



The roots of human altruism

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Human infants as young as 14 to 18 months of age help others attain their goals, for example, by helping them to fetch out-of-reach objects or opening cabinets for them. They do this irrespective of any reward from adults (indeed external rewards undermine the tendency), and very likely with no concern for such things as reciprocation and reputation, which serve to maintain altruism in older children and adults. Humans' nearest primate relatives, chimpanzees, also help others instrumentally without concrete rewards. These results suggest that human infants are naturally altruistic, and as ontogeny proceeds and they must deal more independently with a wider range of social contexts, socialization and feedback from social interactions with others become important mediators of these initial altruistic tendencies.

From the beginning, Darwin (1871) knew that altruism was a problem for his theory of evolution by natural selection. In particular, he was worried about the eusocial insects, such as termites and ants, who sacrificed for one another regularly. The solution to this particular problem came with modern genetics and the theory of kin selection (aka: inclusive fitness), as Hamilton (1964) quantified how the act of helping relatives would promote one's own genes (and ants and termites from within the same colonies are genetically related in especially close ways). For unrelated individuals, Trivers (1971) proposed a theory of reciprocal altruism, in which individuals help others to the degree that they can anticipate being helped in return (thus leading individuals to cultivate reputations for being helpful). Helping can also be a costly signal of fitness and so promote mating opportunities (and again individuals can cultivate reputations for this; Zahavi, 2003).

It is a common observation that human beings, as a species, are extraordinarily helpful, even to non-relatives (in addition to being downright mean on many occasions also). In adults, this could be maintained by any of the mechanisms noted above. But young children also intervene on behalf of others, and in most cases it is unlikely that they are calculating kinship, reciprocity, mating opportunities, or cultivating their reputations for helpfulness. The question thus arises why young children are helpful to

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the degree they are. One answer is cultural. Young children are encouraged and rewarded by adults for being helpful and cooperative; it is part of the socialization process in most, presumably all, cultures. Being helpful is something children do to get adult praise and other social rewards.

Another answer focuses on biology. It is well-known that for reciprocity to become a stable strategy in a social group, it is best if all individuals follow the so-called tit-for-tat strategy in which everyone begins with a predisposition to cooperate and then subsequently does what the other does – so that unhelpful people are ultimately treated in kind (Axelrod, 1984; Axelrod & Hamilton, 1981). It is thus possible that humans have a natural tendency to be helpful and cooperative that they then modulate if they detect cheaters and other uncooperative people (Tooby & Cosmides, 1989). In this case, it might be expected that young children would begin by being cooperative naturally, especially when still under the almost constant care of their parents, and the various mechanisms thought to maintain cooperation would become relevant only as they become older and must deal with others independently – at which point a reputation for being cooperative but not easily taken advantage of becomes important.

In the current paper we defend the thesis that young children are naturally altruistic. Our argument is based on a number of recent studies that we and others have conducted on the propensity of one-year-old children – just beginning to acquire language and to be socialized formally – to help others instrumentally, even when no rewards and none of the usual mechanisms that maintain cooperation evolutionarily would seem to be operative. In addition, studies demonstrating that our nearest primate relatives also, at least in some situations, can be helpful provide further evidence for this claim.

The many forms of altruism

It is quite common for scholars to question whether altruism exists at all. In evolution, any organism that sacrificed itself in ways that were lethal to its and its kin's survival and reproduction would leave no offspring as altruistic descendants – and so there must always be some payback for an organism's sacrifice if its lineage is to persist. Altruism is thus a much-studied topic in evolutionary biology because it is important to understand mechanisms such as kin selection and reciprocal altruism by means of which an organism may perform altruistic acts in the moment, and still survive and reproduce in the long run. In evolutionary biology, the psychological mechanisms involved are not of direct interest,¹ and indeed 'A mindless organism can be an evolutionary altruist.' (Sober, 2002, p. 17). And so even bacteria can be altruistic if their behaviour results in

¹ This difference is also reflected in the classic distinction of ultimate causation (the evolutionary function of a behaviour in terms of fitness costs and benefits) and proximate causation (the e.g. cognitive and motivational mechanisms producing a behaviour; Mayr, 1961; Tinbergen, 1963). One can thus reject the possibility of altruism in terms of ultimate causation, but still accept the idea that we have altruistic motivations to help others in need. In particular, even though acts of altruism will most likely result in some long-term benefit for the helper as well (through indirect mechanisms such as reciprocity, reputation, or kin selection), the behaviour is motivated by the other's need, not the anticipation of future benefits.

Concerning this proximate psychological level, and focusing on the case of humans, some scholars argue that because people derive pleasure from helping others, their helping is not altruistic. However, taking pleasure in seeing others benefit is different from other self-serving motives such as social approval or material gain because it is instigated by another's need and follows only if others actually benefit from the altruistic act (see e.g. Batson et al., 1988). The intrinsic pleasure is thus mediated by the other's welfare and therefore inherently altruistic. Indeed, if performing altruistic acts is intrinsically self-rewarding, this might be the very mechanism by which acts of altruism come about and suggests a biological predisposition (de Waal, 2007; Hoffman, 1981; Mook, 1991).

(temporarily) fitness-reducing outcomes to themselves to the benefit of other bacteria (Dugatkin, 1997). But the behaviour of such a 'mindless altruist' is only for specific acts in highly constrained situations. Human altruism, on the other hand, derives from a predisposition that is not preprogrammed for specific acts, but allows the generation of acts as diverse as comforting a distressed individual (however that might manifest itself on a particular occasion), helping another individual achieve its instrumental goal, sharing food and objects with others, and providing others with helpful information. This flexibility indicates a strong cognitive component in the human version of altruism.

Human altruism thus comes in many forms, possibly supported by different psychological mechanisms. Most of these are evident already in human children (Eisenberg, Fabes, & Spinrad, 2006; Hay & Cook, 2007). Such behaviours have been subsumed under the general term 'prosocial behaviour' (coined by Wispé (1972) as a counterpart to 'antisocial behaviour') because they are all aimed, at least in part, at benefiting another individual. This broad category of prosocial behaviour has been successfully applied in research assessing, for example, individual differences and longitudinal development of prosociality in relation to gene-environment interaction, parenting or educational programs (Eisenberg *et al.*, 2006). In the current paper we will focus on one particular type of prosocial behaviour in infancy and early childhood: instrumental helping. To situate this focus more clearly, we propose the following typology of prosocial behaviour in young children, based mainly on the nature of the benefit provided to the other. (Note that for current purposes, and following Eisenberg *et al.*, we do not consider mutualistic collaboration in which both partners benefit as 'prosocial'; Table 1.)

It is not our purpose here to review all of the many studies on these various topics (see Eisenberg *et al.*, 2006 for a more thorough overview). The representative studies cited in the table are only a few in each case, focusing on children before school age. The main thing to point out here is that in this younger age range, by far the most studies have been done in the affective domain expressed in for example comforting, and a few on sharing objects. In contrast, very few have been done on any kind of informing or instrumental helping. Our focus here – reflecting our recent empirical research – is on the relatively neglected topic of instrumental helping. In instrumental helping, a child perceives an actor who is unable to achieve her goal, and so acts altruistically on her behalf – with the child's primary goal being that the actor achieves hers, even in the absence of an immediate benefit for the child herself.²

Ontogenetic roots of instrumental helping

Instrumental helping has both a cognitive and a motivational component. Cognitively, to help an actor achieve her goal, one must first recognize what that goal is – the change of state in the environment the actor wishes to bring about. Motivationally, to help an actor achieve her goal, one must be motivated by the sight of her achieving her goal, or perhaps the sight of her pleasure upon achievement.

² Note that we draw a distinction between agents performing acts of altruistic helping towards another person's individual goal and collaborative activities in which two or more agents form shared intentions to jointly act towards a shared goal, usually leading to mutualistic outcomes. See Tomasello *et al.* (2005) for a conceptual framework of collaboration with shared intentions, as well as Warneken (*in press*) for the argument that instrumental helping and collaboration might be rooted in different psychological processes.

Table 1. Types of prosocial behavior

Type	Definition	References (examples)
Comforting	Providing emotional support to others	Bischof-Köhler, 1988; Johnson, 1982; Zahn-Waxler <i>et al.</i> , 1992
Sharing	Giving food or objects to others	Hay <i>et al.</i> , 1991; Levitt <i>et al.</i> , 1985
Informing	Providing useful information for others	Dunn & Munn, 1986; Liszkowski <i>et al.</i> , 2006
Instrumental helping	Acting on behalf of others' goals	Rheingold, 1982; Warneken <i>et al.</i> 2006, 2007

With regard to the cognitive component, it is well known that infants from 12 to 18 months of age (if not earlier) understand other person's behaviours in terms of the underlying goals and intentions (for an overview see Tomasello, Carpenter, Call, Behne, & Moll, 2005). For instance, infants in this age range can differentiate purposeful from accidental actions (Carpenter, Akhtar, & Tomasello, 1998) and even infer what another person was trying to achieve without actually witnessing the intended outcome (Meltzoff, 1995). With regard to the motivational component, a number of studies demonstrate that infants as young as 12 months of age begin to comfort victims of distress, based upon responses to and alterations of the emotional need of another person (Bischof-Köhler, 1988, 1991; Johnson, 1982; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). This kind of prosocial behaviour can also be construed as 'emotional helping' as in contrast to instrumental helping, it critically depends on the response to the other's emotional state (rather than an unachieved goal or conative state), which the helper tries to alter (see Warneken & Tomasello, 2006 for more details). Despite the early emergence of these two components of instrumental helping in separate spheres of activity, it remains an open question whether young infants put these together to perform acts of instrumental helping in which they assist another person in achieving an unfulfilled goal. Do young children combine their cognitive understanding of others' goals and their altruistic motivation to help others instrumentally?

When we first addressed this question, we were surprised that there were virtually no experimental studies on helping in young children. The only experimental study was that by Rheingold (1982) with children at 19 to 32 months of age who participated in-household chores simulated in the laboratory. Any act which was appropriate for the task and contributed to its completion qualified as helping and under these criteria many of the young children helped adults by holding a dustpan or putting groceries away. Therefore, this study showed that children can perform sophisticated prosocial behaviours and that the children knew the goals of the rituals. However, it was not assessed whether children would be attentive to the other's unachieved goal, that is, would be able to infer the intended goal when witnessing a failed attempt. Moreover, no control or baseline condition assessed whether children actually performed the behaviours because the other needed help or whether they were motivated to engage in them for its own sake, independently of the other actually needing help.

Therefore, we conducted a series of studies to explore the cognitive and motivational components of helping in infancy. In a first study, we presented 18-month-old infants with ten different situations in which an adult experimenter was having trouble achieving his goal (Warneken & Tomasello, 2006). The variety of situations probed the children's ability to discern a variety of goals and intervene in a variety of ways. For instance, the

experimenter used clothespins to hang towels on a line, when he accidentally dropped a clothespin on the floor and unsuccessfully reached for it. In this case, helping consisted in picking up the clothespin and handing it to the experimenter. In another situation, the ‘cabinet task’, the experimenter was trying to put a stack of magazines into a cabinet, but he could not open the doors because his hands were full. Thus, the child could help by opening the doors for him. For each of the ten tasks there were control conditions to rule out the possibility that children would perform the target behaviour (offering the clothespin; opening the door) irrespective of the other’s need, e.g. because they like to hand things to adults or like to open cabinet doors when their attention is drawn to it. In these control conditions, the same basic physical situation was established, but with no indication that the experimenter needed help.

The finding of this study was that children display spontaneous, unrewarded helping behaviours when another person is unable to achieve his goal (but performed these behaviours significantly less often in control conditions where no help is necessary, see Figure 1). Infants did so spontaneously; that is, they intervened without being explicitly asked for help and never being rewarded or praised for their effort. Moreover, helping was observed in diverse situations. Infants handed out-of-reach objects; they completed an action after his failed attempt of stacking books; they opened the door of a cabinet for the other and they brought about the other’s goal by different means such as accessing a box by lifting a flap rather than using the wrong means which the adult was using by unsuccessfully reaching through a tiny hole. This initial experiment showed that 18-month-old infants spontaneously provide instrumental help and do so in a wide range of situations.

In a follow-up study we tested even younger infants on several of these tasks and found that 14-month-old infants also helped under some circumstances (Warneken & Tomasello, 2007). Namely, they reliably helped with out-of-reach objects such as the ‘clothespin task’, but did not help in the other types of tasks such as the ‘cabinet task’. One possible interpretation for this finding is that they are willing to help, but can do so only in cognitively less demanding situations with more obvious goals such as a person reaching for an object, but fail to do so in situations with presumably more complex goals and more complex types of intervention. Thus, even 14-month-old infants help spontaneously in situations in which they are able to determine the other person’s goal.

These acts of instrumental helping are some of the earliest manifestations of altruism in human ontogeny: children acting on behalf of others without a benefit for themselves. To further examine the interpretation that these acts of instrumental helping are the result of an altruistic motivation, we tested children’s helpfulness by on the one hand

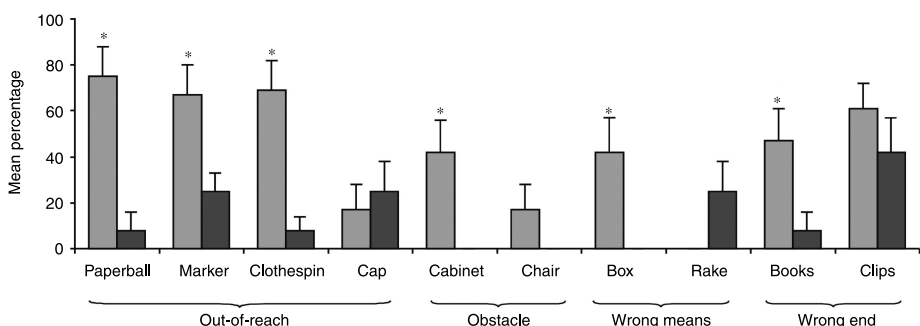


Figure 1. Mean percentage of target behaviours as a function of task and condition. Error bars represent standard error of the mean (adapted from Warneken & Tomasello, 2006).

manipulating the costs for helping, and on the other hand varying whether the helper would benefit from this helpful act.

Young children even helped when the costs for helping are slightly raised. In one study, we once again tested 18-month-old infants in a situation in which an object was on the floor and the experimenter was unsuccessfully reaching for it (Warneken, Hare, Melis, Hanus, & Tomasello, 2007; Experiment 2). But this time the children had to surmount an array of obstacles to pick up the object for the other. This can be quite effortful for toddlers who have just started to walk. But even these obstacles did not hinder them from helping the other person over a test session of ten trials. A similar result was obtained when we made the helping act costly in a different way. In particular, we gave 20-month-old children the opportunity to play with attractive toys in one corner of the testing room (Warneken & Tomasello, 2008). The experimenter was located in the opposite corner, so that when she encountered a problem and needed help, the child had to stop playing and leave the toys behind in order to provide help. Again, children continued to help in the majority of cases and did so over repeated trials – even when they had the alternative to play an attractive game.

Children are thus willing to put some effort in helping – but do they maybe expect to be rewarded in return? In one experiment we directly contrasted whether 18-month-old children are motivated by the other person's goal or an immediate benefit for themselves (Warneken *et al.*, 2007; Experiment 1). We experimentally varied whether the helpee would or would not offer a reward in return for their helping effort. The results could not be clearer: Children once again helped by picking up objects the experimenter was unsuccessfully reaching for – and did so irrespective of being rewarded for it. Rewarding was neither necessary nor did it increase the rate of helping. Thus, what determined children's helping was the other's unfulfilled goal, not an immediate benefit for themselves.

This suggests the possibility that young children have an intrinsic motivation to act altruistically. To further test this hypothesis of an intrinsic motivation for helping, we took advantage of a curious feature of intrinsic motivation: It is a well-established phenomenon that intrinsic rewards can be undermined by salient extrinsic rewards – what has also been called the 'overjustification effect' (Deci, 1971; Lepper, 1981). Social-psychological theories suggest that an induced extrinsic motivation to perform an enjoyable activity in order to receive a reward supplants the previously intrinsic motivation, so that when the extrinsic reward is no longer forthcoming, the motivation for the activity decreases. Would we find such an undermining effect of extrinsic rewards also in the case of altruistic helping? When we used the method established in overjustification research in an experiment with 20-month-olds, we found that children who had received a material reward for helping at an earlier time were subsequently less likely to engage in further helping than children who had not received such a reward (Warneken & Tomasello, 2008; see also Fabes, Fultz, Eisenberg, May-Plumlee, & Christopher, 1989, for school-aged children). This rather surprising finding provides even further evidence for the hypothesis that children's helping is driven by an intrinsic rather than an extrinsic motivation. Rewards are often not only superfluous, but can have even detrimental effects as they can undermine children's intrinsic altruistic motivation.

In sum, these series of studies demonstrate that the ontogenetic roots of altruism are apparent early in childhood. Infants from 14 to 18 months of age display spontaneous, unrewarded helping when another person is unable to achieve his goal. They are willing to help multiple times and continue helping even when the costs are raised. Additional experiments confirm that they are actually motivated by the other person's need rather than an immediate benefit for themselves, as rewarding is neither necessary nor does it

increase their rate of helping. On the contrary, children appear to have an intrinsic motivation to help, and extrinsic rewards seem to undermine it. Taken together, these results indicate that the ontogenetic roots of human altruism are present from very early in human ontogeny.

Phylogenetic roots of instrumental helping

A number of scholars have claimed that human altruism is unique in the animal kingdom (e.g. Bowles & Gintis, 2003). To test this claim – and to seek the phylogenetic roots of human altruism – the obvious place to look is to our closest primate relatives. Specifically, we may ask the question whether our nearest primate relatives, chimpanzees, engage in instrumental helping.

There is converging evidence that chimpanzees have the cognitive capacity to infer other people's goals – and therefore possess one crucial component for acts of instrumental helping (Tomasello *et al.*, 2005, but see Povinelli & Vonk, 2003, for an opposing view). However, when it comes to the motivational component of helping, the issue becomes more controversial. The predominant view appears to be that chimpanzees are guided solely by self-interest: altruistic motivations are thought to be unique to humans, reflecting a species-unique psychology (e.g. Boyd & Richerson, 2006; Henrich *et al.*, 2005; Silk *et al.*, 2005). In support of this view, in a recent experiment chimpanzees did not seem to care about the welfare of other individuals (Jensen, Hare, Call, & Tomasello, 2006; see also Silk *et al.*, 2005; Vonk *et al.*, 2008 for similar findings). More specifically, chimpanzees did not reliably pull a tray with food within reach of a conspecific if they themselves would not benefit from the act. The test subjects were self-regarding and did not seem to pay attention to the needs of the other in this food-retrieval context. But this context might not be representative of all potential helping-situations. In fact, there are a number of anecdotal observations which suggest that chimpanzees might on occasion act altruistically (for overviews see de Waal, 1996). In particular, it has to be pointed out that chimpanzees are very competitive with each other about monopolizable food and it is thus possible that when the test subjects are preoccupied with retrieving food for themselves, this might override altruistic tendencies. Moreover, in these experiments with negative results, the recipient chimpanzees remained rather passive during the test. That is, they were not actively struggling to achieve a concrete goal and thus the need for help might not have been obvious to the chimpanzee subjects. This allows for the possibility that when constraints related to food are lifted and the problem-situation is made more salient to the potential helper, a different picture might emerge.

Therefore, we created several instrumental helping tasks for a series of experiments with chimpanzees. In an initial study, we tested three nursery-reared chimpanzees who interacted with their primary human caregiver (Warneken & Tomasello, 2006). The caregiver enacted the ten different helping-situations adapted from our infant study, including out-of-reach objects, physical obstacles, using wrong means etc. Importantly, the tasks involved objects other than food and the caregiver never rewarded the chimpanzee for helping. The intriguing finding was that all three chimpanzees reliably handed over objects the caregiver was reaching for (and did not do so in control conditions in which she was not reaching for it). These chimpanzees were thus able to determine the caregiver's goal and had the motivation to help in the absence of a reward. However, in contrast to the out-of-reach tasks, the chimpanzees showed no reliable helping in the other types of tasks (removing a physical obstacle by opening a door; opening a container for the other when the other used the wrong means etc.).

One possibility is that they failed to help in these tasks because the supposedly more complex goals might not have been obvious to them or they did not know how to intervene. Thus, these nursery-reared chimpanzees were in principle willing to help, but displayed this behaviour only in restricted contexts in which the other's goal was easier to identify and the type of intervention followed straightforwardly.

This was the first experimental demonstration of altruistic helping in chimpanzees. It has to be kept in mind, though, that these were nursery-reared chimpanzees helping a human with whom they interacted regularly. Thus, it is possible that these chimpanzees present a special case. Human-raised chimpanzees often develop skills not found in individuals with less human contact (Bering, 2004; Call & Tomasello, 1996; Tomasello & Call, 2004). Moreover, although the helping situations were novel for the chimpanzee subjects, the caregiver had previously reinforced other types of compliant behaviour. Therefore, from this initial experiment it remains unclear whether helping is confined to interactions with highly familiar individuals who had rewarded them before or extends also to unfamiliar individuals.

We investigated this question by testing a sample of wild-born chimpanzees who live in a sanctuary in Uganda. These chimpanzees spend the day in the forest of an island and come to a human shelter for feeding and sleeping. While they have regular contact with humans, they were not exposed to comparable human rearing-practices as the three nursery-reared chimpanzees from the initial helping study. Of particular importance for the current purposes was that these chimpanzees were tested by a human who had not interacted with them before the study. In a first experiment, we wanted to investigate whether chimpanzees are actually motivated by the other person's problem or a benefit for themselves (Warneken *et al.*, 2007; Experiment 1). Thus, we tested 36 chimpanzees and compared their behaviour to that of 36 human children at 18 months of age in the helping situation with out-of-reach object described above. The major finding was that just like the human infants, chimpanzees handed the out-of-reach object to the experimenter when he was unsuccessfully reaching for it than when he was not reaching for it – and did so irrespective of being rewarded. Rewarding was unnecessary and did not even raise the rate of helping. This indicates that the chimpanzees were primarily motivated by the other person's unattained goal and not a reward for themselves.

In this experiment the chimpanzees did not have to do much more than to pick up an object from the floor and hand it to the human. But when we made helping slightly more costly by putting the object in a location 2.5 m above the ground, so that the chimpanzees first had to climb up to retrieve the object for the other, they still helped (Warneken *et al.*, 2007; Experiment 2). Thus, the chimpanzees continued to help even when helping required slightly more effort. Taken together, these experiments show that also semi-free ranging chimpanzees perform acts of helping towards a human stranger, even when helping is made effortful and they receive no immediate benefit for themselves.

However, it could still be argued that despite the fact that chimpanzees helped without prior or current rewarding in this situation, chimpanzees might have been rewarded in the past for the general behaviour of handing over objects to humans. Therefore, an even more stringent test might be one with a novel task with no potential reward-history at all. Moreover, these positive instances of chimpanzee helping all involved chimpanzees helping humans. The use of a human as the recipient allows us to experimentally manipulate otherwise uncontrollable factors (such as the exact behaviour of the recipient or him offering a reward or not), but the crucial test-case for social behaviours still is a situation in which chimpanzees interact with a conspecific. Therefore, the question remains: Would chimpanzees help other chimpanzees?

To answer this question we put chimpanzees in a situation in which one chimpanzee (the recipient) was faced with the problem that a door leading to a room with a piece of food was fixed with a chain that he could not unlock (see Figure 2). Only if the other chimpanzee (the subject) released this chain from another room could the recipient enter. All chimpanzees were genetically unrelated group-members and roles of subject and recipient were not switched within a pair to exclude short-term reciprocation within the same context. Results showed that chimpanzees helped by releasing the chain in the majority of cases. They did so significantly more often than in control conditions in which releasing the chain would either not help the recipient or no recipient was present. This shows that subjects were attentive to the recipient's goal: They were more likely to release the chain if the recipient was unsuccessfully trying to enter through that door. Additional correlational analyses showed that the occurrence of the target behaviour was not only different for the experimental as compared to the control conditions, but was also contingent upon the actual behaviour of the recipient: Subjects were most likely to release the chain when the recipient was approaching the door rather than locomoting to some other part of the room. Moreover, the mere physical properties of the apparatus itself (the presence of the mechanism or stimulus enhancement as measured by the amount of movement of the chain) did not account for the results. Importantly, there was also no begging or harassment by the subjects after they helped, ruling out the possibility that they opened the door only to have the recipients access the otherwise unobtainable food and then try to coax it from them. Thus, this experiment showed that chimpanzees also help other chimpanzees in a novel situation without any immediate return-benefit.

A recent study by Melis, Hare, and Tomasello (2008) replicated the finding that chimpanzees would help conspecifics in this problem context. In addition, this new study revealed that there is some, but rather weak tendency for contingency-based reciprocation. The basic design was that chimpanzees were first confronted with a helpful or an unhelpful conspecific (stooges who had been induced to help or not to help during an exposure phase) and could then help them in the same situation with reversed roles: Overall, chimpanzee subjects helped most of the time (and significantly more often than in a control condition), but they had a slight tendency to help the previously helpful individual more than the unhelpful one. This indicates that contingency-based reciprocation within a small time-interval can slightly alter the basic tendency to help conspecifics, but accounts for only a small proportion of the variance (which is in accordance with correlational studies, de Waal, 1997; Koyama, Caws, & Aureli, 2006). Moreover, this finding provides indirect evidence against the notion that

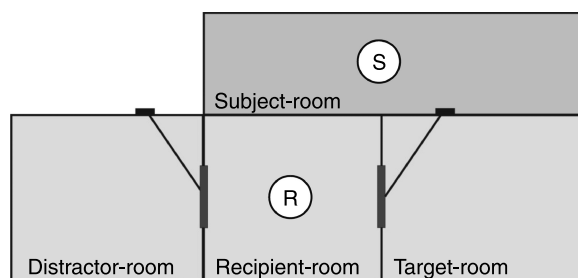


Figure 2. Test area and setup for helping among chimpanzee conspecifics. Both the target and the distracter door were held shut by chains. The recipient (R) could not access either chain, but the subject (S) could release the chain of the target door (adapted from Warneken *et al.*, 2007).

chimpanzees respond only to superficial behavioural cues or the concern that the sight of an incomplete action triggers a tendency to complete it without account of the individual performing the action – because, if this were true, the chimpanzees should perform the target behaviour irrespective of the other's identity and prior relationship history. In sum, this new study by Melis *et al.* (2008) replicates the basic finding and demonstrates in addition that chimpanzees have some sensitivity for contingency-based reciprocity, altering but not fully changing their tendency to help others altruistically.

Taken together, these studies with chimpanzees indicate that the altruistic tendency seen early in human ontogeny did not evolve in humans *de novo*. Chimpanzees also appear to have a basic motivation to act altruistically for others. Thus, the phylogenetic roots of human altruism – at least in the form of instrumental helping – may reach as far back as to the last common ancestor of humans and chimpanzees some six million years ago. The negative experimental findings on chimpanzee altruism all concern situations in which the benefit being provided to another is food. It may be that chimpanzees are not adapted for sharing food – due to a behavioural ecology in which they forage for patchy and unpredictable resources such as ripe fruit – whereas they are adapted for low-cost acts of instrumental helping (perhaps initially for kin, and then more broadly). There is some observational evidence that chimpanzees may comfort others in distress (de Waal, 1996), but there are no observations or experiments suggesting that they inform others of things intentionally and helpfully in their communication (Tomasello, 2008). It may just be that our search for the phylogenetic origins of human altruism must actually trace back not just one, but several different roots involving different domains of activity.

The development of altruism

The reported studies demonstrate that human infants and chimpanzees are able and willing to instrumentally help others. With regard to the ontogenetic roots of altruism, these results indicate that children have a natural tendency to develop altruistic behaviours. Socialization practices can build upon this predisposition for altruism, but socialization is not its original source. In other words, we argue against the notion that socialization practices operate independently of any altruistic predisposition or even impose altruism on children who are originally purely selfish. Children appear to have altruistic tendencies as well, and socialization works *in concert with* this predisposition.

Our claim is supported by three lines of evidence: First, as reported above, altruistic tendencies emerge early in ontogeny before socialization could have had a major impact on the infants' development. Second, socialization practices in early and middle childhood are only effective if they mesh with this predisposition. Third, nonhuman primates display altruistic tendencies in the absence of any socialization practices. Let us examine each of these arguments in turn.

(1) *Early emergence*: It seems implausible to assume that our infants helped because they comply with an altruistic norm. The internalization of altruistic norms or moral value systems is just not applicable to one-year-old children. Also, imitation is not a plausible candidate as our infants helped in various tasks including novel helping situations created for our laboratory experiment that could not have been modelled for them before. Moreover, infants this young just generally do not have many opportunities for helping and its reinforcement through their parents. And even if that is the case under some circumstances, it cannot easily explain why infants demonstrate helping also in novel situations with unfamiliar adults, as demonstrated in the current experiments. That is because in studies in which the attempt was made to elicit

prosocial behaviours in children by external rewards, it resulted in positive effects for the immediate situation, but did not endure and generalize to other situations and other people (for overviews see Eisenberg *et al.*, 2006; Moore & Eisenberg, 1984).

(2) *Subsequent socialization*: If reinforcement is used, external rewards can have a detrimental effect on future behaviours, as shown in our experimental study on helping (Warneken & Tomasello, 2008). Similarly, in an observational study (Eisenberg, Wolchik, Goldberg, & Engel, 1992) with 19 to 27 month-old children, the amount of parental reinforcement of compliant prosocial behaviours (mainly sharing) was *negatively* correlated with prosocial behaviours towards peers two years later. Correspondingly, punishment generally does not appear to have any positive long-term effects (when the possibility of punishment disappears, the effect disappears) and can even undermine prosocial behaviour (Eisenberg *et al.*, 2006; Moore & Eisenberg, 1984). As a matter of fact, when we look at how parents (in North American middle-class families) actually respond to children's prosocial behaviours, it turns out that parents almost never use material rewards and most often just acknowledge the child's prosocial act, responding with overt social approval or praise only in around one fourth of the cases (Grusec, 1991 for children at 4 and 7 years of age). What appears to be the most efficient strategy to elicit prosocial behaviours is what has been termed 'inductive parenting'. Prosocial behaviours are more likely to follow if adults are drawing the child's attention to the feelings, needs, thoughts or intentions of other people (Hoffman, 2000). In other terms, inductive parenting draws upon the child's other-regard - if another's needs are highlighted, positive behaviours follow. The most effective socialization practice is thus one that presupposes an altruistic predisposition on part of the child.

(3) *Altruism in chimpanzees*: Even if one disagrees with the two arguments made above - by for example arguing that the relevant socialization experiences just have not been identified, that external reinforcement works in more subtle ways or that the internalization of norms operate already in infancy - this perspective runs into problems when faced with our finding that also chimpanzees provide signs of altruism. Humans might be very eager to raise altruistic offspring, but chimpanzee mothers certainly do not teach their children altruistic norms and there is no indication that they reward their children for helping others. The fact that both humans and chimpanzees altruistically help others indicates that a basic altruistic tendency emerged in human evolution pre-culturally, before social groups created altruistic norms and taught them to their offspring.

Conclusion and prospects

Our claim is thus that the altruistic tendencies seen in early human ontogeny reflect a natural predisposition. Socialization can build upon this predisposition, but it is not its primary source. Human cultures cultivate rather than implant altruism in the human psyche. And even if we are wrong about this ontogenetic proposal, and human adults do in fact train altruism in developing young, it is worth asking where this tendency of adults came from? We do not see the adults of other species attempting to implant altruistic tendencies in their offspring.

If the data we have presented here are valid, infants are genuinely altruistic early in ontogeny. The starting state of altruism in ontogeny is characterized by children's tendency to help others spontaneously (i.e. in novel situations, without being encouraged to help, and without the expectation of rewards). It even appears that infants help rather indiscriminately, without taking into account if the beneficiary is a

relative or a stranger, whether the other will reciprocate, or how their behaviour will affect their reputation. However, it is implausible from an evolutionary perspective that such a naïve altruism in which people help without regard of any of these factors could persist. As Dennis Krebs points out: 'Evolutionary theory leads to the expectation that dispositions to engage in indiscriminate altruism should not evolve.' (Krebs, 2006, p. 48). For altruism to be sustained as an evolutionarily stable strategy, it must be complemented by safety measures to avoid being exploited by others and bias altruism towards certain individuals under certain circumstances. Thus, mechanisms that make altruism function selectively must be operative as well. However, this does not necessarily imply that all these mechanisms are co-present with the altruistic tendencies in early ontogeny. For instance, the ability to detect cheaters who profit from altruistic acts but do not repay the costs in the future is potentially of less relevance early in ontogeny when children are mainly surrounded by family members, who – even if not always trustworthy – at least share genes with the altruist so that inclusive fitness benefits are likely. The ability to tell apart other altruists from cheaters probably becomes important only later in life as the interaction with strangers increases.

Our proposal is thus that children start out as rather indiscriminate altruists who become more selective as they grow older. Children's emerging social-cognitive understanding and new experiences will enable them to act altruistically more frequently and across a variety of situations, but this should not just blindly lead to more helping, but more selective helping. This general notion of a differentiation process of prosocial behaviours across development has first been introduced by Dale Hay (1994), who quotes Machiavelli's motto that 'A prince must learn how not to be good.' and hypothesizes that factors such as individual differences, gender roles and other norms should lead to a differentiation later in childhood. Our model corresponds to that by Hay in the general statement that a rather undifferentiated prosocial predisposition is differentiated out during later childhood (see also Caplan, 1993; Peterson, 1982), but in our model we focus on other factors as the cause of this differentiation. Namely, we derive our model from evolutionary theory, leading to the proposal to investigate how the proximate mechanism entailed in different evolutionary models begin to play a role during children's development. Namely, these are kin selection, direct reciprocity, indirect reciprocity, and the transmission of norms.

First, when do children begin to direct acts of altruism differentially towards kin versus non-kin? There is evidence that altruism is directed more towards family members and towards monozygotic over dizygotic twins (Cunningham, 1985/1986; Eisenberg, 1983), but little is known about the role of kinship for the earliest forms of altruism in infancy. Studies showed that young children are more likely to comfort their mothers than a stranger (Young, Fox, & Zahn-Waxler, 1999) but this has not been done with regard to the provision of instrumental helping. In any case, evolutionary theory suggests that altruism should be *biased* towards kin. However, one crucial feature of human altruism is the fact that it is not *restricted* to interactions with kin (as in almost all other species). Therefore, to get at the specifics of human altruism, other mechanisms have been proposed to manage altruism among genetically unrelated individuals.

One such mechanism is reciprocal altruism. This is based upon the idea that people should help individuals who will be more likely to repay the incurred costs in the future (and should refrain from helping individuals when there is no prospect of future interaction; Trivers, 1971). When do children start to engage in reciprocal altruism? Reciprocity has mainly been studied in the domain of sharing and distributive justice. When asked about their explicit judgments, preschoolers at 4 to 5 years of age show no

understanding of reciprocity (Berndt, 1979) and refer to reciprocity in their decisions about resource allocations in distributive justice tasks not before 6 to 7 years of age (Damon, 1975). In one study about children's sharing, even children at 9 to 11 years of age engage in little reciprocal sharing, but Keil (1986) found that children at 7 and 12 years of age show increased sensitivity to the contributions of a co-worker in a distributive justice task over repeated trials by allocating rewards more favourable to generous than selfish co-workers. Concerning younger children, we know of only one study in which children at 29 to 36 months of age were tested for their tendency to share toys reciprocally. One child possessed toys while the other child was toy-deprived. Only children who had shared with the other (after being prompted by their mother), received toys back from the previous recipient when roles of who had or had no toys were switched once (Levitt, Weber, Clark, & McDonnell, 1985). Therefore, in more sophisticated sharing situations such as distributive justice tasks, reciprocity appears to be a late achievement, but when the sharing task is kept simple, there is at least one empirical demonstration that reciprocation can occur in middle childhood. However, it is not known how reciprocity would influence children's instrumental helping.

Another critical question is that of indirect reciprocity or reputation formation. In contrast to cases of direct reciprocity (in which two individuals take turns in helping each other), indirect reciprocity describes how people encode third-party interactions. This influences how people choose to interact with these individuals who have previously proven to be selfish or altruistic towards other parties and how people themselves act - as their own reputation is at stake if they fail to act altruistically. Regarding the first issue, recent studies show that infants in the first year of life differentiate between 'helpers' and 'hinderers' (agents displayed as geometric shapes who either assist another agent to climb up an incline or push it down (Kuhlmeier, Wynn, & Bloom, 2003), and show a preference for the helper, Hamlin, Wynn, & Bloom, 2007). These are intriguing results, leading to the question how infants would bring to bear this discriminatory ability in their choice whom (not) to help. Regarding the second issue about children's own reputation, it cannot be expected that infants already strategically manage their reputation as it appears in the eye of the beholder. The limited perspective-taking abilities in infancy do not lead to the expectation that reputation formation plays a critical role in their tendency to help others. We know of no study specifically addressing this issue with regard to prosocial behaviour (let alone instrumental helping), but related findings come from studies of children's self-presentation behaviours and dispositional praise. Self-presentation behaviour - in which individuals try to shape others' evaluations of their public self (also-called 'impression management') - does not appear to be strategically used (Aloise-Young, 1993) or be understood (Banerjee, 2002) by children before around 8 years of age. Moreover, research on dispositional praise in the domain of prosocial behaviour, (in which adults provide internal attributions highlighting the child's prosocial personality to be for example 'a nice and helpful person'), does not influence prosocial behaviour before 8 years of age (e.g. Grusec & Redler, 1980). This finding indicates that changes in children's self-image mediate prosocial behaviour only after they have gained an understanding of personality traits as stable entities (Eisenberg *et al.*, 2006).

Finally, at some point young children become sensitive to, and even internalize, social norms regulating prosocial behaviour. This means that they will blame others for antisocial acts - or even the omission of expected prosocial acts - and will blame themselves, and feel guilty, for these same acts and omissions (Hoffman, 2000). More specifically, prosocial norms and moral obligations should be especially influential in

situations in which the costs for helping are high, leading to altruistic outcomes when conflicts between other-regard and self-regard arise (Eisenberg & Shell, 1986). These mechanisms might bridge the gap between the spontaneous provision of help to more deliberate acts of altruism underlain by moral considerations. Taken together, the internalization of prosocial norms – and their association with distinct emotions such as guilt and shame, which are probably unique to humans – suggests again a complex interplay between biological predispositions and enculturation during ontogeny.

Taken together, there is sporadic evidence about the role of the evolutionarily relevant factors to sustain altruistic tendencies as they have been investigated only for some prosocial behaviours (mainly sharing), mainly with older children, and often outside of controlled experimental situations. Virtually no studies exist about the role of these factors for instrumental helping. In particular, there is a striking gap in experimental evidence between the early manifestations of instrumental helping in infants and their counterparts in middle childhood.

In addition, further research is needed to investigate how children bring to bear their conceptual understanding and categorization of social partners in their own helping behaviour. Specifically, a recent study on the anonymous sharing of resources demonstrated that children entering school-age selectively share more with in-group members over outgroup members and thus begin to show a tendency for parochialism (Fehr, Bernhard, & Rockenbach, 2008). Moreover, using a verbal task with story vignettes, Volland, Ulich and Fischer (2004) found that when children between 4 and 8 years of age were supposed to decide for a puppet character to comfort, help, or share with one of two potential recipients who differed along a particular dimension such as familiarity, reciprocity, harm, and responsibility, they favoured e.g. the one who was more familiar, who had helped previously, had suffered more or who was not responsible for their misfortune etc. Most recently, Olson and Spelke (2008) used a very similar method to systematically test the critical dimensions proposed by evolutionary theory, revealing that children at 3.5 years of age take into account kin relationship as well as direct and indirect reciprocity when deciding for a puppet character who to share with. Thus, when entering middle childhood, children begin to make these conceptual distinctions in the domain of prosocial behaviour, including the critical dimensions put forward in evolutionary theory. Further research is needed, however, to determine when these factors become operative during early ontogeny and how they guide children's own helping behaviour.

In conclusion, we have attempted here to provide a comprehensive picture of the emergence of human altruism, a picture which includes both its phylogenetic roots as reflected in the helpful acts of chimpanzees and its ontogenetic roots as illustrated by the helpful acts of human infants. Future research should seek to investigate the subsequent development of human altruism throughout childhood, specifying how the evolutionarily crucial factors that serve to maintain altruistic behaviours in adults gradually become a part of the developmental process.

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