

Neuromarkers of Sensory and Cognitive Function in Cystinosis

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In this talk, I will describe a series of studies performed in both children and adults with Cystinosis, where high-density electrophysiological (EEG) scalp recordings were used to assess the neurophysiology of basic auditory and visual sensory function, auditory sensory memory functioning, and higher-order cognitive control processes. Cognitive processes specifically addressed were response inhibition, working memory, and error processing. Cognitive testing revealed lower scores on verbal IQ and perceptual reasoning in both children and adults with cystinosis. Electrophysiological data showed that the neural responses to basic tone stimuli are highly typical in children and adults with cystinosis, but we did see a weakness in generating the MMN response to the deviant tones under conditions that were designed to tax the auditory sensory memory system in children¹ with cystinosis. This weakness was not present in adults with cystinosis. Furthermore, individuals with cystinosis showed a surprising increase in the amplitude of their early visual sensory responses, which may be an indication of some hypersensitivity to visual inputs. In the cognitive domain, poorer performance on tasks that required inhibition (flanker and go-no go tasks) was accompanied by clear differences in response-inhibition and conflict monitoring related neurophysiological responses, and a reduction in neural responses associated with awareness of making an error – that is, they did not register the occasions they made errors as effectively as controls.

Overall, electrophysiological assessments of sensory and cognitive functioning in cystinosis across the age span, revealed mild-to-moderate deficits in this population, and were suggestive of adaptive processing to compensate for these neural processing differences. These electrophysiological techniques provide objective measures of neural functioning that may have excellent utility as biomarkers against which to test the efficacy of both pharmacological and other therapeutic interventions.