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The social mind: disentangling affective and cognitive routes to understanding others

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ABSTRACT

To flexibly adjust behaviour to that of other people around us requires some representation of their overt actions, but also of the driving forces behind them, that is, their goals, intentions, and emotions. Socio-affective and -cognitive functions enable such representations via creating vicarious affective states in the observer (empathy) or by accumulating abstract, propositional knowledge of another person's mental state (Theory of Mind). While the empathic sharing of another's emotions is implemented by those neural networks that also process first-hand emotion, Theory of Mind activates a widespread network that seems to process information independent of its specific modality or content. Crucially, these two routes can function independently as individual differences in the respective capacities and network activations are unrelated and selective impairments in one or the other function occur in psychopathology. However, they may co-activate and co-operate in complex social situations, determining how prosocially interactive behaviour unfolds.

KEYWORDS

Empathy; compassion; theory of mind; mentalizing; social cognition

Introduction

Humans encounter and interact with others, their conspecifics, on a continual basis in a multitude of social relations. Being able to flexibly adjust one's own behaviour to that of others requires some representation of the other's actions and, ideally, the motivation behind them, that is, the other's emotions and thoughts (Adolphs 2003; Keysers and Gazzola 2009). Social psychological and neuroscience research over the last few years has identified at least two routes to such representation: an affective route that allows us to feel with others (that is, empathy; de Vignemont and Singer 2006) and a cognitive route that enables understanding of others' mental states (that is, Theory of Mind [ToM] or mentalizing; Frith and Frith 2005). The present review describes these two routes, including their location within the larger domain of social psychological processes, outlines the neural mechanisms underlying them, and characterizes their interplay during

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interaction with others. Crucial evidence regarding these questions also comes from alterations of socio-affective and -cognitive functioning in psychopathology and from the relations to actual (pro-)social behaviour.

The social mind

Humans are certainly not the only social species, but the complexity and flexibility of our social interactions are unrivalled. In comparison to chimpanzees, our closest living biological relatives, even children are more ready to co-operate with and rely on their conspecifics (e.g. see van Leeuwen, Call, and Haun 2014). The affective and cognitive processes that enable complexity in human social interactions are manifold. Many of them are shared with other species but may vary in the sophistication of their development, such as affiliation, emotion contagion, or some forms of perspective taking or ToM (de Waal 2011; Bugnyar, Reber, and Buckner 2016). Others have been speculated to be uniquely human, such as aspects of language and the processing of hierarchical structures (Fitch 2017).

Theoretical accounts vary widely on which processes are deemed crucial for social interaction (Happe, Cook, and Bird 2017). These may range from basic processes like action understanding (Mier et al. 2010), social attention, and memory, to higher-order functions such as social inference and attitudes (Fiske and Taylor 2013). To give an example based on a developmental perspective, the following compilation of processes has been suggested: affiliation, agent identification, emotion processing, empathy, individuals' information store, mental state attribution, self-processing, social hierarchy mapping, social policing, and in-group/out-group categorization (Happe and Frith 2014). How these processes are related to one another seems even less clear (Happe, Cook, and Bird 2017). Across accounts, there is consensus, however, that empathy and ToM are essential elements of higher-level social processing, as they enable access to another person's inner states.

Socio-affective route

Being with others is one of the major triggers of emotions. These social emotions depend on the situation and on others' emotions, but to a large extent they depend on the person him/herself. Witnessing another's misfortune may provoke a shared sadness in one observer and a feeling of *schadenfreude* in another, a compassionate response, linked with the desire to help, in one or indifference, and no emotion altogether in another. While *schadenfreude* and compassion are social emotions, they are in a sense complementary to those of the person eliciting them. Other examples are envy, jealousy, guilt and shame, embarrassment, and possibly pride (Feldman Barrett, Lewis, and Haviland-Jones 2016). Critically, the emotional state of the interaction partners differs; your anger goes along with my guilt. Empathy, in contrast, denotes the sharing of another's affect, thus leading to isomorphic emotional states in the experiencer and the observer (de Vignemont and Singer 2006). I can share both your grief and your joy. It is therefore not surprising that neuroimaging studies have not revealed a specific network related to empathy. Rather, different networks are involved in sharing different emotions. While another's pain activates the anterior part of the insular and cingulate cortices (Singer et al. 2004; Carr et al. 2003), sharing others' joy activates regions in the ventral striatum (Mobbs et al. 2009). The fact that these networks coincide with those that are active during the

first-hand experience of the respective emotions has been interpreted as shared networks supporting the sharing of emotions (de Vignemont and Singer 2006).

By creating a state in the observer that resembles that of another person, empathy enables access to the other's inner conditions. Interestingly, such sharing of others' emotions seems to be spontaneous and happens without the explicit instruction to do so (in healthy individuals, cf. Meffert et al. 2013). However, to date, it is unclear whether and, if so, how exactly this information is read out by more controlled, cognitive understanding of mental states, that is, mentalizing or ToM.

Socio-cognitive route

To understand what another person thinks or feels requires more abstract, propositional representations of that state than mere sharing of another's condition would allow. During human ontogeny, we develop the capacity for such a 'Theory of Mind', the ability to infer and reason about others' perceptions, beliefs, thoughts, and emotions (Frith and Frith 2005; see also Perner, Priewasser, and Roessler 2018). While elements of ToM develop already earlier in life (Kovács, Téglás, and Endress 2010), the critical test whether another person's beliefs about the world can be represented and named if they deviate from their own beliefs is not passed before the age of four or five years (Wimmer and Perner 1983).

The neural network related to ToM largely differs from those brain regions involved in empathy. Across different ToM operationalizations, the temporoparietal junction is consistently activated together with the medial prefrontal cortex (Schurz et al. 2014). However, a larger network including the posterior cingulate cortex/precuneus, superior temporal gyrus, and the temporal poles is active for mental state understanding in more realistically complex scenarios (Wolf, Dziobek, and Heekeren 2010). Interestingly, each of the different ToM operationalizations activates a different portion of this larger network (see Schneider et al. 2014; Saxe and Kanwisher 2003; Mitchell, Heatherton, and Macrae 2002), suggesting that they differentially tap into the processes constituting full-blown ToM (Schurz and Perner 2015).

As emotion sharing is enabled by the neural networks involved in the first-hand emotion experience, the ToM network is also activated for a multitude of other processes. Most prominently, the same regions have reliably been observed during passive control conditions in externally oriented tasks, which led to their denomination as default mode network (Raichle et al. 2001) and further specification as crucial for self-generated thought or mind-wandering (Andrews-Hanna, Smallwood, and Spreng 2014). Parts of it, in particular, in the medial prefrontal cortex, have also been associated with metacognition, the ability to think about and monitor one's own cognitive processes (Baird et al. 2013). What self-generated thought, metacognition, and ToM seem to share is a focus on internal processes, be they related to own mental states or to those of others.

Disentangling socio-affective and -cognitive functions

Independent capacities

The socio-affective and -cognitive functions described above are conceptually separable and have been investigated mainly in distinct lines of research. But how do they relate

to each other? Are strong empathizers also proficient mentalizers? And do the different networks co-activate in complex social settings that require both functions? A recently developed experimental paradigm simulates such complex situations of social understanding and involves participants viewing short autobiographical narrations that vary in emotionality and ToM demands (Figure 1; Kanske, Böckler, et al. 2015). Participants judge the valence of their emotions, probing the empathic sharing of others' affect, and indicate how much compassion they feel for the narrator. Questions about the narrator's thoughts probe participants' ToM capacities. A final rating asks about the confidence in having responded correctly to the previous ToM question, giving an indication of metacognitive accuracy. This study shows that distinct neural networks associated with each of these functions can be isolated within-subject, within-task (for a schematic depiction, see Figure 2; Kanske, Böckler, et al. 2015; Molenberghs et al. 2016). The propensity to empathise with or mentalize on the narrator is also associated with structural brain differences in cortical thickness in these networks (Valk et al. 2016, 2017). Crucially, the task allows probing whether empathizing and mentalizing are directly related, and thus,

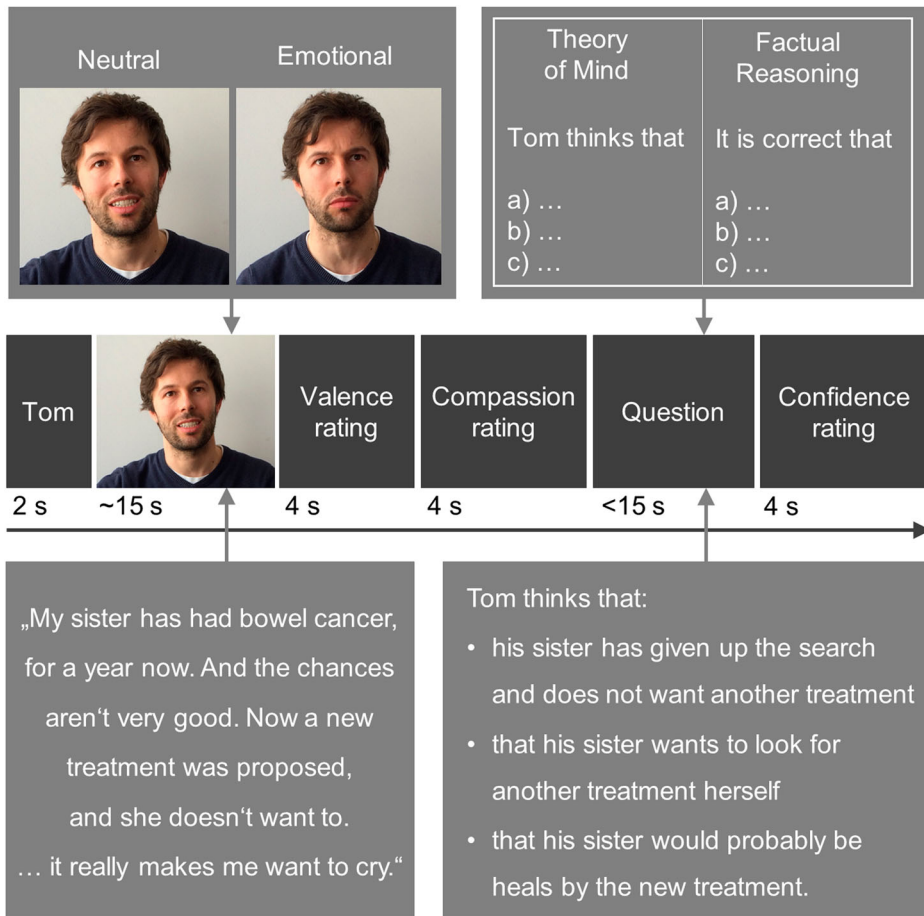


Figure 1. Depiction of events in a trial of the EmpaToM task with an example story and question in the lower row (emotional, ToM condition). Adapted from Kanske, Böckler, et al. (2015).

whether there is a general social capacity. The answer is clearly no; there is no association on a behavioural or neural level, showing that strong empathizers are not necessarily good mentalizers (Kanske et al. 2016).

If empathy and ToM can function independently, then it should be possible to see selective impairments or changes in either one of them. Indeed, impairments in ToM have been consistently described for patients with autism spectrum disorder (Frith 2001) or in ageing (Reiter et al. 2017), while empathy seems to be preserved, when controlling for alexithymic deficits (Bird et al. 2010). Psychopathic individuals and aggressive criminal offenders, in contrast, show empathy deficits (Meffert et al. 2013) without concurrent changes in ToM (Winter et al. 2017).

Interactions of empathy and tom

Complex real-life social situations will require the joint, simultaneous, and possibly interactive activation of the different neural networks associated with empathy and ToM. Indirect evidence for such joint activity comes from a meta-analysis on empathy for others' pain (Lamm, Decety, and Singer 2011). Here, the empathy-related network is activated both when we directly see somebody else in pain and when we have to deduce this from an abstract cue symbol. However, in contrast to direct pain presentation, the abstract cues additionally activate the ToM-related network, putatively because the other's state needs to be inferred from the cues. The affective representation of the other's pain in the anterior insula would then be secondary and follow that of the ToM-related network.

Co-activation of the two networks is also observed in primary studies that involve participants in complex social tasks. For instance, when observing social exclusion, empathizing may again follow the cognitive understanding of the consequences of the situation for the other, resulting in activation of both networks (Masten, Morelli, and Eisenberger 2011). Empathic accuracy studies, in which emotional narrations of others are to be continuously judged regarding the emotional state of the narrator, also jointly activate the

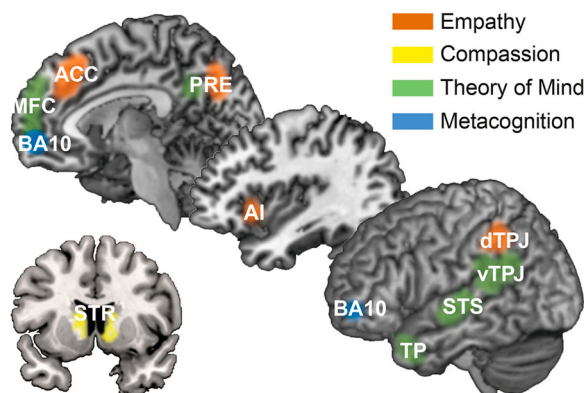


Figure 2. Schematic of the neural networks supporting empathy, compassion, ToM, and metacognition. Anterior cingulate cortex (ACC), anterior insula (AI), Brodmann area 10 (BA10), dorsal/ventral temporoparietal junction (d/vTPJ), medial frontal cortex (MFC), precuneus/posterior cingulate cortex (PRE), striatum (STR), superior temporal sulcus (STS), and temporal poles (TP). Adapted from Kanske, Böckler, and Singer (2017).

empathy- and ToM-related networks (Zaki et al. 2009). However, due to the direct accessibility of the other's emotion, empathic sharing may in this case precede and inform the higher-level cognitive judgment of the other's affective state.

Empathy for others' suffering constitutes a particular case, because it entails an emotionally negative, aversive state in the observer and may, therefore, cause the same consequences as the first-hand negative emotion, such as impaired cognitive functioning (Wessa et al. 2013). Using the experimental paradigm described above (Figure 1) allows direct testing of the consequences of sharing negative affect on ToM. On a neural level, mentalizing-related activity in the temporoparietal junction is indeed inhibited by empathy-related activation in the anterior insula, when the video content is emotionally negative (Kanske et al. 2016). On a behavioural level, this inhibition comes with impairments in ToM performance. This pattern of network interaction resembles that of the task-control or salience network and the default mode network in situations of high external task demands (Menon and Uddin 2010; Trautwein, Singer, and Kanske 2016; Bonhage et al. 2016). The adaptive function may be to prioritize the processing of those aspects of a situation that require immediate reaction, such as others' emotion. The pattern is, however, also reminiscent of increased emotional distraction in psychopathology (Kanske et al. 2013; Kanske, Schonfelder, et al. 2015) and the hypothesis of stress-impaired mentalization, particularly in borderline personality disorder (Fonagy and Luyten 2009; Mier et al. 2013). Impaired emotion regulation and the resulting 'empathic distress' (Singer and Klimecki 2014) may, therefore, lead to a chronified ToM inhibition in psychopathology.

Consequences for social behaviour

Understanding what the emotional consequences of our actions for another person are and sharing these emotions may enable more flexible and prosocial behaviour. Several studies have verified the role of empathy and ToM for prosociality (Masten, Morelli, and Eisenberger 2011; Klimecki et al. 2016; Hare et al. 2010). Specifically, costly helping of others in need is predicted by both activation in the anterior insula and the temporoparietal junction (Tusche et al. 2016). The weight that empathy for or cognitive understanding of the other in need had in the social decision to help was selectively reflected by these regions' activation patterns, respectively. The same held true when empathy and ToM were assessed independently of the specific helping situation, suggesting that stable, individual propensities to engage one or the other of these processes determine social behaviour.

Considering the complex context in which social interactions take place in real life, a number of other important factors play a role. A direct, static relation of, for instance, empathy to prosocial behaviour seems to be an oversimplification. A particularly important factor is group membership. The spontaneous empathic response is reduced for members of another group, which goes along with decreased helping (Hein et al. 2010). Moreover, the suffering of out-group members may even elicit pleasurable emotions such as *schadenfreude* (Cikara et al. 2014). Because of the putative relation to increased in-group empathy, these negative outcomes have been discussed as 'dark sides of empathy' (Breithaupt 2017, 2018).

However, there are studies showing that empathy cannot only be trained but even improved in inter-group settings. Pharmacologically, the administration of oxytocin, a

peptide hormone, increased sensitivity to the pain of Palestinians in Jewish Israeli participants (Shamay-Tsoory et al. 2013). Also, the repeated experience of being helped by an out-group member increases empathy for members of other groups (Hein et al. 2016). Another approach has been to train individuals' capacities to cultivate positive emotions of compassion and concern for others in need, which also increases prosocial behaviour (Leiberg, Klimecki, and Singer 2011; Klimecki et al. 2014).

As research proceeds in answering how we represent not only the overt, behavioural but also the covert, mental states of others, it becomes evident that the challenges lying ahead are to (1) study the different underlying mechanisms in concert, ideally in truly interactive settings, (2) investigate their developmental origins to illuminate the causes of impairments, and (3) probe their malleability via training.

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Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

Philipp Kanske is a neuroscientist and psychotherapist whose research focuses on emotion–cognition interactions such as emotional attention, emotion regulation, empathy and mentalizing. Using neuroimaging methods, he also studies these functions in psychopathology to further our understanding of impairments and find starting points for intervention. He is a graduate of the University of Oregon (MSc), Technische Universität Dresden (Dipl.-Psych.), University of Leipzig (PhD) and Heidelberg University (Habilitation).

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