

A Multimodal Investigation for the Causal Neurobehavioural Evidence of Socio-affective Attention Modulating the Relationship Between Loneliness and Depressed Mood

Depression is a very common form of mental health condition, leading to long-term functional impairments, suicidal behaviours and premature death. Loneliness has reached epidemic levels and is a leading cause of depression. By understanding the causal neuropsychological mechanisms of loneliness on depressed mood, there is an opportunity to shed light on their theoretical framework that is critical for potential translational applications. Current theory suggests that loneliness biases people's attention towards socio-affective information that is interpreted as cues for social threats but evidences are largely correlational. We previously demonstrated that loneliness may hinder affective processing by modulating the affective and attention regulatory functions. Therefore, Study 1 will use a longitudinal design and investigate: (Q1) How the attention to socio-affective information is related to loneliness, depressed mood, and their longitudinal changes. Clarification of these processes will improve understanding of how loneliness may lead to depressed mood across time. Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique that facilitates the excitation or inhibition of the local neural activity. It can provide causal neurobehavioral evidence between the neural target and the psychosocial processes and behaviours. Left dorsolateral prefrontal cortex (dlPFC) is crucial to regulating emotions and emotional experiences, and existing literature has suggested that stimulating left dlPFC is effective in reducing negative affective response to social exclusion and also depressive symptoms. Whether dlPFC modulates socio-affective attention and can regulate depressed mood in lonely individuals are unclear. Furthermore, electroencephalography (EEG) can directly measure neuronal activity and dynamics at high temporal resolution. Therefore, to further understand the role of socio-affective attention in the association between loneliness and depressed mood, in study 2, we will perform a tDCS-EEG study with lonely individuals to evaluate: (Q2) Whether anodal tDCS of the left dlPFC has an effect on the attention to socio-affective information, loneliness, and depressed mood in relation to the brain connectivity in lonely people. Findings will provide casual neuropsychological evidence for left dlPFC and its connectivity underpinning the relations between them. Overall, the proposed project will provide causal neural and behavioural evidence and increase our understanding of the neuropsychological relationships between loneliness, socio-affective attention, and depressed mood. Better understanding will facilitate the development of targeted interventions for people suffering from loneliness and depressed mood.