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Title: Neurophysiological Correlates of Tactile Sensitivities in ASD

Abstract: Abnormal sensory processing in general, and in the tactile domain in particular, is widespread in autism spectrum disorders (ASD), but no physiological basis for those aberrant sensitivities has ever been elucidated. Establishing the physiological correlates of these tactile abnormalities is necessary not only to further enhance our understanding of the biological basis of ASD, but also to inform possible treatments and therapies. We used magnetoencephalography (MEG), to record cortical responses to 500ms of 25Hz pneumatic vibrations using latex tactors on the fingertips of 32 participants ages 8 to 17, of which 15 were diagnosed with ASD. We then mapped the responses from the MEG sensors onto cortical space, and focused on the neurophysiological responses in the primary somatosensory cortex (S1). We also recorded peripheral responses on the median nerve in a parallel group of participants. All participants, regardless of diagnosis, showed a clear sustained 25Hz cortical response to the tactile vibrations. In the control group, we also found a component of the response consisted of cortically generated harmonics at 50Hz, indicating a non-linear neuronal response pattern in the cortex. Such harmonics were absent in our peripheral recordings, confirming they are generated cortically. This non-linear component of the response to vibrations was largely reduced in the ASD group, indicating a more veridical, linear, response to tactile vibrations in that group. The degree to which the 50Hz harmonics component was present in the cortex in any one individual correlated with the severity of ASD as measured using the ADOS score. Furthermore, the magnitude of the harmonics component in each participated was also significantly correlated with the individual scores on the tactile component of the sensory profile questionnaire, indicating that the degree of linearity in the cortical neural response of ASD individuals in S1 was predictive of the magnitude of aberrant tactile sensitivities in each individual.