

## **Wearable Sensors for Multifunctional Assessment in Rett syndrome**

In this study we propose adding wearable and home sensor technology (WHST) to capture data on activity, gait, locomotion, heart rate, and sleep in a small group of girls with Rett syndrome (RTT) as part of the RTT Natural History Study. Using a recently developed data infrastructure and state-of-the-art analytics, the aim is to demonstrate feasibility in augmenting existing methods of diagnosing and monitoring hallmarks of RTT. The US alone has over 600,000 people living with a CNS disorder. However, objective measures able to track disease progression and assessing individual health status are unavailable. This holds true particularly for neurodevelopmental disorders (NDDs) such as RTT. Rett girls are nonverbal; therefore progress, regression, or distress outside clinical settings often relies on subjective or incomplete parental reports. Similarly, FDA-approved clinical outcome measures consist of non-quantitative scaled clinical assessments rating behavioral and functional items. Moreover, in the clinic, assessment of function is confounded by behavioral and emotional reactivity due to anxiogenic settings. It is thus crucial to obtain objective measures of health status outside the clinic, in a familiar home environment. To address the need for quantifiable measures we will equip patients with WHST that monitor parameters of interest (albeit not limited) to RTT, continuously and non-invasively. Early Signal is a non-profit organization focused on transforming health care through the use of WHST. To this end we have evaluated WHSTs and the low-level data they generate, and developed a suite of analytical tools required to process and visually present relationships between measured variables in the obtained multidimensional data sets. The studies proposed herein augment existing clinical trials enrolling children with RTT and MECP2 duplication, currently planned at CHOP under supervision of Drs. Eric Marsh and Tim Roberts. The study works as proof-of-concept for this novel approach, using unstructured WHST data to obtain objective quantitative behavioral data and maximal sensitivity to idiosyncratic individual health trajectories in RTT. In this study we will also capitalize on currently planned EEG-based measures of information processing. Because processing of auditory and visual information lies central to the often compromised interactions between care givers and children with NDDs, capturing surrogate measures that correlate with abnormal electrophysiological findings is of great interest.