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Tension in the *Natural History of Human Thinking*

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Abstract: Michael Tomasello has greatly expanded our knowledge of human cognition and how it differs from that of other animals. In this commentary to his recent book *A Natural History of Human Thinking*, I first critique some of the presuppositions and arguments of his evolutionary story about how homo sapiens' cognition emerged. For example, I question the strategy of relying on the modern chimpanzee as a model for our last shared ancestor, and I doubt the idea that what changed first over evolutionary time was hominin behavior, which then in turn brought about changes in cognition. In the second half of the commentary I aim to show that the author oscillates between an additive and a transformative account of human shared intentionality. I argue that shared intentionality shapes cognition in its entirety and therefore precludes the possibility that humans have the same, individual intentionality (as shown in, e.g. their instrumental reasoning) as other apes.

Keywords: Shared intentionality; Cooperation; Joint attention; Evolutionary theory; Human phylogeny; Human development.

A Natural History of Human Thinking is the new link in the chain of anthropological theory that Tomasello (2014) has so brilliantly forged over the last two decades. By exposing the unique quality and critical importance of shared intentionality, he has steered current debates about the distinctness of human rationality into an entirely new and highly promising direction. In this commentary, I will put my finger on a few points of tension in his reconstruction of the origins of human cognition. It seems that the author is pulled in different directions as he attempts to reconcile many different, and sometimes conflicting, ideas. In particular, I noticed a fluctuation between the following mutually incompatible positions: between continuity and discontinuity from ape to human cognition,

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and between an additive and a transformative account of shared intentionality. I will try to expose some of the inconsistencies and show why the idea of cognitive continuity and the conception of shared intentionality as an additional ability besides our animal abilities is problematic.

In the first section, I will challenge some of the assumptions Tomasello brings to bear in his evolutionary narrative – either as tacit presuppositions or as explicit arguments. More specifically, I will 1) raise concerns about his reliance on modern chimpanzees as a model for the last shared ancestor between humans and apes, 2) point out the risk of circular argumentation in the evolutionary explanations, and 3) question the proposed direction of causation from cooperative behavior to cognition.

1 Problems with the Evolutionary Narrative

1.1 Chimpanzee Time Machines

Tomasello's evolutionary story is based on the presupposition that humans' closest living genetic relative, the chimpanzee, provides a valid referential model for the last common ancestor of pan and homo (LCA). However, this assumption is widely criticized in contemporary biology and philosophy of biology (e.g. Almécija et al. 2015; Vaesen 2014). Evidence is growing that today's chimpanzee is not a time machine into our shared evolutionary past. Since the LCA, the African apes have had at least 6 Million years to evolve. Fossil and molecular evidence indicates that the anatomical, behavioral, and social changes since then have been profound. For example, it looks as though our common precursor was not a knuckle-walking creature and may not have swung on tree branches. Some scholars even claim that the LCA "turns out to have been scandalously unlike a chimpanzee or bonobo" (Sayers et al. 2012, p. 121). Though we do not know much about how the LCA lived, it is very unlikely that he was as pan-like as Tomasello makes him out to be.

Now one might ask if the dissimilarity between today's chimpanzee and the LCA poses any significant problems for Tomasello's evolutionary reconstruction. It could be argued that the specific nature of our common ancestor is irrelevant as long as he did not cooperate or show any signs of joint intentionality. All that seems to matter for the story is that it begins with individual intentionality at the node where pan and homo diverge and continues with the emergence of shared intentionality in the lineage leading to modern humans. However, it is entirely possible that the LCA was equipped with something like shared intentionality or

at least a proto-form of it. This might sound radical, because it would imply that joint intentionality gave way to the more individualistic and competitive modes of interacting that we encounter in today's African apes. But useful abilities or traits 'get lost' in evolution all the time (e.g. think of legs in the snake's phylogeny). Note that I am not claiming that the LCA was a creature with shared intentionality. I am simply pointing out that it cannot be ruled out as a possibility.

At the end of the day, Tomasello's natural history and his comparative research program are anchored in the doctrine that the living chimpanzee serves as a valid model for our common ancestor. The experiments with primates are not just conducted to better understand the living exemplars, but with the motivation to learn more about the evolutionary roots of our own cognition. In light of this ambition, Tomasello should address the problem that this doctrine stands on shaky ground.

1.2 Circularity

A second problem with the evolutionary story that is spun around homo sapiens' peculiar cognition is the danger of circular argumentation. Before turning to the arguments, let us summarize what we know from comparative research with apes and human children. Controlled experiments and observations in the wild have revealed that great apes behave in ways we would consider egoistic or selfish were we dealing with humans. Apes act for their own benefit, with little regard for others unless they hinder or promote the achievement of the ape's own individual goals. Apes, it seems, are opportunistic and competitive. From experiments and our engagement with infants and young children, by contrast, we know that even prior to much, if any, language production, humans enjoy sharing attention and have an unparalleled propensity for reciprocal and cooperative engagement with others. They are much more 'relational' than any other primate. So much for the evidence from comparative studies.

The following is the abbreviated evolutionary account which Tomasello gives to explain the origins of this fundamental difference between humans and apes. Non-human ape cognition evolved in the context of *competitive* foraging and mating practices. Conversely, human cognition evolved in the context of *cooperative* activities, such as collective hunting, confrontational scavenging of carcasses and jointly organized aggression against hostile outgroups. It is speculated that this 'cooperativization' in hominins evolved in response to some ecological change, such as reduced availability of small game, from which the other ape ancestors were somehow spared (or to which they responded in alternative ways). The apes thus retained the competitive nature of their predecessors. But this does

not seem to explain much: The evolutionary forces are said to have operated on activities that are already qualified ("competitive" and "cooperative") in ways that designate precisely those modes of interaction for which we sought a genetic explanation. We are thus caught in a loop of circular argumentation: Cooperation evolved in humans because hominins faced evolutionary pressures to cooperate.

1.3 Complex Cooperative Behavior Before Cognition?

A third aspect I stumbled over in the evolutionary narrative is the alleged *direction of causation* between behavior and cognition. After the emergence of the genus homo about 2 Million years ago and some time prior to the appearance of *homo heidelbergensis* around 300,000–400,000 years ago the organization of hominin social life is said to have become increasingly complex – again, due to ecological changes that necessitated or favored collaborative efforts. To navigate the ever more intricate social matrix, a cognitive revolution had to take place to turn the individualistic mental make-up of our primal ancestor into shared intentionality:

> Human social life is much more cooperatively organized than that of other primates, and so, in the current hypothesis, it was these more complex forms of cooperative sociality that acted as the selective pressures that transformed great ape individual intentionality and thinking into human shared intentionality and thinking (p. 31).

Tomasello reiterates this causal direction throughout the book, conceiving of the new form of thinking as the *end product* of collaborative behavior in the first instance and a new form of communication in the second instance. He echoes a position that seems accepted by at least part of the anthropological community. Hrdy (2009), for example, postulates the same causal direction between behavior and brain development in marmosets. In her account, cooperative breeding behavior, i.e. sharing the burden of nurturing altricial young among multiple group members, evolved first. Being passed back and forth between the biological and 'alloparents', the offspring not only had to come to differentiate between individuals, but had to learn to constantly monitor others' intentional states. Hence the emergence of 'mind-reading' in these primate species. Leaving aside the problem of overly rich interpretations of animal behavior, the same genetic sequence of '*behavior → cognition*' is proclaimed in this hypothesis.

However, this sequence is equivalent to putting the cart before the horse. In Tomasello's account, if a complex social structure with cooperative activities between hominins was already in place and sustained over extended periods of

time, what purpose does a subsequent cognitive turn in the form of a 'cooperativization' serve? This cognitive shift appears superfluous given that the behavior had already adapted effectively to the selective pressures. I would argue that in order to support and sustain complex cooperative action and communication of the kind performed by modern humans, the cognitive revolution would have had to take place concomitantly with the said behavioral changes, not in the aftermath. The cooperative behavior needs the corresponding cognition to support it.

I suspect that what leads Tomasello to propose this causal direction is in some way related to the idea that natural selection can only operate on something measurable or observable, like behavior. But I do not see why this would imply that cognition has to be left out of the picture until some later point in phylogenetic time. Again, I find it difficult to imagine what the cooperative behavior at time 1, i.e., before it is governed by the agents' knowledge of what they are doing, would look like. I picture it to be rigid and limited. But such behavior has very little in common with the spontaneous, intelligent, and flexible cooperation that we see every day in humans and the genesis of which Tomasello set out to explain.

2 The Tension between an Additive and a Transformative Account of Shared Intentionality

A tension I encountered throughout the text is that between passages in which Tomasello advocates cognitive continuity and others in which he suggests a drastic cut in the phylogeny of human cognition. This problem is particularly noticeable in the first two chapters. On the one hand, Tomasello happily applies Ockham's razor and strives for continuity: "In the absence of evidence our default assumption will be evolutionary continuity (deWaal 1999). That is to say, when great apes behave identically with humans, especially in carefully controlled experiments, we will assume continuity in the underlying cognitive processes involved" (p. 15). The author invokes the principle of parsimony to avoid biased or unnecessarily different interpretations of abilities that humans have in common with other animals.

In line with this, Tomasello and colleagues have declared in recent articles that ape and human reasoning are to a large extent identical (Herrmann et al. 2010). According to their Cultural Intelligence hypothesis, our thinking stands out only in a clearly demarcated domain of social cognition: Humans are simply extraordinary mind-readers and excellent cooperators. In matters of physical

cognition, however, they do not differ much from the apes. In the authors' own words: "Humans share many cognitive skills with nonhuman apes, especially for dealing with the physical world, but in addition have evolved special skills of social cognition" (Herrmann et al. 2010, p. 102). This idea of continuity between the physical cognition of apes and humans is empirically grounded in the results from test batteries that assessed, among other things, object permanence, object rotation, or the choice and use of tools. In these tests, apes performed at levels comparable to those of human children between 2 and 4 years (see also Wobber et al. 2013). In the *Natural History*, Tomasello again stresses that the capacities for instrumental reasoning are essentially the same in apes and humans: "Important aspects of human thinking derive not from humans' unique forms of sociality, culture, and language, but rather, from individual problem-solving abilities of great apes in general" (p. 2).

However, this directly contradicts other statements in the book. In these other passages, Tomasello asserts that the ability for shared intentionality transforms human cognition on the whole. Its impact is not restricted to a distinct domain of social cognition or to instances in which we are cooperatively or communicatively engaged with others. Instead, shared intentionality "changed everything" (p. 5) – "not just the way that humans think about others but also the way they conceptualize and think about the entire world […]" (p. 144).

Tomasello thus fluctuates between an 'additive' and a 'transformative' account of shared intentionality. The philosopher Andrea Kern and I are convinced that the transformative account is correct. The ability to engage in joint or shared intentionality should not be considered as simply added to the repertoire of abilities that we share with other animals. It is not just another skill that is tacked onto an animal nature, as Tomasello has us believe in this passage: "[…] out of the elements of these sophisticated processes of individual intentionality built for competition […] humans evolved, *in addition* (emphasis added), even more sophisticated processes of joint intentionality […] built for social coordination" (p. 34). Instead, we argue that shared intentionality permeates the way in which children apprehend and approach all kinds of situations – even those that do not involve any joint attention or cooperative action.

To illustrate and provide preliminary support for the transformative view, I will analyze a task that has been used to compare the problem-solving abilities of apes and human children. In the so-called "peanut task", participants have to retrieve a peanut from the bottom of a narrow tube by releasing water into the tube and making the peanut float. Orangutans (Mendes et al. 2007) and chimpanzees can solve this problem, whereas human children under the age of 6 years are for the most part unsuccessful (Hanus et al. 2011). At first sight, shared intentionality seems entirely irrelevant to this problem, and the results appear to favor the

continuity position (in fact, in this particular case, the apes seem to 'outsmart' the children).

That this interpretation is flawed becomes evident when we look past the test result and instead focus on 1) the *'translational' process* and the many adjustments that are necessary to make the task work when the tested species is changed (from ape to human or vice versa), 2) the *different approaches* apes and children take toward the problem, and 3) the dependency of children's test results on how the task is socially framed or embedded. This shift in perspective will bring to light that children's physical cognition differs in kind from that of apes and cannot be separated from their shared intentionality. For lack of space, I will limit the analysis to points 2 and 3.

In a recent study, I tested 4-year-olds with the peanut task and varied the social setting in which the task was presented (Moll, unpublished). First, children across experimental conditions had a hard time understanding that they were expected to complete the task on their own, even though an adult was present. Many of them approached the adult for advice or to comment on the challenging nature of the task. Second, pilot data and parental reports revealed that children were reluctant to use water because they were concerned about spillage. (Many young children are prohibited from playing with water inside the house.) There are additional factors that might make this task more challenging for children than for apes. For example, 'functional fixedness', i.e. the bias that prevents an agent from considering atypical or unusual ways of using an object, is probably much stronger for children, because their concept of water ("Water is for, e.g. drinking, washing one's body, etc.") conflicts, or at least has no overlap with, their concept of tools ("Tools are rigid things designed for specific problems"). When children instead of apes are tested, there are thus unique social, conceptual, and normative forces in play that can exert a hindering effect on the test performance.

Interestingly, however, the source of these forces that keep young children from passing the task, i.e., shared intentionality, also holds the key for solving it. Shared intentionality allows children to learn from others. It is what makes them receptive to others' assistance and knowledge. When I presented 4-year-olds with pedagogical cues, their success rate at retrieving the peanut increased from 8% (baseline success rate) to 67%. It takes very little to get children on the track to the problem's solution. But children are able to learn much more than just how to solve the particular problem they are facing. They can acquire general knowledge about water and its properties. A few years down the road, many of them will be able to explain why the peanut floats and predict which other objects would float, etc. They acquire the concept of (positive) buoyancy. None of this is available to apes, who can only solve a given problem at a particular time. Hence, apes and

human children do not share the same 'naïve physics' or the same kind of instrumental rationality.

I hope to have shown that shared intentionality is not just another ability added to the individual intentionality of animals. The way in which cognitive tests that were originally designed for apes have to be adapted to children's social nature (including the necessary explication of the goal and the rules), the distinct manner in which children approach the tests, and their openness to receiving others' help and knowledge: All these factors show that shared intentionality infuses human cognition entirely and cannot be thought of as a separate skill, inserted into an animal mind.

Tomasello's shared intentionality hypothesis has had an enormous impact on how human sociality and thinking are reflected on and discussed in philosophy of mind, psychology, and anthropology today. I would like him to consider the possibility that shared intentionality has even greater implications for human cognition as a whole than he suggests in the book.

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