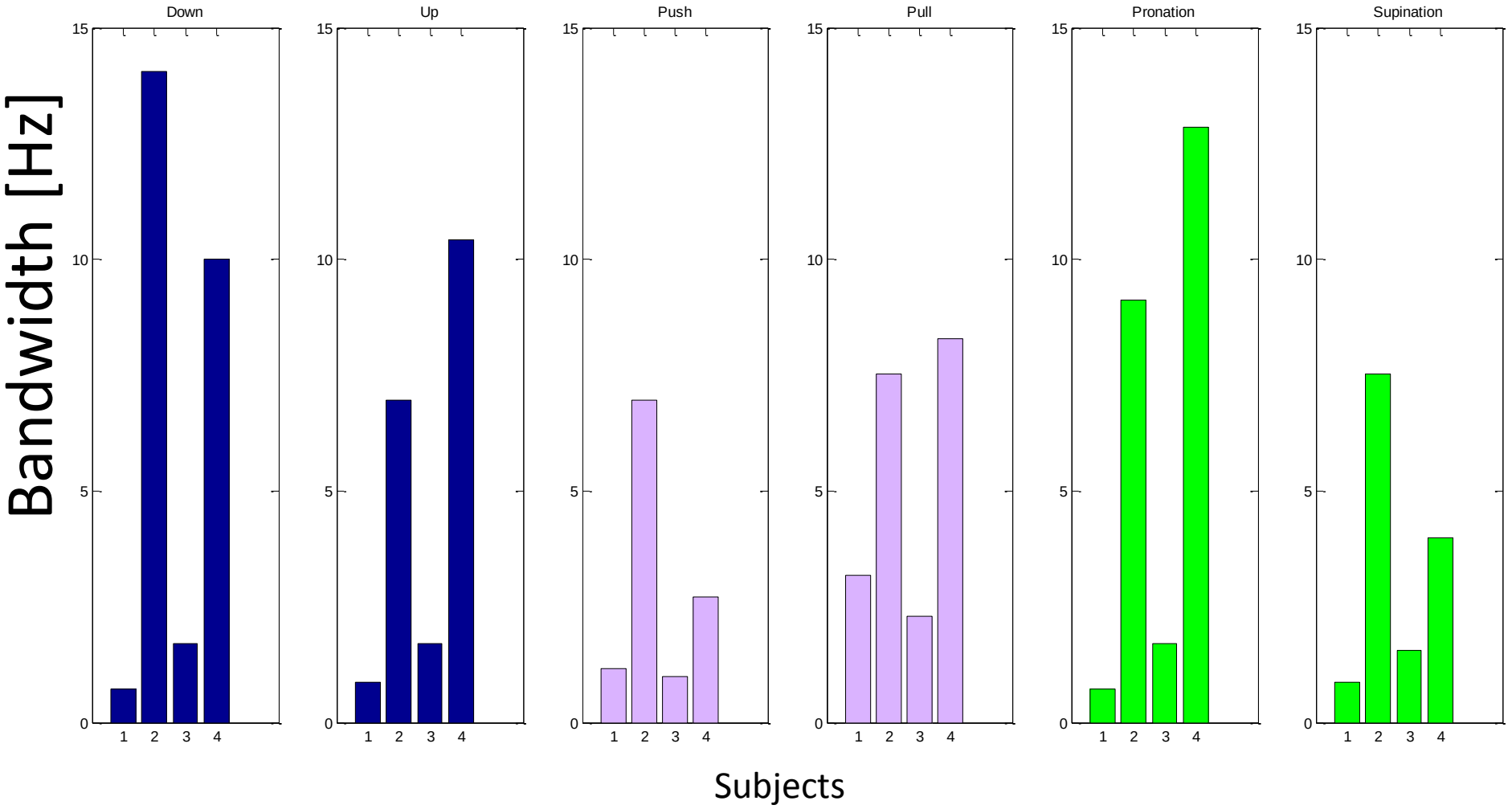
Performance (Force Error)



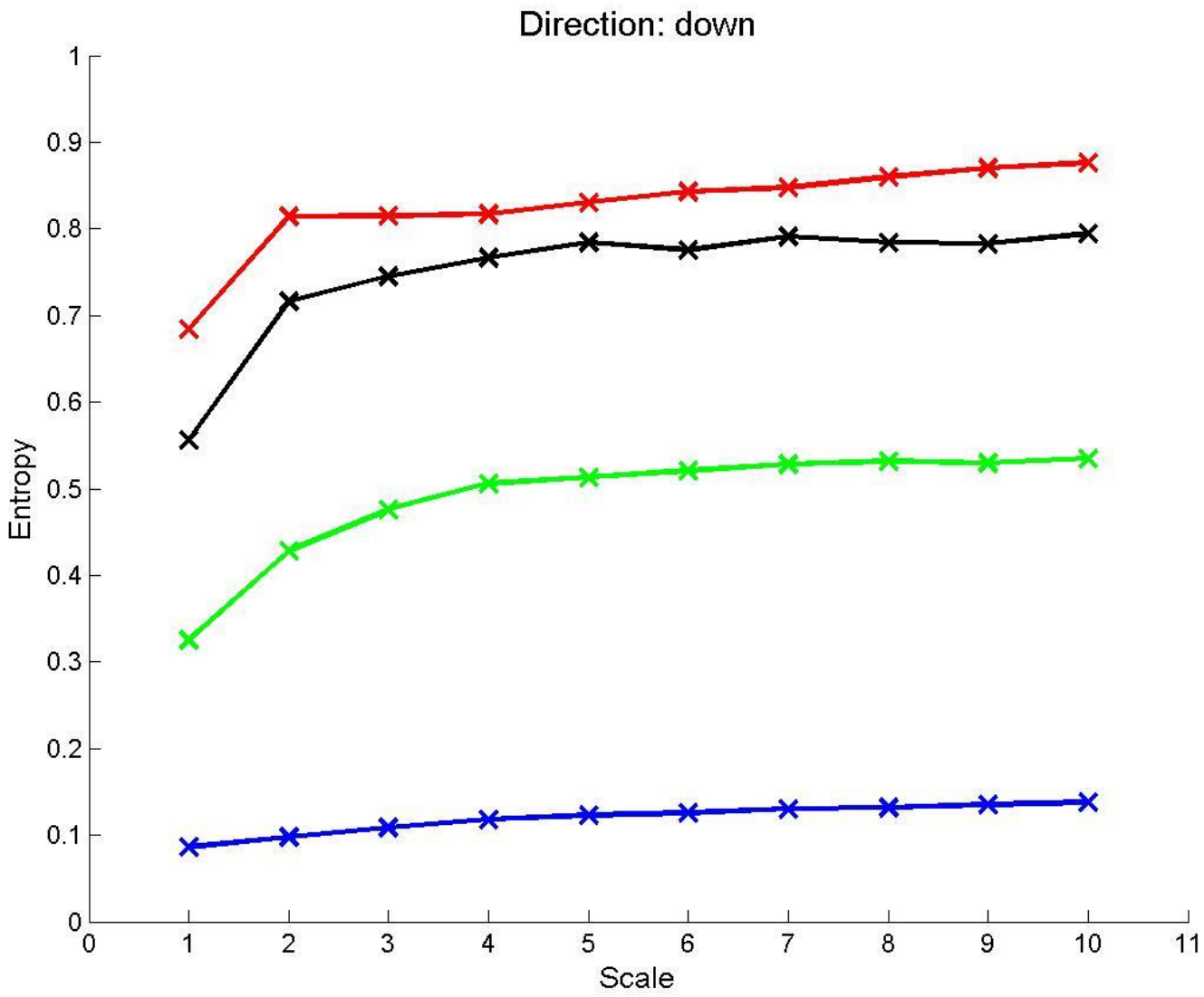
Force directional error



Spectral bandwidth



Multiscale Entropy



In conclusion:

- A lot of options with a simple setup
- Metrics need to be validated with larger population and clinical measures
- Measure should be easy interpretable for a clinician

- For isometric force assessment, the table should probably not move.