Social Cognition, Empathy and Agent-Specificities in Cooperation

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1. Introduction: We-Intentions and Shared Intentions

In the contemporary debate, joint actions are often defined as any kinds of social interactions in which two (or more) agents share an intention to cooperate; for example, playing in an orchestra, or moving a piano together. The kind of intentions that motivate joint actions have become a topic of controversy. Some call these intentions 'shared intentions', others call them 'we-intentions'. Searle (1990), for example, has argued for a 'we-intention' as a specific kind of attitude involving collective intentionality in the mind of a single individual; accordingly, an individual can we-intend even if no other agent exists, and 'we-intentions' may occur in a brain in a vat. Bratman (1993, 2014) has argued for an additive account that defines a 'shared intention' of a group as being composed of the personal intentions of the group members that are interrelated in a specific way. Gilbert (2009) also accounts for a 'shared intention' as being composed of personal intentions, yet as not reducible to them; in fact, a shared intention of a group as a plural subject may continue to exist even if some personal intentions of single group members have dissipated or rescinded. Of course, this list is not exhaustive but what these and other accounts in the debate share is a detailed discussion of the nature of 'we-intentions' or 'shared intentions' as well as the interrelation between the shared intention of the group and the personal intentions of the single group members. These approaches fail, however, to account for the social cognitive foundations of shared intentions in particular as well as the variety of social cognitive and affective capacities that may come into play in joint actions in general. The present paper aims to fill this gap. I will argue for a three-dimensional approach to cooperation according to which each cooperative phenomenon can be located on the continua of (i) a cognitive axis, (ii) a behavioural axis, and (iii) an affective axis.

In a first step, I will elucidate the social cognitive prerequisites of being engaged in joint actions involving a shared intention by considering various empirical findings. Drawing on findings from developmental psychology, I will discuss the scope of cooperative activities that joint actions involving a shared intention is able to capture. I will review a number of

developmental findings, which show that little children are already able to engage in a variety of cooperative activities that do not presuppose the sophisticated and demanding social cognitive skills that are required to engage in cooperation involving shared intentions. This suggests that cooperative phenomena lie on a cognitive continuum, ranging from cognitively demanding joint actions involving shared intentions to other kinds of joint actions that are cognitively less demanding and present in early infancy. Moreover, agents coordinate their behaviour in cooperative activities. But such coordination may be more or less well-matched. Accordingly, cooperative phenomena also lie on a behavioural continuum, ranging from little to highly complex coordinative behaviours (see Fiebich, Nguyen, and Schwarzkopf 2015 for a discussion). In a second step, I will show that cooperation should not only be regarded as a two-dimensional but three-dimensional phenomenon, lying also on an affective axis, which is determined by the degree of 'sharedness' of the affective states in question, ranging from individual affective states to more or less complex shared affective states of agents. I will point to a number of findings from social psychology that support the view that the affective axis is orthogonal to the cognitive and behavioural axis in cooperative activities. I end with discussing the implications of the analysis with respect to social cognition in general.

2. Social Cognitive Foundations of Joint Actions Involving Shared Intentions

Although the various accounts provided in the literature differ in detail with respect to what intentions in a group come to, most philosophers agree on conditions of individual intention, interdependence and common knowledge being essentially involved, arguing, for example, (i) that any member of the group intends to do his or her part for there to be a shared intention (individual intention condition), (ii) that any member of the group does so, because he or she expects the other members of the group to do the same (interdependence condition), and (iii) that (i) and (ii) are common knowledge in the group (common knowledge condition) (e.g., List and Pettit 2011; see O'Madagain 2014, p. 348 ff. for a discussion). Despite disagreeing on whether or not joint commitments are necessarily involved for establishing a shared intention, both Gilbert (2009) and Bratman (2014) add a 'persistence interdependent condition' according to which the individual intentions of the group members for there to be a shared intention continue to exist as long as any other member continues so to intend and believes that this is the case. Many philosophers share the view that when being engaged in collective behaviour, individuals share an intention to collaborate – and even proponents of atomistic accounts, who argue for 'we-intentions' as an attitude in the mind of a single individual, defend the view that when multiple individuals are engaged in collective actions,

interdependence of the personal intentions and common knowledge about sharing an intention to cooperate (say, forming a pact to help humanity) need to be involved (Searle 2010). Finally, as pointed out by Bratman (2014), when it comes to cooperation, agents coordinate their behaviour to each other in virtue of the shared intention by being mutually responsive (mutual responsiveness condition), and they are willing to compromise and mesh subplans if required (meshing subplans condition).

What are the social cognitive prerequisites to fulfil these conditions? Except for the individual intention condition (forming an intention to do something does not seem to require any social cognitive skills at all), social cognition is presupposed in various ways. Intending to perform a joint action in accordance with and because of each other's intentions to do so (interdependence condition), to track the maintenance of one's own and other people's intentions (persistence interdependence condition) and intending to mesh each other's subplans (meshing subplans condition) presupposes meta-cognitive capacities such as building meta-representations of the interrelation of each other's mental states as well as meta-representations of the single sub-tasks devoted to any agent in a shared task. The capacity to build shared task representations is required, for example, in the 'joint Simon task'. In the individual condition of that task, participants were asked to respond to the colour of a stimulus on a computer screen whilst ignoring its spatial location (e.g. pressing a right key when a green stimulus appears, or pressing a left key when a red stimulus appears). Participants were revealed to react faster when the spatial relationship between the stimulus and the response was compatible (e.g., when pressing a right key in response to a stimulus on the right) than when it was incompatible. This has been called the 'Simon Effect', and that effect has been found to disappear when participants were instructed to respond to only one stimulus colour in a go/no-go condition (see Lu and Proctor 1995 for a review). Intriguingly, Sebanz et al. (2003) found that the effect reappeared when participants were requested to respond to only one stimulus colour in a joint condition where they were sitting next to another person who had to carry out the alternative response (call this 'joint Simon Effect'), indicating that individuals integrated the co-actor's actions in their own action planning in a joint Simon task. In line with this finding, ERP measurements have shown that perceiving the stimulus conditions that require a co-actor to perform a certain action in a joint action task induces a response inhibition in individuals to perform the action themselves and individuals were slower in responding to stimuli that referred to the co-actor's actions, indicating the occurrence of an action selection conflict (Sebanz et al. 2006b). Ramani and Miall (2004) found that shared task representations enable individuals to anticipate a co-actor's actions

even in situations where those actions could not be observed. Referring to these and other findings from social psychology, Sebanz et al. (2006a) speculate that "the ability to form shared representations of tasks is a cornerstone of social cognition. It allows individuals to extend the temporal horizon of their action planning, acting in anticipation of others' actions rather than simply responding. Whereas predictions based on action observation are simple and immediate, predictions based on known associations between certain events in the environment and others' actions allow one to prepare actions in response to events that will only occur a considerable time ahead" (p. 73). Indeed, findings from psychopathology suggest that building shared task representations in the joint Simon task presupposes sophisticated social cognitive capacities such as having a robust theory of mind since the effect does not occur if the participants are impaired in or lack these capacities; for example, Liepelt et al. (2012) conducted the joint Simon task with schizophrenic patients but could not find the joint Simon effect.

Having a robust theory of mind refers to the capacity to understand other people's minds and behaviours in terms of mental states such as intentions and emotions, beliefs and desires that may differ from one's own and may not match with the current state of affairs (e.g., the other may have a false belief about an object's location). As pointed out by Tollefsen (2005, p. 81 ff.), mutual common knowledge about having the appropriately interrelated personal intentions for there to be a shared intention (mutual common knowledge condition) requires each agent to have a 'robust theory of mind'. That is, having a shared intention requires not only to know that oneself as well as the other agent knows about having the appropriately interrelated personal intentions for there to be a shared intention but also to know that the other agent knows that oneself knows this and that oneself knows that the other agent does so. Although Bratman (2014), for example, aims at working mostly with an intuitive notion of common knowledge (p. 5), 'to fix ideas' he refers indeed to such a demanding conception of common knowledge, arguing for "common knowledge as consisting in a hierarchy of cognitive aspects of the relevant individuals: it is common knowledge among A and B that p just when (a) A knows that p, (b), B knows that p, (c) A knows that B knows that p, (d), B knows that A knows that p, (e) A is in an epistemic position to know that (d), (f) B is in an epistemic position to know that (c), and so on" (p. 57). Finally, being mutually responsive in intention and action (mutual responsiveness condition) does not require a robust theory of mind but recognizing each other's embodied intentions and responding adequately in intersubjective activities is sufficient (Gallagher 2001). For example, embodied intentions such as grasping activities are directly encodable on the basis of low-level social cognitive

processes such as mirror neuron activities, potentially informed by the pragmatic context in which the action takes place (Iacoboni et al. 2005).

3. Social Cognition in Joint Actions and Joint Activities

The studies reviewed above indicate that being engaged in joint actions involving shared intentions is cognitively demanding in presupposing meta-cognitive capacities such as building shared task representations and having a theory of mind. These skills may be required indeed in a number of joint actions. Imagine we share the intention to build a tree-house together tomorrow. This needs to be communicated and common knowledge between us, which, in turn, requires both of us having a robust theory of mind. Moreover, we may need to form shared task representations about how to build the tree-house together (e.g., you need to hold the shelves to enable me to nail them together) and when it comes to situations where our sub-plans clash (e.g., you want to paint the house blue but I prefer to paint it red), our shared intention needs to provide the necessary background for meshing these subplans indeed (e.g., we may bargain to paint the house violet in the end).

Theory of mind has been one of the main research foci in the debate on social cognition for decades, and several theories have been proposed to account for the social cognitive mechanisms that underlie a robust theory of mind. According to theory theorists, for example, individuals understand other people's minds and behaviours in terms of mental states on the basis of folk psychological rules (e.g., Carruthers 2009). Simulation theorists, in contrast, propose that individuals put themselves imaginatively into the shoes of another person in order to simulate the thoughts and feelings that they would experience in his or her situation (e.g., Goldman 2006). Although arguing for different social cognitive mechanisms being predominantly or even necessarily involved in mentalizing activities, theorists from both camps share the assumption that social understanding in terms of mental states is the primary and pervasive way to understand other minds and behaviours. Accordingly, being engaged in cooperative activities involving shared intentions requires social cognitive prerequisites that are proposed to be essential by the main accounts of social cognition that are defended in the contemporary debate. However, as we will see in the following, developmental findings suggest that a variety of cooperative activities do not require such sophisticated skills.

3.1. The Developmental Constraint

A number of developmental studies have supported the view that children do not acquire a robust theory of mind until age 5 when they are able to understand other people’s behavior in

terms of beliefs about state of affairs in the world that may be false (see Wellman et al. 2001 for a review). Moreover, Astington and Jenkins (1999) found in a longitudinal study that children's language competencies foster successful performance in false belief tasks, and indeed cross-cultural divergences in children's ontogenetic trajectory of passing the false belief task seem to be due to culture-specificities in mental state concepts (see Fiebich 2016 for an overview).

Being engaged in joint actions involving shared intentions is cognitively demanding in presupposing a robust theory of mind (see section 2). Hence if joint actions involving shared intentions would specify the criteria for being able to engage in cooperation *in general*, little children (or psychopathological populations) who lack a robust theory of mind would not be able to cooperate at all (call this 'developmental constraint').

However, Warneken et al. (2006) found that already 2-year-old children are engaged in cooperative problem solving activities and social games involving parallel or complementary roles (see also Brownell et al. 2006 for similar results). At this age, children also complain if they are engaged in a joint activity in which another person does not keep the rules of a conventional game (Rakoczy et al. 2008). Moreover, developmental research suggests that 3-year-old children have an understanding of the underlying joint commitment of joint actions. For example, 3-year-olds continue to engage in a dyadic reward-retrieval cooperative activity that requires the effort of each agent for success by continuing to engage in the collaborative activity even if they (though not the other child) got surprisingly access to her part of the reward in the middle of the cooperation (Hamann et al. 2012).

As discussed by Tomaello et al. (2005), 'coordinated joint engagement' in triadic interactions involving not only following adult leads but also sharing goals, coordinating roles and directing adult behavior and attention has been found to be present already in 12- to 15-month-olds (Bakeman and Adamson 1984), for example, when building a block tower together in a coordinated fashion. Indeed, 14-month-olds not only tried to reengage an adult who stopped participating in a joint action but also performed the adult's turn for him, indicating an understanding of not only having a shared goal but also the divided roles involved (Ross and Lollis 1987). Finally, simple cooperative behaviors are observable already in 3-month-olds who facilitate the mother's movements by preparing specific preparatory body adjustments in a pick-up sequence (Reddy et al. 2013), and drop their body tension when the adult fails to complete the expected pick up sequence (Fantasia et al. 2014b).

Notably, these findings may not even cover the full range of cooperation in early childhood. As pointed out by Fantasia et al. (2014a), "developmental research on cooperation is based on a rather restricted pool of tasks, which are designed to assess cooperative problem-solving and related abilities like role reversal, perspective-taking and joint attention. These do not necessarily cover the whole range of possible cooperative interactions in a child's life, as there are many situations […] in which a clear, explicit division of roles and statement of goals is not needed" (p. 4). To sum up, all this suggests that children cooperate with each other long before they acquire a robust theory of mind.

3.2. Meeting the Challenge of the Developmental Constraint

Children younger than age 4 to 5 do not have a robust explicit theory of mind yet. Hence little children's understanding of their own and the other agent's intentions as well as their having mutual common knowledge about sharing an intention with another agent needs to rely on less demanding social cognitive skills. Tollefsen (2005) proposes to substitute the criterion of having mutual common knowledge with having mutual common awareness. This is cognitively less demanding in requiring the capacity of joint attention rather than having a robust theory of mind. Joint attention involves mutual common awareness of both individuals being attentive towards something (e.g., the same goal, or the same external entity such as an object, an event, or another person). Indeed, developmental findings have shown that few-month-old infants are engaged in triadic interactions involving joint attention (see Reddy 2008 for a review). Moreover, joint attention may support the coordinated behaviours of the agents in cooperative activities in various ways, and intentional joint attention itself can be regarded as being a basic joint action (Fiebich and Gallagher 2013). Joint attention to mental contents such as shared plans (e.g., going for a picnic together) may in turn be essential for having a joint plan in the first place; this ability also does not seem to be acquired until age 4 to 5 (see O'Madagain and Tomasello, MS, for a discussion).

Also, attributing intentions to another agent to fulfil the other criteria of being engaged in joint actions involving shared intentions requires having a robust theory of mind. One way to meet that challenge of the developmental constraint is to simply replace the concept of shared intentions with that of shared goals. Butterfill (2012), for example, argues that sharing goals is cognitively less demanding than sharing intentions. Sharing the intention to paint a house together, for example, requires coordinated planning (who will buy the colour, etc.) and hence knowledge of other's intentions and their relations to one's own (Bratman 2014). Sharing the goal to move a large barrel together into a boat, by contrast, requires each agent's goal-

directed actions in the near future to be coordinated partially by expecting the other agent's goal-directed actions and their common effects, but it does not imply knowledge (Butterfill 2012). Moreover, intentions are planning states that require levels of consistency and interrelatedness between sub-plans, whereas a goal is more minimal because it does not require there to be that kind of consistency. In a similar vein, Tummolini (2013) argues for substituting the interdependence condition of agents' shared intending for a joint action (in accordance with and because of the other agent's intention to do so) with what he calls 'goal adoption' that is supposed to be cognitively less demanding and can hence account for the cooperative activities of young children who do not yet possess a robust theory of mind; "it requires that the participating agents have the ability to form goals with social content, but this content is just that the other one achieves what he wants. It implies that agents are able to form allocentric representations of others' goals and are able to switch between egocentric and allocentric perspectives. It does not need interconnectedness in the content of intentions because the interdependence is due to the fact both participants' relevant goals" (p. 92).

Another way to meet that challenge of the developmental constraint is to appeal to (i) children's understanding of 'intentions-in-actions' (rather than 'prior intentions'), and (ii) their understanding of social rules and roles. The distinction between 'intentions-in-actions' and 'prior intentions' goes back to Searle (1983) who argues that individuals can have a prior intention that *represents* a future action (e.g., the intention to go for a walk tomorrow afternoon), or an intention-in-action that *is presented* in the current action execution (e.g., the intention-in-action to grasp for the tea cup is presented in the grasping movement). Unless other people tell us their prior intentions, we need to have a robust theory of mind to figure them out inferentially. Developmental findings suggest that an understanding of other people's intentions-in-action is acquired prior to a robust theory of mind in human ontogeny. Woodward (1998), for example, found that 6-month-old infants understand other people's grasping gestures already as being goal-directed to objects (rather than locations). Moreover, 18-month-olds exhibit an understanding of another person's embodied intention-in-action even if the other person performs actions that fail to achieve the goal in question (Meltzoff 1995). Unlike prior intentions, embodied intentions such as grasping behaviours are directly perceivable and may shape the perception of our own affordances in an ongoing coordinated joint activity (Abramova and Slors 2015).

Although it seems plausible that one typically cannot intend something that goes beyond the own bodily control (Velleman 1997), the notion of 'shared intention-in-action' is still

intelligible since personal intentions-in-action can be 'socially extended' and entail not only one's own but also the other agent's intentions-in-actions as well as their interrelation as an intentional content, e.g., when performing a specific dance move on ice together with another skater (Seemann 2009; Blomberg 2011). As pointed out by Blomberg (2011), "as one of the dancing ice skaters traces a curve on the ice, he lifts his partner up into a position where she has one leg held above her head and the other leg stretched out parallel to the ice (a so-called full Biellmann position). Here, the intention-in-action of each of the skaters will be dependent on the intention-in-action of the other, and the move as whole will be a basic action for each of them. The bodily movements of their partner will be part of the conditions of satisfaction of the intentions-in-action of each of them" (p. 347).

In general, introducing the notion of shared intentions-in-action is useful not only to meet the challenge provided by the developmental constraint. There is no doubt that individuals often make prior agreements to engage in various kinds of joint action. However, on many occasions, shared intentions are not formed prior to the action execution itself but may emerge 'on the fly' within a social interaction. As pointed out by Tollefsen and Dale (2011), alignment processes, broadly understood as "the dynamic matching between behavioural or cognitive states of two people" (p. 392) that involve lower-level coordinative structures may play a role in forming higher-level goals and hence may account for the formation of shared intentions in joint actions in ways other than via explicit 'deep commitments'.

Shared intentions may also emerge in social contexts, and knowledge about the rules and roles that apply to that context may help us to form expectations about each other's behaviour and to cooperate successfully. Imagine we meet in the operating emergency room, having a patient with a particular injury in front of us, with you being the doctor and me being the nurse. In such a context, we may immediately form the shared intention to help that patient by me handing you the tools that you need to perform the operation in question. Developmental findings suggest that children understand social roles and are engaged, preferentially with older children, in pretend plays like playing house or doctor from age 2 onwards (Howes and Farver 1987). At the same age, children understand the conventional rules of games, rebuke when the other player does not observe these roles and try to reengage another person when he or she suddenly stops to participate in the middle of a joint activity (see section 3.1.). Understanding social rules and roles facilitates children anticipating the other agent's behaviour in congruency with those rules and roles. Bratman (1993; 2014, p. 27 ff.), unlike others (e.g., Gilbert 2009), does not account for joint commitments being necessarily required

for there to be a shared intention. Still children's attempts to reengage the other agent when he or she immediately stops being engaged in a cooperative activity can be conceived as an indicator of children's understanding of each other's intentions being persistent independent and the commitment to pursue the cooperation until its end. Moreover, children's rebuking another player when he or she does not observe the rules of a game displays an understanding of being jointly committed to observe the rules that apply to the cooperation activity.

Upshot: The analysis shows that the (social) cognitive demands involved in cooperative activities are a matter of degree, ranging, for example, from cognitively demanding joint actions in which mutual common knowledge requires sophisticated social cognitive skills such as having a theory of mind and being capable of forming meta-representations to basic joint actions in which mutual common awareness is present already in intentional joint attention. Hence it is useful to devote the term 'joint action' to cognitively demanding cooperative activities that involve shared intentions, and to use the term 'joint activities' for any other cognitively less demanding activities in which agents cooperate with each other to achieve a particular outcome. That is, any cooperative phenomenon can be located on a cognitive axis where the highest point of cognitively demandingness is joint actions involving shared intentions. Moreover, any cooperative phenomenon can be located on a behavioural axis, ranging from highly complex coordinated behaviours (potentially being determined by sophisticated rules and roles) to basic coordinated behaviours such as simple turn-taking activities (see also Fiebich et al. 2015 for a discussion with respect to the cognitive and behavioural demands in human-robot cooperation). However, as we will see in the following, human-human cooperation should not only be regarded as two-dimensional phenomenon, lying on a cognitive axis and a behavioural axis, but as three-dimensional phenomenon, lying on an affective axis in addition. Finally, the analysis speaks in favour of an alternative account of social cognition that puts less emphasis on having a robust theory of mind but points to the variety of other social cognitive skills and competencies that may be sufficient to engage successfully in cooperation and other situations of social understanding.

4. We-Experiences, Empathy and Agent-Specificities in Joint Actions and Joint Activities

As we have seen in the previous sections, a number of philosophers and psychologists have discussed the social cognitive prerequisites of being engaged in joint actions involving shared intentions, illustrating that shared intentions are cognitively demanding, and hence need to be reconsidered in one way or another (e.g., Tollefsen 2005; Tummolini 2013). These

approaches fail, however, to account for the phenomenological experiences and agent-specificities that arguably may also play an important role in joint actions and joint activities.

Phenomenological considerations suggest that joint actions and joint activities are accompanied by we-experiences such as the 'experiential sharing' of emotions. As pointed out by Krueger (2015), emotions can be 'shared' in various ways; emotions can be shared expressively by performing bodily or facial gestures or verbal reports, or emotions can be shared by being transferred from one subject to another one, e.g., my expression of disgust may cause you to respond in a similar fashion whilst developing your own rising feeling of nausea. We may also share an emotion by collectively realizing it, e.g. our feeling grief about the death of our child may be shared by being affectively bound up with one another and integrated in various ways.

Note that in the two former cases the emotion in question remains tied to a single individual. In the third case, in contrast, shared emotions are collectively realized by two (or more) individuals. 'Shared' emotions understood in this sense is hence more useful for the present purposes. Following Zahavi (2014), I propose that 'experiential sharing' of shared emotions "isn't merely individual experience plus reciprocal knowledge; rather, what we are after is a situation in which the experiences of the individuals are co-regulated and constitutively bound together, that is, where the individuals only have the experiences they have in virtue of their reciprocal relation to each other" (Zahavi 2014, p.245). This definition is also well-suited for capturing the phenomenal dimension of we-experiences analogue to the interdependence condition of shared intentions in a way that not only the intentions but also the experiences of the agents being engaged in joint actions are constitutively bound together and reciprocally co-regulated (e.g., when enjoying a movie together; see below). Findings from social psychology indicate that the experiential sharing of affective states such as emotions, moods, or arousals may impact the cooperative behaviours of the agents in various ways. Locke and Horowitz (1990), for example, found that analogue to the persistence interdependent condition of shared intentions in joint actions, shared affective states are persistence interdependent as well insofar as individuals prefer to continue to interact with those individuals who are in a similar mood like themselves, even if this mood is a negative one.

As pointed out by Zahavi (2014), experiential sharing presupposes and involves not only self-understanding but also other-understanding. Such understanding is affective in nature but needs to be distinguished from empathy that only presupposes being in an affective state that is isomorphic to another person's affective state because of observing or imagining that state

of the other person and presupposes knowing that the other person is the source of being in the affective state in question (see de Vignemont and Singer 2006 for a discussion). In addition to this, experiential sharing presupposes reciprocity and co-regulation. When being engaged in the experiential sharing of enjoying a movie together, for example, each agent does not only empathetically experience that the other agent is jointly enjoying the movie but that experience, in turn, also affects the quality and structure of their own enjoyment.

In general, (shared) affective states being involved in joint actions can be regarded as a matter of degree, ranging from empathetic feelings of one agent to another one to more or less complex shared moots or emotions of agents (see Zinck 2011 for a discussion of basic emotions like joy versus more complex emotions like guilt or shame). Accordingly, in addition to locating cooperative phenomena on a cognitive axis and a behavioural axis (Fiebich et al. 2015), such cooperative activities can be located on the continuum of an affective axis that is determined by the degree of 'sharedness' of the affective state in question, ranging from individual empathetic feelings of a single agent to more or less complex shared emotions of agents. This affective axis is orthogonal to the cognitive axis and the behavioural axis insofar as findings from social psychology suggest that the (shared) affective states of the cooperating agents are reciprocally interrelated to the cognitive states of the agents on the one hand, and the coordinated behaviours of the agents on the other hand.

First, joint actions are characterized by mutual responsiveness (mutual responsiveness condition). On a behavioural axis, mutual responsiveness is determined by the extent to which the agents coordinate and align their behaviours to one another. Communication can fulfil the criteria for there to be a joint action (though that does not need to be the case since communication may take place without an intentional action on part of the hearer; see Moore 2016 for a discussion), - and if individuals are engaged in a joint communicative action, they may align on various levels of linguistic organization; this, in turn, may facilitate a fluid conversation (Pickering and Garrod 2004) and increase the experience of pleasure. But not only impacts mutual behavioural responsiveness the shared affective states of the agent, shared emotions also impact the mutual behavioural responsiveness of the cooperating agents. As pointed out by de Boer and Badke-Schaub (2008), shared emotional arousal typically supports the successful coordination of agents in team actions. Second, joint actions are characterized by the shared intention of the cooperating agents on the highest end of the cognitive axis. Intriguingly, van den Hooff et al. (2012) found that empathy affects eagerness and willingness to share knowledge, and that these emotions, in turn, influence the knowledge

of having a shared intention. Moreover, findings from social psychology indicate that empathy may play an important role in cooperative activities and that agent-specificities may shape the empathetic experiences of the cooperating agents. Various findings from the domain of sports and the performing acts such as music and dance indicate that empathy has a supportive effect on perception-performance relations as well as prosocial behaviours (see Sevdalis and Raab 2014 for a review). Behrends et al. (2012) found that particular elements of joint activities, including imitation, synchronous movement and motoric cooperation, are suitable to foster empathetic abilities. In general, a number of studies indicate that females are more empathetic than males (Lorimer and Jowett 2010; Kavussanu et al. 2009). Agent-specificities also matter with respect to who is the target of the empathetic experience. For example, Stuermer et al. (2006) found that "empathy had a stronger effect on helping intentions when the helper and the target belonged to the same cultural group than when they belonged to different groups" (p. 943). Finally, Ford and Aberdein (2015) investigated the influences of empathy on the joint Simon task and found that the magnitude of the joint Simon effect was correlated positively with empathy only when the person who was sitting next to the participant were a friend but not when it was a stranger.

In sum, these findings suggest that (shared) affective states may support the success of cooperation in various ways (e.g., by increasing prosocial behaviour, supporting perception-performance relations etc.). This may be crucial in cooperative settings where the cognitive or behavioural skills of the agents are enhanced by (shared) affections in a way that the cooperation in question succeeds, which may have failed otherwise. For example, one sport team may win against another team because the experienced shared emotional arouses of its members enhanced their behavioural coordination to a significant extent. Accordingly, accounting for the affective dimension of cooperation is necessary for a comprehensive account of cooperation.

5. Summary and Outlook

The outcome of the analysis is two-fold: First, cooperation should not be regarded as a one and only phenomenon that is present when two agents share an intention. Being engaged in joint actions involving shared intentions presupposes rather sophisticated social cognitive and meta-cognitive skills such as forming shared task representations and having a robust theory of mind. However, findings from developmental psychology suggest that children are engaged in cooperative activities long before they acquire a robust theory of mind. The analysis has shown that the social cognitive demands of understanding shared intentions can

be reduced by, for example, accounting for shared intentions-in-action being involved rather than prior intentions and for mutual common awareness rather than mutual common knowledge. Also, knowledge about rules and roles in pragmatic/conventional contexts of games may help infants to understand other people's intentions and behaviours early in ontogeny. All this calls for reconsidering the widespread view that cooperation needs to be understood as joint action involving a shared intention. Rather, any cooperative phenomenon can be located on the continuum of a cognitive axis, ranging from joint actions involving shared intentions that presuppose sophisticated social cognitive skills like having a robust theory of mind to joint activities for which less sophisticated social cognitive skills like joint attention or the capacity to identify embodied intentions-in-action are sufficient. Moreover, cooperative phenomena can be located on the continuum of a behavioural axis that is determined by more or less complex coordinated behaviour patterns of the agents. That is cooperation can be regarded as lying on the continuum of a cognitive axis and a behavioural axis, ranging from cognitively demanding and complex coordinated joint actions and joint activities to joint activities that require only few (social) cognitive skills and little coordination (Fiebich et al. 2015). Findings from social psychology suggest that the cognitive and behavioural dimensions of cooperation may be shaped by the (shared) affective states of the cooperating agents. That is, cooperation is not only a two-dimensional phenomenon, lying on a cognitive and behavioural axis, but a three-dimensional phenomenon, lying on an affective axis in addition, which is determined by the sharedness of the agents' affective states, and not only intentions but also affective states reveal to be constitutively bound together and co-regulated, potentially shaped by the personal or social relationship between the cooperating agents.

Second, the analysis points to a pluralist approach to social cognition in cooperation. As we have seen above, robust theory of mind capacities are required in some situations of social understanding; for example, joint actions involving shared intentions. This is in line with traditional accounts such as theory theory and simulation theory that emphasize having a robust theory of mind as being essential for social understanding in everyday life. In other joint activities, however, there is no need of such sophisticated social cognitive capacities. Instead, understanding social rules and norms in conventional contexts, recognizing the embodied intentions of the other agent, alignment processes, we-experiences and empathy as well as personal or social relationships may be essential and sufficient to cooperate. This is in line with pluralist theories that recently entered the social cognition debate (Andrews 2012; Fiebich and Coltheart 2015; Fiebich et al. 2016); our everyday social understanding relies on

a variety of social cognitive processes and procedures, dependent on various factors, including the cognitive competencies of the engaging agent, or the social or personal relationship between them, and often cognitively demanding theory of mind competencies are not required so that less effortful, normative-regulative strategies may come into play.

Note that the criteria for there to be a shared intention (as well as my reconsideration of those criteria) typically amounts to how the personal intentions of a dyad of agents need to be interrelated rather than how the interrelation of the personal intentions of a larger group of agents should look like (e.g., Bratman 2014). Accordingly, my analysis of the phenomenological dimension amounts to 'shared emotions' of agents, who are in some bodily proximity to each other, rather than to 'complex emotions' of larger groups that may be essentially normative (Szanto 2015). This is also analogue to what Tomasello (2016) calls 'joint intentionality' that characterizes the intentionality involved in dyadic face-to-face cooperation, which is present in early human ontogeny and needs to be distinguished from 'collective intentionality' that defines the intentionality involved in the cooperation of larger groups and societies, involving institutional frameworks and cultural identities. Notably, joint intentionality does not only emerge prior to collective intentionality in human ontogeny but also phylogeny. Although chimpanzees, who belong to humans' nearest living relatives, form social relationships such as friendship and tend to trust and collaborate preferentially with those bond partners in food retrieval collaborative activities, they do not engage in a number of activities that are characteristic for joint intentionality, including the formation of joint goals structured by joint attention or joint commitments (Engelmann and Hermann 2016; Engelmann and Tomasello, in press); hence cooperative activities involving joint intentionality can be considered as being specifically human.

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References

Abramova E, Slors M (2015) Social cognition in simple action coordination. ConsciousCogn 36: 519-531

Andrews K (2012) Do Apes Read Minds? MIT Press, London

Astington J W, Jenkins J M (1999) A longitudinal study of the relation between language and theory-of-mind development. Dev Psychol 35(5): 1311–1320

Bakeman R, Adamson I (1984) Coordinating attention to people and objects in mother-infant and peer-infant interactions. Child Dev 55: 1278-89

Bartsch K, Wellman H M (1995) Children's talk about the mind. Oxford University Press, New York

Behrends A, Mueller S, Dziobek I (2012) Moving in and out of synchrony: A concept for a new intervention fostering empathy through interactional movement and dance. The Arts in Psychotherapy 39: 107-116

Blomberg O. (2011) Socially Extended Intentions-in-Action. Rev Philos Psychol 2:335-353.

Carruthers, P (2009) How we know our own minds: the relationship between mindreading and metacognition. Behav Brain Sci 32(2): 121-38O'Reilly A, Bornstein M (1993) Caregiver-interaction in play. New Dir Child Adolesc Dev 59:55-66.

Bratman M E (1993) Shared Intention. Ethics 104(1):97-113

Bratman M E (2014) Shared Agency. A Planning Theory of Acting Together. Oxford University Press, Oxford

Brownell C A, Ramani G B, Zerwas S (2006) Becoming a social partner with peers: cooperation and social understanding in one- and two-year-olds. Child Dev 77:803-821

Butterfill S (2012) Joint action and development. Philos Q 62:23-47

De Boer R J, Badke-Schaub P (2008) Emotional alignment in teams: how emotions support the design process. Precedings of International Design Conference – Design 2008 (Dubrovnik, Korsika): 179-186

de Vignemont F, Singer T (2006) The empathetic brain: how, when and why? Trends Cogn Sci 10(10):435-441

Dominey P, Warneken F (2011) The basis of shared intentions in human and robot cognition. New Ideas Psychol 29:260-274.

Engelmann J M, Tomsello M (in press) The middle step: Joint intentionality as human-unique form of second-person engagement. In: Jankovic M, Ludwig K (eds.) The Routledge Handbook on Collective Intentionality

Engelmann J M, Hermann E (2016) Chimpanzees trust their friends. Curr Biol 26(2):252-256

Fantasia V, De Jeaegher H, Fasulo A (2014a) We can work it out: an enactive look at cooperation. FrontPsychol 5(874):1-11

Fantasia V, Fasulo A, Costall A, López B (2014b) Changing the game: exploring infants' participation in early play routines. Front Psychol 5(522). Doi: 10.3389/fpsyg.2014.00522

Fiebich A, Gallagher S, Hutto D (2016) Pluralism, interaction and the ontogeny of social cognition. In: Kiverstein J (ed.) The Routledge Handbook on The Philosophy of the Social Mind. Routledge, London

Fiebich A (2016) Narratives, Culture, and Folk Psychology. Phenomenol Cogn Sci 15(1):135-149

Fiebich A, Coltheart M (2015) Various Ways to Understand Other Minds. Towards a Pluralistic Approach to the Explanation of Social Understanding. Mind Lang 30(3): 238-258

Fiebich A*, Nguyen N*, Schwarzkopf S* (2015) (*equal contribution) Cooperation with robots? A two-dimensional approach. In: Misselhorn C (ed.) Collective Agency and Cooperation in Natural and Artificial Systems. Springer, Heidelberg

Fiebich A, Gallagher S (2013) Joint attention in joint action. Philos Psychol 26(4):571-587

Ford R M, Aberdein B (2015) Exploring social influences on the joint Simon task: empathy and friendship. Front Psychol 6(962):1-11

Gallagher S (2001) The practice of mind: Theory, simulation, or primary interaction? J Consciousness Stud 8 (5–7):83–107

Gilbert M (2009) Shared intention and personal intentions. Philos Stud 144:167-187

Goldman A (2006) Simulating Minds: The philosophy, psychology, and neuroscience of mindreading. Oxford University Press, Oxford

Hamann K, Warneken F, Tomasello M (2012) Children's developing commitments to joint goals. Child Dev 83(1):137-145

Howes C, Farver J (1987) Social pretend play in 2-year-olds: Effects of age of partner. Early Childhood Res Q 2(4):305-314

Iacoboni M, Molnar-Szakacs I, Gallese V, Buccino G, Mazziotta J, Rizzolatti G (2005) Grasping the intentions of others with one's own mirror neuron system PLoS Biol 3 (3): 529-35

Kavussanu M, Stamp R, Slade G, Ring C (2009) Observed prosocial and antisocial behaviors in male and female soccer players. J Appl Sport Psychol,21:S62-S76

Krueger J (2015) The affective 'we': self-regulation and shared emotions. In: Szanto T, Moran D, The Phenomenology of Sociality: Discovering the 'We'. Routledge, New York

Liepelt R, Schneider JC, Aichert DS, Wöstmann N, Dehning S, Möller H J, Riedel M, Dolk T, Ettinger U (2012) Action blind: disturbed self-other integration in schizophrenia. Neuropsychologia 50(14):3775-3780

List C, Pettit P (2011) Group Agency: the Possibility, Design, and Status of Corporate Agents. Oxford University Press, Oxford

Locke K, Horowitz J (1990) Satisfaction in interpersonal interactions as a function of similarity in level of dysphoria. J Pers Soc Psychol 58(5):823-831

Lorimer R, Jowett S (2010) The influence of role and gender in the empathic accuracy of coaches and athletes. Psychol Sport Exerc 11:206-211

Lu C R, Proctor R W (1995) The influence of irrelevant location information on performance: a review of the Simon and spatial Stroop effects. Psychon BullRev 2:174-207

Meltzoff A (1995) Understanding the intentions of others: Re-enactment of intended acts by 18-month-old children. Dev Psychol 31:838-850

Moore R (2016) Gricean Communication, Joint Action, and the Evolution of Cooperation. Topoi. DOI: 10.1007/s11245-016-9372-5

O'Madagain, C (2014) Can Groups Have Concepts? Semantics For Collective Intentions. Philos Issues 24(1): 347-363.

O'Madagain C, Tomasello M (MS) Joint Attention to Mental Content and the Social Origin of Reasoning. Available on author's website: https://drive.google.com/open?id=0B3KSPsdpmkynZTRtTnAtU2JVVHc

Pickering M J, Garrod S (2004) Toward a mechanistic psychology of dialogue. Behav Brain Sci 27: 169-190

Ramnani N, Miall R C (2004) A system in the human brain for predicting the actions of others. Nat Neurosci 7(1):85-90

Rakoczy H, Warneken F, Tomasello M (2008) The sources of normativity: young children's awareness of the normative structure of games. Dev Psychol 44(3):875–881

Reddy V (2008) How Infants Know Minds. Harvard University Press, Cambridge

Reddy V, Markova G, Wallot S (2013) Anticipatory adjustments to being picked up in infancy. PLoS ONE 8:e65289. 10.1371/journal.pone.0065289.

Ross H S, Lollis SP (1987) Communication within infant social games. Dev Psychol 23:241-48

Searle J (1983) Intentionality. Cambridge University Press, Cambridge

Searle J (1990) Collective Intentions and Actions. In: Cohen P, Morgan J, Pollack M (Eeds.) Intentions in Communication. MIT Press, Cambridge, MA

Searle J (2010) Making the social world. Oxford University Press, New York Sebanz N, Knoblich G, Prinz W (2003) Representing others' actions: just like one's own? Cognition 88(B11-B21):11-21

Sebanz N, Bekkering H, Knoblich G (2006a) Joint action: bodies and minds moving together. Trends Cogn Sci 10(2):70-76

Sebanz N, Knoblich G, Prinz W, Wascher E (2006b) Twin peaks: an ERP study of action planning and control in co-acting individuals. J Cognitive Neurosci 18(5):859-870

Seemann, A (2009) Joint agency: intersubjectivity, sense of control, and the feeling of trust. Inquiry 52(5): 500-515Sevdalis V, Raab M (2014) Empathy in sports, exercise, and the performing arts. Psychology of Sport and Exercise 15:173-179

Stuermer S, Snyder M, Kropp A, Siem, B (2006) Empathy-Motivated Helping: The Moderating Role of Group Membership. Pers Soc Psychol B 32(7):943-957

Szanto T (2015) Collective Emotions, Normativity, and Empathy: A Steinian Account. Hum Stud 38: 503-527

Tollefsen D (2005) Let's Pretend! Joint Action and Young Children. PhilosSoc Sci 35:75-97

Tollefsen D, Dale R (2011) Naturalizing joint action: a process-based approach. Philos Psychol 25(3)385-407

Tomasello M, Carpenter M, Call J, Behne T, Moll H (2005) Understanding and sharing intentions: the origins of cultural cognition. Behav Brain Sci 28: 675–735

Tomasello M (2016) A natural history of human morality. Harvard University Press, Harvard

Tummolini L (2013) Making our ends meet: shared intention, goal adoption and the third-person perspective. Phenomenol Cogn Sci 13:75-98

van den Hooff B, Schouten A.P., Simonovski S (2012) What one feels and what one knows: the influence of emotions on attitudes and intentions towards knowledge sharing. JKM 16(1): 148 - 158

Velleman J (1997) How to share an intention. Philos Phenomen Res 57(1):29-50

Warneken F, Chen F, Tomasello M (2006) Cooperative activities in young children and chimpanzees. Child Dev 77:640–663

Wellman H M, Cross D, Watson J (2001) Meta-analysis of theory-of-mind development: the truth about false belief. Child Dev 72:655–684

Woodward A L (1998) Infants selectively encode the goal object of an actor's reach. Cognition 69(1):1-34

Zahavi D (2014). Self and Other: Exploring Subjectivity, Empathy, and Shame. Oxford University Press, Oxford

Zinck A (2011) Emotions Hold the Self Together: Self-Consciousness and the Functional Role of Emotion. mentis, Paderborn