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Michael Tomasello on Language Development: The Puzzle of Human Linguistic Uniqueness

Joseph T. Kessler
College of William and Mary

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**Michael Tomasello on Language Development:
The Puzzle of Human Linguistic Uniqueness**

A thesis submitted in partial fulfillment of the requirement
for the degree of Bachelor of Arts in Interdisciplinary Studies from
The College of William and Mary

by

Joseph T.. Kessler

Accepted for High Honors

Talbot J. Taylor, Director

Barbara J. King

Ann M. Reed

Williamsburg, VA
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1 – Abstract

Michael Tomasello's account of language development, and hence of human linguistic uniqueness, differs strongly from the Chomskyan version that is currently dominant in the field of linguistics. Tomasello claims that human language is not due to a genetic endowment unique to the species *Homo sapiens*, but rather, that humans have certain non-language-specific cognitive and interpersonal capacities that lead them to become full participants in the social use of language. In his current theory, individuals of any species would require the general capacities of intention-reading, relevance assumptions, role reversal imitation, and pattern-finding in order to develop a language. Because these capacities are not conceived of as specifically and autonomously linguistic – but rather as social and cognitive in nature – their presence or absence in prelinguistic human infants and nonhuman apes can be tested for using the experimental methods of developmental psychology and cognitive science. Based on such tests, Tomasello has concluded that whereas human children possess all of the capacities that he deems necessary for language acquisition, there is limited or negative evidence for chimpanzees' capacities to act helpfully, assume helpfulness in others, form joint goals, and construct and conform to group expectations. This thesis raises a degree of skepticism towards Tomasello's claims, citing the growing body of evidence against his specific research findings involving both apes and humans. It further suggests that his overall account of the necessary capacities for language development is both unverified and unverifiable, and that therefore the issue of human linguistic uniqueness is still an open question.

2 – Introduction

Over the long history of humankind's metalinguistic commentary, that is, our use of language to discuss matters of language, it has frequently been observed that language itself is a uniquely human phenomenon. In the modern field of linguistics today, scholars argue over what the precise definition of language should be, but essentially all of them would agree that it is a code, or practice, or cultural artifact, or mental faculty found only among members of the human species. However adept members of other species are in communicating with one another in the wild, and however impressive certain experimental efforts to foster language skills in nonhuman lab subjects may appear, to the best knowledge of modern science, there has never been a user of language who was not also a member of the species *Homo sapiens*.

From the perspective of modern science, moreover, there must be some explanatory factor to account for the presence of linguistic behaviors in humans and their absence in individuals of other species. As human infants develop skills in language as they age, while members of even closely related species do not, there must be some factor or factors unique to humans that enable language development. Noam Chomsky, the seminal figure of modern linguistics, has asserted that this factor is the language faculty itself, which he views as a single genetic endowment for linguistic competence, an adaptation unique to our species and autonomous from other human abilities. In essence, Chomsky argues that humans evolved language in a single genetic adaptation sometime after our evolutionary split from the other ape species, and so the non-linguistic skills humans share with other primates are irrelevant to an explanation of human

language (Chomsky 1996). In the Chomskyan view, only humans have language because only humans have evolved the specific genetic adaptation for language.

Other scientists disagree with this position, however, and emphasize the cognitive and social complexities that have been documented in closely related animals such as chimpanzees (*Pan troglodytes*). Various research findings that chimp communication is atypically complex in the animal kingdom suggest to these researchers that perhaps Chomsky is mistaken in separating human language so discretely from other cognitive capacities in our species. They contend that perhaps human language is not the product of a single autonomous genetic endowment, but is instead something that can be learned by any creature with the proper complex of skills in cognition and sociality. From this perspective, the communicational abilities of chimpanzees may represent evidence that some of the requisite skills for acquiring language can be found in the capacities of other species.

Researcher Michael Tomasello is one such thinker who discounts the Chomskyan definition of the nature of language in favor of a more nuanced account of the interacting cognitive and social skills underlying linguistic competence. Tomasello's theory of language development in human infants highlights specific capacities that he argues lead to children becoming full participants in the social use of language. Because these capacities are not conceived of as specifically and autonomously linguistic – but rather as social and cognitive in nature – their presence or absence in prelinguistic human infants and nonhuman apes can be tested for using the experimental methods of developmental psychology and cognitive science.

Tomasello's account is not in disagreement with the claim that nonhuman apes lack the capacity to acquire language in a human-like fashion. He admits that despite humanity's close evolutionary tie to chimpanzees and the other great apes, the capacity of our infants to acquire language is unmatched in the young of those other species. However, unlike Chomsky, Tomasello argues that many of the abilities which foster language development in human infants can be experimentally proven to exist in other species as well. In Tomasello's theoretical framework, the ultimate explanation for human linguistic uniqueness will be found in the identification of those abilities which are necessary for the development of language, and which are present in humans but not in chimpanzees.

In this thesis, I attempt to provide an overview of Tomasello's research and conclusions on the topic of language acquisition and its corollary, human linguistic uniqueness. I begin by describing Tomasello's general approach to the topic of language and his claim that language is – and should be studied as – a facet of cognition. I describe the strengths of this approach, and how it has affected Tomasello's explanation for human linguistic uniqueness. I also note that as new research findings have revealed behavioral capacities hitherto unrecognized in nonhumans, Tomasello has had to modify his views on why only humans can acquire a language.

The thesis then provides a detailed look at the researcher's current account of the cognitive capacities required for the acquisition of language, explaining Tomasello's view that intention-reading, role reversal imitation, relevance assumptions, and pattern-finding skills undergird the individual's development of language. For each of these behavioral capacities, I also provide a description of the experimental evidence Tomasello cites in

support of the claim of its presence in humans and its presence or absence in apes. The thesis ends with a discussion of Tomasello's research and his arguments, and of how elements of the former may support but do not prove the latter. I suggest that although Tomasello has crafted a cohesive and compelling account of human linguistic uniqueness, he has in no way solved the puzzle.

3 – Tomasello's Approach to Language

3.1 – Overview

In Tomasello's current theory of language acquisition, language is treated not as a specific biological adaptation, but rather as a form of cognition that children develop through regular interaction with adult speakers. In this view, human children are born with certain cognitive capacities that foster growth in linguistic competence and with certain interpersonal abilities that motivate such development. Tomasello agrees with Chomsky that members of no other known species, including the closely related chimpanzees, are able to develop language, but he argues that this fact does not indicate that language is an inherently human endowment. Rather, in Tomasello's view, creatures such as chimpanzees lack some of the cognitive and interpersonal capacities that are prerequisites to language and which human children possess. According to Tomasello's account of language learning, there is a necessary relationship between a being's possession of those particular capacities – rather than of a specific language endowment in humans – and his or her development of language. Specifically, he contends that language is learned by an individual who hears an utterance, attempts to decipher the meaning intended by its speaker, and then, in order to communicate the same meaning,

intentionally produces the same form(s). An individual of any species which possesses the requisite cognitive and interpersonal capacities should – according to Tomasello – be able to develop language in this way. As a corollary to this necessary relationship which he posits, Tomasello asserts that beings that cannot develop language must be deficit in one or more of the capacities necessary for such a process.

Tomasello's theoretical and experimental approach to language has been heavily influenced by the early work of the psychologist Jerome Bruner, who emerged in the 1970s with a view of language development in many ways contrary to the dominant Chomskyan framework of the time. Bruner held that children acquire language in the context of familiar, regularized environments that scaffold the learning experience, and that a child in such an environment is an active participant motivated to master linguistic forms for communicative purposes. Bruner also asserted that neither language nor its acquisition is wholly autonomous from other cognitive complexities of the human mind, as Chomsky had argued, but rather that each is best understood as a process of human cognition in general (Bruner 1985). Bruner's framework thus allowed him to empirically study the developmental stages of child language acquisition, with a focus on linking increasing linguistic proficiency with the cognitive capabilities displayed by human children before and during the acquisition process.

Bruner later modified his original set of claims by conceding to Chomsky's position that language learning relies upon a Language Acquisition Device (LAD) biologically encoded in humans, while stressing that such a device could not operate without an environmental Language Acquisition Support System (LASS) of familiar frames for the child to learn within (Joseph, Love, and Taylor 2001). Tomasello disagrees

with this later concession, but he supports Bruner's original position that language is a form of human cognition rather than a distinct and autonomous biological endowment.

3.2 – Language as cognition

In Tomasello's words, language is "cognition packaged for purposes of interpersonal communication" (Tomasello 2008: 150), and he considers there to be no theoretical need for a separate Language Acquisition Device. Instead, he argues that the skills humans employ to acquire and use language are tied to species-characteristic general cognitive and interpersonal abilities. Tomasello considers this socio-cognitivist position to be "a less rigidly nativistic view of language acquisition in which there is a biological foundation for language, just not in the form of specific linguistic structures preformed in the human genome" (Tomasello 1995: 32). It is in this sense that he likens language to the game of chess, whose rules are learned as new players interact "with mature players... [to] develop quite sophisticated cognitive skills in the context of this game, many of which would seem domain specific in the extreme" (Tomasello 1999: 207). Such complexities, Tomasello argues, do not indicate that we as a species have evolved some sort of "innate chess-playing module" (Ibid.), but merely that humans have the cognitive powers to develop abilities in chess when exposed to the right sort of learning environment. Tomasello considers language to be, like chess, the result "of both historical and ontogenetic developments working with a variety of pre-existing human cognitive skills, some of which are shared with other primates and some of which are uniquely human" (208).

3.3 – Strengths of Tomasello's approach

Because of this socio-cognitive perspective, Tomasello has chosen to examine the development of children's language through the experimental study of their cognitive and interpersonal capabilities. Tomasello's focus on abilities that are not autonomously linguistic has meant that he can construct tests without regard to any specific theory as to the nature of linguistic knowledge. Instead, following the early Bruner, Tomasello studies cognitive and interpersonal abilities apart from language, and uses his experimental findings to inform his theory of language development. Another strength of Tomasello's research paradigm is that, because the cognitive and interpersonal skills he examines can be experimentally researched independently of language-using abilities, such capacities can be tested for in nonhuman apes as well as in humans. By conducting such tests and making cross-species comparisons based on his research findings on cognition and sociality, Tomasello formulates his conclusions regarding the species-specific nature of human language.

3.4 – Human linguistic uniqueness

With this focus on studying language as a facet of cognition not dependent upon any specialized genetic linguistic adaptation, Tomasello asserts that human linguistic distinctiveness cannot be explained by merely labeling language as a human-only domain. That is, he reasons that if there were some single "language gene" which enabled language and which was present only in the human lineage, as Chomsky contends, then the fact of human linguistic uniqueness could be explained in fairly simple terms: humans alone have language because humans alone have the genetic adaptation for language, and

other animals do not have language because other animals do not have the language gene. The self-supporting nature of such a claim effectively rules out cross-species research on the subject, however, and it does not take into consideration Bruner's finding that non-linguistic cognitive skills scaffold the acquisition of language in humans. Rather than positing human uniqueness as founded in a genetic endowment for language, Tomasello's approach has been to determine precisely which general social and cognitive – which is to say, non-linguistic – capacities humans make use of in their acquisition of language, and then to experimentally test for each of these capabilities in our closest relatives, chimpanzees and the other great apes¹. Due to the relatively recent evolutionary branching of our species from the other apes, Tomasello reasons that the cognitive skill set of humanity should closely resemble that of the chimpanzees, and that the cognitive and interpersonal abilities of modern nonhuman apes represent "evolutionary steps along the way to human communicative activities" (Tomasello 2008: 19–20). Because he believes that linguistic competence is a form of cognition enabled by certain interpersonal capacities rather than a specific human adaptation for language, Tomasello engages in cross-species comparisons of such capacities with the goal of isolating the specific domains in which the human skill-set differs from that of other apes. According to his framework, it is these differences that must explain why species whose cognitive and interpersonal capacities otherwise greatly resemble those of humans have not also developed language.

3.5 – Tomasello's shifting conclusions on linguistic uniqueness

Tomasello thus asserts that the explanation for human linguistic uniqueness will be found in the cognitive and interpersonal feature(s) that humans possess and that chimpanzees do not. Because, over time, scientists have discovered more about the abilities possessed by great apes, Tomasello's conclusions regarding the specific capacities that drive human language competence have undergone a number of shifts. For example, in 1999 Tomasello's writings detailed "the uniquely human social-cognitive adaptation for identifying with other persons and so understanding them as intentional agents like the self" (Tomasello 1999: 7), a single factor that, he argued, results in "most, if not all, of the species-unique cognitive skills of human beings (Ibid. 15)." More recently, however, Tomasello has observed "that great apes understand much about how others work as intentional, perceiving agents... in ways very similar to young human children" (Tomasello 2008: 45). Such findings have required Tomasello to periodically revisit his conclusions on the specific factor(s) underlying human linguistic uniqueness.

This thesis is concerned primarily with Tomasello's current model of language development and explanation for human linguistic uniqueness, but it is important to realize that historically his claims have resembled shifting goalposts for human socio-cognitive exclusivity. One significant critique of his approach is therefore that at any point in his career, his theory of linguistic uniqueness has included the claim that chimpanzees do not possess some capacity or set of capacities X, and yet each prior iteration of this claim has eventually had to be discarded in light of more refined experimental techniques and subsequent experimental findings. There is therefore no clear and compelling reason to assume that the experiments Tomasello cites in support of

his most recent account cannot and will not be refined further, to perhaps yield strikingly different findings regarding chimpanzee capacities in the future. Even within the structures of Tomasello's experimental approach, there is growing evidence that it may be time for him to shift the goalposts of human linguistic uniqueness once more, and that the features that have succeeded intention-reading as language-necessary and human-unique in his current account may in fact be present in chimpanzees as well. I take up this discussion again in the final section of this thesis.

4 - Tomasello's account of the cognitive capacities necessary for language

4.1 - Intention-reading

While Tomasello no longer believes that the understanding of intentionality in others is a trait unique to humans, he still maintains that it is one of the fundamental and necessary capacities of an organism that enable it to acquire language. In Tomasello's theory of language acquisition, an organism's capacity "to understand conspecifics as intentional/mental agents like the self" (Tomasello 1999: 53) allows the individual to enter into periods of joint attention with others, in which the acquisition of new signs can take place. Necessary prerequisites to the development of this understanding are therefore the individual's understanding that he or she is an intentional being, as well as his or her ability to draw analogies between others and the self. In Tomasello's words, developing individuals first "come to a new understanding of their own intentional actions... then use their 'like me' stance to understand the behavior of other persons in this same way" (Tomasello 1999: 72). According to Tomasello, this recognition of intentionality in the actions of others, a skill he refers to as 'intention-reading,' is the understanding that others

"have goals and... make active choices among behavioral means for attaining those goals, including active choices about what to pay attention to in pursuit of them" (Tomasello 2003: 21). Thus, for Tomasello, abilities of intention-reading are those of attention-reading as well.

An individual with such abilities, argues Tomasello, is one who is able to enter into the joint attentional frames that Bruner theorized were central to the language acquisition process. While two individuals (prototypically an adult and a child) could happen to be each attending to the same object or situation, for Tomasello the two cannot be said to be engaging in joint attention unless each understands that his or her own attention and the other's are intentionally directed. Even if the adult, understanding the intentionality of both parties, has somehow acted to direct the child's attention to where the adult is attending, if the child does not understand that the adult has done so intentionally, a joint attentional frame will not arise. Tomasello elaborates:

The basic point is that joint attentional frames are defined intentionally, that is, they gain their identity and coherence from the child's and the adult's understandings of "what we are doing" in terms of the goal-directed activities in which we are engaged... Consequently, when an adult addresses an utterance to an infant too young to comprehend intentions, from the infant's point of view the adult is just making noise... Sounds become language for young children when and only when they understand that the adult is making that sound with the intention that they attend to something. This requires an understanding of other persons as intentional

agents who intend things toward one's own intentional states. (Tomasello 2003: 22-23)

Thus, according to Tomasello, only an individual capable of intention-reading – that is, capable of recognizing intentionality in others – will be able to enter into periods of joint attention with other individuals, and thereby come to acquire language.

As noted above, it was once Tomasello's claim that humans alone are capable of recognizing intentionality in others. Following his theory, ascribing to humans an intention-reading capability implies that *a*) humans can analogize from themselves to others, *b*) humans can recognize their own intentions, and *c*) humans can understand the intentionality of others. The first of these points, claims Tomasello, is supported by a survey of research on human neonatal imitation conducted by Meltzoff and Gopnik (1993), who propose that humans "understand that other persons are 'like me' from birth – with much learning of specifics still to come" (Tomasello 1999: 71). Next, Tomasello observes that experimental evidence supports the claim that human infants can recognize their own intentionality, although this ability appears to develop around the eight- to nine-month mark in most human children. For example, Piaget (1952, 1954) found that children younger than eight months, when reaching for a desired toy, would react to an adult placing a pillow in front of the toy either by switching to interact with the pillow instead of the toy or by remaining focused on the toy while expressing frustration at the new object. At the eight-month mark, however, a human infant in this experimental situation would typically react by grasping the pillow, moving it aside, and then proceeding to interact with the toy. In Tomasello's analysis, "the infant removes an obstacle and proceeds without hesitation to the goal, [so] it is plausible to assume she had

a distinct goal in mind ahead of time... and clearly differentiated this goal from the various behavioral means among which she had to choose in order to attain the goal" (Tomasello 1999: 73). That is, this infant subject in Piaget's experiments evidently understood that she had an intention to play with the toy in question, and consciously chose a series of actions to carry out to bring that goal to fruition. Such a being, asserts Tomasello, understands herself as an intentional agent.

Regarding the final component of an intention-reading capability, Tomasello argues that human infants are also capable of bringing together their analogizing skills and their understanding of their own intentionality to recognize that others are intentional beings as well. "By at least 12 months of age," he writes, "[human] infants understand that actors actively choose means for pursuing goals... that others see things... [and] that actors choose to attend intentionally, for some reason, to some subset of the things they perceive" (Tomasello 2008: 139). As evidence for these capacities, he cites a 2003 study by Tomasello and Haberl, in which 12-month-old human infants showed evidence of being able to reason that an adult's excitement was over an object in the room that was new to the adult, even though the same object was not new to the child. In the researchers' analysis, the infants appeared to understand that another individual's experience can affect his or her emotional reaction and attention, and that in such cases the other is intentionally directing his or her attention toward what is egocentrically new and exciting. Based on these findings, Tomasello concludes that there is experimental support that human infants possess each of the component abilities that he claims are necessary for intention-reading and engaging in joint attention.

To determine whether apes might also be able to engage in such intention-reading and joint-attentional behaviors, Tomasello has tested for the presence or absence in the chimpanzee species of the abilities *a*, *b*, and *c* above. The first of these, the ability of an ape to analogize from itself to others, has to my knowledge never been specifically addressed by Michael Tomasello in an experimental setting. Nevertheless, in a 2007 study examining altruistic motives in chimpanzees, Tomasello's research team found that ape subjects who watched a conspecific struggle to open a door that the apes observing knew how to open would spontaneously apply that knowledge to open the door for the other ape (Warneken et al. 2007). In this experiment, the subjects did not appear to expect a reward for their behavior, and they did not engage in the behavior in a control condition when a group-mate was not attempting to access the door (Tomasello 2009: 11). While there are many possible implications of such findings, Tomasello has argued that an individual solving a problem for another by applying a solution previously learned in an egocentric context must be engaging in some sort of self-to-other analogy.

The second component of an intention-reading capacity is the ability of an individual to recognize his or her own intentions. In his most recent published works, Tomasello has argued that this too is an ability possessed by apes. Many primate gestures, he says, "are individually learned and flexibly used, especially in the great apes, and so may be properly called intentional signals" (Tomasello 2008: 20). Among the reasons he provides for such an assertion – which contrasts with his 1999 published opinion – is the finding that ape "individuals typically produce a gesture only when the recipient is appropriately attentive, and afterward they often monitor the recipient's reaction and wait for a response... sometimes [using] sequences or combinations of

multiple gestures when the other does not react appropriately" (Ibid. 21). Tomasello argues that in this way apes resemble the infants in Piaget's pillow-and-toy studies, as they appear to form a goal and intentionally pursue that goal by making conscious choices of various means along the way. Tomasello thus concludes that nonhuman apes possess the second component of intention-reading from his theory, the understanding of their own nature as intentional beings.

Finally, Tomasello argues that apes appear to understand the intentionality of others. He notes that when apes gesture to a conspecific, they monitor the other's perception and gesture more frequently when that individual is facing them. Tomasello describes this monitoring as "a paradigm case of intentional action, in this case toward others and with some understanding of the way the other's reaction depends on her abilities to perceive and intend things" (Tomasello 2008: 33). That is, Tomasello thinks there is conclusive evidence that an ape can understand that others have their own perceptions and intentions and can reason that these will determine what the response to his or her actions toward them will be. The evidence Tomasello cites to support an ape understanding of others' goals includes the research finding that when a human researcher repeatedly passes food items to a chimpanzee and then stops, "the ape reacts in a frustrated manner if the human is doing this for no good reason (i.e., is unwilling) whereas she waits patiently if the human is making good-faith attempts to give the object but failing or having accidents (i.e., is unable)" (Tomasello 2008: 45). In addition, in research such as the altruism study mentioned above, chimpanzees offer help to conspecifics "in a way very similar to human infants – which requires an understanding of the other's goal" (Ibid.). Studies of apes also indicate their awareness of others'

perceptions, as when test subjects take into account whether a human researcher can see them when gesturing to ask for food (Tomasello 2008: 47). Tomasello concludes from these findings that apes, like humans, are aware of other beings' intentionality. Thus, in accordance with his current theory of language acquisition, he should conclude that apes have the cognitive skill-set required to engage in joint attentional frames as well. While to my knowledge Tomasello himself has never explicitly drawn this conclusion in print, he did find in a comparative study of chimpanzees and human infants that in interaction with an adult human and some object, individuals of each species interacted with the object while simultaneously monitoring the adult human's behavior and eye gaze relatively frequently. In that study, Tomasello notes that there was some discrepancy between the behavior of enculturated and captive apes in this regard, but that in the right environment, chimpanzees can display "human-like social-cognitive and joint attentional skills" (Carpenter, Tomasello, and Savage-Rumbaugh 1995).

4.2 - Relevance assumptions

According to Tomasello, scenes of joint attention scaffold the language acquisition process, providing a narrowed context for a language learner attempting to understand new linguistic forms. He defines the communicative context as "not simply everything in the immediate environment, from the temperature of the room to the sounds of birds in the background, but rather... what is 'relevant' to the social interaction, that is, what each participant sees as relevant and knows that the other sees as relevant as well" (Tomasello 2008: 74). As such, the ability to make assumptions of relevance within the

domain of joint attentional scenes is fundamental to Tomasello's account of a language learner's requisite capabilities. In his words:

The key for language understanding in such a situation would be for the [adult] speaker to use some novel word or phrase in a context that suggested his reason for making that utterance at that time... In such cases, the learner makes an inference of the type: If the speaker is using that unknown expression with communicative intention X, then it is relevant to his goal in the current joint attentional frame as I already know it. (Tomasello 2003: 25)

To illustrate this claim by means of a constructed example, we could imagine a one-year-old child watching his father pick up toys from around the room. If at one point the father were to point to a toy fire truck sitting next to the child and say, "How about that truck there?", Tomasello would argue that if any language-learning is to occur, the child must be able to infer that the adult is intending for that stream of sounds to be relevant to his goal of cleaning up the toys. Without making that inference of relevance, Tomasello says, the child will not be able to determine the speaker's meaning. Thus, in Tomasello's theory, a language learner must approach scenes of joint attention with the assumption that the speaker has some particular "communicative intention" motivating his speech act(s) therein. As the above passage indicates, however, Tomasello also believes that competent language users actually have such intentions, their "reason for making that [relevant] utterance at that time." (In our constructed example, this would be the father's intention that the toys be picked up from the floor.) Tomasello asserts that for a speech act to be understood by a new language learner, it "must be grounded [by the speaker] in

the immediate joint attentional frame in a manner sensitive to the current perspective, knowledge, and expectations of the listener" (Tomasello 2003: 293)². At a general level, then, Tomasello's account of language includes speakers (and would-be speakers) acting with relevance toward the current scene and assuming such relevance in the acts of others.

Relevance alone does not account for comprehension of communicative acts, however. Rather, in Tomasello's theory, human-like skills of language develop from motivations of helpfulness, which lead individuals to act with relevance specifically to the other party in an interaction. It is necessary but not sufficient, he argues, for language users to generally act relevantly and assume relevance in others; in addition, they must act helpfully and assume such helpfulness in others. When one being capable of language communicates with another, Tomasello says, "the assumption that I am attempting to inform you of something I think you will find useful or interesting guides your search for communicative relevance" (Tomasello 2008: 101). By his reasoning, learners of a language must assume that what is said to them in a joint attentional scene is intended to be "useful or interesting" to themselves, and for this reason be highly motivated to decipher acts of communication directed toward them. In his own words, this assumption of the other's helpfulness on the part of each party in a linguistic interaction "is what motivates them to cooperate in getting the message across in the first place – they both assume mutually that it will be to their individual and mutual benefit to do so" (Tomasello 2008: 88). Assumptions and motivations of mutual helpfulness enable the two parties to work together to ensure that the language learner fully understands the communicative act in question: "the participants in [language-like] communication must

reason not just practically, but cooperatively" (Tomasello 2008: 93). Only through this sort of cooperation, Tomasello argues, can language learning occur.

To illustrate his reasoning, Tomasello presents an example based on Quine (1960) of a visitor to an unfamiliar culture who does not speak the local language. If a native of that culture were to utter the word "Gavagai" as a rabbit ran past, argues Quine, the visitor would have no means of telling which aspect of the situation the speaker was intending to highlight: the rabbit itself, its coloring, its speed, its unexpectedness, its suitability as the night's dinner, or any of practically an infinite number of other possibilities. Tomasello agrees that "without any forms of shared experience or common ground with the native speaker (which are, for the purposes of the parable, specifically excluded), there is simply no way" for the visitor to understand what the other has meant (Tomasello 2008: 156). However, he comments, a variation on Quine's parable illustrates the transformative power of cooperative assumptions upon the learning environment:

Suppose that there is a cultural practice in the native's village of catching small fish for dinner in a certain way [involving a bucket and a pole]... And let us assume that the stranger is in the process of becoming enculturated into this practice through repeated participation. Now one evening when dinnertime comes, and preparations begin, the native picks up the pole from outside the hut and points for the stranger through the door to inside the hut – perhaps saying "Gavagai." To the degree that the stranger understands the practice, she will know that the native wants her to fetch the bucket inside so that they can go fishing – and so the word *gavagai* almost certainly means either "bucket" or "fetch," or perhaps

something more generic like "that" or "there." But if upon arriving at the stream, the native starts indicating to the stranger that she should fetch other things, also using the word *gavagai*, and not using this word to point out things when they do not need to be fetched, our stranger can begin to crack into the native language. (Tomasello 2008: 156-157)

If, as in this example, (a) the native speaker intends for his speech to benefit the addressee to some degree, and (b) the language learner assumes this to be case, then, Tomasello concludes, the learner will be motivated to master the new linguistic form. And if the unfamiliar utterance takes place within the domain of a joint attentional frame – established in the example above through the two individuals' joint pursuit of a common goal – then, Tomasello argues, the learner will be able to use the communicative context of the joint attentional frame to determine the speaker's meaning. This, Tomasello claims, is how human infants come to understand the language that is addressed to them.

Tomasello has collected a substantial body of experimental data supporting the claim that human children make pragmatic assumptions of relevance on the part of their partners in social interactions. For example, one study familiarized twenty-four month old children with four distinct hiding places of four distinct objects, after which an adult announced her intention to "find the gazzer" and attempted to open one hiding place in particular. Upon finding it locked, the researcher frowned in vexation and said "Let's see what else we can find" before proceeding to take out an object from a different hiding place and then smiling. In later testing, children demonstrated that they had learned the word *gazzer* for the first object, even though a) they never saw the object directly after the adult researcher said the word, b) they did see a distracter object soon after the

utterance, and c) the adult smiled at the distracter object and frowned in relation to the object that remained locked away (Akhtar and Tomasello 1996). In a similar study, a twenty-four month old child, his or her mother, and a researcher played together with three distinct objects until the mother left the room, after which the researcher brought out a fourth object for the child and him to play with as well. Upon the mother's return to the room, she exclaimed "Oh look! A modi, a modi!" without looking at any one particular object. Children tested in this manner later demonstrated an association between the word *modi* and the fourth object of the study, leading Tomasello's team to conclude that they had reasoned the other three objects would not have been relevant to their mothers' excitement (Akhtar, Carpenter, and Tomasello, 1996). Tests such as these, Tomasello claims, indicate that as early as age twenty-four months, human infants can use social-pragmatic relevance reasoning to understand novel utterances (Tomasello 1999: 114-115).

In the experiments testing for assumptions of relevance, the adult researchers were instructed to act with relevance themselves. However, Tomasello has also gathered evidence to support the claim that human beings – specifically, human children – are naturally motivated to act relevantly in joint attentional frames. In an observational study, for example, Carpenter et al. asked parents to record their observations of their infants' pointing in regular social interactions. Such instances included:

Example 14: At age 11.5 months, J points to the door as Dad is making preparations to leave. *Gloss:* Attend to the door; Dad's going out it soon...

Example 19: At age 13.5 months, while Mom is looking for a missing refrigerator magnet, L points to a basket of fruit where it is (hidden under the fruit). *Gloss:* Attend to the basket of fruit; it's there.

Example 20: At age 14 months, two different children, J and L, have accidents when a parent is not looking; when the parent comes to investigate, the infant points to the offending object (i.e., the thing he bumped his head on, or the thing that fell down). *Gloss:* Attend to that object; it hurt me/fell down. (Tomasello 2008: 114-115)

In all such examples, the child's declarative comment expressed by pointing (as interpreted by the researchers in the accompanying gloss) appeared to the researchers to be relevant to the unfolding joint attentional scene. While there is no way to conclusively verify the researchers' glosses, Tomasello finds their interpretations persuasive and argues that this research indicates that human children act relevantly in addition to assuming relevance in the actions of others.

Tomasello also presents evidence that human children approach social interactions with the assumption that other individuals will be helpful towards them. He cites a 2005 study, which found that fourteen-month-old children can find a desired toy by following the pointing or ostensive eye gaze of an adult to spot where the toy is hidden. In each trial, the child subject was shown two possible buckets, one of which contained the toy and the other of which was empty. The researcher next indicated, either by gazing back and forth between bucket and child or by intentionally pointing, which container held the object the child wanted. The subject was then encouraged to pick a bucket to find the toy, and the results showed that children selected the correct container

at a ratio far above chance. This finding contrasts with the control setup for the experiment, wherein the researcher did not appear to intentionally indicate the correct bucket – although he still had an arm or line of sight extended towards it – and children guessed right roughly half of the time (Behne, Carpenter, and Tomasello 2005). From this, Tomasello concludes that human children naturally assume helpfulness in the intentional actions of others, a trait that they bring with them to the task of acquiring language (Tomasello 2008: 131).

Finally, Tomasello argues that human infants themselves are helpfully motivated towards other individuals. He claims that Example 19 in the Carpenter et al. study cited above, wherein the child L pointed to the location of the item her mother was seeking, is indicative of a general human tendency to offer helpful information to their social partners. In an experimental study performed by members of Tomasello's team to investigate this claim, a series of 18-month-old human infants observed an adult researcher (whom they had just met) struggling to accomplish some task, such as reaching for an accidentally dropped marker or bumping into a cabinet with his hands full while trying to open it. 22 of the 24 infants studied helped the adult perform the task – in this case, picking up and returning the marker or opening the cabinet door – and they did so almost immediately, "before the adult either looked to them or verbalized his problem... Thus, the experimenter never verbally asked for help, and for the vast majority of helping acts, eye contact (as a subtle means of soliciting help) was also unnecessary" (Warneken and Tomasello 2006). Each task also had a control setup, such as the adult dropping the marker intentionally or bumping into the cabinet in the process of doing some other activity. In these setups, the infants subjects did nothing, "showing that they

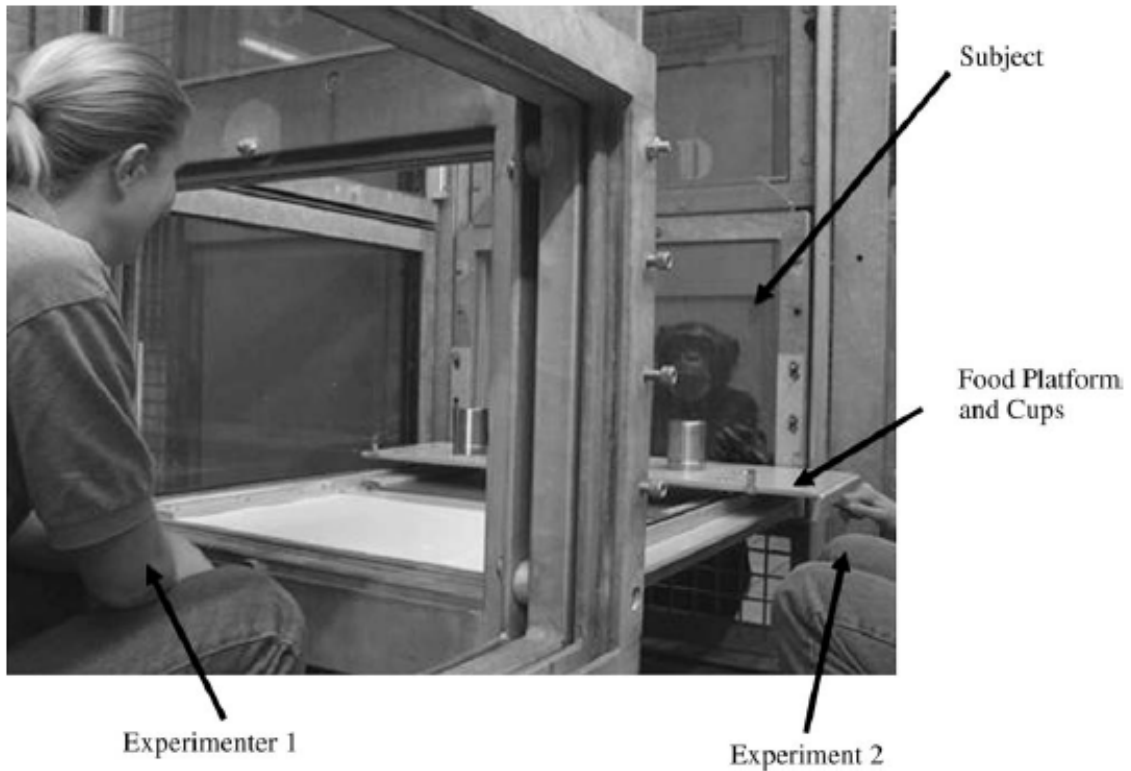
do not just like fetching [markers] or opening cabinets in general" (Tomasello 2009: 7). On the basis of such studies, Tomasello concludes that "children's early helping... is an outward expression of children's natural inclination to sympathize with others in strife" (Tomasello 2009: 13). In his view, human children at the time of their entry into language are therefore able and naturally motivated to a) act relevantly, b) assume relevance in others, c) act helpfully and d) assume helpfulness in others. All four of these, claims Tomasello, are required for the understanding and acquisition of linguistic utterances.

As shown in the preceding section, Tomasello currently believes that apes have the cognitive skill-set required to engage in joint attentional frames: they show evidence of analogizing from self to other, they recognize their own intentions, and they have an understanding of the intentionality of others. The next logical question for Tomasello is therefore whether within the domain of joint attentional frames non-human apes are able to understand linguistic utterances. According to his current theory of language acquisition, this ability has the four components a – d mentioned immediately above: acting relevantly, assuming relevance in others, acting helpfully, and assuming helpfulness in others. He has therefore conducted research to test for these four behavioral tendencies in the great apes.

To explore the issue of whether chimpanzees act relevantly toward other individuals, Tomasello would say, is to question whether apes ground their communicative acts "in the immediate joint attentional frame in a manner sensitive to the current perspective, knowledge, and expectations of the listener" (Tomasello 2003: 293). To test for this behavior, researchers associated with Tomasello devised an experiment wherein an ape subject who had learned to use visual gestures to beg for food from

human researchers was matched with a food-holding researcher who would either be facing the ape (condition 1) or facing away from the ape (condition 2). The study found that ape subjects "were highly sensitive to front-back body orientation of the experimenter and gestured preferentially when the experimenter was facing them. These findings corroborate previous studies that have shown that chimpanzees and orangutans use visual gestures toward partners who are facing them...but use more vocalizations to partners that are not facing them... [In addition], subjects significantly reduced their behavioral output when the experimenter left the room" (Kaminski, Call, and Tomasello 2004). Tomasello cites this finding as evidence that apes do in fact take into account such factors as the perspective of their audience when attempting to communicate (Tomasello 2008: 47). Although to my knowledge he has never described apes' actions in terms of relevance, his claim that they engage in practical reasoning to communicate by "determining what the other wants, the reason he wants it, and what he is likely to do next" (Tomasello 2008: 49) echoes his comment that speech acts are relevant due to the speaker's sensitivity "to the current perspective, knowledge, and expectations of the listener." Given those arguments, it seems fair to attribute to Tomasello the composite claim that apes act relevantly.

According to Tomasello, there is also significant evidence that apes assume that the acts of others are relevant, at least to the others' own goal(s). For example, in an experiment similar to that of Behne, Call, and Tomasello (2005), researchers presented a series of individual chimpanzee subjects with a choice of two identical opaque cups, one of which held a desired item of food. The chimpanzees learned that they could keep the food item discovered if they picked the correct cup, but that they would only be allowed



The chimpanzee subject faces Experimenter 1 while Experimenter 2 brings the food platform with two identical opaque containers towards the ape. From Hare and Tomasello, 2004. "Chimpanzees are more skilful in competitive than in cooperative cognitive tasks."

to guess once per trial. In the "competitive condition," the subject learned that an experimenter also wanted the food item, and that the human would reach for the correct cup to get it. When a second experimenter moved the platform holding the cups so that the first experimenter could extend an arm as though reaching for the correct cup, but could not actually grab it, the chimpanzees were able to correctly guess which container held the food. In Tomasello's analysis, the apes "were thus able to infer: she wants to get into that bucket for herself; therefore, there must be something good in there" (Tomasello 2008: 41). In other, non-competitive situations (discussed in more detail below), the chimpanzees did not appear to interpret a researcher's outstretched arm as an indication of where the food item was hidden. However, Tomasello argues that when chimpanzees understood the researcher was motivated to obtain the food for herself, they were able to

assume that her reaching was relevant to her goal, and to learn from that assumption information that was of benefit to themselves (namely, the location of the food). Thus, he concludes, chimpanzees assume relevance in the intentional acts of others.

As noted above, Tomasello defines the helpfulness which he claims is a requirement for language acquisition as intentional relevance to the other party's intentional goal in a social interaction. In the studies of human infants, for example, test subjects intentionally performed actions that were designed to assist another party in accomplishing his or her goals, and seemed to reason that the intentional acts of the other party were designed to help them accomplish their own goals. Tomasello has looked for similar behaviors of helpfulness in chimpanzees, but argues based on his findings that the species fails to meet the behavioral requirements to merit the attribution of a helpful motivation. In a study currently awaiting publication, for example, Bullinger, Zimmermann, Kaminski, and Tomasello designed an experiment wherein a human needed a tool to fetch something, but appeared to not know the tool's location. A chimpanzee test subject knew of the human's need and could, if so inclined, point to the tool's location. The evidence for this knowledge is that the researchers found that apes reliably pointed to the location under the test condition of the tool being used to fetch something for the ape itself. But when the human wanted to use the tool to fetch something for herself instead, the apes failed to point to it, "which is consistent with the interpretation that their pointing is really a directive" rather than an offer of helpful information to the other party (Tomasello 2009: 17). That is, in Tomasello's opinion, although chimpanzees assume and can act with relevance, they do not appear to be

motivated to communicatively share with another information that would be relevant to the other's own goals. In this sense, Tomasello argues, they are not helpful.

Finally, Tomasello claims that chimpanzees do not assume that the behavior of others is intended to be helpful to the self – a key component of his account of how individuals understand unfamiliar linguistic expressions. In the object choice task presented by Hare and Tomasello (2004), for example, chimpanzee subjects were only able to reliably understand a human's reaching behavior and thus choose the correct container to find the hidden food item in the competitive condition where the human was assumed to want the food for herself. When an experimenter who had never competed with the ape for food pointed or gazed informatively – i.e., helpfully – toward the correct container, the ape seemed to follow the gesture and correctly identify the target of the human's attention. However, the chimpanzee would then pick a container at random, regardless of whether it was the attention target or not. Tomasello argues that such behavior indicates "that following the directionality of the point was not the problem; they just did not seem to understand its meaning, its relevance to their search for the food. It is as if the apes said to themselves, 'OK. There's a bucket. So what? Now where's the food?' ...[The apes] were *not* able to infer: she wants me to know that the food is in the bucket" (Tomasello 2008: 39, emphasis in original). Tomasello observes that in the wild, chimpanzees compete with one another for food, rather than cooperate, and thus have no need for

...something like the philosopher Paul Grice's principle of cooperation [in humans]: others are trying to be helpful by informing me of things relevant not to themselves but to their interlocutors. Chimpanzees do not

operate with [or assume that others are operating with] anything like a Gricean principle of cooperation – fittingly, in their natural worlds – and thus they have no basis for making the appropriate relevance inference.

(Tomasello 2009: 18)

Thus, in Tomasello's opinion, chimpanzees act with and assume relevance, but neither act helpfully nor assume helpful motivations in the actions of others.

4.3 – Role Reversal Imitation

Although Tomasello asserts that making relevance assumptions is a necessary skill for a learner of language to have, he argues that this ability is not sufficient to explain how language develops as an intersubjective social phenomenon. He claims that, even if the members of a given species were able to establish joint attention with interactional others and to decipher speaker meanings within such interactions – and did so by relying on assumptions of relevance and helpfulness – they would still not develop what we call language unless they also possessed the ability and the motivation to imitate each other's communicative acts. Without this imitative foundation promoting stability of meaning across individuals and situational contexts, argues Tomasello, members of the species might freely and idiosyncratically invent their own utterances to suit their current needs, rather than use forms they have heard previously in the speech of others and/or used previously themselves. He contends that other individuals of this species would do their best to interpret unfamiliar speech acts as they occur, as prelinguistic human infants do, but that this task would be greatly complicated by the lack of stability in utterance form and meaning. In fact, Tomasello explicitly claims that stability is what enables, in

part, the listener's understanding of meaning: "In general," he observes, "if a child were born into a world in which the same event never recurred, the same object never appeared twice, [or] adults never used the same language in the same context, it is difficult to see how that child – whatever her cognitive capabilities – could acquire a natural language" (Tomasello 1999: 109). According to Tomasello, members of a species capable of language must be able to use "the same language in the same context" across interactions, and they must be motivated to do so.

Tomasello has written extensively on the topic of role-reversal imitation, the process by which "an individual [who] comprehends how a communicator is using some communicative device toward her... then reproduces that use in her own communication back toward others in kind" (Tomasello 2008: 103). To do so, argues Tomasello, the language learner must construct a mental representation of the communicative device that includes the roles of its speaker and listener(s), and then substitute into that representation the relevant parties for his or her own use of the act. Role-reversal imitation is thus a specialized form of imitation, in which the imitator substitutes the self in the role of performer in his or her conceptualization of the action to perform, and also substitutes some other party – prototypically the original performer – into his or her own original role as recipient. Tomasello claims that a typical instance of imitation – as when a child first sees an adult playing with a toy and then proceeds to play with the toy in the same way – does not qualify as role-reversal, as the imitating individual substitutes only himself or herself for the original actor in his or her mental representation of the action, while the target of the action and the goal in relation to that target remain the same. Yet unlike in this situation, Tomasello asserts that "the adult's goal in using [a communicative

device] involves the child's attentional state. Consequently, if the child simply substitutes herself for the adult she will end up directing the [communication] to herself – which is not what is needed" (Tomasello 1999: 105). To engage in role-reversal imitation, argues Tomasello, an individual must view a social interaction from a 'bird's eye view' in which she "knows that she is in some sense equivalent to others [and that] actors can substitute for one another in acts of imitation and role reversal" (Tomasello et al. 2005: 689).

As with the other elements of Tomasello's theory that were mentioned above, however, the mere ability to engage in role-reversal imitation is not sufficient to explain the occurrence of the behavior in actual speakers. Rather, communicators must be motivated to engage in this kind of imitation. According to Tomasello, the motivation to imitate (in general) can more properly be construed as the motivation to adhere to norms, which arises from "mutual expectations about behavior and a concern for reputation plus pressure to conform to group expectations" (Tomasello 2008: 212). That is, once a language-capable individual understands the meaning behind a communicative act, he or she will be motivated by a social pressure toward conformity to produce the same action when he or she wants to convey the same meaning, and so will not invent an original, ad hoc communicative device to achieve this purpose. The social pressure to conform, Tomasello suggests, reflects "a kind of group identity and social rationality" that is most apparent in collaborative acts requiring multiple individuals to work together to accomplish a mutual goal. Thus, according to Tomasello, beings that collaborate with one another to pursue common goals must possess a strong sense of group identity which, in turn, produces the motivation to imitate in accordance with perceived social norms.

As Tomasello believes that human infants are capable of understanding the meaning behind a communicative act, he asserts that they should be able to express the same meaning through role-reversal imitation as long as a) they know that they are "in some sense equivalent to others", which underlies the motivation to conform and b) they are able to learn imitatively from the actions of others. This first requirement, identification of the self with others, has already been mentioned as one of the cognitive capabilities Tomasello ascribes to intention-reading individuals, and so should need no further mention here beyond the reminder that Tomasello has found that both humans and apes seem to act upon such identification. He has also gathered evidence purported to show that human infants satisfy requirement *b*, i.e., possession of the ability to learn imitatively. For example, in an experimental study by Meltzoff (1988), later modified by Carpenter, Nagell and Tomasello (1998), eleven-to-fourteen-month-old infants who observed an adult researcher bend at the waist, touch his head to a wall panel, and thereby turn on a light, later proceeded to turn on the light through the same sequence of actions, "even though it was an unusual and awkward behavior and even though it would have been easier and more natural for them simply to push the panel with their hand" (Tomasello 1999: 82). The experimental setup emphasized the "goal-directed nature" of the imitated action, and the researchers tested and rejected the alternate hypothesis that the children were naturally motivated to imitate witnessed actions beyond the goal of turning on the light. They also tested for, and rejected, the idea that touching one's head to the wall panel was a behavior a human child would enjoy performing outside of any imitative context. Tomasello comments:

One interpretation of this [imitative] behavior is that infants understood (a) that the adult had the goal of illuminating the light; (b) that he chose one means for doing so from among other possible means; and (c) that if they had the same goal they could choose the same means – an act in which the child imagines herself in the place of the other. (Tomasello 1999: 82)

Tomasello contends that experiments such as these demonstrate the capability of human infants to engage in imitative learning, and so role reversal imitation is well within their capabilities as intention-reading individuals who understand communicative meanings and identify with others.

If, as Tomasello claims, human infants engage in role reversal imitation in their acquisition of language, then they must be motivated to use their imitative skills in that manner. According to his theory elaborated upon above, such motivation would also be manifested as a sensitivity to social norms, and would ultimately be expressed in collaborative action between individuals toward a common goal. In support of the claim that social norms govern human behavior, Tomasello observes, "[I]f I attempt to communicate with you – I say 'Hey, Ethel' and you look at me – when I then produce my gesture or utterance, you cannot just ignore me as though I did not attempt to communicate... [And] if I make a small request, like 'Please pass the salt' at the dinner table (either in speech or gesture), you cannot really reply with 'No' – unless you make some excuse for why you cannot comply in this circumstance (and knowing this, I must make reasonable requests)" (Tomasello 2008: 92). He elaborates upon additional norms that humans seem to follow in communicative interactions, and finally concludes:

Thus, from the production side, we humans must communicate with others or we will be thought pathological; we must request only things that are reasonable or we will be thought rude; and we must attempt to inform and share things with others in ways that are relevant and appropriate or we will be thought socially weird and will have no friends. From the comprehension side, we again must participate, or we will be thought pathological; and we must help, accept offered help and information, and share feelings with others, or we will risk social estrangement. The simple fact is that, as in many domains of human social life, mutual expectations, when put into the public arena, turn into policeable social norms and obligations. (Tomasello 2008: 93)

According to Tomasello, experimental tests of human children support these claims, showing that "children do not just follow norms as they encounter them, but in new situations they actively seek out what they are supposed to do – what the social norms and rules are in the situation – so that they can behave accordingly" (Tomasello 2009: 35). In one particular experiment that Tomasello highlights, three-year-old children were taught how to play a one-player game, after which they were introduced to a puppet announcing that it would play the game now too. When the puppet played its game in a different way than what the children were used to, many of them raised objections to the puppet's behavior (Rakoczy, Warneken, and Tomasello 2008). According to Tomasello, "The children's language when they objected demonstrated clearly that they were not just expressing their personal displeasure at a deviation. They made generic, normative declarations like, 'It doesn't work like that,' 'One can't do that,' and so forth. They do not

merely disapprove of the puppet playing the game differently; he is playing it improperly" (Tomasello 2009: 37). Although the children in this experiment are well beyond the prelinguistic phase, Tomasello claims that the sensitivity to norms that they display is indicative of human infants in general, including those in the first year of life who are beginning to acquire language. On the basis of such findings, Tomasello concludes that human children are keenly aware of the set of behavior-guiding norms that restrict their social actions.

According to Tomasello, such norms are indicative of a sense of group identity that also surfaces in acts of collaboration between individuals. "In shared cooperative activities," he writes, "we have a joint goal that creates an interdependence among us – indeed, creates an 'us.' If we are carrying a table to the bedroom, I cannot simply drop it and run off without hurting us and our goal" (Tomasello 2009: 41). Warneken and Tomasello (2006) tested what amounts to the same proposition in an experimental setup, by having an adult experimenter first participate in some activity (either a social game or an instrumental task) with a 14-to-24-month-old child, and then abruptly stop. According to Tomasello, the child subjects responded to such a shift in the researcher's behavior by "actively encourag[ing] him to reengage... suggesting that they had formed with him a shared goal to which they now wanted him to recommit" (Tomasello 2009: 64-65). He also notes that this behavior was the same whether the collaborative activity had been the instrumental task in which adult and child were working together to achieve some prize or the social game that had no practical goal beyond the playing itself. In fact, the child subjects "sometimes turned the instrumental tasks into social games by placing the obtained reward back into the apparatus to start the activity again; the collaborative

activity itself was more rewarding than the instrumental goal" (Ibid.). In Tomasello's opinion, therefore, humans are collaborative agents with a conception of group identity that motivates imitative adherence to social norms. As such, he says, we are motivated to engage in role reversal imitation in the acquisition of language.

Turning our attention back to apes, it is unclear whether Tomasello believes that chimpanzees are unable to engage in human-like role-reversal imitation. After all, as Tomasello defines it, role-reversal imitation requires the would-be imitator to have an understanding of the other's communicative meaning in some situation, so Tomasello might conceivably argue that because they do not assume the helpfulness of others, apes are unable to infer meaning in this way. If so, that argument would entail the assertion that role-reversal imitation never occurs in non-human apes – and thus cannot be tested for – but not that chimpanzees do not have the cognitive capacities that would be required to perform the behavior otherwise. In fact, Tomasello does appear to grant such capacities to apes, in that he describes them as capable of both imitative learning and identification with others. The latter is accounted for in Section 3.1 of this thesis in relation to chimpanzee self-to-other analogizing, while the former is one of the latest capacities that Tomasello's research team has experimentally found indicated in the behavior of chimps.

In a 2007 experiment, for example, Buttelmann, Carpenter, Call, and Tomasello studied eight enculturated, or human-raised, chimpanzees, to determine whether the apes were rational imitators when performing an action on a newly introduced device. The devices were grouped in pairs that were highly similar, e.g., a box that lit up when pressed on its top and a box that made noise when activated in the same fashion. The test

subjects watched as an experimenter interacted with one of the devices using some body part besides his hands, for instance activating one of the boxes by pressing his forehead to its top. While interacting with the device in this fashion, the experimenter's hands would either be free or otherwise occupied. (The chimpanzee subject would later be shown the experimenter interacting with the other object of the pair, with the opposite hands

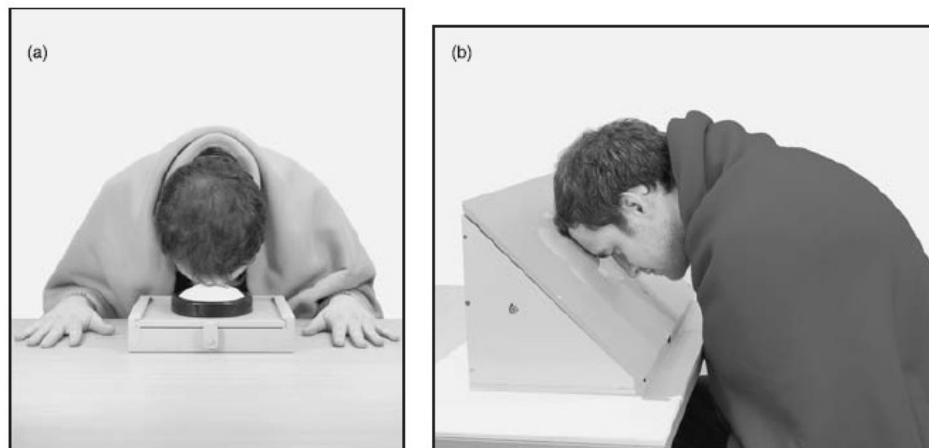


Figure 1 *The Head task: E1 performing a demonstration (a) in the Hands Free condition of the light version and (b) in the Hands Occupied condition of the sound version as seen from the participants' perspective.*

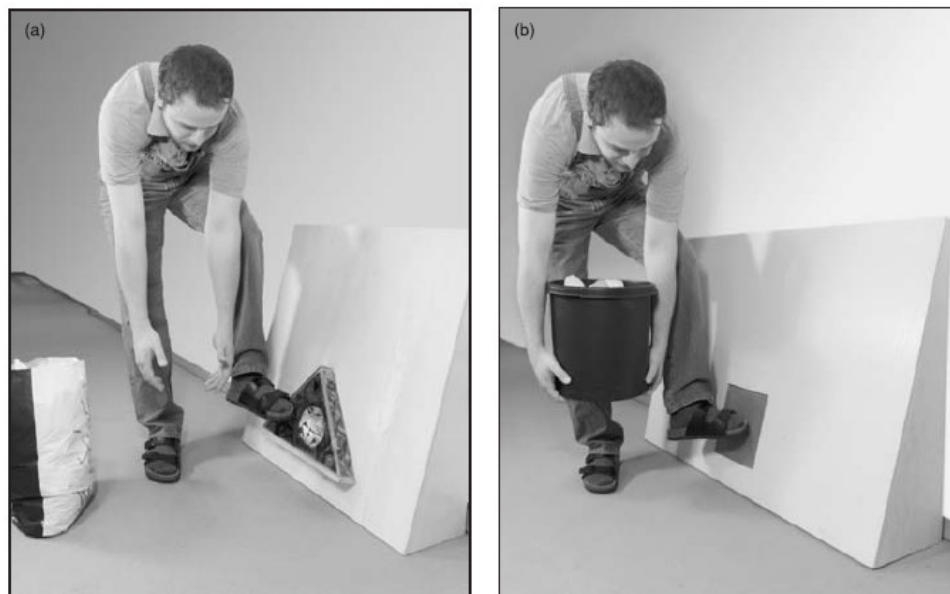


Figure 2 *The Foot task: E1 performing a demonstration (a) in the Hands Free condition of the light version and (b) in the Hands Occupied condition of the sound version as seen from the participants' perspective.*

condition.) The goal of the experiment was to see whether and to what extent the enculturated apes would imitate the actions of the human researchers upon the devices. When the apes were subsequently given the chance to interact with the devices themselves, there were three possible outcomes: the subjects could imitate the earlier actions of the humans fully, rationally, or not at all. For this experiment, full imitation was defined as copying every aspect of the previous action, regardless of whether the human had been constrained by having his hands occupied at the time. Rational imitation, by contrast, was defined as imitation in which the test subject seemed to take the original situation's constraints into account. For example, if the experimenter's hands had been full when accessing the device, a rational imitator would assume that using hands instead of some other body part was likely an acceptable strategy for oneself to pursue. If, however, the experimenter's hands had been free and yet not used in the original condition, a rational imitator would assume that the specific body part that was used had been chosen freely by the human, and that the action must be imitated with that body part exactly. In other words, a rational imitator would perform differentially based on his analysis of the test condition as free or constrained, while a full imitator would instead imitate the entirety of the action he saw, regardless. A non-imitator, of course, would not reliably imitate any aspect of the situation.

At the conclusion of the test trials, the research team concluded that their chimpanzee subjects could reliably "imitate others rationally, taking into account the reasons behind their actions" (Buttelmann, Carpenter, Call, and Tomasello 2007). Although these subjects were enculturated apes, whose behaviors are different from those of individuals in the wild, there is no reason to assume that their cognitive capacity for

imitative learning is a cultural artifact rather than a nature property of chimpanzee cognition. To my knowledge, Tomasello himself has never ascribed to chimpanzees the capacity for role-reversal imitation, yet their possession of that capacity would seem to be a logical entailment of his current theory and experimental findings. If chimpanzees can imitate as well as identify with others, then Tomasello's current theory would support the notion that their species has the cognitive capacity (although perhaps not the right social environment) for role reversal imitation.

Despite these findings, Tomasello argues that nonhuman apes do not have the cooperative motivation required for normative behavior like role reversal imitation, and thus do not engage in such behavior. In the Warneken and Tomasello (2006) study cited above, in which human researchers synchronized their behavior with a test subject in a problem-solving task and then abruptly stopped, the research team tested for awareness of norms in young human-raised chimpanzees as well as in human children. They found that, unlike the 14-to-24-month old children, the chimpanzees did not react to their partner's sudden abandonment of the joint activity between researcher and subject. Tomasello reports that "when the human partner stopped participating, no chimpanzee ever made a communicative attempt to reengage her – even in cases where they were seemingly highly motivated to obtain the goal" (Tomasello 2009: 64). In Tomasello's opinion, this finding suggests both that the chimpanzee subjects had not formed a joint goal with the human experimenter and that they felt no pressure to conform to group expectations and act collaboratively. He observes that when the researchers sought to engage the chimps with the tasks in the experiment that had been designed as social games rather than as instrumental tasks, the nonhuman subjects "showed no interest...

basically declining to participate" (Ibid.). Collaboration for its own sake, Tomasello concludes, is not a significant motivating factor for chimpanzees.

Tomasello also asserts that apes are not motivated by social norms of fairness, citing a chimpanzee study based on the classic ultimatum game from economic game theory. In the classic setup, two strangers who cannot see one another are assigned the roles of proposer and responder for the duration of the game. The proposer is presented with a lump sum of money and must propose what percentage of it she will give to the other party, and what percentage she will keep for herself. The responder is then presented with the proposal, which he can either accept or reject. If he accepts the proposer's terms then each party gets to keep the agreed upon sums, but if he rejects the proposal, neither the proposer nor the responder walks away with anything. Although it would thus be in the responder's best interest to accept any offer (as any cash gain should be better than none), in actual practice responders tend to reject any offer lower than 30%, a behavior which Tomasello interprets as enforcing the norm of fairness. He notes that, perhaps due to their anticipation of such enforcement, proposers typically make an offer of around 50% to their unseen partner (Tomasello 2009: 32-33). Tomasello conducted a similar experiment with chimpanzee subjects in which one ape was given a choice between two trays, each with a pre-established division of ten desirable food items for the subject and his or her partner in an adjacent room. For example, in one condition, the subject could choose either a tray that held eight grapes for him- or herself and two for the other ape, or a tray that held five grapes for each. Once the "proposer" had selected a tray and pulled it toward the two rooms as far as he or she could, halfway, the "responder" in the adjacent room could choose to either complete the transaction by

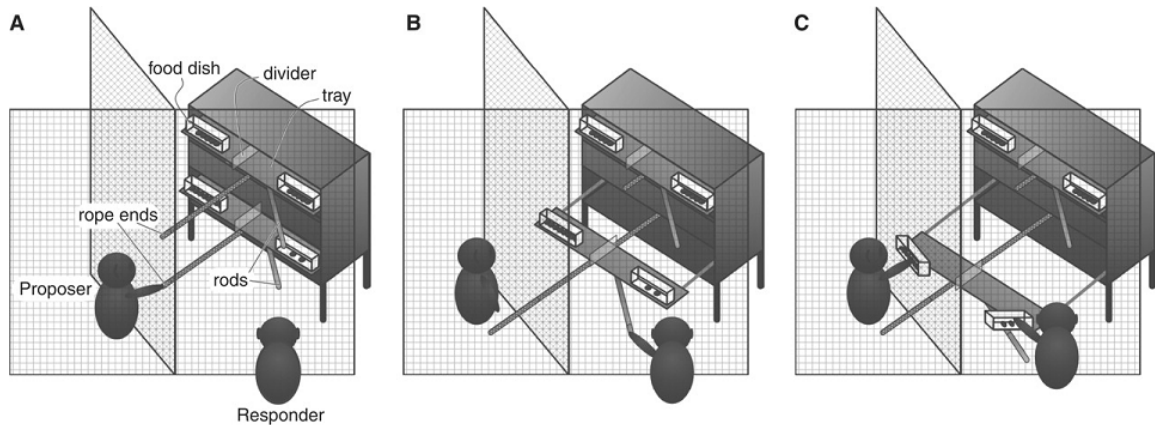


Fig. 1. Illustration of the testing environment. The proposer, who makes the first choice, sits to the responder's left. The apparatus, which has two sliding trays connected by a single rope, is outside of the cages. (A) By first sliding a Plexiglas panel (not shown) to access one rope end and by then pulling it, the proposer draws one of the baited trays halfway toward the two subjects. (B) The responder can then pull the attached rod, now within reach, to bring the proposed food tray to the cage mesh so that (C) both subjects can eat from their respective food dishes (clearly separated by a translucent divider)

Keith Jensen, Josep Call, and Michael Tomasello. "Chimpanzees Are Rational Maximizers in an Ultimatum Game," 2007.

pulling the tray the other half of the way toward both parties or reject the offer by not pulling. According to Tomasello, the chimpanzees he tested acted as rational maximizers: in the role of responder in the ultimatum game for desirable food items, they accepted any offer higher than 0% (but not 0%, indicating that the subjects were not just utilizing the acceptance mechanism arbitrarily or for its own sake). Tomasello comments that chimpanzees are thus very unlike humans in the playing of the ultimatum game: they do not systematically make fair offers to conspecific responders; they do not systematically reject unfair offers from conspecific proposers; and they very rarely (2% of trials in this experiment) exhibit signs of anger at an unfair offer. Based on these findings, Tomasello concludes that the apes have no human-like norm of fairness motivating their cooperation and collaboration with others (Jensen, Call, and Tomasello 2007). More generally, he asserts, "There is no evidence that nonhuman primates create anything resembling a public space in which considerations of reputation and normative sanctions are at play" (Tomasello 2008: 216). Without the notion of group identity that these social norms would imply, states Tomasello, chimpanzees are not motivated to conform imitatively to group expectations, including the expectation that a communicator who understands the

meaning behind a communicative device will produce an utterance of the same form to convey the same meaning. Therefore, he concludes, there is no evidence that a stable language-like system of communication could ever arise among a group of chimpanzees.

4.4 – Pattern-finding and grammaticalization

As shown above, Tomasello believes that the word-learning competence of humans is the result of many different cognitive and interpersonal capacities, none of which serves the explicit purpose of language acquisition alone, and not all of which are found in chimpanzees. In essence, Tomasello's explanation for the inability of nonhuman apes to acquire words in a human-like fashion is founded on his conviction that they do not act helpfully or assume helpfulness in others and that they lack the capacity to form joint goals and conform to group expectations. At the same time, Tomasello is aware that a full language does not consist of words alone. He agrees with Chomsky that a theory of human linguistic uniqueness should be based not on claims about lexical acquisition, but rather on claims about the acquisition of syntactic competence. However, a key component of Tomasello's theory of language acquisition is the claim that syntax, prosody, and other non-lexical features of language are acquired through the same general processes as are words. Tomasello asserts that such features are not only algebraic structures that organize the linear combination of words, but are also meaning-bearing elements of language in their own right. He observes that "if I say to you 'The dax got mibbed by the gazzer,' you know – without knowing the meaning of a single content word – that the gazzer did something (called mibbing) to the dax (and we have entered that event from the perspective of the dax, as patient)" (Tomasello 2008: 297).

Tomasello argues that this sort of knowledge is held by all native speakers of English, and that it is particularly the knowledge of the grammatical structure's meaning. He likens meaning-bearing syntactic constructions to lexical items in a language, concluding "that the construction itself – the abstract pattern – is a linguistic symbol, albeit a complex one with internal structure... But since abstract constructions are essentially patterns of use, they cannot be imitated directly, but rather children must (re-)construct them across individual learning experiences with different exemplars of the construction" (Tomasello 2008: 297-8).

For example, Tomasello claims the English construction "X got Y-ed by Z" has a specific meaning, which is in part that Y-ing is an action Z performed upon X. He argues that language learners, hearing repeated instances of this pattern (e.g. "The baby got scolded by the mommy," "I got slapped by her," etc.), will be able to decipher the pattern's meaning like they would the meaning of a single word, "using their general skills of intention-reading and pattern-finding. They understand the communicative functions of utterances... by reading the intentions of the speaker. They then find patterns across item-based constructions by schematizing and making analogies" (Tomasello 2003: 143). The requisite pattern-finding and analogizing abilities, Tomasello writes, "are necessary for children to find patterns in the way adults use linguistic symbols across different utterances, and so to construct the grammatical (abstract) dimensions of human linguistic competence" (Tomasello 2003: 4). Tomasello contends that this type of acquisition, which so closely resembles word-learning as he sees it, is the only way children can learn a language, for he does not believe such grammatical structures to be innate. Flatly disagreeing with Chomsky's notion of an evolved Universal Grammar in

humans, Tomasello asserts that children acquire language "within the constraints of preexisting human cognition and sociality... It is not that the evolution of some kind of innate syntactic template is impossible, it is just that currently there is no evidence for it empirically... and no need for it at all [theoretically]" (Tomasello 2008: 313). He concludes that "although many aspects of human linguistic competence have indeed evolved biologically, specific grammatical principles and constructions have not" (Ibid.).

Due to Tomasello's conviction that syntactic structures are acquired in the same fashion as are words, there is little specifically concerning syntactic acquisition to add to the present discussion of his theory of the comparative linguistic capacities of apes and humans. According to Tomasello, any individual capable of acquiring lexical items will already possess the capacities required to acquire patterns of syntax as well, provided also that that individual is able to recognize those patterns in the speech around him or her. He defines the requisite pattern-recognizing skills as ones of categorization, which include but are not limited to "the ability to create analogies (structure mappings) across two or more complex wholes, based on the similar functional roles of some elements in these different wholes" (Tomasello 2003: 4). As support for the human capacity for this behavior, Tomasello cites an article by Gentner and Markman (1997) which offers a variety of examples of children who are in the process of learning language and who display the ability to analogize in non-linguistic domains. The researchers mention:

Lucas, a 25-month-old child, plays with a new toy that has six colored doors. Each door has its own key—a red key for a red door a blue key for a blue door, and so on. Lucas opens each door with the key of the corresponding color. Then he sees a seventh white key. He carefully

inspects the toy from top to bottom . Then he turns to his parents and asks,
"Where the white door?" (Gentner and Markman 1997: 48)

Tomasello argues that this child's analogizing behavior is representative of the mental processes of categorization that a language learner must bring to bear on the linguistic input he or she is hearing. He also cites experimental studies on the pattern-finding abilities of prelinguistic humans in the auditory domain, such as a study by Marcus et al (1999). In that experiment, researchers played for seven-month-old human infants a three-minute speech stream of nonsense words containing trisyllabic units of the form ABB, like *wididi* or *delili*. They then played two other speech streams, one of which had other ABB nonce words like *bapopo* and the other of which utilized the same syllables but in a different order. The study was set up so that the infant subjects could look at either sound source in the latter part of the experiment, and the researchers found that children preferred to look toward the source playing the earlier pattern. Tomasello concludes "that prelinguistic infants are able to find patterns in auditory stimuli of an abstract nature, which would seem to be a necessary (although not sufficient) skill in the learning of abstract grammatical patterns in linguistic stimuli" (Tomasello 2003: 30). Along with the capacities which Tomasello argues are required for a being to learn individual words, he claims that pattern-finding skills of this type are necessary for the acquisition of language.

Nevertheless, Tomasello does not consider human pattern-finding skills to be an essential component of his account of human linguistic uniqueness. Rather, he thinks that such skills "are evolutionarily fairly old, probably possessed in some form by all primates at the very least... allow[ing] organisms to categorize many different aspects of their

worlds into a manageable number of kinds of things and events" (Tomasello 2003: 4). In support of this claim, Tomasello cites a number of studies which conducted tests similar to those of Marcus et al. on cotton-top tamarin monkeys and which found comparable results of the subjects' pattern-finding skills. He describes these skills as "very deep-seated" evolutionarily (Tomasello 2003: 30), and hence, likely also present in the great apes. To investigate ape pattern-finding skills and particularly the comprehension of English syntax, Tomasello analyzed the performance of the bonobo Kanzi, who has displayed some degree of competence at understanding spoken English and at using a lexigram keyboard to communicate, in response to vocal requests involving two objects whose roles could easily be reversed, such as "Put some milk in the water." He concluded:

Kanzi's performance indicated that he was doing more than simply responding to the words in the sentences in some plausible way; he understood the use of word order as a contrastive symbolic device. For example, Kanzi responded correctly to the two requests: 'Put the *hat* on your *ball*' and 'Put the *ball* on the *hat*.'... Kanzi knows [that in English] the object being put (e.g., 'hat') is named first and the place it is being put (e.g., 'on the ball') is named only afterwards, even when the object and location could easily have been reversed. He knows that the person biting or chasing is mentioned before 'bite' or 'chase,' and the one being bitten or chased is mentioned only after. He knows these things presumably because he has seen one order paired with one version of the key event

(e.g., *X chasing Y*) and another order paired with another version of the same event (e.g., *Y chasing X*). (Tomasello and Call 1997: 267)

Tomasello does not believe that Kanzi is a fully linguistic creature, and he notes that the bonobo "uses mostly single words... he uses his lexigrams mostly to request rather than to report or make comments... his production of symbol combinations shows no signs of grammatical marking, and his comprehension of symbol combinations shows word-specific structure only" (Tomasello and Call 1997: 268). Nevertheless, he takes the bonobo's competence in comprehending certain English structures as an indication that great apes share the pattern-finding abilities which he takes to be necessary (if not sufficient) components of the human capacity for language-learning.

In Tomasello's view, besides the pattern-finding abilities that he claims humans share with all primates, the question of syntactic acquisition is not truly a separate matter from that of the acquisition of words. Therefore, in his theoretical argument, the ability to acquire syntactical structures does not require a separate component in the explanation for human linguistic uniqueness. Although syntax, like language itself, appears only in the communication of humans, Tomasello does not consider either to be innately human properties. Rather, in his view, syntactic structures and words alike are acquired by human children because our species possesses many particular cognitive and interpersonal capabilities, some of which – but not all – are shared with apes.

5 – Discussion and conclusions

Tomasello's current explanation for human linguistic uniqueness, as a corollary of his overall account of language acquisition and development in humans, is strengthened

by years of experimental research. His research team has tested human infants and found evidence for many of the myriad cognitive and cooperative abilities which he claims are requisite for a learner of language. Similar tests of nonhuman apes have yielded limited or negative evidence for the creatures' capacities to act helpfully, assume helpfulness in others, form joint goals, and construct and conform to group expectations. Because his experimental data show that there are many cognitive and interpersonal skills which nonhuman apes share with humans, there is compelling, if not conclusive, support for Tomasello's claim that it is the apes' lack of these cooperative abilities which precludes their acquisition of a human-like language.

Although my focus in this thesis has been on Tomasello's theoretical account, rather than on the plausibility of the experimental findings he has claimed, it is worth pointing out that his research data and his specific conclusions about nonhuman primate socio-cognitive capacities have not been universally accepted. For example, although Tomasello claims that nonhuman apes do not act helpfully toward other individuals, a recent experimental study on food-sharing behaviors in captive bonobos found that when given a choice between monopolizing a desirable food source and voluntarily opening a door to let a conspecific share the food, the apes preferred the latter option. The researchers noted that the bonobos may have shared the food "in an attempt to receive favors in the future from the recipients or due to a more altruistic motivation" (Hare and Kwetuenda 2010). Primatologist Frans de Waal relates anecdotal and experimental evidence that supports this proposal and which contrasts sharply with the lack of ape helpfulness described by Tomasello:

[Apes] seem to monitor their interactions more closely and keep better track of each individual's contributions to common goals [than do monkeys]. Chimpanzees, for example, regularly break up fights over food without taking any of it. I once saw an adolescent female interrupt a quarrel between two youngsters over a leafy branch. She took the branch away from them, broke it in two, then handed each one a part. Did she just want to stop the fight, or did she understand something about [fair] distribution? There's even one observation of a bonobo worried about getting too much. While being tested in a cognitive laboratory, a female received plenty of milk and raisins but felt the eyes of her friends on her, who were watching from a distance. After a while, she refused all rewards. Looking at the experimenter, she kept gesturing to the others until they too got some of the goodies. Only then did she finish hers. (de Waal 2009: 190)

Frans de Waal also conducted a study on ape awareness of cultural norms by introducing a high-ranking female in a captive population of chimpanzees to a device that could be made to dispense food in two distinct ways and then demonstrating for her one particular method of accessing the device. Two distinct groups were studied in this fashion, with the female in each shown a different way of using the machine to procure food. Whiten, Horner, and de Waal (2005) studied the ways in which other individuals in each group subsequently accessed the device themselves, after having seen the female (and, over time, other individuals) use it. They found that there was a strong tendency for chimpanzees to adopt the method used by the rest of their group, and some individuals

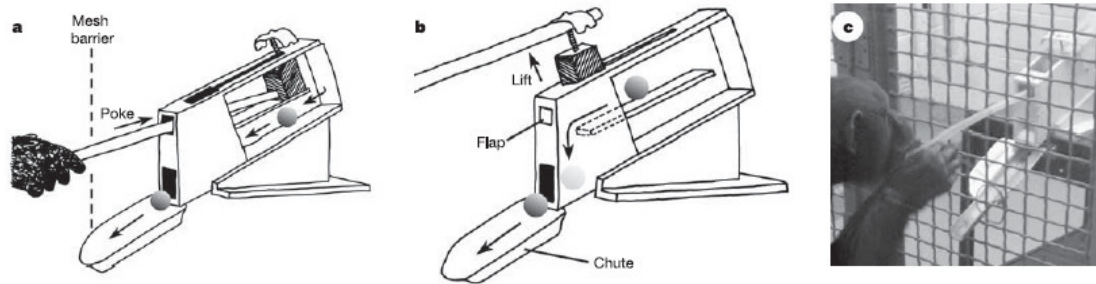


Figure 1 | Two techniques for gaining food from the 'Pan-pipes' apparatus. For each technique, the chimpanzee must insert a stick-tool through mesh caging to contact the apparatus and free a desirable food item that is trapped behind a blockage in the upper of two pipes. The food then rolls down a chute into the chimpanzees' enclosure. The Pan-pipes were 12 cm outside of the enclosure. **a**, In the Poke method, the stick-tool is

inserted under the front flap, pushing the blockage back along the ramp so that the food is knocked off and rolls forward underneath. **b**, In the Lift method, the stick-tool is passed under hooks, allowing the blockage to be lifted and the food to roll forward. **c**, Chimpanzee GG performing the Poke method.

Andrew Whiten, Victoria Horner, and Frans B. M. de Waal. "Conformity to cultural norms of tool use in chimpanzees," 2005.

who had first discovered the opposite method for themselves "went on to match the predominant approach of their companions, showing a conformity bias that is regarded as a hallmark of human culture" (Whiten, Horner, and de Waal 2005). These findings do not discredit Tomasello's experimental data, but they provide a wider context of research and conclusions into which his experimental studies should be placed, and they perhaps suggest the need for a more nuanced explanation of great ape socio-cognitive capacities than Tomasello currently provides.

There is also reason to be somewhat skeptical of Tomasello's research on human children, and of the specific conclusions he draws regarding the language acquisition process. For example, his current account places a great deal of importance on speakers' motivation to imitate the forms of others' communicative acts when they intend to convey the same meanings, which he calls using "the same language in the same context" (Tomasello 1999: 109). He claims that this motivation has its source in the language-learning child's awareness of social norms and expectations, and he provides experimental evidence that children operate with such norms to a degree unmatched in chimpanzees (Rakoczy, Warneken, and Tomasello 2008; Warneken and Tomasello 2006). Yet the children in these studies were all 14-months-old or older – some as old as

three years – which suggests that they had all begun to acquire language already. Although Tomasello's research is striking, the finding that language-learning children operate under norms of reciprocity does not indicate that children are aware of those norms *before* they enter into language, which is what Tomasello's account of language acquisition would require. In fact, Tomasello cites the work of Kagan (1981) in his discussion of helpfulness expectations to observe that human children "do not typically operate with these kinds of norms in other domains of activity until late in the preschool period... and so perhaps they are operating with something less than adult-like norms initially" (Tomasello 2008: 133 – 134). This hypothesis is supported by the research of Murnighan and Saxon (1998), who studied the bargaining behavior of human children engaged in an economic ultimatum game of the sort described above. Comparing the responses to proposed divisions of M&Ms by children in kindergarten, third grade, sixth grade, ninth grade, and college, the researchers found that the younger children were willing to accept much smaller offers than were older participants. In other words, the younger participants in the study behaved more like the chimpanzees that Jensen, Call, and Tomasello (2007) describe as "rational maximizers." This suggests that sensitivity to social norms is perhaps not an innate property of humans, but rather is one that develops in an individual over time as he or she is brought up in a social-interactive and cooperative environment – a proposal that, if true, would also cast doubt on the negative findings of normative behavior in chimpanzees who have not been raised in such an environment. In his published writings that I have read, Tomasello does not devote a great degree of time or attention to this point, but it is one with profound implications as to the plausibility of his overall account.

Moreover, even if we were to accept all of Tomasello's findings and specific conclusions about great ape and human socio-cognitive capacities, there would still be reason to doubt his overall account of language acquisition. Although that account is attractive in that it avoids the postulation of a single, species-unique autonomous language endowment in humans, it does so at a significant explanatory cost, which to my knowledge is unacknowledged anywhere in print by Tomasello. This cost is the ascription to language-learners of a large number of mental abilities whose evolved purpose is not specifically language: abilities which, Tomasello claims, human infants must bring to bear on their linguistic environments by the time they are only a few months old. As is discussed in detail above, Tomasello argues that, for a child to be able to learn the language spoken around him or her, the infant must:

- i. understand that he or she is a producer of actions (page 13)
- ii. understand that he or she produces actions as a result of his or her own intentions, i.e. that he or she is "an intentional agent" (page 13)
- iii. understand that he or she makes active choices among possible actions to attain his or her goals (page 14)
- iv. understand that he or she chooses what to direct his or her attention to in pursuit of his or her goals (page 14)
- v. be able to analogize between himself or herself and others (page 13)
- vi. reason by analogy to himself or herself that others have intentions motivating their actions, and that those actions are actively chosen in their pursuit of particular goals (page 14)

- vii. assume that others have intentions towards his or her own attentional and intentional states (page 14)
- viii. be able to jointly attend with another individual to some third entity (page 14)
- ix. assume that another's unfamiliar action, such as the production of an unfamiliar utterance, is (in addition to being consciously chosen and being motivated by the other's goals) intended by the other to be relevant to the current joint attentional frame (page 20)
- x. assume that others are taking into account his or her perspective, knowledge, and expectations when producing actions intended toward his or her attention and intentions (page 20)
- xi. understand that actions may be relevant to the joint attentional frame (page 20)
- xii. be able to act relevantly to the current joint attentional frame (page 21)
- xiii. take into account the perspective, knowledge, and expectations of others when interacting with them in a joint attentional frame (page 21)
- xiv. be motivated to helpfully inform other individuals of items relevant to them (page 21)
- xv. be motivated to act helpfully toward other individuals in general (page 21)
- xvi. assume that others are acting helpfully toward him or her (page 21)
- xvii. assume that others are using their utterances to helpfully inform him or her of items relevant to himself or herself (page 21)
- xviii. assume that there is a mutual benefit in cooperating with others communicatively (page 21)

- xix. be able to use the communicative context of a joint attentional frame (combined with the abilities and assumptions noted above) to determine the meaning of an unfamiliar utterance (page 23)
- xx. recognize that actors can substitute for one another in acts of imitation and role reversal (page 33)
- xxi. be able to imitate the actions of others (page 33)
- xxii. be able to construct a mental representation of communicative devices heard in the speech of others (page 33)
- xxiii. be able to engage in role-reversal imitation by substituting speaker for listener and vice versa in his or her mental representation of the speech act and then imitatively performing that act (page 34)
- xxiv. possess a sense of group identity and social rationality that motivates and governs his or her participation in collaborative activities (page 34)
- xxv. recognize and respect social norms, and so attempt to imitate the linguistic conventions of others (page 34)
- xxvi. recognize and mentally reconstruct patterns across repeated social interactions (page 46)
- xxvii. be able to apply pattern-finding abilities to the linguistic environment to discover conventional syntactic patterns (page 46)

By adopting this detailed account of language acquisition, Tomasello is able to identify the particular abilities (from the set of those he takes to be language-foundational) which humans possess but which he claims the other great apes do not – on the above list, items *xiv-xviii*, *xxiv*, and *xxv*. However, it must be acknowledged that

Tomasello's theory is only plausible to the extent that we consider it likely for pre-linguistic human infants to be able and motivated to engage in such complex mental behaviors. Although Tomasello has argued in several published works that his account of language development is preferable to that of Noam Chomsky, he cannot contest that most generativist theories only postulate the language learner's possession of a single required endowment, whereas Tomasello's account presupposes over twenty. Tomasello has endeavored to support each item in his account with experimental findings, but Ockham's Razor would suggest that we maintain a healthy skepticism toward his theory, on account of its complexity. Although many of its components are well-supported by experimental data, Tomasello's account of language development and human linguistic uniqueness is far from the simplest theory available.

At the same time, it is important to recognize that although Tomasello provides experimental evidence for many of his claims, there are some cognitive abilities on the list above for which he has not (to my knowledge) published experimental evidence. For example, the first item mentioned, the capacity of the child to understand that he or she is a producer of actions, does not appear to be supported by any experiment cited by Tomasello, although it must logically be a developmental prerequisite of item *ii*, the infant's understanding that his or her own actions are a result of his or her own intentions. That is, an infant surely cannot understand that he or she has intentions which cause the actions he or she produces to occur without first understanding that out of the set of all actions he or she perceives, a subset are produced by the self. Yet this first step is unacknowledged by Tomasello, and has not (to my knowledge) been explicitly tested for in human infants. Such gaps in Tomasello's experimental data do exist, although they are

not numerous; in general, Tomasello has endeavored to prove by means of experimental support that each ability in his account is present in human infants and that at least some of those capacities are absent in other apes.

Nevertheless, even if it were shown experimentally that, by the beginning of language-learning, human infants possess every cognitive and interpersonal ability required in Tomasello's account of language development, his theory linking those abilities to language-learning would remain unproven. For, crucially, that theory posits that a being's ability to perform all of the specific items listed above is a necessary condition for his or her ability to acquire a language: human infants can only develop language because they have the abilities *i* through *xxvii* above, and nonhuman apes do not develop language because, lacking some of those abilities, they cannot do so. Tomasello claims that a being's possession of the full list of features is "of particular importance for language acquisition... These skills are *necessary* for children to acquire the appropriate use of any and all linguistic symbols, including complex linguistic expressions and constructions... [or] are *necessary* for children to find patterns in the way adults use linguistic symbols across different utterances, and so to construct the grammatical (abstract) dimensions of human linguistic competence" (Tomasello 2003: 3-4, emphasis added). These claims of necessity, however, are unsupported in his data.

Instead, what Tomasello has found evidence for is a correlation between the listed items and the development of language, in that the human infants he has studied have been experimentally shown to possess each ability on the list³ and have presumably also acquired a language. His findings regarding the linguistic uniqueness of humans are similarly correlative in nature, as he claims that the apes he has studied have possessed

neither the totality of cognitive and interpersonal abilities in his account nor the development of a human-like language. These findings regarding both apes and humans would support the assertion that there is a correlation between the abilities listed above and the development of language, yet Tomasello proposes that the relationship is one of necessity.

It is a weakness of Tomasello's theory, and a reason to be skeptical as to his conclusions, that this necessity itself cannot be tested. That is, it would be impossible – not to mention highly unethical – to experimentally remove one of the abilities in Tomasello's account from a human infant, such as his or her understanding that actions can be relevant to a joint attentional frame (item *xi* above), to test whether the child would fail to develop language as Tomasello's theory would predict. Nor could a researcher somehow engender all of the listed traits in a nonhuman creature, to test whether the creature could then learn a language. Yet without tests of this nature, there is no conclusive proof that the items in Tomasello's account (though correlative) are actually required for the development of language. Unlike the correlation, a necessary relationship between those abilities and language development cannot be independently tested and thereby experimentally proven.

Moreover, even with the evidence for strong correlation, it is plausible to imagine Tomasello's account could include one or more items which in fact do not affect language development. For example, by virtue of the fact that humans live on earth and that human infants develop language, there is a clear correlation between living on earth and acquiring a language, and yet presumably there exists no necessary link between these items; it would be incorrect to assert that humans have language because we live on earth

and that no individuals living off of earth (even human infants raised on the moon) could develop language. Although Tomasello has provided compelling reasons for believing that the items he lists *could* help a language learner, he cannot show experimentally that the child *needs to have* those abilities in order to acquire language, and that means that the correlation may be misleading. The ultimate weakness of Tomasello's account is that despite its attractiveness as an explanatory theory, the explanation he provides cannot be tested empirically. (Although it is important to note that this weakness is also found in Chomskyan theories, which in addition cannot even be tested for a correlation between language development and a scientifically unverifiable single language-specific endowment. Therefore, this weakness of unproven causality may be more indicative of the field of language acquisition studies itself than of Tomasello's approach in particular.) For all of the experimental data that Tomasello has collected on language development in human infants, his theory as to the necessary prerequisites of language development remains conjectural.

In general, the experiments Tomasello has conducted support the notion that unlike humans, chimpanzees are not naturally motivated to act helpfully, assume helpfulness in others, form joint goals, or construct and conform to group expectations. Insofar as the unverifiable logic of Tomasello's account of language development can be accepted, these inability may represent at least part of the reason why chimpanzees do not acquire language as human infants do. While the puzzle of human linguistic uniqueness remains an open question, Michael Tomasello's cross-species research on the cognitive and interpersonal abilities of apes and humans has helped to lay out in detail the many complexities of the issue.

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7 – Notes

¹ Tomasello's research involving nonhuman subjects has focused primarily on individuals of the species *Pan troglodytes*, the common chimpanzee, although he has conducted research on dogs and goats as well.

² According to Tomasello, these expectations are often due to the joint attentional scene between speaker and learner being an activity "recurrent in their daily experience, such as bathing, feeding, diaper changing, book reading, and traveling in the car... [in which] the child understands her own and the adult's goal's in the situation, which enables her to infer the relevance of the adult's language to those goals" (Tomasello 1999: 110).

³ Although to my knowledge it is true that Tomasello has never tested for each ability in his account in the same group of infants, it seems reasonable enough to assume that multiple human infants have similar cognitive capacities, such that if one group of infants is proven to be able to do X and another group is proven to be able to do Y, the conclusion that infants can do X and Y is sound.