MOVEMENT IMPAIRMENTS DO NOT PRECLUDE VISUOMOTOR ADAPTATION FOLLOWING STROKE

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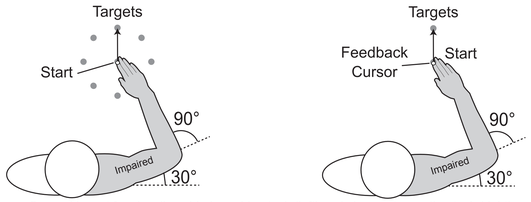
Introduction

Vision is important for performing movements in daily life. It is also an important component of stroke rehabilitation where therapists often provide visual cues and feedback to facilitate the relearning of motor skills. However, the ability to learn movements using visual feedback can be impaired after stroke. It is unclear how impairments in using vision to perform goal-directed movements relates to movement impairments that are commonly observed after stroke. **Here, we investigated the relationship between impairments in movement and a type of learning known as visuomotor adaptation after stroke.**

Methods

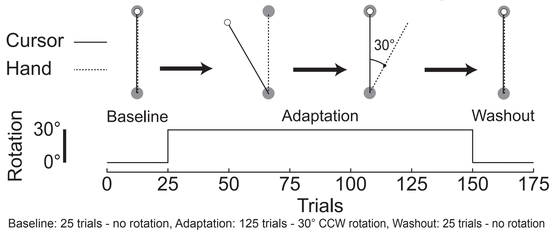
Visually Guided Reaching Task (VGR)

Visuomotor Rotation Task (VMR)



General layout for visually guided reaching task (left) and visuomotor roation task (right)

Visuomotor Adaptation Paradigm



Baseline: 25 trials - no rotation, Adaptation: 125 trials - 30° CCW rotation, Washout: 25 trials - no rotation

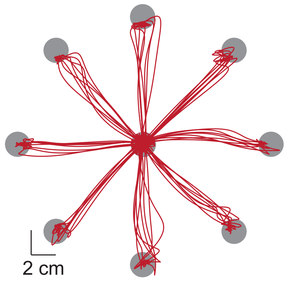
Demographics and Clinical Measures

Table 1. Demographics Median [Range]	Controls (n = 41)	Participants with Stroke (n = 41)
Age (Years)	62 [33-72]	65 [27- 88]
Sex (Female : Male)	22 : 19	17 : 24
Handedness (Left : Right)	6 : 35	2 : 39

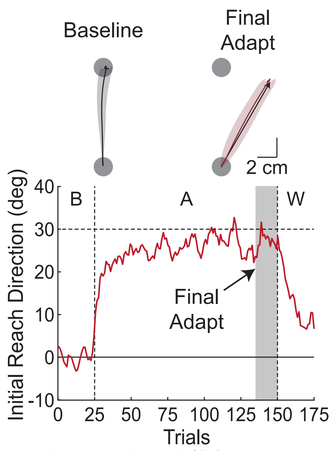
Table 2. Clinical Measures Median [Range]	Participants with Stroke (n = 41)
Affected Side of Body (Dominant : Non-Dominant)	26 : 15
Stroke Type (Ischemic : Hemorrhagic)	36 : 5
Time Post-Stroke (Days)	30 [3 - 1102]
Arm Strength (*MRC* /45)	43 [20 - 45]
Arm Motor Impairment (*CMSA* /7)	6 [3-7]
Arm Motor Impairment (*FMA* /66)	62 [35 - 66]
Functional Independence (*FIM* /126)	115 [87 - 126]

A) Participants with Stroke Are Impaired in Visually Guided Reaching and Visuomotor Adaptation

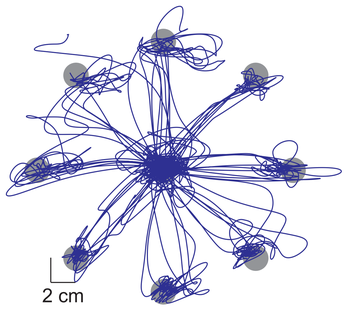
Exemplar Control



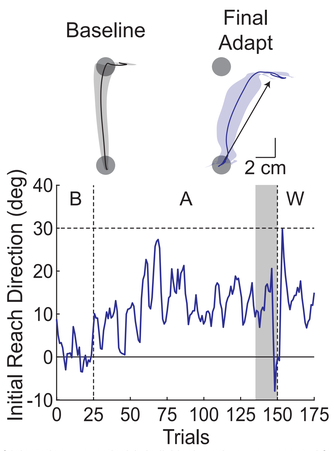
VGR Overall Score = 0.25
(Not Impaired)



Exemplar Stroke

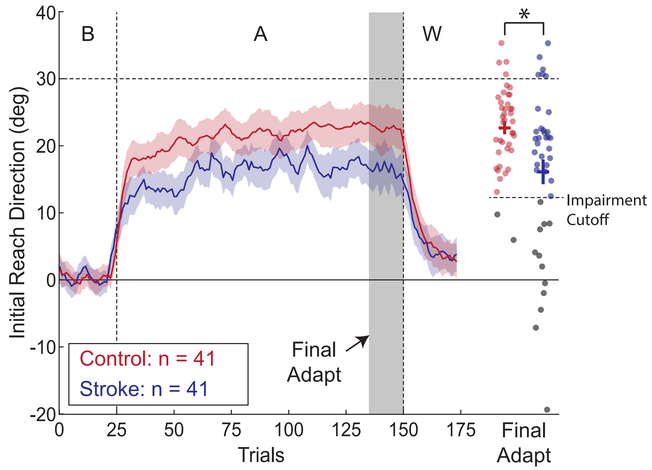


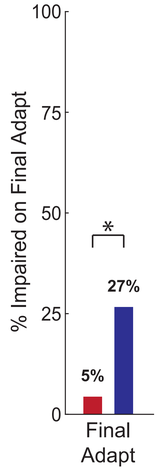
VGR Overall Score = 7.11
(Motor Impaired)



Hand paths and adaptation curve from the rotation task (VMR) and hand paths from the visually guided reaching task (VGR) for an exemplar control and stroke. Hand paths (VMR) were averaged over baseline, Initial Adapt and Final Adapt (first and last 15 trials of Adaptation, respectively). Individual reaches are presented for VGR.

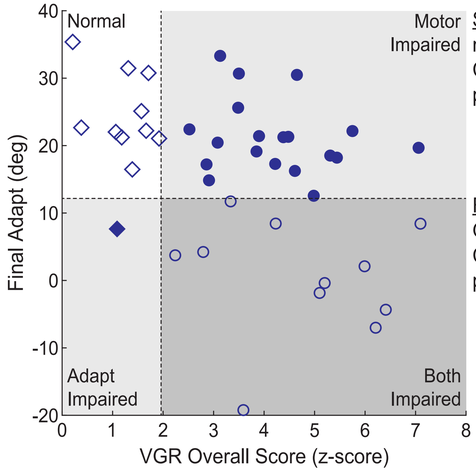
B) Average Adaptation was Reduced After Stroke





Average adaptation curves for controls (red) and stroke (blue). Final Adaptation and the proportion of patients that failed this parameter differed across groups.

C) Motor Impairments did not Preclude Normal Adaptation



Spearman's Correlation
rho_{39} = -0.444
CI [-0.662,-0.139]
p = 0.002*

Fisher's Exact Test
Odds Ratio = 5.000
CI [0.559,44.73]
p = 0.223

Final Adapt vs Overall VGR Scores. Each marker type represents a unique impairment phenotype observed in the stroke sample.

Acknowledgements

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Conclusions

Participants were impaired on the visuomotor rotation task, the visually guided reaching task, both, or neither. The presence of motor impairments did not preclude normal adaptatio meaning a patient's level of motor impairment is not indicative of their potential to improve their movements through practice. Therefore, we currently lack assessments of visuomotor learning that could be used to tailor therapy to a patient's specific learning needs and personalize rehabilitation care.