

Kanzi or can't he?

Spontaneous
symbol
acquisition and
communicative
use by pygmy
chimpanzees
(*Pan paniscus*).
SAVAGE-RUMBAUGH, S., MCDONALD,
K., SEVCIK, R.A., HOPKINS, W.D.
AND RUPERT, E. (1986)
*Journal of Experimental
Psychology*, 115(3), 211-35.

Introduction

Some topics in psychology create a lot of controversy. Sometimes it is easy to see why they are controversial but sometimes the controversy is harder to explain.

A topic that creates a lot of passionate opinions is the area of animal language. The issue is whether language is unique to human beings or whether it is something that other animals can also learn.

The study described here is about language acquisition in chimpanzees. As such it is strongly related to the work of Gardner and Gardner (1969), which is summarized in Chapter 4 (also see www.friendsofwashoe.org). Gardner and Gardner showed some evidence of very limited language learning in a chimpanzee named Washoe who was able to use some signs from American Sign Language (ASL) appropriately, and who developed a vocabulary of 30 signs by the end of a 22-month project. Quite apart from the very small vocabulary that this represents, and the very slow rate of acquisition (in comparison with a typically developing human child), there appeared to be limitations in the way in which the vocabulary was learned and used. When looked at carefully, Washoe did not seem to go beyond the associational level of sign and symbol usage (Lock, 1980).

Associational usage of words, or of signs and symbols, refers to the rather limited process of using them appropriately in specific 'here and now' contexts. For example, a child learns to name pictures in a book that is being read with a parent, or points to a toy that they can see and that their parent names. Often at this level processes such as imitation, and the use of situational cues and prompts, 'scaffold' the child's early use of the words, which are rather simply learned as being 'associated' with the thing (the object or event or whatever) that they are naming.

In contrast, the referential level of word usage is far more sophisticated. This is the way in which words can be used flexibly to represent concepts, which allow people to refer to things (objects, events and so forth) that are not in the here and now. So for example, if a child refers to a toy in their bedroom, and then runs off to get it, they are using the name of that toy in a referential sense. It is really usage of words in this latter sense that qualifies as using a language.

Studies of apes such as Washoe have shown that they are able to move beyond the associational level of sign and symbol usage, but only if given specific training so to do. For example, two chimpanzees known as Sherman and Austin needed 18 months of training in order to be able to fetch a specific item from another room following a request made of them by means of a symbol (Savage-Rumbaugh, 1986), even though they could correctly select the

requested item if it was offered as a one-from-three choice directly in front of them. So, one striking difference between the 'language' that was acquired by apes in these sorts of study, and the language that is acquired by human children, is that human children develop referential use of signs and symbols (usually words) entirely spontaneously, and comparatively rapidly. Human children do not have to be taught specifically to understand the concept of referring to something that is not present, or the concept of referring to more abstract things such as their own or other people's actions.

The study

Washoe, Sherman and Austin were common chimpanzees (*Pan troglodytes*). Savage-Rumbaugh et al. set out to observe and document language acquisition in a different species of ape; namely the pygmy chimpanzee (*Pan paniscus*). Pygmy chimpanzees had previously been observed to be of particularly high intelligence (Yerkes and Learned, 1925), which might have implications for the course of their language acquisition. It may be that some of the language learning limitations shown in studies of common chimpanzees are species-specific limitations.

Methods

The study uses structured and unstructured observational methods set within a longitudinal case-study design. The main subject of the observations was Kanzi, a pygmy chimpanzee born in captivity, who was four years of age when the report of the study was written. Observations of his younger sister, Mulika, are also reported, but she was born three years after Kanzi, so she was still very young at the time of the report. Where appropriate, the behaviour of Kanzi and Mulika is compared with that of Sherman and Austin, two common chimpanzees.

The main medium for the chimpanzees' communication was a set of 'lexigrams', or symbols, to which communicating partners would point (see www.greatapetrust.org/bonobo/language/index.php for a description and an image). In the laboratory these symbols were built into an electronic system, in which the selected symbol became brighter when touched, and which also produced a spoken word by means of a speech synthesizer (after Kanzi had provided evidence that he understood spoken words). In the field the researchers used a laminated board with photos of the symbols, to which communicating partners would point. In the spirit of a total approach to communication, ASL signs and spoken words were also used to accompany the act of pointing to the lexigrams.

Unlike Sherman and Austin, Kanzi and Mulika received no formal training in the use of the symbols. Symbols were simply used with them in everyday settings. Kanzi had also had the opportunity to observe his mother's use of the symbols, from the age of 6 to 30 months. Many of the communication opportunities came from everyday activities such as finding food. During certain periods of the year food was only available from specific locations around the

55-acre forest that surrounded the laboratory. Kanzi would do things like select which food or which location he wanted to travel to, by means of photographs of the foods and lexigrams. He would then take the researchers to the locations and collect the foods in a backpack. Kanzi and Mulika also helped with domestic chores such as doing the laundry and changing beds. All activities were used as opportunities to engage in communication.

Utterances (as shown by his use of lexigrams and gestures) were recorded automatically by the electronic devices in the laboratory, and in the field pencil and paper records were kept, which were then transcribed to computer records at the end of the day, along with contextualizing field notes. The report is based on complete records of Kanzi's utterances from 30–47 months, and of Mulika's from 11–21 months. All utterances were coded as 'correct' or 'incorrect' and then as 'spontaneous', 'imitated' or 'structured'. Spontaneous utterances were unprompted by humans; structured utterances were responses to requests or questions, or some sort of human behaviour designed to elicit an utterance. Independent observers coded samples of videotaped utterances to check for inter-observer reliability, which was found to be high.

A word was adjudged to be part of the chimpanzees' vocabulary if a) the relevant lexigram was used correctly on nine out of ten consecutive days, and subsequently b) nine out of ten spontaneous usages showed appropriate behavioural 'concordances'. The researchers give the following examples. If one of the chimpanzees indicated spontaneously 'treehouse', the utterance would only be recorded as a correct concordance if the chimpanzee then led the researcher there. Or if a specific food was indicated, it would only be scored as a concordance if that food was then chosen from a selection of food choices. These concordances did not need to be provided on consecutive days. This stringent behavioural criterion was a means of verifying that the chimpanzees actually 'knew' the meaning of the lexigrams that they were using.

Results

From the rich set of findings that are extensively set out, there are a number of key observations that are particularly noteworthy. Perhaps the most noteworthy aspect of the story is the apparent spontaneity of Kanzi's and Mulika's 'language acquisition'. For example, it is noted that without any training both chimpanzees used 'iconic gestures' (gestures that bear a physical resemblance to their meaning) to communicate: for example making appropriate twisting hand movements to indicate their desire to remove a twist-top lid. Such gestures were also accompanied by vocalizations.

Another example of spontaneous development in this respect is in the use of lexigrams. When he was separated from his mother, Kanzi surprised the researchers by demonstrating, behaviourally, an understanding of the symbols on the communication device that he had previously observed his mother using. The researchers had not realized that he had learned that specific symbols referred to specific things. One example from the field notes illustrates this well:

Kanzi requested 'apple' (by touching the symbol on the keyboard) and one was retrieved ... for him. He took a few bites of it and then dropped it on the floor and began to do playful spins Kanzi then suddenly stopped his spinning, touched 'apple' again, and picked up the apple ... and took a bite of it Kanzi then touched 'apple chase', and began running around the room with the apple ... while smiling and glancing back toward the experimenter. (p. 219)

This field note also draws attention to another important feature of Kanzi's use of symbols; that is, the way in which he combined symbols and gestures into more sophisticated two- or three-word 'utterances'. It was in this respect that there were striking differences between Kanzi's utterances, on the one hand, and the reported symbol usage of common chimpanzees in previous studies, such as Washoe, Sherman, Austin and Nim. The most interesting differences were observable in three-word utterances. Nim, for example (see Sanders, 1985), never referred to other people as the subjects or objects of the utterances. And because Nim only ever referred to himself in those utterances, the word 'Nim' (or 'me') added little to the communicative content of the utterances ('Tickle me Nim', 'Grape eat Nim', 'Banana eat Nim'). Furthermore Nim's most common two- or three-word utterances were mostly requests for food. Kanzi, on the other hand, included other people as either subject or object, or both, in his three-word utterances ('Chase person₁ person₂', 'Person₁ chase Kanzi', 'Person₁ tickle person₂'), and usually used these utterances when trying to initiate games. The fact that Kanzi may or may not be referred to as the subject (agent) or object (recipient) of his utterances adds an extra layer of information giving to what was evident in Nim's (and indeed in Sherman and Austin's) utterances, and 'would seem to be a precursor of syntactical structure' (p. 230).

Symbols that were new to Kanzi's and Mulika's vocabulary were often first observed in what the researchers call 'usage routines'. In other words, new words tended to be used for a while only in specific contexts (specific settings or specific activities), as if the context, or sequence of events, 'reminded' the chimpanzees of the behaviour of pointing to the symbol. This is the kind of associational level of word use that Sherman and Austin struggled to go beyond without specific and relatively lengthy training. For Kanzi and Mulika, however, this early stage of word acquisition appeared to be exactly that; a stage, beyond which they moved spontaneously to more flexible and 'referential' usage. It is also noted by the researchers that Sherman and Austin's limited understanding of spoken English was heavily context dependent, and that understanding would not withstand tests such as getting the chimpanzees to select a specific food from a choice of three. Kanzi and Mulika, in contrast, clearly understood spoken English words in ways that were not dependent on context. Kanzi and Mulika were able to respond to specific words, even when those words were embedded in complex phrases, and when there were no associated contextual cues as to the intended meaning. Furthermore, this understanding was not taught, but emerged from their exposure to the everyday language of the humans who worked with them.

Discussion

More than one year of detailed daily field notes and structured observations makes for a project that is rich in data, so only a few of the key findings have been summarized here. The original paper has more than 12 full pages of results. Studies such as these, which are based on extensive, reliable observations, that are built into sophisticated descriptions of complex processes, are in many ways the bedrock of an empirical psychology.

The researchers were able to document systematic differences between the language that Kanzi and Mulika, the pygmy chimpanzees, used and understood, and the language that was used and understood by common chimpanzees from previous studies. The fundamental differences were to do with the spontaneity of learning demonstrated by Kanzi and Mulika, and 'the ease with which [they] have comprehended that lexigrams could be used as a mode of symbolic communication to communicate about absent referents and events' (p. 229). The observation that Kanzi was able to represent in words the abstract notion of, for example, one person doing something to another person, rather than simply using symbols to request food, seems to bring his utterances closer to what we might think of as a 'language' with an underlying structure (grammar).

Although the language that Kanzi and Mulika developed was clearly at a more advanced level than that of the common chimpanzees, it is still also very different from the language that is achieved by children. The researchers show how the stages that Kanzi and Mulika went through have parallels with the stages of language acquisition in children. However, the differences are more striking than the similarities.

A sceptical look at the data produces some different conclusions from those offered by the researchers. One key test is to see whether Kanzi distinguishes, on the basis of the kind of syntactic knowledge that comes easily to human children, between utterances like 'dog bites man' and 'man bites dog'. The same words in a different order produce a completely different meaning unlike many of the utterances that Kanzi makes. 'Give banana' for example can mean 'please give me a banana' 'give someone else a banana' or even 'I will give a banana'. Almost any behaviour that Kanzi did with a banana following the utterance 'give banana' will seem to be correct. This is not the case with sentences like 'man bites dog'.

Of the 660 commands that are recorded as being given to Kanzi, only 21 followed the 'man bites dog' / 'dog bites man' variety that could be used to test his understanding of grammar. Kanzi is reported as responding accurately to 12 of these commands (57 per cent) but the assessment may have been a little generous. For example in one instance the researchers asked Kanzi to 'make the [toy] dog bite the [toy] snake' and 'make the snake bite the dog'. In both cases the snake ended up in the dog's mouth but both responses were coded as correct. If codings of this sort are excluded, Kanzi's accuracy drops to 30 per cent (Wynne, 2008).

At the Kanzi website (www.greatapetrust.org/bonobo/meet/kanzi.php)

you can read how Kanzi's achievements are now characterized. The claim is made that 'his vocabulary includes more than 500 words! His comprehension of spoken language is at least equivalent to that of a two-and-a-half-year-old child.' You can also buy a range of ape-related products through the Great Ape Trust which supports him, our favourite being the PROUD TO BE A PRIMATE bumper sticker.

We did ask Kanzi for an interview but he declined.

Questions

1. Give an example of an associational usage of a word.
2. Give an example of a referential usage of a word.
3. What is anthropomorphism (it's in the glossary for the book)? Identify some examples of anthropomorphism in the study.
4. Why do the authors make so much of the observation that Kanzi and Mulika picked up much of the 'language' that they learned spontaneously?

Suggested answers

1. A parent points to the family dog, sitting in front of the fire, and the child says 'dog'.
2. The child looks at the parent and says, quizzically, 'cat?' The parent responds by saying 'The cat's in the garden,' and the child is satisfied with that response. One aspect of a so-called referential usage of words, is the way in which they can be used to refer to things that are not in the 'here and now' (not in the immediate physical context).
3. Anthropomorphism is the attribution of human characteristics to other species. Describing how Kanzi initiated 'games' is attributing a human concept (a 'game') to a set of his behaviours.
4. Previous studies of apes learning a human language had showed that much of what was learned had to be actively taught, in a structured way, over a long period of time. Human children quite clearly do not need to be taught their language, and also learn comparatively very quickly. So the spontaneity of Kanzi's and Mulika's learning in this respect shows that the way in which they were acquiring their 'language' was more human-like than had previously been shown by other apes. How much more human-like it was is a matter of opinion.

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