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Kristin Andrews

York University, andrewsk@yorku.ca

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A Role for Folk Psychology in Animal Cognition Research
Kristin Andrews
York University

If we consider that the field of animal cognition research began with Darwin's stories about clever animals, we can see that over the 150 years of work done in this field, there has been a slow swing back and forth between two extreme positions. One extreme is the view that other animals are very much like us, that we can use introspection in order to understand why other animals act as they do, and that no huge interpretive leap is required to understand animal minds. On the other extreme we have the view that other animals are utterly different from us, that no matter how similar their behaviors may appear, the mechanisms they use to act and the reasons for their actions are utterly unlike humans behavior; it would be anthropocentric to assume otherwise. In this paper I want to defend a middle ground that involves the use of folk psychology in the science of animal cognition research, in order to investigate both similarities and differences. Further, I will argue that the use of folk psychology need not involve a problematic anthropomorphism. I will show how the animal cognition research benefits by appeal to folk psychology by discussing the study the psychologist Anne Russon and I conducted on orangutan pantomime communication (Russon and Andrews 2010).

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1. Introduction

If we consider that the field of animal cognition research began with Darwin's stories about clever animals, we can see that over the 150 years of work done in this field, there has been a slow swing back and forth between two extreme positions. One extreme is the view that other animals are very much like us, that we can use introspection in order to understand why other animals act as they do, and that no huge interpretive leap is required to understand animal minds. On the other extreme we have the view that other animals are utterly different from us, that no matter how similar their behaviors may appear, the mechanisms they use to act and the reasons for their actions are utterly unlike humans behavior; it would be anthropocentric to assume otherwise.

Darwin and Romanes are sometimes painted as exemplifying one extreme. Certainly, sometimes Darwin sounds as if he endorses a view like the one described above. Darwin's early argument for similarity was based on the idea that humans and other animals evolved from a common ancestor, and that the processes of evolution do not allow for fundamental differences between closely related species. This leads Darwin to make comments like there is "no fundamental difference between man and the higher mammals in their mental faculties" (Darwin, 1880, 66). Indeed, Darwin claims that other animals share with us the experiences of

happiness, misery, pain, wonder, and curiosity, that other animals engage in reason, imagination, and deliberation, and that other animals have a sense of right and wrong as well as a sense of god. While “man...is capable of incomparably greater and more rapid improvement than is any other animal” (Darwin 1880, 79) the difference is one of degree and not of kind.

On the other hand, there are those that criticize animal cognition research for relying on introspection and human folk psychology. For example, the psychologist Daniel Povinelli has argued that contemporary animal cognition researchers are too eager to undermine claims of human uniqueness, and they see more in the way of similarity than difference. Povinelli worries that the science of animal cognition is harmed when the researchers assume similarity, because real differences will not be found. Furthermore, he thinks that contemporary theories of evolution are inconsistent with Darwin’s mental continuity claims (e.g. Povinelli & Bering 2002; Povinelli et al. 2000; Penn et al. 2008). Povinelli and Bering write, “if the dramatic resculpting of the human body and brain that occurred over the past 4 million years or so involved the evolution of some qualitatively new cognitive systems, then this insistence on focusing on similarities will leave comparative psychologists unable to investigate hallmarks of their own species—or chimpanzees, for that matter. It [seeking to find similarities across species] is an agenda that does justice to no one” (Povinelli & Bering 2002, 116). Similar concerns are shared to some degree by other animal cognition researchers (e.g. Shettleworth 2010a, 2010b, Silk 2002, Blumberg & Wasserman 1995, Wynn 2004, 2007).

What Povinelli and Bering state is a conditional. It is true that if human evolution involved a qualitatively new system, then we won't be able to find traces of it in other species. But the issue in question is whether or not the antecedent of the conditional is true! By focusing on difference and ignoring similarity, researchers do justice to no one.

In this paper I want to defend a middle ground that involves the use of folk psychology in the science of animal cognition research, in order to investigate both similarities and differences. Further, I will argue that the use of folk psychology need not involve a problematic anthropomorphism. "Anthropomorphism" can be defined as the attribution of human psychological, social, or normative properties to non-human animals, though it is usually also taken to be an attribution made in error. For example, the author a widely used textbook on animal cognition, Sara Shettleworth, defines anthropomorphism as "the attribution of human qualities to other animals, usually with the implication it is done without sound justification" (Shettleworth 2010a, 477). And by "folk psychology" I am referring to the commonsense conception of actions, which can include things like belief and desire, but also emotions, moods, traits, and labels for complex behavior such as grieving, communicating, or teaching (Andrews 2012a). I will show how the animal cognition research benefits by appeal to folk psychology by discussing the study the psychologist Anne Russon and I conducted on orangutan pantomime communication (Russon and Andrews 2010).

The general method involves starting with looking at natural behavior in animals, and identifying certain behaviors that might involve complex cognitive

mechanisms. We can use folk psychology in order to group behaviors together into types, and then we can examine how the animal might engage in the behavior. An example of this strategy comes from Byrne and Whiten's research on deception (1988). They asked researchers to send in reports of incidents of behaviors that appeared to be deceptive, and then they analyzed those cases to determine what they might have in common and how they might differ. This led them to make a distinction between cases as examples of different kinds of deception. Level-0 deception involves being unintentionally misled, level-2 deception involves the deceiver is knowingly lying, and level-1 deception involves the deceiver knowing that his actions lead another misinterpret the situation. Thus, after first taking all the cases as examples of potential deception, Byrne and White were able to come up with finer distinctions of deception, which allowed them to re-categorize behaviors into one of the three categories. This conceptual work starts with a folk psychological term—deception—and then refines it given empirical evidence. With the novel understanding of types of deception, future behaviors can be better understood and experiments can be developed that rely on a more precise understanding of the category being investigated.

Byrne and Whiten give us an example of how the use of folk psychology can allow us to individuate, categorize, and then analyze sets of behaviors as candidates for behaviors of a certain type, which in turn allows us to analyze and reevaluate the categorization by coming to better understand the category itself. The analysis will sometimes result in excluding the behavior as a member of the category. And once behaviors are grouped together more precisely, one can begin to do the difficult

work of uncovering the mechanism(s) involved in that behavior. The psychologist's goal to discover mechanisms can only be achieved with an analysis of a number of behaviors of the same type, but this step of categorizing behaviors is where the real controversy begins. Once the behaviors are categorized appropriately, experiments can be done to get at cognitive mechanisms

The experimental search for mechanism may sometimes result in realizing that the category doesn't involve the kind of sophisticated cognitive capacities that were previously thought. If there is a plausible mechanism for the behavior that doesn't require metacognition or language, for example, then we could also reevaluate whether humans need those fancy mechanisms in order to engage in behavior of the same type. We can state this as a principle: Whenever an animal behavior is able to be explained in terms of simple mechanisms, we ought to evaluate whether the same type of behaviors performed by humans can also be explained in terms of the same simple mechanism. While the psychologist C. Lloyd Morgan is famous for his canon: "in no case is an animal activity to be interpreted in terms of higher psychological processes, if it can be fairly interpreted in terms of processes which stand lower in the scale of psychological evolution and development" (Morgan 1930, p. 292), his support for the principle described above is often ignored. Morgan was committed to not over-intellectualizing human cognition: "To interpret animal behavior one must learn also to see one's own mentality at levels of development much lower than one's top-level of reflective self-consciousness. It is not easy, and savors somewhat of paradox" (Morgan 1930, 250). It is this second lesson of Morgan, long ignored, that will serve us well.

2. Doing research with nonlinguistic animals

One may worry off the bat about the use of folk psychology in animal cognition research, because these individuals lack language, we cannot use our language in order to describe and categorize their behaviors. By so describing their intentional actions in our terms, we are presenting them as members of our human community, with human interests and human concerns. Many have quickly pointed out, however, that psychologists are perfectly able to make attributions and categorizations of behaviors when dealing with human infants, without anyone criticizing the researchers for being adultomorphic. Researchers working with prelinguistic children face the same constraints as do those working with nonlinguistic animals; we cannot describe and categorize their behaviors using their own concepts, because they may not have those concepts at that stage in development. But researchers working with prelinguistic children also lack some constraints that they may have with other animals; the researcher is human, so there are no cross species differences of embodiment, perception, ability and so forth that could lead one astray in making attributions.

By being of the same species, and by spending time with members of the species at that developmental stage, we tend to think that infants are relatively easy to interpret, because their desires are very limited, as are their behaviors. The lack of complexity in an infant's social life and personal goals makes the art of interpreting her relatively easier than interpreting a human whose life history,

personal goals, developed fears, secret agendas, and so forth, had plenty of time to develop in an idiosyncratic way.

Take for example the paradigms used to test infants on cognitive tasks, such as looking time tasks. In these tasks, infants are presented with a stimulus that is shown to them again and again until they get bored. How do we know that the infant is bored? She stops looking at the stimulus. (That's the first folk psychological interpretation needed.) Then the infant is shown a new stimulus, and if she looks longer at the new stimulus, she demonstrates that the difference between the first and second stimuli were saliently different to her. (That's the second interpretation needed.) If the infant doesn't look longer at the new stimulus, then the stimulus is deemed to be conceptually the same to the infant (That's the third interpretative move.) All researchers are measuring is looking time, and looking time is only interesting if it means something. By interpreting looking time as interest (and sometimes as surprise), the researchers can draw their conclusions about infant cognition. But there is no independent confirmation of this interpretation. The point is that interpretation is needed to get this research off the ground. Without it, we would have no means for testing the child's concepts, predictions, and so forth.

Another task commonly used with infants to gage their predictions is anticipatory looking. Infants are visually presented a narrative, and then the narrative is paused, and the location where the infants look is deemed to be the place the infants predict the actor to go next. Here again, the observable behavior is looking, but the look is interpreted as a prediction.

So, the point is that there is interpretation in infant cognition research. Is this a problem? Not really. We need to make some assumptions to get any research off the ground; psychologists assume this existence of other minds, for one! And the reason that psychologists are able to make these kinds of interpretations of infant behavior is because psychologists have been exposed to a large number of infants for a long time. By spending time with infants, they get to know the natural behaviors, their patterns, and through that time they come to categorize the infant's behavior using folk psychology. Our interpretations become more entrenched in our understanding of children when the predictions we make from them bear fruit. We get to learn how to interact with infants through this experience. And when researchers analyze their folk expertise with children, they can come to develop generalizations such as "Infants look longer at things they are interested in".

Infant research flourishes because researchers understand the infants they are working with in a folk way. Because human researchers are so familiar with human infants that they cannot see it as anything else—their experience with human infants leads them to see anticipatory looking as anticipation, as interest, as invisible intentional states. Correspondingly, animal cognition research needs starting assumptions and permission for interpretation to get off the ground as well.

The traditional approach to science has been to keep a distance between the scientist and her research, and this has been especially true in animal cognition research. Researchers who violate this principle are often thought not to be objective. For example, when Jane Goodall started naming the chimpanzees she was observing at Gombe, and when she referred to individuals using gender pronouns

rather than the definitive object term “it”, she was criticized and some scientists worried about her ability to remain objective (Midgley 2001). The closeness between researcher and subject also leads to worries about Clever Hans effects. Hans was a Russian trotting horse who amazed early 20th century crowds with his ability to do mathematical calculations, read German, and recognize musical notes. Hans could respond to a verbal request to, say, add 2 plus 3 by tapping his hoof on the ground five times. While the audience was convinced that Clever Hans knew how to add, scientists were skeptical. Oskar Pfungst investigated, and found that Hans’ owner was inadvertently cuing Hans to start and stop tapping his foot. Hans was clever all right, but not in the way the crowds were thinking. The horse didn’t know how to do math, but he did know how to please his owner. But now animal cognition research goes to great lengths to avoid cuing their subjects, which sometimes involves the researcher wearing masks or opaque goggles so as to be literally blind to the correct behavioral response. Compare this to children sitting on their mothers’ laps when asked to perform cognitive tasks. The burdens are greater for animal studies, given the unequal degree of concerns about cuing and subjective relationships in the two areas of investigation.

The quest for between scientific rigor and objectivity encourages researchers to put distance between themselves and their nonhuman subjects, be it a Plexiglas barrier or opaque goggles. Christoph Boesch, a field researcher who studies chimpanzees, has criticized captive research by pointing to a number of biases that exist in ape research but not in human research (Boesch 2007). In a review of experimental studies, he found that in the ape experiments there are physical

barriers between subject and researcher, there is little or no conspecific interaction, and the tasks are quite unnatural. Whereas in the children studies, often their parents accompany them, there are no physical barriers separating researchers and children, and the studies are often quite natural. Another difference is that in the animal studies there is often no relationship between the participant and anyone else in the testing environment. This isn't the case with most human developmental research, where even if parents are not involved, the researcher has to spend time gaining the trust of the child through play and shared language.

There is empirical data on the effect of relationships on ape behavior toward humans that suggests that orangutans and gorillas are more likely to approach and initiate interaction with familiar humans than they are with unfamiliar ones, and that there are different preferences among the class of familiar persons (Smith 2012). For example, Smith found that familiar visitors are approached more often than unfamiliar visitors, but less often than familiar staff, who are in turn less likely to be approached than are familiar keepers. Because the researcher is part of the experimental set-up, a difference in the quality of relationships between researcher and participant in the animal studies compared to the child studies raises additional questions about the ability to make comparisons between species.

While developmental psychologists have to gain the child's trust before starting the experiment, comparative psychologists have to allow the animal subject to become habituated to them. Habituation and trust are different kinds of relationships, and while habituation may be achieved by mere tolerance, trust requires a kind of acceptance. This perspective is discussed by the biologist Augusto

Vitale who says that much research couldn't have been done without the development of "a close and stable relationship with the studied subject" and that such a relationship "is essential for collecting reliable data" (Vitale 2011, 215) because only in a trusting situation can the animal "behave fearlessly and...focus on the tasks the researcher is asking them to solve" (Vitale 2011, 216).

In order to move beyond these biases in animal cognition research, I advocate that animal cognition research should start with the development of folk expert opinion on the part of the researchers.

3. Folk psychology in animal cognition research

In animal cognition research, an animal's movements are individuated and discriminated as particular behaviors through appeal to some interpretive framework; it is the interpretive framework that leads us to see movement as meaningful behavior, such as hunting, punishing, communicating or deceiving. Such behaviors are defined in terms of their proximate causal role; it is here that we have a role for folk psychology.

Folk psychology is most generally defined as "our commonsense conception of psychological phenomena" (Churchland 1981, p. 67), but a more helpful definition comes from the philosopher Barbara Von Eckardt, who states that folk psychology minimally consists of "(a) a set of attributive, explanatory, and predictive practices, and (b) a set of notions or concepts used in these practices" (Von Eckardt 1995, p. 300). The practices of folk psychology would include things such as predicting, explaining, justifying, evaluating, and coordinating behavior.

And the concepts of folk psychology include theoretical mental entities such as beliefs, desires, intentions, emotions, sensations, goals, and personality traits (Andrews 2012a). Functionalism in the philosophy of mind is an interpretive stance that takes the concepts of folk psychology as having causal power within that interpretive framework. As David Lewis argues, the theoretical terms of folk psychology get their meaning from the role they play in the theory; mental states are “definable functionally, by reference to their causal roles” (Lewis 1972: 204). As Daniel Dennett argues, folk psychology identifies real patterns of behavior that are described in shorthand terms by the concepts (Dennett 1991). These causal roles and patterns of behavior are silent on the question of mechanism, though it is generally assumed the same kinds of behaviors can be implemented in very different ways, both at an algorithmic level and a physical level (Bickle 2008).

The current use of folk psychology in animal cognition research is undeniable, if unacknowledged. The common appeal to terms such as goals, planning, memory, thinking, anxiety, surprise, choice, confusion, and so forth illustrate the reliance on folk psychology by scientific psychologists; the terms were coined by the folk to explain people’s behavior, and then came to psychology to be further investigated. Given the widespread reliance on folk psychological terms in comparative cognition, there need not be any general concern about their use. However, concerns can arise when folk psychological terms are used that have greater connotations or causal implications than appropriate for the circumstances; for example, when the term “punishment” is used to describe an act of antagonism toward a rule-breaker, it may be an overattribution if an attribution of punishment

(say, as opposed to retributivism) connotes a particular attitude towards the transgressor (such as a desire for rehabilitating the transgressor). However, just as there may be folk psychologies for humans across cultures (see Lillard 1998), there may well be folk psychologies across species, and to do comparative psychology it is productive to look at both differences and similarities across species at the folk psychological level.

An example of a research program that does look at differences between species in terms derived from folk psychology is the factor analysis approach to personality research. Personality is an example of a folk concept that has enjoyed the interest of scientific analysis. In the human case, an individual's personality traits are assessed using an instrument such as the Five-Factor Personality Inventory (FFPI). While the FFPI can be administered to the subject who is asked to make self-ratings, it is thought to be more accurate when it is given to a number of individuals who know the subject well (Hendriks et al. 1999). To use this method with apes, researchers spoke with zookeepers and others involved in daily husbandry or training activities with the individuals in order to develop an instrument for assessing personality using the same methods used in developing the human FFM, and used this method to assess personality in chimpanzees (King and Figueredo 1997) and orangutans (Weiss et al. 2006). As with the development and implementation of the FFM, raters are given lists of adjectives and asked to rate an animal on a 7-point Likert scale (according to which 1 indicates total absence of the trait and 7 indicates extremely large degrees of the trait). Adjectives and

descriptions on the orangutan scale include formal definitions of the folk psychological terms:

Defiant: Subject is assertive or contentious in a way inconsistent with the usual dominance order. Subject maintains these actions despite unfavorable consequences or threats from others.

Protective: Subject shows concern for other orangutans and often intervenes to prevent harm or annoyance from coming to them (Weiss, personal communication).

After administering the instrument to a number of raters, responses were assessed for statistical reliability both within and between raters. It was found that the individual differences in chimpanzees and orangutans are grouped together by factor analysis just as they are in the case of humans. However, differences were found between species in the content of the factors. For example, six personality factors were found in chimpanzees; they found correlates for all the human factors, plus an additional factor for dominance (King and Figueredo 1997). Orangutans, on the other hand, showed only the orangutan correlates for Neuroticism, Extraversion, Agreeableness, and Dominance, but also showed a factor that is a combination of Conscientiousness and Openness that was called Intellect (Weiss et al. 2006).

It can be long painstaking work to develop the folk expertise necessary to develop a species appropriate folk psychology. For many animal cognition researchers, there is not the same sort of shared social and physical environment between researcher and subject that is enjoyed by the child and adult in developmental research. Experimentalists working with animals may never see a

single member of the species in his typical ecological and social environment. Experimentalists may not spend time with their subjects outside of the research context; they may not hang out together, or play, or otherwise engage in activities that would allow the development of a trusting relationship. Experimentalists may in fact try to steel themselves against their subjects, so as to remain objective. Such limited experience with the animals makes it quite difficult to develop a folk expertise about the species. Field researchers, on the other hand, are usually spending day after day observing the species in all matter of natural contexts, and they are more likely to attribute psychological properties to animals than are those working in a controlled environment such as a zoo or a lab (Horowitz and Bekoff 2007). This serves as some evidence that field researchers have better access to the cognitive and affective capacities of their subjects than do researchers on captive animals, at least those who do not spend ample time with the animals.

Ethologists have long known that experience in the field involves the development of a skill that makes such researchers more likely to understand their subjects, and I am suggesting that this skill is analogous to the skill that most good developmental psychologists have in interacting with human infants. Field researchers who engage primarily in observational studies typically spend much more time with their subjects than do experimentalists, and they have to learn how to observe before they begin to see what is going on. Indeed, ethologists in training are told they have to learn to see before their data is worth saving for analysis (Lehner 1996). After the budding ethologist learns how to see, and learns the typical behaviors of the species being studied that she can develop an ethogram—a catalog

of species-normal behaviors, and the functional roles associated with them. Only after that can she conduct a formal observational study. This preliminary period of observation, called “reconnaissance observation” in classical ethology, allows the ethologist to get to know her subjects and to understand what is an individual difference, and what is species normal, so it also gives her a baseline of normal behavior.

While ethologists who first learn about a species is one example of folk expertise, it can also be found in caregivers, farmers, and others who interact with animals on a regular basis. Zookeepers, caregivers of rehabilitant apes, as well as observant dog and cat owners may be in a position to develop folk expertise as well.

In order to make similar progress on animal cognition research, we must work toward first achieving folk expertise in the species to be studied. Field researchers, who spend years observing groups and individuals, can come to understand stages of development, culture, and species-normal behavior in a way similar to humans who spend time working with children. Folk expertise about an individual will include knowledge about the individual’s typical behaviors, and the extent to which those behaviors reflect individual differences in the species or developmental stage. With a focus on starting animal cognition research with folk expertise, that experience can be used to design studies while keeping in mind the species and its natural physical and social environment, just as human-infant researchers do.

With the development of folk expertise, researchers can develop species appropriate folk psychologies and engage in the sorts of research programs

illustrated by Byrne and Whiten's work on animal deception. Researchers can identify behaviors as types of behavior, and then examine how the animals might engage in that kind of behavior. This methodological approach would be useful for moving ahead on the muddled debates about theory of mind in apes (Andrews 2012a; 2012b, 2005) as well as research on pedagogy and communication. Let us now turn to an illustration of the method at work.

4. Case study: Orangutan gestural communication

The folk psychological concept of communication has long resisted any satisfactory analysis by philosophers or psychologists working in this area. Definitions range from the robustly intentional, such as those influenced by the work of H.P. Grice (1969), according to which an instance of true communication requires the communicator acting with the intention that the receiver understands that the communicator *wants* the receiver to understand, and that the receiver does in fact understand the communicator's intention. On this sort of view, only mind readers can communicate, which makes the class of communicators quite small. On the other hand, there are nonintentional accounts of communication such that a communicative act is an exchange of information from a sender to a receiver. The worry with these views is that the accounts of information relied on excludes cases that we should expect an account of communication to accommodate. For example, animal researchers who appeal to Fred Dretske's account of information as (to put it simply) the reduction of receiver uncertainty, would exclude as communicative a supervisor's presentation of a problem with her student's argument in her

dissertation, because that would increase the student's uncertainty (see Wheeler et al. 2011 for an example of how animal cognition researchers have used Dretske's (1981) analysis). Another nonintentional view adopted by some animal cognition researchers amounts to a behavioral change in the communicator that effects the behavior of the communicatee, to the benefit of the communicator (Maynard Smith & Harper 2003). This view is thought to be noncognitive (Wheeler et al. 2011), and can be used to call the changes in plants communicative; for example, Wheeler and colleagues give the example of deceptive communication between orchids and insects, when the orchids produce the odor of the female insect, thereby attracting the male, who is needed for pollination (Jersakova et al. 2006). Thus, the worry about these views is that the class of communicators becomes quite large.

A satisfactory understanding of a cognitive account of communication would at least start by including interactions between adults and pre-mindreading children and excluding the interaction of orchids and insects (as well as the interaction of customers and dancers at a strip bar, based on the finding that women who are ovulating receive higher tips (Miller et al. 2006)). That is, our folk psychological understanding of communication seems to include the former and excludes the later. An analysis based on that starting point might lead to a revision of what to include and exclude from the category of communicators, but that sort of analysis is yet to be done. The definitions that are chosen are done on theoretical grounds, rather than as a result of empirical investigation, and the folk psychological method can help in the development of satisfactory definitions.

One example of how this method can play out is the study on orangutan pantomime carried out by Anne Russon and myself (Russon & Andrews 2011). While working with rehabilitant orangutans, we came to notice that the orangutans would sometimes act out what they wanted their human caregivers to do to them. To recognize these requests, we had to first become familiar with the orangutans' typical behavior. For example, we knew that the orangutans liked to play in the dirt, and would often sit on the dusty ground and take piles of dirt into their hands and dump it on their heads. We also knew that the human babysitters would clean them up afterwards by brushing the dirt from their heads with a leaf. With this background understanding (and Anne's 20 years experience working with orangutans) we were well placed to recognize a communicative request when it was made by Ceceb, a juvenile male ex-captive orangutan under rehabilitation. Ceceb was sitting across from Anne in the forest. He picked up a leaf and handed it to Anne. Anne used it to clean Ceceb's head, then dropped the leaf. Ceceb handed Anne another leaf, but this time she played dumb, and just held the leaf. After a few seconds Ceceb took the leaf back from Anne, rubbed it on his own head, and then placed it on her notebook, acting out what he wanted Anne to do to him. At that point, Anne acquiesced, rubbing Ceceb's head. We interpreted this event as Ceceb asking Anne to clean his head by handing her the leaf, and when she didn't respond as he expected, Ceceb elaborated on his message by acting out what he wanted Anne to do with the leaf.

Anne and I had planned to play dumb the next time one of the orangutans asked us to do something, in order to test whether he would elaborate on what

appeared to be a communicative message to begin with. When Ceceb handed Anne the leaf, we thought it was a request for cleaning. If this folk psychological interpretation is correct, then Ceceb should be unsatisfied if the recipient doesn't act as he requested. Thus, we hypothesized that Ceceb would repeat or develop the message in order to get the result he wanted. It was only by our first taking his act of handing us the leaf as communicative that we were able to vary the proper response. Ceceb's further elaboration supported our original interpretation of the act as communicative.

This interaction illustrates the first steps of the folk psychological approach to animal cognition; the researchers get to know the species and the individuals, and begin to interpret individuals behaviors, and test their interpretations by forming predictions about what the individuals should do if the interpretations are correct. Once the folk psychological attribution is further defended in this way, the incident can be categorized as an example of the folk psychological category for further examination.

Anne had witnessed similar behaviors during her twenty years of interactions with orangutans, and she searched her 20 years of data to find the few cases that she had recorded incidentally during data collection for other studies. From about 40 potential incidents, we identified 18 clear cases of pantomime communication. Given this data set, we began to analyze the functions and structures of these communicative behaviors in order to begin to better understand orangutan communication. There are of course clear limitations to this study—the small number of cases, the focus on rehabilitant orangutans, the small number of

populations studies—but we present these findings as preliminary and aim to gather additional reports of pantomime in orangutans in order to continue to develop a fuller understanding of orangutan communication.

What we found is that orangutans tended to communicate for imperative purposes (17/18 cases), and in response to failures of a previous message (12/13 cases). Pantomime was used to deceive in seven cases. Of particular interest is the one incident that appeared to have a declarative function. In this case, a juvenile female orangutan named Kikan had been treated by a research assistant, Agnes Ferisa, who removed a stone from Kikan's foot, and then sealed the wound with latex from a leaf that she plucked from a nearby tree. A week later Kikan tugged on Agnes, and, getting her attention, held up her foot, picked a leaf, and poked its stem on her foot near the now-healed wound. We interpret this behavior as a declarative showing that the wound had healed.

Declarative communication is not expected from the great apes, and is rare even among encultured symbol using apes (at least in formal studies). As a consequence, researchers don't look for it, and may fail to see it when it presents itself. While we shouldn't take one case as evidence that orangutans use pantomime for declarative communication, we should use it to develop new methodologies and look for it in the behavior of other orangutans. If Agnes hadn't expected Kikan to communicate, she wouldn't have noticed the attempt to communicate. By relying on our folk psychology we are better able to see what may be there.

The orangutan pantomime communication research is continuing, and with the identification of additional cases, and the further organization of those cases into

subtypes, we can identify the contexts that elicit such acts and then develop experiments to test communicative behaviors in a more controlled way. The controlled studies can help to uncover the mechanisms involved in these incidents we identify as communicative, and will both help us better understand the nature of communication as well as help us better understand which of those incidents we initially categorize as communicative may be excluded.

To better understand how this method works, consider this story about how chemists were able to better understand the folk concept of gold. The chemists took exemplars of the minerals the folk categorized as gold, and identified the molecular structure of the exemplars. This led to the discovery that there were two different molecular structures associated with the minerals, and it led to the creation of a new category, pyrite. By better understanding gold, some minerals previously thought to be gold were excluded from the category, and given a new category of their own. This method allowed chemists to better understand the different properties associated with the different kinds of minerals.

By continuing to categorize behavior as pantomime to see under what conditions such behaviors are performed, we can examine things such as the ostensive cues may be involved—whether they are mere attention getters (as Tomasello (2008) claims), or whether they are cooperative gestures indicating shared attention (such as pointing)—in order to attempt to identify the cognitive mechanisms involved in nonhuman intentional communication. This research can help to challenge the theoretical work into the nature of communication as well as the empirical work on the extent of intentional communication among species.

6. Conclusion

Our reliance on folk psychology is so strong we often don't realize when we are doing it. Even the mere act of seeing behavior as intentional, and of being able to categorize animals together as actors distinct from plants and rocks, is a folk psychological move. The critics of the role of folk psychology in animal cognition research are making distinctions of their own, deeming it acceptable to talk about animal memory or even beliefs, but unacceptable to talk about, e.g., animal emotions or understanding seeing (Penn 2011, Povinelli and Vonk 2004). But the point is that we don't know which folk psychological attributions are correct or not until we examine them, and I am proposing a method for doing so.

Interpersonal engagement is rich with interpretation. To remove interpretation in the case of nonhuman animal cognition research is to make it impossible to categorize behaviors together, which is essential for doing the science. But interpretation is not the final word; it is merely the starting point.

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