LEFT LATERALIZATION OF MOTOR CIRCUIT CONNECTIVITY IS ASSOCIATED WITH BETTER MOTOR PERFORMANCE IN CHILDREN

A. D. Barber1,2, S. E. Joel1, P. Srivinasa2, S. Spinelli2, J. J. Pekar1,2, and S. H. Mostofsky1,2

1Johns Hopkins School of Medicine, Baltimore, MD, United States; 2Kennedy Krieger Institute, Baltimore, MD, United States

Introduction: Imaging studies have examined the functional roles of individual regions for motor control [1,2], however there has been limited examination of the importance of network connectivity to motor performance. In this study, resting state differences in functional connectivity within left and right motor circuits are associated with motor performance in right-handed typically developing (TD) children.

Methods: 40 healthy, TD children ages 8-12 years were assessed for motor performance outside of the scanner using the Physiological and Neurological Examination for Subtle Signs (PANESS). The PANESS is a standardized battery of axial and appendicular motor control that is sensitive to developmental changes in children’s motor abilities [3]. Total PANESS score is made up of several subscores including overflow and timed scores. Overflow measures inadvertent movements other than the intended movement. Fewer overflow movements, lower total timed scores, and lower total PANESS scores are indicative of better motor performance.

Figure 1: Motor Circuit Seed Regions. (LH Circuit in Red, RH Circuit in Blue, Bilateral rostral and dorsal SMC, involved in both circuits, in Pink)

Results and Discussion: There was a significant relationship between mean connectivity within the LH and RH motor circuits (R=0.573, p=0.0001: Figure 2). Neither mean connectivity within the LH nor the RH motor circuits was significantly associated with motor performance as measured by either Overflow scores (LH: R=−0.26, p=0.100; RH: R=0.09, p=0.570). Timed scores (LH: R=−0.24, p=0.133; RH: R=0.17, p=0.302), or Total PANESS scores (LH: R=−0.18, p=0.259; RH: R=0.21, p=0.18). In contrast, highly robust correlations were seen with differences between mean connectivity within the LH and RH motor circuits, with the LH-RH difference predicting better motor performance (Overflow: R = 0.519, p = 0.0006; Timed: R = 0.583, p = 0.0001; Total PANESS (Figure 3): R = 0.555, p = 0.0002).

Conclusions: Motor performance in children is associated with LH dominance in motor connectivity.

References: