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### Paper 1: Language and Cognition in Nonhuman Primates

It is a long-standing tradition of the human race to elevate itself above all others, even those animals whose genetic makeup differs from our own by less than 2%. Despite the rapidly growing wealth of information gathered about the intelligence, both rational and emotional, of our closest relatives under the primate order, we still regularly insist on distinguishing ourselves from creatures to whom we believe ourselves innately superior. As a result, we justify the capture, confinement, and display of nonhuman animals (primates included) on the basis that they are not cognitively comparable to humans--meaning, they do not think and feel in the same way that humans do, and therefore will not be caused the same degree of discomfort and psychological damage that humans would be caused if held captive in an unnatural environment, sometimes isolated, and often trained to perform for large crowds on a regular basis. Typically, the key distinctions between human cognition and nonhuman cognition are self-awareness, complex emotion, and the use of an advanced communication system. However, recent studies of nonhuman primates, including gorillas, bonobos, chimpanzees, and some New World Monkeys, indicate that these species may have a higher capacity for language use than previously understood. If we have found that nonhuman primates are capable not only of self-awareness and more complicated emotions than originally assumed, but also of learning and manipulating some forms of human language to a significant extent, then that common justification for their maltreatment is invalid. If this is the case, we may be forced to re-evaluate the morality of

holding and raising certain nonhuman primate species in captivity, for the purposes either of research or entertainment.

Prior to discussing the ethical consequences of these discoveries, we must first review if and how language is actually evolving in our primate relatives. In order to do so, an important distinction should be made between the two senses of the faculty of language into which scientists have begun to sort language capacity. These are the broad and narrow senses, defined respectively as follows: a) the combination of sensory-motor, conceptual-intentional, and internal computational systems, as well as the capacity to learn human language without explicit instruction, and all the internal systems necessary to do so (i.e. respiration, digestion, memory, etc.) and b) the internal computational system alone, including recursion abilities (Hauser et al., 2002). While there remains significant controversy over which mechanisms of language are shared between humans and other animals, the hypothesis that recursion is the key difference between human and nonhuman language ability has become increasingly more popular amongst professionals across the fields of linguistics, biology, anthropology, psychology, and neuroscience (Hauser et al., 2002). Some studies have shown, over the course of decades, that certain species of nonhuman primates may share with us the broader sense of faculty of language, but have no capacity for recursion (Hauser et al., 2002). This means that they do not have access to the infinite range of discrete expressions (pairings of sound and meaning) that humans do. While some apes have been taught to learn and correctly independently reproduce variations of human sign language and recognize some human speech, they have always proven to be limited in a way that humans simply are not. Although neurological foundations for language exist in nonhuman primates, as can be seen from clear homologues in their brains to

language-relevant parts of the human brain, limitations in their language abilities seem to be derived from shortcomings in social cognition and the structure of their vocal tracts, as well as a near-complete lack of theory of mind (Zuberbuhler, 2003).

With that said, if it is true that the origin of language is gestural rather than a spontaneous outgrowth from primitive vocalizations seen in chimpanzees and other primates today, then the observation of gestural communication systems in chimpanzees and other nonhuman primates may well be a sign of the early stages of complex language evolution (Hewes et al., 1973).

Still, since there is no true consensus on whether or not nonhuman primates are currently in the process of developing this narrower sense of language faculty in addition to the broader sense, let us shift to a discussion of why it's even possible they may be pushed in that direction by the gradual powers of natural selection. In a 2003 review of anthropological research for that year, R.I.M. Dunbar analyzed the legitimacy of what is called the "social brain hypothesis", which is meant to explain the rather large size of the primate brain. In the process of his analysis, he draws a connection between the expansion of social groups and the need for better means of communication for the preservation of the more complex social web (Dunbar, 2003). This, he argues, is why we note more complex systems of communication (gestural and primitively vocal) amongst primates that live in large community groups, rather than in solitude or mere partnerships (Dunbar, 2003). Now, we know that individuals living in large community groups typically stand a better chance of survival together than single organisms or those living in relatively small groups. Thus, it is reasonable to expect that as nonhuman primates like chimpanzees, bonobos, gorillas, and some species of New World Monkeys continue to expand

into larger social groups, we may begin to see more and more advanced language systems amongst them.

In terms of what language capacity nonhuman primates have been known to demonstrate already, the species who have predominantly been the focus of study so far are chimpanzees, gorillas, and bonobos; only recently have New World Monkeys been included in the list of potential subjects of interest. Normally, when humans have attempted to teach language to nonhuman primates like chimpanzees, they have found that progress was only achieved through explicit training, and genuine understanding was rather questionable (Savage-Rumbaugh et al., 1985). However, scientists have found that pygmy chimpanzees, called bonobos (*Pan paniscus*), seem better equipped to learn human language and communicate with a deeper level of understanding than regular chimpanzees (Savage-Rumbaugh et al., 1985). For example, a young bonobo named Kanzi managed to pick up a great deal of vocabulary and a significantly deeper comprehension level than most explicitly trained chimps simply through having been raised amongst human caregivers and learning through observation (Savage-Rumbaugh et al., 1985). This was truly a remarkable discovery when it was first realized over thirty years ago, and it has provided much-needed insight into how we may have been approaching the question of nonhuman primate language-learning abilities completely incorrectly. Success was also had when a dedicated caretaker named Penny Patterson met and raised a western lowland gorilla, named Koko, teaching her to use over 1000 words of an adapted version of American Sign Language; this remarkable accomplishment can likely be ascribed primarily to the incredible bond that Patterson has forged with Koko over her long life of nearly 50 years, not to explicit training as was previously believed necessary and preferable.

Further related research has been done to explore the difference between early speech patterns in human children and the learning language patterns of nonhuman primates. It was once thought that a highly notable difference in the speech patterns of humans and nonhuman primates while learning language was that humans used far more declarative phrases than primates did, indicating a significant portion of thought being dedicated to opinions and individual perspective in human infants, but not in primates (Lyn et al. 2011). A 2011 study confirmed that after observing language use in two human children, two bonobos, and a chimpanzee, it was clear that human children were more likely to make comments and statements with the intention of giving/showing, possessing, and/or attention-seeking than were the nonhuman primates (Lyn et al., 2011). However, the difference was much less stark than researchers had expected, because the nonhuman primates did, in fact, also use declaratives to address past/future events, name objects, negotiate, and comment about other individuals (Lyn et al., 2011). This newfound knowledge lends itself to the argument that at least some species of nonhuman primates are far more self-aware and worthy of respect as individuals than has been acknowledged in the past.

In other recent research news, a movement has sprouted to push for more research on New World Monkey vocal communication systems, since there may actually be more relevant parallels between these species and humans than species of Old World Monkeys and humans (Snowdon, 2013). For instance, they have a wider set of vocal expressions than do most Old World Monkeys, as well as syntax and basic grammar that has yet to be found in Old World Monkeys, even those trained with human languages (Snowdon, 2013).

In reflection upon the research gathered within this paper, it appears that the more research that is performed on language ability in nonhuman primates, the more it appears that

there are a fair few species who are either already capable of human language use to a minimal (but still significant) degree or who are evidently in the earliest stages of language evolution themselves. In light of that information, it is safe to say that nonhuman primate cognition is growing closer every day to human cognition, and it is already very, very close. With this in mind, the keeping of nonhuman primates in cages and/or closed exhibits must be no more humane or ethically acceptable than to do the same to humans. Along similar lines, forcing nonhuman primates to perform in circuses or shows at animal theme parks, or even simply to tolerate being on display at zoos all day long, several days a week, must be morally wrong. The more research that is done to understand primate cognition, the more vital it will be that we take steps to amend the ethical issues of primate mistreatment worldwide.

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