Disclosure: None disclosed.

Objective: To investigate the relationship between white matter microstructure integrity and implicit motor learning in healthy individuals and individuals after stroke, using diffusion tensor imaging (DTI). We hypothesized that higher white matter integrity would be associated with increased implicit motor skill learning. **Design:** A single blinded survey controlled study. **Setting:** Brain Behaviour Lab and MRI Centre at the University of British Columbia. **Participants:** Thirteen individuals with chronic ischemic middle cerebral artery stroke and nine healthy age-matched controls recruited through volunteer sampling. **Interventions:** A continuous tracking (CT) task containing repeated segments to probe implicit skill learning was practiced for six days; on day one DTI was performed in a 3T MRI. A retention test on a separate day was used to assess motor learning. **Main Outcome Measures:** Tracking accuracy was measured by root mean square error (RMSE); fractional anisotropy (FA) was indexed in the posterior limb of internal capsule (PLIC) bilaterally. **Results:** Regression analyses indicated that in the stroke group, post-stroke duration was not predictive of implicit learning ($p=0.778$, CI(0.95)= -0.044 to 0.041). The addition of ipsilesional PLIC FA explained a unique amount of the variance in learning score ($R2=0.557$, $p=0.008$, CI(0.95)=7.709 to 39.226) and the model became significant ($p=0.025$). Increased change associated with learning was associated with higher ipsilesional FA values. **Conclusion:** These findings indicate that microstructural status of the ipsilesional primary motor output tracts is closely associated with implicit motor learning in individuals with chronic stroke. **Key Words:** Stroke; Motor function; Neuroscience; Rehabilitation.

Poster 25

Portable Upper Extremity Robotics is as Efficacious as Upper Extremity Rehabilitative Therapy. Stephen Page (Ohio State University Medical Center, Columbus, OH), Valerie Hill, Susan White.

Disclosure: None disclosed.

Objective: To compare the efficacy of an upper extremity (UE) rehabilitative program incorporating repetitive task specific practice (RTP) integrating a portable robotic system called the "Myomo" with the efficacy of RTP only. **Design:** Randomized controlled pilot trial. **Setting:** Outpatient rehabilitation hospital. **Participants:** Sixteen participants (seven males; mean age = 57.0 ± 11.0 years; mean time post stroke = 75.0 ± 85.63 months) with chronic, stable, moderate UE impairment. **Intervention:** Subjects were randomized RTP requiring performance of UE tasks, either while wearing the Myomo (Myomo) or manually (RTP). UE practice occurred during 30-minute sessions occurring three days/week for eight weeks. **Main Outcome Measures:** The UE Fugl-Meyer (FM), Canadian Occupational Performance measure (COPM) and Stroke Impact Scale (SIS) on two occasions before intervention and again one week after the interventions had concluded to all subjects. **Results:** After intervention, both groups exhibited nearly-identical FM score increases of ≈ 2.1 points; the Myomo group exhibited larger score changes on all but one of the COPM and SIS subscales; however score changes between groups were nonsignificant. **Conclusions:** Findings suggest that therapist-supervised RTP integrating the Myomo is as efficacious as manual RTP in subjects with moderate UE impairment. This approach could be selectively incorporated as part of usual care to aid practice attempts, and used at home since patients with moderate UE impairment often have difficulty independently attempting valued UE tasks. **Key Words:** Stroke; Motor function; Neuroscience; Rehabilitation.

Poster 26

Adjustment of Gait Asymmetry by Curved Walk in Individuals Post-Stroke. Noritaka Kawashima (Research Institute of National Rehabilitation Center for Persons with Disabilities, Tokorozawa, Saitama, Japan).

Disclosure: None disclosed.

Objectives: To test if hemiplegic patients walk on a curvature path with paretic side inside, environmental constraint due to curved walk would act effectively to improve on the gait asymmetry. **Design:** Cross-sectional, experimental research. **Setting:** National Rehabilitation Center for Persons with Disabilities, Japan. **Participants:** Twelve chronic hemiplegic patients Intervention: Gait on three different degree of curvature path (radius=3.5, 2.5, 1.5m) in both clockwise (CW) and counter-clockwise (CCW) directions with their self-selected speed. **Main Outcome Measure:** The extent of asymmetry in the spatial (step length) and temporal parameters (stance and double support time) were calculated with paretic: intact ratio based on the three-dimensional motion analysis and ground reaction force measurement during walking. **Results:** Spatio-temporal asymmetry tended to be improved/worsened when the patients walk along mild curvature path (radius=3.5m) with paretic side inside/outside. Most of patients told us they felt difficulty for balancing during gait on the sharpest curve (radius=1.5m) irrespective of direction, and the above mentioned direction dependent adjustment of asymmetry was not observed in gait on this curvature path. **Conclusion:** Adjustment of the gait asymmetry can be regarded as the result of physical constrains due to curved walk. Since to walk along mild curvature path provides an effective means for immediately modifying gait asymmetry in hemiplegic stroke patients, the results suggest that curved walk may be usefully applied in physical therapist practice. **Key Words:** Stroke; Motor function; Neuroscience; Rehabilitation.

Poster 27

Benefits of Mirror-Therapy for Hemiparesis Following Stroke are Reduced With Increased Engagement of Contralesional Hemisphere. Steven Jax (Moss Rehab Research Institution, Philadelphia, PA).

Disclosure: None disclosed.

Objectives: Mirror therapy (MT) has emerged as a novel treatment of hemiparesis following stroke, although the mechanisms underlying its benefit are poorly understood. The goal of this study was to test the hypothesis that MT increases recruitment of the contralesional hemisphere to control the impaired limb by comparing traditional mirror therapy with weighted mirror therapy (WMT), in which a weight was added to the unimpaired limb. **Design:** Using a parallel groups design, participants were randomly assigned to either MT or WMT. No control therapy was included. **Setting:** Rehabilitation research institute. **Participants:** A convenience sample of stroke survivors with mild to moderate unilateral hemiparesis. **Intervention:** Participants in each group completed six 45-minute treatment sessions over two weeks. **Main Outcome Measure:** Jebsen Taylor hand function test, Wolf motor function test, maximum grip and pinch force, timed finger tapping. **Results:** The small sample of the study was not expected to definitively conclude that there would be a statistically significant difference between the therapies. However, effect sizes were larger for all outcome measures for the MT condition relative to the WMT condition. **Conclusions:** The results indicate that attempting to further engage the contralesional hemisphere in stroke survivors is disruptive to MT. Future research is needed to better understand the mechanisms of mirror therapy. **Key Words:** Stroke; Motor function; Neuroscience; Rehabilitation.

Poster 28

Strategies to Adapt Walking Mechanics to Path Curvature After a Stroke. Karine Duval (University of British Columbia, Vancouver, BC, Canada).

Disclosure: None disclosed.

Objective: The ability to turn while walking is compromised in people with stroke. The aim of this study was to understand the contribution of biomechanical gait impairments to locomotor adaptations to path curvature in people with stroke. **Design:** Experimental. **Setting:** Rehabilitation Gymnasium. **Participants:** Data were collected from eight individuals with hemiparesis due to a stroke and 12 age-matched able-bodied individuals. **Intervention:** Participants walked along four paths of different curvature (straight line, large circle, medium circle, small circle) while whole body kinematic data in three dimensions were collected. **Main Outcome Measures:** A modulation index representing the slope of the regression line between peak joint angle and path curvature at specific phases of the step cycle

was computed to represent joint kinematic modulation patterns. **Results:** In able-bodied individuals, we observed consistent modulation of transverse and frontal plane movements at the ankle and hip as path curvature increased. For example, in order to walk smoothly around the circle, the control group increased the amplitude of hip adduction in the leg located on the inside of the circle during stance. In individuals with stroke, we observed disordered modulation of the adaptation of frontal and transverse kinematic movement parameters as path curvature increased. In general, the stroke group would show reduced hip adduction on their affected leg even if it was on the inside of the turn. **Conclusions:** Adaptations in the kinematic pattern seen during curved walking in able-bodied participants were not seen in the stroke group. **Key Words:** Stroke; Motor function; Neuroscience; Rehabilitation.

Poster 29

Cortical and Biomechanical Dynamics of Lower Extremity Robotics Training at Different Levels of Motivational Incentive. Ronald N. Goodman (Baltimore VA Medical Center, Baltimore MD), Larry Forrester, Richard Macko, Anindo Roy.

Disclosure: None disclosed.

Objective: Determine in persons with chronic stroke the effects of high versus low reward (social, monetary & performance feedback) incentives on motor performance and concurrent cortical networks over the course of ankle robotics training. **Design:** Randomized pilot, pre-post group comparisons. **Setting:** Human motor performance laboratory. **Participants:** Ten chronic (>3 months) non-aphasic hemiparetic stroke survivors (age range 45-75 years) were randomly assigned to either a low (LR) or high-reward (HR) group. **Interventions:** 3-weeks, 3 x weekly, visuomotor ankle robotics training, with subjects seated and playing a videogame by dorsi- and plantarflexing the paretic ankle to match on screen targets with a cursor. Sessions lasted one hour. **Main Outcome Measures:** Gait velocity, paretic ankle motor control, and EEG-derived measures of networking (coherence) and activation (spectral power) and inter-session log2 learning profiles. **Results:** In both groups self-selected gait velocity trended towards improvement ($p=.08$). The HR group improved more than the LR group in movement smoothness, as indexed by reduced jerk ($p\leq.05$) and its associated learning curves ($p\leq.05$). These performance changes were accompanied by reduced input to the left hemisphere motor planning region ($p\leq.05$, coherence) and reduced activity in the left temporal region ($p\leq.05$, power), compared to the LR group. **Conclusions:** Combining motivational rewards with visuomotor ankle robotics training may enhance the trajectory of improved ankle motor control and increased gait function after stroke. The observed changes in EEG coherence and power are consistent with neurophysiological models of learning. Future work will address dose response effects for optimizing duration of lower extremity robotics training and the intensity of reward. **Key Words:** Stroke; Motor function; Neuroscience; Rehabilitation.