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Developmental Processes in the Language Learning of Child and Chimp

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I shall be approaching this commentary primarily from the point of view of a developmental psychologist, comparing the linguistically-mediated tool use and exchange of champanzees described by Savage-Rumbaugh et al. with comparable developments in human children.

An interesting contrast with children is the apparently greater difficulty for chimps of simply labeling an object in comparison with naming the same object when it is needed as a tool. Indeed, my research has indicated that the linguistic encoding of an instrument or tool is extremely rare in the one-word stage of children, and its first appearance, is months after the first appearance of a simple label (Greenfield and Smith, 1976). Our study of the development of linguistic functions in two children in the one-word stage also found that the earliest labels precede the earliest instances of naming something in a request context.

All of this would seem to indicate that the difficulty for the two sorts of semantic function is reversed in children and chimps, with chimps (1) more easily learning to use language to request than to name and (2) showing more interest in tools than children do. The former contrast is more interesting, for it suggests that a primary difference between chimps and people is their difficulty with symbolization per se--forming arbitrary relations between signifier and signified, making one thing arbitrarily stand for another. For the chimps, there seems a relatively long period in which they learn more

easily when the word to be acquired is embedded in, part of, an action context. The behavior of the more language-experienced Lana does indicate, however, that awareness of arbitrary symbols eventually develops even in chimps, for Lana was immediately able to transfer her tool words from the request to labeling context without further training.

As Savage-Rumbaugh et al. point out, the stage of action--embedding parallels our description of the pure performative stage in child language. In pure performatives, sounds are part of action contexts; sound pattern and referent are not clearly separable. The arbitrary connection between sign and referent does not yet exist. The parallel should not be stretched too far, however; the chimps' requests for tools involve using a word to trigger an action of another person in a specific situation. The chimp's early tool vocabulary is less tied to the animal's own action than the child's pure performative (e.g., saying bye-bye while waving). The chimp's vocabulary does appear, however, to be more tied to the total context in which a new word is introduced than the child's. Children seem to have a greater tendency to abstract a part of the context in which a word is introduced. They then use this abstraction as the basis for further uses of that word, correct or incorrect. But there may be an earlier stage in which human children do not abstract either; Piaget (1951) describes the earliest word uses of his children as totally tied to one particular context.

There are, however, a couple of other possible explanations for the chimps' difficulty with labels. From the procedural information presented, it seems as though the chimps had to produce labels in response to a

question like "What's this?" (or some other verbally presented request for a name). In the original tool request situation, in contrast, the chimps were to name the tool in response to a nonverbal situation: seeing a hiding place baited with food. In our study, we found that a child's spontaneous use of a given semantic function in one-word form occurred first in response to a nonverbal context, only later in response to verbal. For example, the children in our study could spontaneously label entities before they could use the same words to answer the question "What's this?" If this same progression exists in chimps, it could also explain why labels were so difficult to learn for the chimps under the conditions of this study.

Another possible explanation of the chimps' difficulty in learning object labels lies in the role of extrinsic vs. intrinsic reinforcement in language learning. In the label-training procedure the chimp was asked to name an object and rewarded with praise or food if correct--an <u>extrinsic</u> reinforcement condition. In the tool-request situation, in contrast, the chimp was given the tool he had named (even if it was the wrong tool for the situation); here, the consequences had an <u>intrinsic</u> relation to the chimp's language behavior. In the naturally occurring language acquisition process of children, extrinsic reinforcement seems to play almost no role at all (e.g., Brown, 1973). At the same time students of child language have pointed to the potential importance of intrinsic feedback that gives the child information about what he or she has been taken to mean (Ryan, 1974). This type of intrinsic feedback is provided in the tool requesting situation, where the chimp is given a tool corresponding to the name he produces on the computer keyboard.

In the object-labelling situation, in contrast, he could be given food as a reinforcer, no matter what object name was produced. If this extrinsic reinforcement was interpreted by the chimp as intrinsic, this procedure could actually be confusing. The chimp might conclude that the referent of blanket, one of the labels in the study, was the food reinforcer. Finally, after-the-fact reinforcement for correct symbol selection in the label-learning procedure seems to have replaced an initial stage in which symbol and referent are systematically paired. Such a stage existed in the tool-request procedures, but not in the object-labeling one.

Each of these different explanations for the greater ease of learning and using vocabulary in the tool request procedure would have different implications for the language acquisition process in chimps and its comparison with humans. But more information from the authors about the object learning procedure is needed before it is possible to rule any particular explanation out.

A parallel between chimps and children appears in the concepts implicit in their errors of word use during the acquisition of particular lexical items. Thus, Savage-Rumbaugh report a confusion between words denoting members of the tool category (e.g., between key and stick), but not between tool names and food names. This pattern indicates the functional category, tool, as the basis for the lexical confusion. Similarly, Braunwald (in press) reports examples where her own child spontaneously extends tool names to other tools that fulfill a similar function (e.g., broo for broom is extended to also refer to dust mops). Function is certainly not the only basis of children's

lexical extensions and, in fact, it is often difficult to separate function and form (as in the broom, dust mop example). What is clear, however, is that the surface behavior of child and chimp is not very different in some cases of lexical extension.

Perhaps the most striking parallel between child and chimp is the necessity for a prelinguistic sensorimotor understanding of various forms of action and communication for symbolic encoding of actions and desires to take place. Evidence on this point continues to accumulate for children. For example, using the child's response to offers to study the transition from sensorimotor to linguistic communication, we found that offers (of an object or an activity) were initially made by the mother on the sensorimotor level alone, then simultaneously on both the linguistic and sensorimotor levels, and finally on the linguistic level alone (Zukow, Reilly, and Greenfield, in press). Correlatively, at the early stages, children would generally not respond to offers unless all the sensorimotor elements were present. (e.g., Mother says "Do you want a cookie?" while holding out the cookie to the child). Response to a linguistic offer depended on having the sensorimotor information simultaneously available. Recently Bruner (personal communication) has found the same pattern of development from sensorimotor to linguistic for the child's expression of requests to the mother. In the interanimal communication experiment reported here, the animal differs from the human child in not having prior experience in which a second chimp fulfills his requests. Hence, it was necessary for the human experimenter to direct one chimp's attention to the other

chimp, in order to get the chimp to address his request to another animal. Here the experimenter acted like the mothers in our study, using attention getting devices to transform initially unsuccessful communications into successful ones.

These parallels and divergences between the developmental processes of child and chimp are important in establishing the full nature of linguistic communication and in identifying what therein is uniquely human. Knowledge of parallels is also important in preventing premature conclusions about chimpanzees' language learning limitations. When many of the chimp's limitations of today turn out to have been earlier stages in the child's acquisition process, we should not be surprised when, tomorrow, the chimp follows the child to the next step on the road to mature linguistic communication.

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