Project Details	
Project Code	MRC18NMHCa Zhang
Project Title	Locating the absent self: characterising neurocognitive impairments of self-representation in autism spectrum disorder
Research Theme	Neuroscience & Mental Health
Summary of Project	Combining advanced brain imaging and computational approaches, we will identify brain networks and neural dynamics that show alternations in adults with autism spectrum disorder. Using novel behavioural measures, we will explore how the alternations in the autistic brain give rise to impaired self-representation in autism.
Project Description	The cardinal symptom of atypical social interaction in autism spectrum disorder (ASD) has been linked to impaired self-representation. Understanding this "absent-self" is important for investigating why and how social disconnect occurs in ASD, and is fundamental for diagnosis and evaluating treatment efficacy. However, current research is hampered by the lack of sensitive measures of the autistic self. This PhD will address this challenge, by combining robust measures of self-representation, cutting-edge brain imaging and computational modelling. We will establish how changes in brain activities and neural dynamics give rise to the absent-self in ASD. This will help develop new effective behavioural and medical interventions for ASD in early life. Our innovative doctoral training is reflected in: 1. Novel measures from a Cardiff ASD cohort. This project will recruit 30 adults with ASD and 30 controls from the Wales Autism Research Centre (WARC) for comprehensive brain-imaging and cognitive testing. We will quantify self-representation using a novel matching-decision paradigm, in which participants learn paired associations between arbitrary stimuli and "self"/"friends"/"strangers" categories, and then decide whether a new similar stimulus represents the self or others. The use of abstract self/other stimuli enables rigorous measures of self-representation using psychophysical methods (PubMed ID 27918835), and inferences on cognitive processes using computational modelling (PubMed ID 26582559), which will guide imaging analysis with increased sensitivity beyond conventional introspective reports in ASD. 2. Cutting-edge multimodal brain-imaging. During the matching-decision task, we will collect functional MRI (fMRI) data at high spatial resolution (1 mm isotropic) on Cardiff's new 7T MRI scanner and magnetoencephalography (MEG) data at millisecond temporal resolution. The fMRI-MEG integration enables precise localisation of key brain regions and quantification of neural dynamics associated with self-representation. We will use machine-learning classification to identify brain networks that show altered dynamic patterns in ASD. By relating imaging to cognitive performance, we will identify how the network dynamics contribute to behavioural phenotype in ASD, thus providing new knowledge about the neurocognitive mechanisms underlying impaired self-representation in ASD. Further added-value includes (1) our multidisciplinary expertise in brain imaging (JZ, Cardiff), social neuroscience (JS, Bath) and developmental psychology (CJ, Cardiff), and (2) the strong feasibility from the support of WARC's research database, which currently includes >200 individuals with ASD, accompanied by relevant neuropsychological information. Beyond academic beneficiaries, outcomes will be disseminated through regular public engagement events. Through WARC, we will provide impact opportunities with clinicians, policy makers, as well as individuals with ASD and their families.

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