

Primary Versus Secondary Motor Stereotypies

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Introduction: Stereotypies are involuntary repetitive and rhythmic movements and can be defined as either primary or secondary. Primary stereotypies are seen in typically developing (TD) children whereas secondary stereotypies are associated with some other developmental disorder, such as autism spectrum disorder (ASD). Primary stereotypies are generally viewed as a movement disorder due to the absence of other neurological symptoms, while secondary stereotypies have been hypothesized to represent self-stimulatory behaviors performed by the individual to get some sort of sensory satisfaction. However, many patients report that they are unaware of their stereotypies until attention is brought to them, suggesting they are not self-stimulatory and instead purposeless. This study aims to characterize differences between primary and secondary stereotypies.

Materials and Methods: Survey data were collected and analyzed to evaluate the occurrence of stereotypies and associated characteristics, such as the settings in which they occur. Quantitative assessment of stereotypies was performed with simultaneous video-based motion analysis and electroencephalography (EEG). Subjects with primary or secondary stereotypies were recruited at the University of Rochester Medical Center. After obtaining informed consent, subjects were fitted with a 64 lead EEG cap and jacket containing infrared markers for movement tracking using the mobile brain/body imaging system (MoBI). Subjects performed a variety of tasks, deliberate mimicking of the stereotyped movement, the iPad Flanker Inhibitory Control and Attention Task, a Toy Task to measure response to visual and auditory stimuli and free play with selective toys that tend to eventuate stereotypies. Motion data were analyzed during spontaneous and non-spontaneous stereotypies in all participants. EEG data were collected but were not analyzed for this report.

Results and Discussion: To date, 5 subjects have been tested; three with primary stereotypies and two with secondary. Although the sample size is small, these preliminary data indicate that the average age at onset of stereotypies was younger in TD subjects when compared to those with ASD. Parent report of behavioral setting suggests that TD individuals tend to have stereotypies in multiple behavioral settings, whereas ASD individuals have stereotypies in a single type of setting. Our data show that video capture of stereotypies for motion analysis is feasible and generally well tolerated by the subject. Although data are still being analyzed, the combined approach of simultaneous motion analysis and EEG is a potentially powerful tool for investigating the neurophysiology of stereotypies.

Future Directions: Using EEG data, we will analyze the presence of the movement related cortical potential (MRCP) prior to movement onset. Studies have shown that the MRCP occurs prior to voluntary motion and is an indication of motor planning. We further plan to use EEG data to determine whether presence of stereotypies correlates with a change in arousal.

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