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Introduction

Here is a question: why is joint action so prevalent amongst humans? I don't think we should expect there to be one unitary answer to this question. However surely it would be wrong to say that it is only because there is just no other way for individual's to reach their aims. To put things very crudely, we often do things with others because we like to do things with them. Of course this is not to say that in all cases of joint action is enjoyable and cooperative; indeed I will argue that we should work with a concept of joint action which refer to actions that can occur even in more competitive or antagonistic contexts. Rather I claim a lot of our motivations for joint action are essentially *social* in character. Yet existing accounts of joint action seems to have overlooked the importance of these social motivations almost all together.

I will argue that an appeal to social motivation is required to give a complete account of the psychological mechanisms involved in joint action since one of the main functions of joint action is the formation and strengthening of social bonds. The structure of the argument is as follows: I start by first adopting and giving some arguments in favour of a broad working definition of joint action from the exiting literature. I then suggest that social motivations have an important role in accounting for joint action that is not directly related to the individual or joint goal of the action. My specific proposal is that social motivations function to benefit the individual, paradigmatically, by functioning to generate psychological and reproductive rewards related to the being a part of a *social bond*. I then describe some physiological and psychological mechanisms that act as social motivations and discuss an example of a joint action (social play) that enables social bonds. In response to the criticism that a joint goal or shared intention is sufficient to account for at least the fully cooperative cases of joint action, I argue that we should adopt a two-function approach to joint action (based on a suggestion for imitation). Finally, I consider if there is any way to incorporate social motivations into existing accounts of joint action and suggest further research on the ways in

which shared social motivations initiate and coordinate behaviour in joint action.

1. Defining joint action

The paradigm cases of joint action, which research has tended to focus on, involve a group of individuals solving or performing some precise task together; whether it be moving an object around a space, finding their way by looking at a map, or dancing a pas de deux. But obviously many of our social interactions occur when there is no apparent problem to be solved and indeed when the agents have little interest in cooperating. Should we then limit our discussion and define joint actions as the class of social interactions that are at least primarily of a problem-solving and cooperative character? This seems unduly restrictive as the coordination in behaviour between individuals that occurs in the cooperative contexts may very well be employed when individuals are less inclined to cooperate. Moreover as far they are able to co-ordinate their actions it is likely that it is facilitated by similar perceptual, cognitive and motivation mechanisms as those that are present in cooperative joint actions. Indeed many researchers have favoured broader definition of joint action, precisely to be able to explain a wider class of phenomenon. In fact, for these reasons I will keep with the definition that Sebanz and colleagues propose in their 2006 review article on joint action:

> *"Joint action can be regarded as any form of social interaction whereby two or more individuals coordinate their actions in space and time to bring about a change in the environment*."
> (Sebanz et al. 2006a; Knoblich and Sebanz 2008)

This definition not only has the advantage of not presupposing any particular attitude or mechanism responsible for the phenomenon[1]. It also quite correctly draw attention to the fact that joint actions require high level of behavioural coordination and this, at least to some extent, is why we are

[1] One may argue that this depends on what is meant by "to bring about a change in the environment". Here I am assuming that for the individuals' to coordinate their actions to bring about a change, they need not have same intention or goal in mind. I assume this is in line with Sebanz and colleagues' intention.

interested in the phenomenon to begin with. What I will argue, however, is that, if we consider the range of joint actions that fall under such a definition, we need to bring in additional explanatory resources than those which so far have been on offer. As is often supposed this explanation does appeal to something that is *shared* between individual participants in the joint action. However my suggestion does not end up being productively construed either as a shared goal, intention, or representation; rather it will be construed as a shared general social motivation.

2. Four examples of joint action

I think it is helpful to start with some target cases of joint action which I think we can agree would fall under the above suggested definition: A) Two experienced movers are brought together for a one-off job to move a piano from the fourth to the street by carefully lowering it using a rope and pulley. The task is familiar to both of them and the goal is clear. Let's also suppose they have no history of working together and due to the arrangements with their boss, they know that there are little prospects that they will work with, let alone encounter, each other again.

Now consider the case slightly modified: B) An experienced mover has just taken on a trainee with the aim of employing her in her company. The trainee is also very keen to get the job. They embark on their first task together that, as it so happens, mirrors the first case: to move a piano from the fourth floor to the street by using a rope and pulley. In this second scenario, just as in the first, it seems that point of the activity is to successfully move the piano from the fourth floor to the street. However, it seems the actions in the second case are also facilitated by some shared social motivation for completing the task, since ultimately, given that all goes smoothly, the mover wishes to employ the trainee and the trainee wishes to be employed. This *motivation* has a prima facie role in a supposed *instructor-learner* nature of the coordination, whereas in the first case we do not need to suppose that any particularly social motivations has any role in explaining the nature of the coordination.

Now consider the following scenario: C) A couple of children are playing hide and seek in a schoolyard. Although the children have to coordinate their movements, taking their cues from one another, there seems to be no shared goal or shared intention. In fact the intentions of the children are at odds with each other (the seeker wishes to find the others as soon as possible; the hiders wish to hide as long as possible). Still there is some shared *social motivation*, let's for now for simplicity say it is to play with the others[2]. Moreover it seems precisely this shared social motivation that gets the whole joint action off the ground.

Here is another case of social interaction where arguably involves the behavioural coordination we are concerned with in joint action, but where no apparent shared intention seems to be found: D) Two siblings are sitting across from each other at a kitchen table, discussing how to split their father's inheritance[3]. They each have goals of negotiating a target of what they consider to be a fair share of the inheritance. Now it turns out that they don't have the same idea of what a fair arrangement is and perhaps they both can sense this. There might even be considerable tension between each of their ideas of what a 'fair share' is, so that they cannot be said to have a shared intention, in the normal sense of the term as the actual content of their intentions conflict with one anther. However, now suppose the two siblings have both sincerely agreed that they won't let this issue have any severe implications for their long-standing relationship – the wish representing a shared social motivation. It therefore seems the scenario is neither straightforwardly co-operative nor antagonistic. In fact both the individual intention (to achieve a fair share) and shared social motivation (to maintain their healthy relationship) each has impact on how the he verbal behaviour,

[2] I will say more about social play in section 5
[3] Language, in terms of coordination both in gestures and speech, is generally subsumed under discussions of joint action, albeit highly evolved kind (Sebanz et al. 2006)

facial expression and body movements are coordinated.[4] If anything, the complexity and open-endedness of the negotiation compels us to think of the scenario as *explorative*.

So if we grant that all the above cases are ones of joint action, in accordance with the guiding definition, it seems a social motivation can only count as explanatorily redundant in the first case (A); in all of the other cases there seems to be something about the shared social motivation that orchestrates the particular joint action (curiously, (A) is almost the exception to the rule for joint actions[5]). I will now turn to argue that these motivations are irreducibly social because of how they are connected to the establishment and maintenance of social relationships or social bonds.

3. What are the benefits of social motivations?

In describing these cases I have hinted at two aspects social motivation that I will take as jointly distinguishing them from both individual (non-social) intentions and joint goals: The first aspect is a negative one; it merely makes a claim of what a social motivation is *not*. A social motivation is not directed toward the benefits of the action *per se*. This prevents social motivations from being reduced to individual intentions as well as joint intentions held by the individual participants. Of course it does not exclude that often the joint action is also guided by individual goals (as in case C) or even joint goals (as in case B) that of course also may also motivate individuals to partake in them. In fact I will say more about how these levels of motivation interact in section 6. The second, more interesting aspect of social motivation that I have hinted at, is that the benefits of joint action lie beyond the token action. What I want to do in this section, is to argue that this social motivation in joint action has the function of bringing about a specific benefit, which normally is the

[4] You might think the scenario can be explained by a joint intention to strike equilibrium between their individual aims and their shared interest in not severing their relationship. But the scenario need not collapse into such an account. For instance, let's suppose that one of the siblings in the end has a stronger social motivation and the other will pursue her individual intention further.

[5] It is also worth noting that even in this case it seems almost artificial to suppose that there are *no* social motivations or social dynamics at play at all.

formation, maintenance or strengthening of a social bond; but it may also be to establish a social hierarchy such as the subjugation of another individual.

Social bonds seems to have played and important role for an extremly long time in human evolutionary history. Social bonds will be recognized regardless of one thinks of natural selection operating in the human social world; say whether one prefers models of inclusive fitness (Hamilton 1964) or group-level selection accounts (Boyd and Richer son 1988). From now on I will primarily use the framework of inclusive fitness, although a lot of what I say about how social bonds promote inclusive fitness will of course also be true if we allow for group-level selection (although they might make quite different predictions of which kind of social bonds are prioritised).[6] Proponents of the inclusive fitness framework, where an individual's fitness is roughly measured by the total number of offspring, give important weight to the formation of social bonds, primarily between kin and near-kin, but also between individuals over which long-term reciprocal arrangements might be formed (Hamilton 1964; Trivers 1971; Dawkins 1976).

Despite this the prima facie plausibility that social bonds confer on our inclusive fitness, it is only recently that researchers has become concerned with empirically demonstrating the differential fitness advantage which social bonds confers on individual animals. The fitness advantage due to social bonds has been demonstrated in a variety of different mammalian species, but primary amongst females. It has been shown how it can increase the shared care for dependent young, reduce levels of female aggression between females, decrease the cost of maternal investment, and reduce the risk for infanticide (Panksepp & Burgdorf 2000; Gerlach & Bartmann 2002; Hayes & Solomon 2004). Silk and colleagues for instance studied the effects of social bonds on female baboons' inclusive fitness. The research indicates that female baboons that are more socially integrated are more reproductively successful

[6] I stick mainly to the inclusive fitness framework, not because I think it is correct, but it seems to be the view that most researchers in this area seem to implicitly or explicitly adopt.

than females who are more solitary (Silk et al. 2003). Moreover, the importance bonds persist and extend beyond close kin if circumstances demand it. For instance, females formed stronger bonds with their paternal sisters when no close maternal kin were available, and when no kin is present they compensated by forming strong bonds with non-relatives (Silk et al. 2006).

Arguably as we are concerned with mainly human joint action we hardly need to refer to the indirect and long-term reproductive awards to see how social bonds matter for *human* inclusive fitness. Indeed it is almost a truism in the psychological literature that social bonds and relationships have direct beneficial effects on human health, reproduction, and general well-being across the life span (see House 1988; for two recent studies see Uchino 2009; Cornwell &Waite 2009). In short, any way you choose to cut it, for humans, primates, as well as possibly many other mammals, social bonds have adaptive value and therefore represent a fundamental human motivation (Baumeister & Leary 1995).

4. Mechanisms for socially motivation

I hope to have demonstrated that any activities conducive to forming and maintaining social bonds are likely to be very important for our inclusive fitness. But of course we still need to know how social motivation is linked to social bonds. In other words what are the *mechanisms* that increase the chances for social bonds being established and solidified (thereby enhancing our reproductive fitness)? In anticipation, there will of course be a remaining gap in my argument that shows that these mechanisms are, in fact, involved in joint action – this will be the topic of the next section.

I will mention two kind of socio-motivational mechanisms, but there may of course be other relevant kinds. First there are mechanisms on the physiological levels that can act as non-conscious social motivations. An example is the hormone Oxytocin. This hormone turns out to be an ancient

hormone, found even in molluscs but in mammals the hormone is presumed to be co-opted for the specific task of managing maternal nurturing behaviour. However, at least for humans it seems Oxytocin can be elicited in behaviour that is not immediately linked to maternal nurturing. For instance it may to be involved in pair-bonding behaviour by being released in plasma and in cerebrospinal fluid by any non-noxious stimuli such as touch, warm temperature etc. (Gimpl and Fahrenholz 2001; Uvnäs-Moberg 2003). Consequently, it seems likely that oxytocin may be involved and serve to motivate us in other social interaction than the mother-infant relationships, yet may still be associated with the feeling which maternal nurturing induces.

A different set of social motivations lie on the psychological level and as such represent motivations that we, at least at times, can be quite conscious of us. An example here is our emotions. It is by now well-recognised that emotions involved in social interactions function precisely to enable and maintain relationships (Izard 1978; Keltner and Haidt 1999; Gonzaga et al 2001). Probably the most famous influential account for the social function of emotions is given in Robert Frank's seminal *Passions within reason* (1988). Frank argues that emotional dispositions such as love and trust are superior to any practical or prudential reasoning because they motivate us in a unique way so that we can accrue the benefits of long-term relationships, such as monogamous sexual relationships and friendships. Along similar lines Anderson and Keltner (2002) have more recently argued that the primary function behind the feeling of *empathy* is to help individuals form and maintain social bonds. According to them, it is no coincidence that emotions related to empathy are more likely to be elicited on occasions when there already is some existing bond between the individuals, or some (evolutionary) incentive for the bond to be established (such as the other being kin).

Anderson and Keltner (2002) suggest that empathy forms and maintains social bonds in three principal ways. First, empathy signals sincere solidarity.

When individuals feel and moreover display similar emotions, they communicate to each other that they share a common perspective on the situation in question (Hoffman 2000). They also correctly point out that because emotions and in particular their facial expressions of emotions, are often and therefore quite difficult to feign, empathy can be construed as a "true test" of individuals' solidarity with each other (Anderson & Keltner 2002; Tronick 1989). Closely, related to this they mention a second way in which empathy facilitates social bonds, though not just by sharing each other's emotions, but also in the doing the gaining access others' thoughts and intentions. This is conducive to predicting others' behaviour, which in turn puts us in a better position to form cooperative bonds. Their third suggestion is that empathy helps coordinate actions of individuals in rapid, automatic fashion, so that we can be more effective in our collective response to potential opportunities or threats.

Notice that the mechanism responsible for the motivation might both precede the social interactions, and so help *bring it about*, but it might also be elicited in the interaction and *affect us "on the fly"*, as it were. It might therefore be tempting to conclude that these emotions don't just allow us to gain us the long-term benefits of social bonds, but always serve as reward mechanisms themselves directly selected for that purpose. However this should not be concluded for all cases as one should remember that not all mechanisms that are socially motivating are as agreeable as love, trust and empathy. It is not only positive emotions that do all the work in serve social bonds, but also emotions such as jealousy, guilt and shame. Others like repulsion might even function as deterrents for other individuals and their social behaviour (Keltner & Haidt 1999). These emotions might just as their positive-counterparts socially motivate us and are perhaps particularly likely to arise from competitive/ antagonistic social interactions. Finally it may not only be affect and emotions that consciously (socially) motivate us. Depending on whether one signs up to the Humean dictum that "reason alone can never produce any action" we may allow that certain prior knowledge and

judgments of others can act as (conscious) social motivations sometimes even bypassing the affective level (Koenig & Harris 2005).

5. Shared social motivation in joint action: The case of social play

The next step is to understanding how joint actions, specifically, are related to these social motivations and the social bonds. I want to begin by looking at a particularly striking and central type of joint action, which occur in human and non-human: social play. It may first of all be worth mentioning that it is not at all clear what role 'social play' has in relation to the existing literature on joint action literature. On the one hand, it seems like a paradigm of joint action, requiring that participants are coordinated both in attention, movement, and also thought and imagination. It has also been argued that social play; especially pretend play or pretence is crucial for the child's development for practicing social roles (Bretherton 1984) as well as the rehearsal of one's mindreading abilities (Nichols & Stitch 2003)

On the other hand, in most cases there isn't a goal of social play that is jointly intended or even individually intended by the participants, which may be why play so far has not been discussed in relation to joint action. When children are playing the rules and social roles are often under constant renegotiation. Earlier I have suggested that many joint actions rather then being cooperative or competitive are much more explorative in character (as in the inheritance case D) and social play often seems like such an activity. Even in those cases where play resembles more a game (such as in C – the example of hide and seek) where there is a way to "win the game" and therefore individually intended goals, it is not necessarily the case that this is also the reason *why* individuals engage in the activity. It is therefore tempting to understand play precisely due to its *apparent practical insignificance*. This of course already would make the action potentially socially motivated since it fulfils the first (negative) aspect of the individual not aiming toward any benefits of the joint action *per se*.

But what is there to be said for the positive aspect of social motivation here; do the participants motivation to engage in the social play function to bring about the formation, maintenance or strengthening of a social bond? Indeed this does seem to be in line with what many ethologists and psychologists claim to be true for social play. The fact that social play is very prevalent amongst many mammals and not just humans, indicates that social play may serve a very important evolutionarily functions (Bekoff 2001; Pellegrini et al 2007). Most authors agree that social play could be adaptive for different reasons – which, at least to some extent, might be a result of social play in different populations being a result of different phylogenies (Bekoff 2001). Even so, apart from the function of training in various motor, cognitive and social skills few contend that play has likely evolved in humans for establishing and strengthening social bonds and for promoting group cohesion at large (Fagan 1981; Sroufe et al. 1999). From the past section we can hypothesise that one way in which social play achieves this end is by utilising various socio-motivational mechanism, to making social play so enjoyable fun and engaging (Trezza et al. forthcoming). This is even more plausible if we think of the individual participants as moreover *sharing* social motivations generating feedback loops between the participants' emotional states (for more on this point see section 8).

6. Two-function approach to joint actions

A natural objection here is that I might be cherry-picking my examples. Although social play might count as a joint action, it surely a peripheral to most joint actions that usually concern us which are of a more cooperative character and involve the presence of a jointly intended goal. As argued for earlier I don't think a model of joint action or social interactions should assume that they are cooperative or collaborative, as many joint actions can also be competitive or explorative in character. But leave this aside for moment. What should one say about a case where there is indeed a goal which participants jointly intend? Is it not sufficient that there is such a joint

or share intention for the joint action to get off the ground – why would we need to appeal to a social motivation in these cases?

Here it will prove helpful to take a brief detour to look at a related phenomenon: imitation. In contrast to discussions of joint action, the social motivations for imitation although not taking centre stage, have not been completely ignored. One of the most interesting discussions of the social function of imitation is still Ina Uzgiris who outlines two central functions of imitation (1981). First she suggests imitation functions as a vehicle for social learning, where there is some behaviour- or action-type (opening a box), which is imitated and subsequently adopted into the imitator's action repertoire. The significance of imitation here depends precisely on the act modelled and the degree of fidelity by which it passed on; however, it is neutral in respect to the relationship the imitator has to the model or the opportunity for further interactions between them.

Uzgiris then goes on to suggest a second function for imitation that closely parallels the social bonding function that I have argued for in the case of joint action. Uzgiris calls this second function a *shared experience of mutuality*, which she claims in turn, sustains and promotes further social interaction with the partner (1981: 3). Although she thinks these social dynamics are set into play whenever someone serves as a model or authority to be imitated, she hypothesises that these dynamics may become increasingly important about the time when the child reaches the age of two and imitation of complex action increases (1981: 5). Others researchers have also suggested that this age-related trend coincides with children becoming increasingly motivated to engage in social interaction, so that they begin to focus more on the way in which something was done rather than the outcome or effect which the action produces (Meltzoff 2007).

Following Uzgiris, Mark Nielsen and colleagues have tested the differential impact social engagement has on the child's imitative behaviour. In the first

set of experiments, Nielsen (2006) found that 24-month-olds persisted in imitating even when it results in frequent failure and there is an obvious better alternative available to the child. Nielsen hypothesized that the child might persist in imitating a model's inefficient object use in order to satisfy social motivations. To test this interpretation, Nielsen et al. (2008) compared the imitative responses of 24-month-olds to live and videotaped model demonstrating how to open the box in order to retrieve a toy using an object to activate the switch. The idea behind using videotaped demonstrators was that the demonstrator could act in a socially engaging manner but, due to the medium, there would be no opportunity for "live" or spontaneous social interaction between the demonstrator and the child. The results indeed showed that children were significantly less inclined to imitate a videotaped adult, allegedly because the opportunity for social interaction was reduced. In a second experiment, the children were allowed to interact with the adult on a TV monitor by using a closed-circuit system and it was found that the amount of imitation children exhibited returned to "normal" levels. They concluded that children's imitative behaviour is affected by the opportunity to socially engage with the model.

Now rather than suggesting that imitation primarily functions to enable social bonds or that we imitate to be liked (Dijksterhouse 2005), it seems preferable to opt for Uzgiris conciliatory approach. She suggests that the two functions of imitation – 1) acquiring behaviour and skills through social learning and 2) promoting further social interaction with the partner, are indeed theoretically compatible as the dual function of imitation (1981). Moreover she claims that the interplay of these two functions has a better chance of explaining experimental results than if we simply focus on one of the two functions.

Not surprisingly, I claim something similar is true for joint action, even when we face a cooperative scenario where the participants can be said to have a shared intention or joint goal. That is to say, just as in the case of imitation I suggest there are two functions of joint action: the first to gain the benefits of

achieving the jointly or individually intended outcome of an action. In a sense it doesn't matter if the end is achieved on one's own or with others as long as it is attained (but it is a brute fact that for some ends to be achieved, one often has no choice but to jointly act with others). I take this function to be implicitly or explicitly accepted by most researchers interested in joint action, so what I have been arguing for is the second function of joint action; namely, (primarily) to form, maintain, or strengthen social bonds. I have argued that this is achieved by joint actions either being brought about by or eliciting social motivations.

My example B in the beginning can serve to illustrate the model. The mover and the trainee jointly perform the action of moving the piano from the fourth floor using a rope and pulley, where the first aim, and hence function of the action, is to get the piano to the street (or wherever it is to be ultimately moved). However because of their social positions in relation to one another, there is an additional social function, which if all goes well is for the trainee to be employed by the mover. Perhaps one way in which this is accomplished is via the joint action eliciting social motivations such as confidence and trust.

Some qualifications are in order. The function of forming social bonds does *not* presuppose that they be achieved through *cooperative* joint action, they can equally be attained through *competitive or explorative* joint action. Think about how verbal sparring between two individuals can be seen as form of flirtation, resulting in a romantic relationship. I've also allowed that joint action might have more "antagonistic" social functions such as generating social hierarchies. Finally, although these two functions of joint action are not mutually exclusive, they don't *always* both have to be in play nor do we have to be motivated us as strongly in each case. In fact it would be interesting to investigate the conditions that affect the interplay between these two functions in humans[7]. As in imitation there may be some age-related trends in

[7] Incidentally I think joint action can have these two function for some non-human mammals although it is no my ambition to discuss this possibility presently.

terms of the function for joint action, but primarily I suspect the function will depend on factors such as the nature and importance of the action, the existing relationship and trust between participants and the potential for a new bond to be formed.

7. Social motivations in existing accounts of joint action

I hope to have shown that the formation of social bonds is one of two central functions of joint action and that this is facilitated by psychological mechanisms, shared by participants, which act as social motivations. So why has the literature on joint action neglected the social function of joint action? A first thing to say is that probably many will agree that a social motivation is *present* in many cases of joint action; just that it carries no or little explanatory weight accounting for joint action.

Rather than focus on the motivational prerequisites for joint action, the literature tends to focus on candidate cognitive and sometimes perceptual preconditions such as shared intentions (Bratman 1992; Tomasello et al. 2005; Carpenter 2009), shared task representations (Sebanz & Knoblich 2009), joint attention (Sebanz et al. 2006; Knoblich & Sebanz 2008), action monitoring and action prediction processes (Vespar et al. *Forthcoming*), joint commitments (Gilbert 1992), abilities to communicate (Gergely & Csibra 2005a), and abilities for mind/ intention-reading (Tomasello et al 2006; Carpenter 2009)[8]. There is considerable debate about which of these are more important and which can be accounted by a more fundamental ability, but it seems fair to say that the agreed candidate psychological mechanisms are cognitive and perceptual rather than motivational or affective in character.

[8] It may be worth contrasting my critique here with those that argue against joint action requiring mind/intention-reading abilities (Tollefsen 2005). My concern here is not to show that such abilities are *too complex* to be required for joint actions, just that these mind-reading can hardly act as a social motivation in and of themselves.

For instance in their important review paper on joint action Sebanz et al. (2006) in conclude that research into joint action reveals that the following mechanisms are key to understanding the activity.

> First, joint attention provides a mechanism for sharing the same perceptual input and directing attention to the same events. Second, a close link between perception and action allows individuals to form representations of others' action goals and to predict action outcomes. Third, by forming shared task representations, it is possible to predict actions based on certain events in the environment, independent of action observation. Fourth, action coordination is achieved by integrating the 'what' and 'when' of others' actions in one's own action planning. This affects the perception of object affordances, and permits joint anticipatory action control. Finally, the ability to distinguish between effects of one's own and others' actions might be reduced in joint actions where the combined outcome of one's own and others' actions is more important than the results of individual actions. (Sebanz et al 2006: 75)

Now to be fair, nowhere do the authors claim that they are aiming at generating an exhaustive list of *all* the psychological preconditions of joint action. And as joint action many times involves quite complex behavioural coordination on the part of the participants, it is of course crucial to try to find account of the cognitive and perceptual abilities that underpin such coordination. Even so, their account seems incomplete precisely in relation to the aim of describing the key psychological mechanisms that make joint action possible, since the social motivation, indeed any motivation, is completely absent.

Perhaps it is supposed that the social motivation just falls out of an account that shows how the behavioural coordination that occurs joint action is cognitively and perceptually possible? But it is not clear how this would work. After all individuals rarely come at joint action motivated to (jointly) solve a specified coordination problem; in fact if it were so joint action might go a lot smoother than is often the case. Another thought might be that most joint action basically can be explained by a motivation to cooperate to achieve an end. But this doesn't seem to capture the fact that we are differentially motivated to cooperate in different cases and that this in turn affects the

nature of the coordination. Moreover, although I have claimed that the motivation to cooperate at a conscious or unconscious level can be a shared social motivation, it is not the only social motivation by far since I have argued that joint action can occur in cooperative, explorative and antagonistic contexts alike.

At best the motivational components might be presumed to be encompassed by a rich enough understanding of *shared intention*. Since there are several prominent version of shared intention (see for instance Bratman 1992; Tuomela 1993; Gilbert 2003; Tomasello et al. 2006; Pettit & Schweikard 2006) one might think that at least one of these could be developed in such a way to encompass the social motivation that I have claimed is shared by participants in joint action. I have nothing in principal against the suggestion, though I think this would demand a considerable revision of the concept of 'shared intention'. First, I have argued that a social motivation is *not* oriented toward the immediate goal of the action and this is the work which most people take shared intentions as doing. Second, what at least all philosophical account of shared intentions demand is that there is some common *propositional content* (e.g. 'I intend to form a social bond with X') which is either is instantiated in each individual participant or in the jointly acting group as a whole (Pettit & Schweikard 2006). In contrast, I put no such demand on the activities of joint action. That is, I do not demand any *shared* propositional content between agents for them to have a shared social motivation. I merely demand that each participant has some social motivation (realized by various psychological or physiological processes) which *functions* to enable (primarily) the forming of social bonds. The same mechanism can of course be active in all the participants and I guess that it might be represented as a shared intention but nothing I have said entails that it must be that way for joint action to get of the ground.

Finally it is worth noting how my understanding of social motivation differs from the suggestion given by Tomasello and colleagues, who claim that the

primary motivation behind collaborative activities is to share the intentional mental states of others (2005). They claim that this specific motivation is unique for human *and* is a necessary precondition for the collaboration that is ubiquitous in human cultures. Here I agree with Csibra and Gergely (2005b) who in a response to Tomasello et al. argue that the evolution of collaboration can be plausibly accounted for without one very specific basic motivation to share others' psychological states. However that is not to exclude that the motivation to share the intentional mental states of others may on some rare occasions also be a shared social motivation for engaging with others in joint action.

Let me emphasize that my objective here is not to challenge the idea that many of the above-mentioned perceptual and cognitive abilities are involved or even necessary for joint action to occur. Rather my contention is that if one leaves out the social motivation, one also leaves out a key psychological component of what explains both the function and shared psychological mechanisms that enable joint action. This raises the question of whether the socio-motivational mechanisms have some explanatory primacy in relation to the cognitive-perceptual mechanisms. Indeed I suggest these social motivations to be fundamental in at least two senses. Via the appeal to the adaptive importance of sociality and social bonds, I have already indicated that if there is specialised set of cognitive and perceptual abilities employed in joint action they may not have evolved if there was not already a social motivation for engaging in joint action. It also seems likely that the social motivations may have primacy on the level of explaining not only the initiation but also the behavioural coordination in many cases of joint action. The hypothesis is that it is only through different cues revealing the social motivation that we can understand how the coordination between individuals is orchestrated. It is to this task I finally turn.

8. Social motivation in accounting for the initiation and coordination joint action

In this section my aim is to briefly go over a couple experimental results in rather different domains than joint action but which all the same seem to indicate that the social motivation might be important for understanding the coordination achieved in joint action. These are quite speculative suggestions and are in one sense more intended to encourage psychologists to further investigate the possibility that social motivation have a differential impact on the coordination that occurs in joint action.

First, research on autistic subjects indicates that these subjects perform worse when they are asked to *initiate* joint or socially shared attention relative to an object or event, than when they merely have to *use social means* to request an object or event (Mundy 1995). Now one plausible explanation for why the autistic subjects are worse at initiating socially shared attention is that they are not socially *motivated to engage in the task*. There is some research in neuroscience that seems to support this view. There is considerable neuro-anatomical evidence that high-functioning autistic subjects show characteristic of the effects of amygdala damage (Howard et al. 2000). At the same time recent findings in social neuroscience also show that many of the central cortical regions important for motivation such as the highly inter-connected regions of the amygdala and the orbitofrontal cortex are also crucial for social judgments (Spitzer et al 2002; Adolphs 2003). Taken together this indicates that the initiation and execution of joint attention (and possibly also joint *action*) might just as depend on a specialized set of socio-motivational processes, which are distinct from other cognitive skills (such as requesting or mindreading).

There is some evidence that social motivations facilitate the detailed coordination of behaviour such as gaze-following which seems essential for much joint action. It has recently been suggested that gaze-following is highly sensitive to socially motivating features such as facial expression of emotions (Teufel et al, *forthcoming*) Whereas factors such as the sex, rank, and relatedness of the animal (Barbary macaques), whose gaze the subject

followed, did not affect gaze-following rates, the subjects were much more likely to follow the gaze if a gaze-cue was accompanied by a facial expression. Moreover a follow up subject revealed that when a specific facial expression was given in reaction to a social exchange between third parties, it was particularly efficient in triggering a gaze-following response.

The authors conclude that animals would not be so efficient or tuned to following gaze if there wasn't something special about the social/ emotional information that a facial expression conveys. The more basic explanation that I will briefly argue for is that such information is particularly *socially motivating* to the subject, thereby prompting a readiness to follow the gaze of another. In the context of infant-adult interactions, Gianino and Tronick (1988) suggest that facial expressions, gestures, and language, which indicate the person's affective or motivational state, serve as *other-directed regulatory behaviours*, precisely because they serve to regulate and coordinate the behaviour of the partner. Basically in joint actions emotions not only motivate but also communicate and this will then enable coordinated social interactions. The case of positive emotions like joy is particularly clear. Here the emotion itself motivates you to further engage with the other and the concomitant happy, encouraging, facial expressions serve to motivate the other person to engage or co-ordinate her actions with you – regardless of whether you share a joint goal/ intention or not.

Conclusion

Sebanz and colleagues at the end of their review article on joint action note that it can also be a desired characteristic of certain kinds of joint action that they afford the participants experiences of synergy and flow: "For example, musicians in a band might strive to experience a sense of agency that transcends individual boundaries, which is based on what it feels like to produce action effects as a group"(2006: 75). I have argued that this sort of experience is in fact central rather than peripheral to the function of joint action. More precisely I have argued that experiences such a sense of synergy

and flow may very well be the shared social motivations that paradigmatically function to enable the forming and strengthening of social bonds. This challenges further research 1) to more closely investigate the neurological and psychological mechanisms responsible for motivating us to engage in joint actions and 2) integrate these results with the cognitive and perceptual mechanisms in order to attain a more complete account of joint action

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