Social cognition: from empathy to pragmatic ability

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Social cognition refers to the ability of make sense of the world through processing signals generated by members of the same species (Frith, C. 2008. Social Cognition. *Philosophical Transactions of the Royal Society B: Biological Sciences,* 363(1499), 2033-2039.). A very basic component of social cognition is empathy, that is the ability to experience the emotional states of another's person. A more sophisticated aspect of social cognition is the capacity to understand affective and emotional aspects in themselves and other individuals. Finally, pragmatics is an articulated cognitive ability allowing people to go further a signal, i.e. the literal meaning of utterance, in order to understand the others' communicative intention.

Aim of the present symposium is to analyse different aspects of social cognition, analysing such aspects from different perspective: starting from the neural networks involved during the empathic experience of pain or during the experience of social exclusion, to the development of more complex forms of social and communicative interactions in typical and atypical development.

In particular, the first contribution reviews fMRI evidence showing that empathy for another person pain recruits the same neural networks involved in the first person experience o pain, testifying that empathy is a sort of "embodied simulation" of the affective state of the other person. Still focusing on the neural correlates involved, the contribution that follows investigates the role that different forms of social support, physical and cognitive, play in modulating a specific experience of pain that is social exclusion. The third contribution describes how empathic judgments of another person's emotions changes across life span, from adolescents to elderly people and how the maturation and decay of functional brain networks contribute to explain such modification. Finally, last contribution investigates the role that theory of mind and inferential ability play in explaining communicative pragmatic difficulty of children with autism spectrum disorders.

The neurophysiological basis of empathy

Claus Lamm

In my talk, I will review fMRI evidence consistently showing that empathy (for pain) recruits neural networks overlapping with the first-hand experience of pain. More specifically, anterior insular (AI) and midcingulate cortex (MCC) were involved in both directly experienced pain, and in empathy for pain. Since this suggests that empathy recruits similar neural mechanisms as the first-hand experience of the emotion one is showing empathy for, this finding has been interpreted to indicate that empathy relies on "shared representations" and the engagement of functionally equivalent processes between self and other-related experiences. However, similarity of neural activations alone is insufficient to indicate equivalence of representations. To obtain more conclusive evidence on whether empathy indeed recruits functionally similar neural processes, we therefore performed a series of behavioral, ERP and fMRI studies aiming to show that experimentally changing the first-hand experience of pain (by means of placebo analgesia) also changes empathy for pain, and that this is supported by similar neural networks. Our data show that placebo analgesia reduces empathy for pain, and that this is accompanied with matching ERP and activation changes in the "shared" empathy for pain network identified previously. This provides more direct evidence that empathy engages functionally equivalent processes as first-hand emotion experiences, supporting claims that empathy relies on some sort of "embodied simulation" of the affective state of others.

Social support and social exclusion: an fMRI study

Rosalba Morese

This study aims to investigate the role of social support in modulating the neural correlates involved in social exclusion. We focused on two different forms of supports: physical and cognitive. By physical support we refer to physical contact, e.g. provided by a friend; by cognitive support we refer to the communication of useful information about social exclusion experience, e.g. “I’m sorry you has been excluded” proffered by a friend. 61 women divided in three group - cognitive support (N= 19), physical support (N=20) and control group (N=22) - participated to the study. Experimental fMRI session was composed by 3 phases. (A) Social exclusion I: each group was scanned while playing the virtual Cyberball game. During Cyberball two (virtual) persons play with a ball, and they keep out of the game the experimental subject. (B) Social support: experimental group received physical or cognitive support while control group do not received any kind of social support. (C) Social exclusion II: each group was scanned for the second time during the exclusion experience provided in the Cyberball game. We then compared physical and cognitive groups to control group using the contrast social exclusion I vs. social exclusion II. FMRI results show that during social exclusion (II) physical support decrease the activation of Anterior Insula (AI), usually associated with visceral pain and negative affective experience, and that cognitive support decrease the activation of AI and Temporal Parietal Junction (TPJ), area usually involved in the representation of mental states of other individuals.

Empathy and self-other distinction over the life-span: behavioral and neurophysiological evidences

Giorgia Silani

Successful social interactions require the capacity of understanding affective and emotional states of others. Humans tend to understand the states of others in relation to their own, but such a self-projection mechanism can result in biased social judgments if confusion between self and others subsists. Recently, we showed that empathic judgments of another person’s emotions are indeed systematically biased towards the participant’s own current emotions if they are incongruent to those of the other person; and that the size of the bias is associated with variations in neural activity of dedicated brain regions (Silani G., et a. 2013. Supramarginal gyrus is crucial to overcome emotional egocentricity bias in social judgments. *Journal of Neuroscience*. 25; 33(39)). In this presentation, I will describe how egocentrically biased judgments change across the life span, showing that the presence of the bias follows a quadratic curve with increasing age. Adolescents and elderly people are in fact less able to disengage from their own emotional perspective compared to mid-aged participants, resulting in more biased judgments of other’s affective state, because shifted towards their own emotions. The findings are discussed in light of the maturation and decay of specific functional networks in the brain.

Contextual and social inference abilities in children with high-functioning autism spectrum disorder and their typically developing controls

Soile Loukusa, Leena Mäkinen, Eeva Leinonen, Hanna Ebeling & Irma Moilanen

The ability to make pragmatic inferences is required in order to understand the speaker’s intended meaning in communicative situations. Even if it is well known that

children with autism spectrum disorder (ASD) have difficulties with pragmatic inference, researchers do not entirely agree on the prevalence of these difficulties. The aim of this study was to investigate how children with ASD and matched controls answer contextually and socially challenging questions which vary in terms of their cognitive demands.

Sixteen Finnish high-functioning children with ASD (mean age 7;7 years) and 16 typically developing age-matched control children participated in this study. Children with ASD were diagnosed by a child neurologist or a child psychiatrist at Oulu University Hospital in Finland. Diagnoses were based on investigations carried out by a multiprofessional team according to ICD-10 criteria. In this study the children were asked test questions which were planned to measure context utilization, social language use and understanding of intentions, thoughts and feelings. The material contained 39 questions and they aimed to study how children managed to derive inferential conclusions.

The results indicated that children with ASD have difficulties with many of the contextually and socially complex questions. In this study, the difficulties with contextual inference in children with ASD were not evident only in questions requiring theory of mind (ToM) but they also had difficulties with contextually challenging questions without demands for ToM processing. This study suggests that the pragmatic inference difficulties of the children with ASD are based on multidimensional cognitive problems.