Title: Examining how social cognition shapes shared conscious experiences: An inter-subject correlation analysis of the developing brain

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Abstract: The developmental period between childhood and adolescence is marked by profound changes to cognition. In particular, social cognition, the ability to think about other people, and the underlying brain areas that support it, become drastically more sophisticated. This is likely driven by an expanding social network, which shapes richer shared conscious experiences during this time. However, the relationship between social cognition and shared conscious experiences remains unclear. The aim of the current project was to explore whether differences in social cognition are associated with differences in shared conscious experiences. To do this, we used data extracted from The Healthy Brain Network Biobank. We first acquired metrics of social cognition measured with the Social Responsiveness Scale in children between the ages of 7-12. We divided participants into 3 groups: high social cognition (HSC), low social cognition (LSC), and autism spectrum disorder (ASD). To get a metric of shared conscious experiences, we computed inter-subject correlations (ISC), from the fMRI data acquired while each participant watched a short-clip of the movie “Despicable Me”. Movie watching is ideal for probing shared conscious experiences because it requires the viewer to integrate cognitive systems to follow the plot. We found no differences in neural synchronization (ISC) between the HSC and LSC groups across the brain. However, we found significant differences between those two groups and those diagnosed with ASD. That is, the ASD group had significantly less ISC not only across the whole brain, but in three networks: the limbic, theory of mind, and default mode networks. Despite differences in these areas, we found no difference in sensory areas (i.e., the visual and auditory network) between the three groups. These results suggest children diagnosed with ASD had a quantitatively unique conscious experience of the movie, but this is not driven by solely by social cognitive abilities.