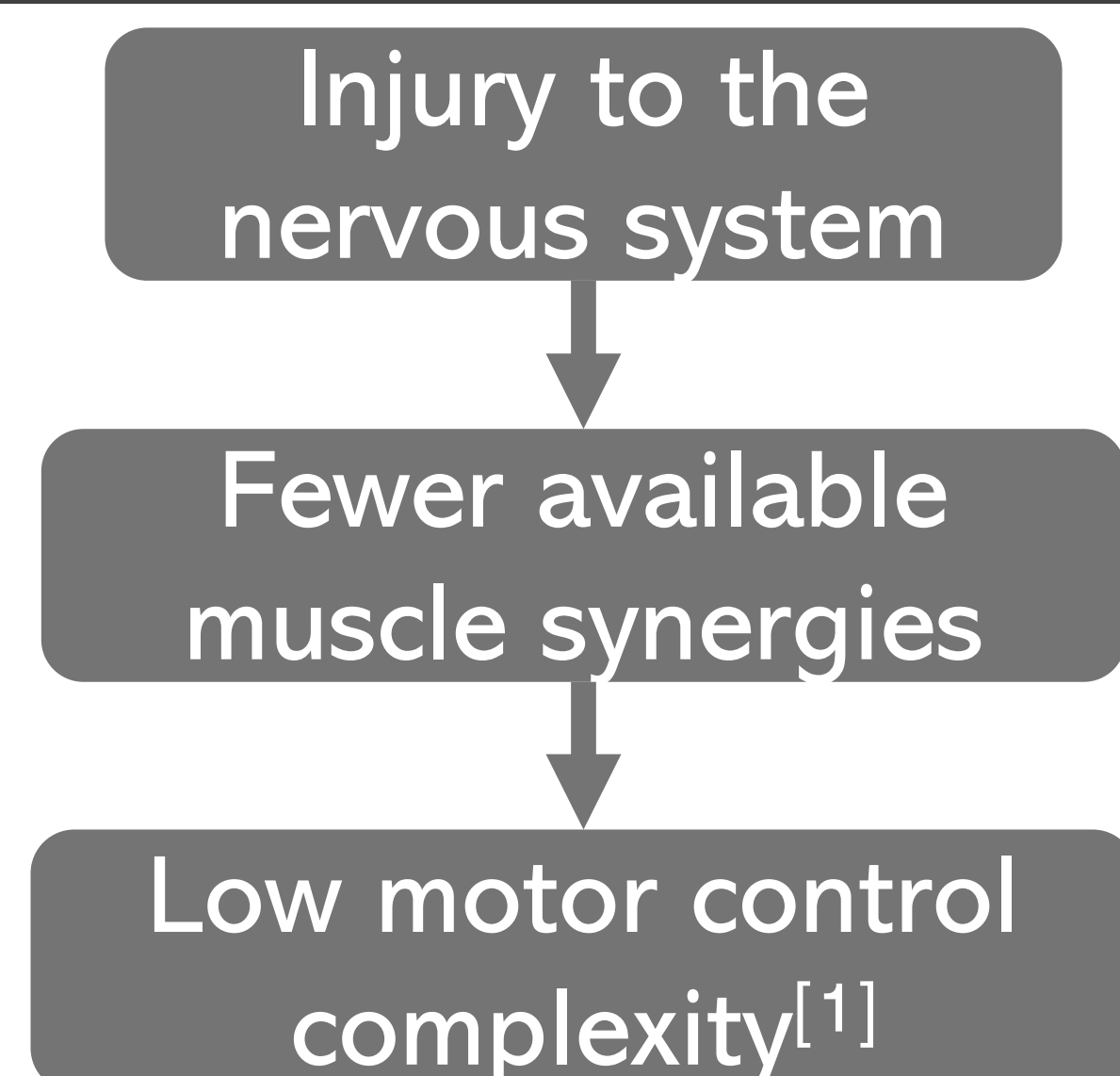


Improvement in Motor Control Complexity During Exoskeleton Gait Training With Biofeedback in Pediatric Patients

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Can exoskeleton & biofeedback training improve motor control complexity in kids?

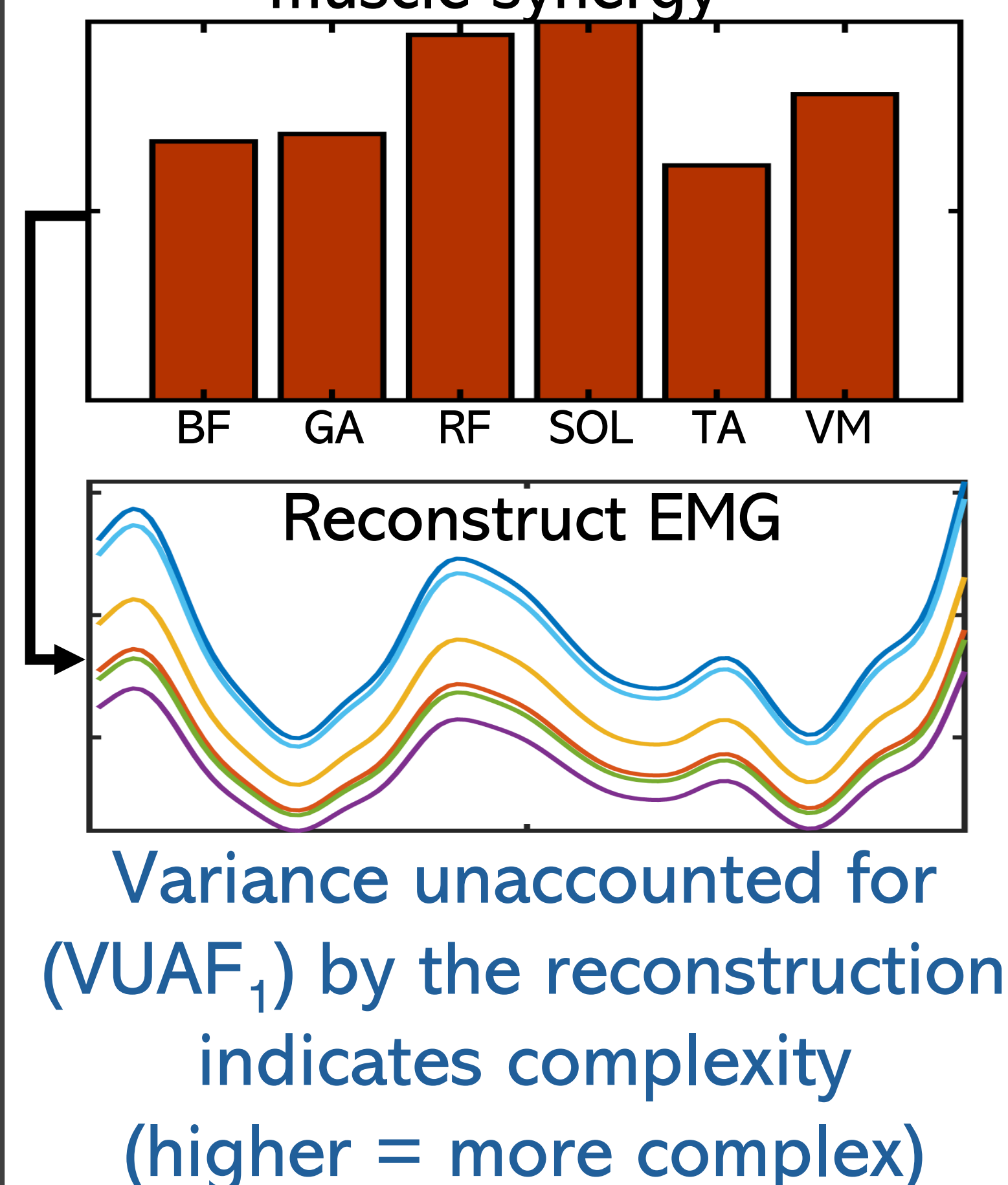


Exoskeleton intervention has shown kinematic benefits from active assistance^[2,3]

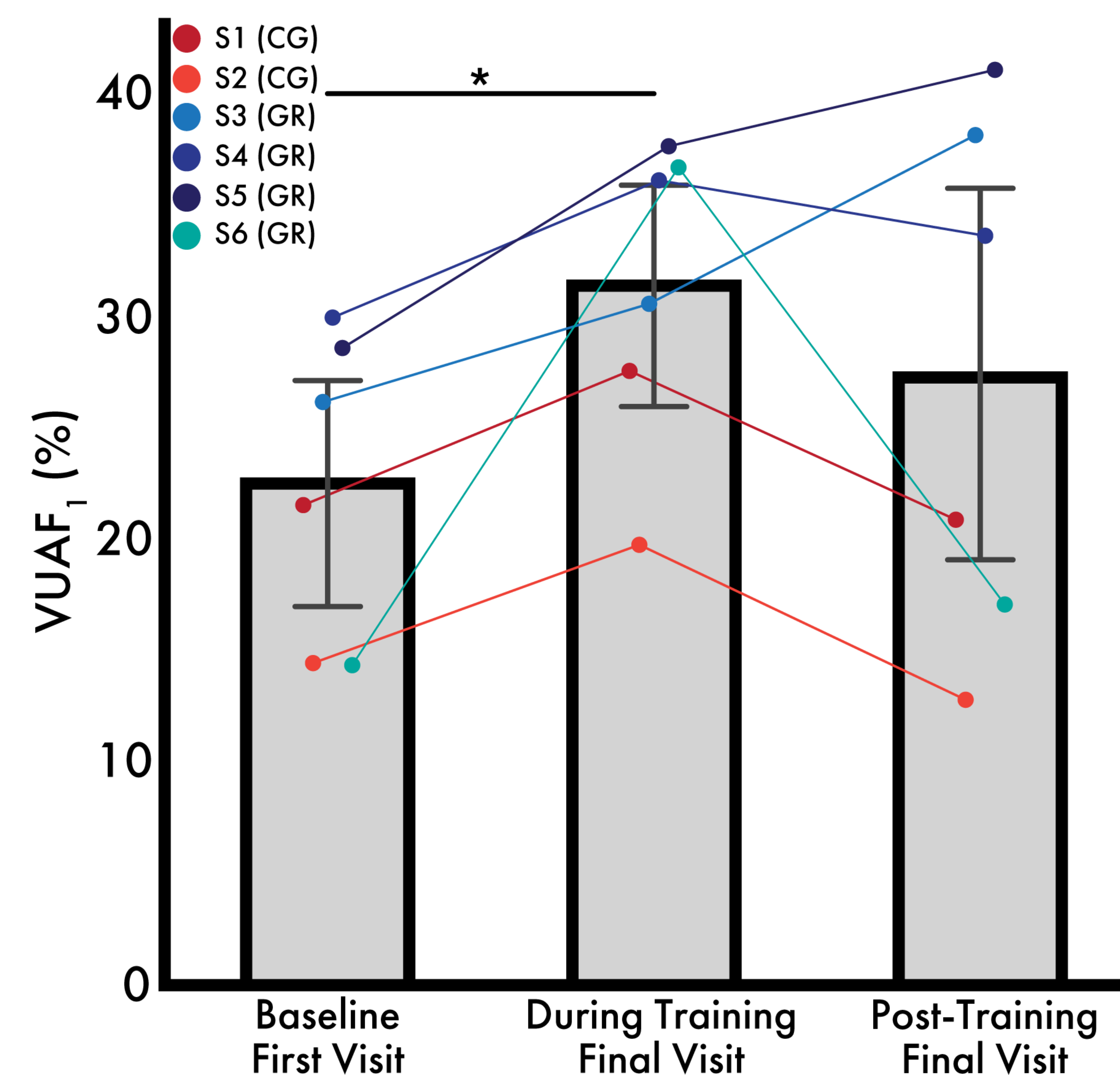
Hypothesis: Gait training with exoskeleton assistance and biofeedback will improve motor control complexity during and after training

Evaluating Motor Control Complexity

EMG decomposed into one muscle synergy^[5]



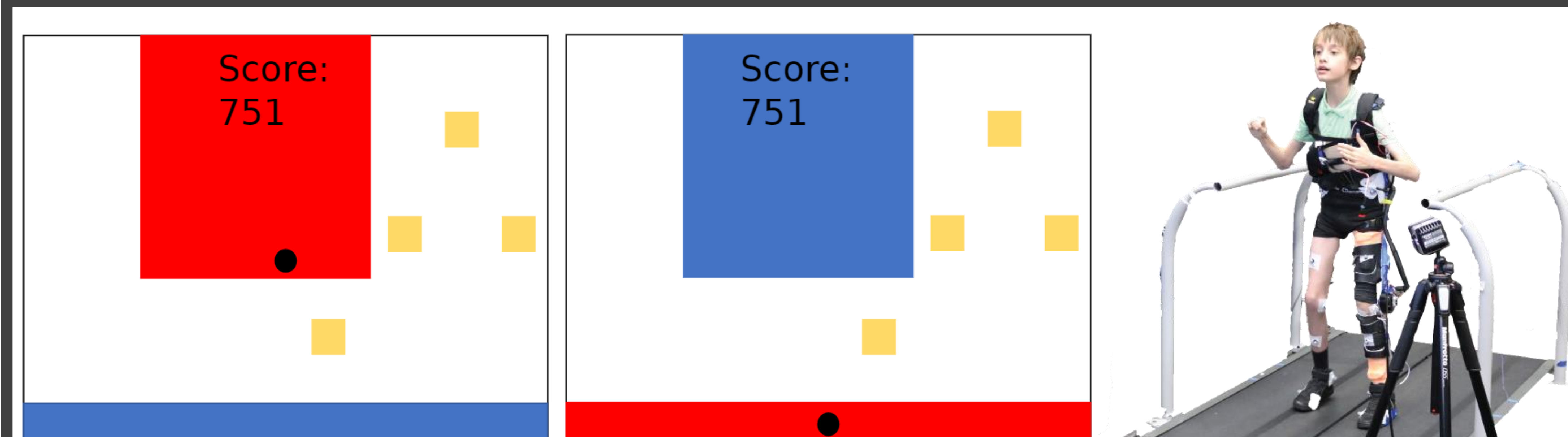
Results & Discussion



All subjects improve VUAF₁ during training ✓

Post-Training retention varies – gait presentation relevant

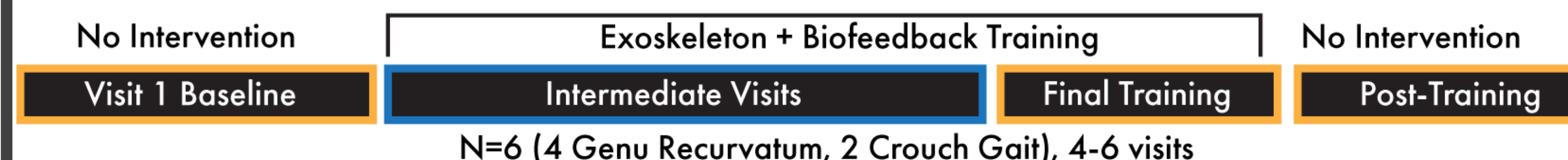
Methods and Approach - Biofeedback Game + Exo Assistance



• Provides score in real-time based on knee angle

• Exoskeleton operates in an “assist-as-needed” mode

Training Timeline



Δ% VUAF₁ from baseline Training Post-Training

S1	6.0	-0.1
S2	5.3	-1.6
S3	4.4	11.2
S4	6.2	3.7
S5	9.0	12.5
S6	22.3	2.7

>5% | 0-5% | <0%/no change

Genu Recurvatum retains VUAF improvement better than Crouch Gait

CG subjects (S1 & S2) return to baseline after training | GR subjects (S3-S6) show at least minimal retention

Interaction between gait presentation and training parameters (assistance strategy, biofeedback information) impacts retention

[1] Schwartz, M.H. (2016) *Dev Med & Child Neuro*
[2] Conner, B. et al. (2021) *J. Biomech*
[3] Lee, D. et al. (2023) *IEEE Trans. Biomed. Eng.*

[4] Steele, K.M. et al. (2015) *Dev Med Child Neuro*
[5] Ting, L.H., Chvatal, S.A (2010) “Decomposing muscle activity into motor tasks: methods and interpretation.”