

# Evaluation of Chimpanzee Language Experiments of R. A. Gardner and B. T. Gardner, Terrace, and Rumbaugh and Savage-Rumbaugh

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Can we teach a chimpanzee a language? Different researchers have different opinions. R. A. Gardner and B. T. Gardner, Terrace, and Rumbaugh and Savage-Rumbaugh raised chimpanzees Washoe, NeamChimsky (Nim), and Lana respectively and tried to teach a language to them. R. A. Gardner and B. T. Gardner's study is well designed by choosing and teaching Washoe America Sign Language (ASL). However, ASL is only used in a small number of people; therefore, even the chimp can master it, the result is not representative enough to include all major human languages. Also, using limitation as a training method is successful and a surprising result is obtained: Washoe was claimed to perform delayed imitation. One result claimed by R. A. Gardner and B. T. Gardner is that Washoe showed motive for communication, which is not convincing. However, other results of Washoe's abilities of "vocabulary", "differentiation", and "transfer" seem convincing because they could be explained by its understanding that the sign can represent meanings. The methodology of Terrace's study seems more rigorous. The aim of his study is to explore whether apes can create sentences by analysing Nim's combinations of signs and their differences with that of children. The analysis of results of sign combinations is not convincing. However, what is convincing is that the results show huge differences between Nim's and children's utterances. In terms of methodology, the training methods in Rumbaugh's study seem to have no big difference from R. A. Gardner and B. T. Gardner's and Terrace's. In terms of the results, Lana was claimed to perform communication with companions. Another result of the experiment is that Lana was claimed to master the ability to use names.

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## Introduction

Whether language is unique to human beings has been an intriguing question explored by scientists for centuries. To solve this problem, some researchers tried to figure out whether they could teach a language to chimpanzees. Although some researchers argue that chimpanzees will never communicate linguistically, and it is impossible to let them acquire a language, a few decades ago, R. A. Gardner and B. T. Gardner, Terrace, and Rumbaugh and Savage-Rumbaugh raised chimpanzees Washoe, Nim, and Lana respectively, wishing to teach a language to them and they reached some conclusions eventually (R. A. Gardner & B. T. Gardner, 1969;

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Rumbaugh, 1977; Terrace, Petitto, Sanders, & Bever, 1979). This study will evaluate the methodologies of three experiments and show convincement of some of their results respectively.

### **Evaluation of R. A. Gardner and B. T. Gardner's Experiment**

Some parts of the methodology of R. A. Gardner and B. T. Gardner's (1969) study are well designed but still some problems exist. Firstly, they chose to teach Washoe America Sign Language (ASL) rather than a verbal language. This can be justified by Hayes and his colleagues' study of the Chimpanzee Viki. They took efforts to teach speech sounds to Viki; however, it learned only four sounds representing English words in six years (R. A. Gardner & B. T. Gardner, 1969). It therefore proves that a verbal language used by most humans is not an appropriate learning material for chimpanzees and a large amount of time will be wasted if researchers wish the chimpanzee to learn enough sounds. Also, Traxler (2011) maintained that chimps perform well in acquiring aspects of gestural communication because they are more likely to control voluntarily gesturing rather than vocalization. As a result, ASL seems a better choice compared a verbal language in terms of the learning speed of the chimpanzee. However, ASL is only used in a small number of people; therefore, even the chimp can master it, the result is not representative enough to include all major human languages.

Secondly, using limitation as a training method is successful and a surprising result is obtained. R. A. Gardner and B. T. Gardner (1969) claim that apes' imitateness is "proverbial, and rightly so" because those who have spent significant time with chimps consistently report that they are willing to participate in visually directed imitation. As a result, the limitation is a natural behaviour of chimpanzees; they are therefore more likely to acquire vocabulary in this way efficiently. More significantly, Washoe was claimed to perform delayed imitation, which helped it acquire signs for "toothbrush" and "flower"; researchers believed this type of limitation also plays an important part in human child language acquisition (R. A. Gardner & B. T. Gardner, 1969, pp. 666-667). This is probably true because children may also say some new words after being taught for days. However, besides this method, they also used instrumental conditioning and prompting to teach Washoe signs. These methods (including limitations) still have a large difference compared to how human children acquire language.

One result claimed by R. A. Gardner and B. T. Gardner is that Washoe showed motive for communication, which is not convincing. As they described, Washoe visited Gardner's home, climbed on the counter, and signed "toothbrush", so R. A. Gardner and B. T. Gardner believed that it was asking for it and showed motive for communication (R. A. Gardner & B. T. Gardner, 1969). This explanation is not convincing because considering that Washoe was trained to sign "toothbrush" through operant conditioning, therefore it may just sign for a reward rather than wishing to ask for a toothbrush. Traxler (2011) also argues that a large proportion of ape signs are connected with food and rewarding actions and they just signed for obtaining something.

However, other results of Washoe's abilities of "vocabulary", "differentiation", and "transfer" seem convincing because they could be explained by its understanding that the sign can represent meanings. Washoe can enlarge its vocabulary gradually, at which state it is normal to be confused about two similar words and what they can represent. Washoe was initially confused about "flower" and "smell", but soon with training, it can differentiate these two words. Further, it also could transfer its signs to new objects which belong to each referent class. One example is: Washoe could transfer sign for "key" to various keys without being trained to do so on purpose (R. A. Gardner & B. T. Gardner, 1969, pp. 670-671). The deep reason for these abilities could be attributed to the "conceptual-intentional system" in apes, which may not be the unique system held by

humans (Hauser, Chomsky, & Fitch, 2002, p. 1569). As a result, apes may utilize this system to obtain such abilities under appropriate training in the experiment.

### **Evaluation of Terrace's Experiment**

The methodology of Terrace et al. (1979) study seems more rigorous. The learning material and training methods are similar to R. A. Gardner and B. T. Gardner's (1969) study; however, in order to create a similar environment as children, Nim was raised in a home and accompanied by humans rather than in a laboratory. This is a better choice because it will make results more persuasive if researchers wish to compare chimps with children because there will be fewer variants.

The aim of this study is to explore whether apes can create sentences by analysing Nim's combinations of signs and their differences with that of children. The analysis of results of sign combinations is not convincing. Nim was found to use two-sign combinations in a particular pattern, which is not convincing. For example, it used "more + x" and "give + x" more frequently than "x + more" and "x + give" respectively. Researchers denied that this phenomenon is caused by Nim's position habits by comparing the predicted possibility of the combinations with the observed one. Failure of explanation lets researchers imply that these combinations may be structurally constrained (Terrace et al., 1979, p. 893). However, even though the position habits cannot explain this phenomenon, Nim should not be expected to have basic grammar. Once children acquire certain grammar (e.g. more + x), they are nearly impossible to use "x + more" mistakenly. The probability of Nim making mistakes is still too high compared to children. In languages similar to English, when grammatical rules are set, "the related behaviour is almost 100% consistent" (Traxler, 2011, p. 13).

However, what is convincing is that the results show huge differences between Nim's and children's utterances. Nim's mean length of utterances (MLU) appears to be stuck at 26 months whereas children's MLU will continue to increase. More notably, Nim can even produce 16 signs utterances even though its MLU (1.6) is lower than children's MLU (2.0) (Terrace et al., 1979). These differences imply that Nim might use a completely different mechanism to produce utterances which cannot be treated as sentences. For example, "give orange me give eat orange me eat orange give me eat orange give me you" is a 16-sign utterance produced by Nim (Terrace et al., 1979, p. 895). It is easy to observe that this utterance contains a lot of repetition which is different from children's utterances. In fact, these repetitive sequences reflect the superstitious behaviours exhibited by pigeons, dogs, and college undergraduates when a dependency exists between behaviour and rewards, but the delivery of the incentive is delayed (Bruner & Revusky, 1961). As a result, the motive for Nim to sign also seems the desire for food or rewarding action like tickling. These huge differences show that Nim cannot produce a sentence or have grammar. The deep reason for that could be that it lacks the "computational mechanisms for recursion", which is unique to humans (Hauser et al., 2002, p. 1569), therefore losing the capability to utilize words to build meaningful sentences.

### **Evaluation of Rumbaugh and Savage-Rumbaugh's Study**

In terms of methodology, the training methods in Rumbaugh's (1977) study seem to have no big difference from R. A. Gardner and B. T. Gardner's (1969) and Terrace et al.'s (1979). The most significant change is the chimp's communication tool, which has both advantages and disadvantages. Instead of ASL used by R. A. Gardner and B. T. Gardner and Terrace, this study planned to use an artificial language called Yerkish with artificial lexicon and grammar. The major advantage of this language is that it has a "parser" or "automatic

sentence analyzer” (Rumbaugh, 1977, p. 92), which could help researchers record all words or utterances produced by Lana and analyze their structures accordingly. This will guarantee the completeness of Lana’s utterances and the accuracy and effectiveness of the analysis. However, the use of artificial lexicon and grammar also brings some problems. By using the “correlational grammar”, which is different from traditional grammar treating syntactic structures apart from semantics, descriptions of lexicon and grammar may sometimes merge (Rumbaugh, 1977, p. 92). This is just one difference between Yerkish and normal human language. Actually, the differences between them are so huge that researchers could not reach the conclusion that the ape can learn human language, even though the experiment did succeed. Instead, they may just prove that the ape can use Yerkish.

In terms of the results, Lana was claimed to perform communication with companions. Rumbaugh (1977) states that Lana started a conversation including an appropriate request on her own initiative. The conversation is shown below.

LANA: ? Tim move into room. [8:58 a.m.]

TIM: No.

LANA: Tim give. [8:59 a.m.]

? Tim give milk behind room.

TIM: No give. (Incorrect use of “give”)

LANA: ? Tim move milk behind room. [9:00 a.m.]

TIM: Yes. (p. 178)

This “conversation” seems coherent if researchers believe Lana does have intention to communicate. However, this “conversation” could be explained in other way. Lana’s motivation is still obtaining the food. Due to her high intelligence, she found certain sign combinations could help her achieve that and she may not know what she is doing at all. This is reasonable because apes will discuss about food frequently once they acquire how to sign (Traxler, 2011). They do not need the ability to “speak” a language to get food; instead, they can use what they learn and observe to find novel way to solve the problem and get reward through high intelligence. As a result, the claim that Lana can perform communication is not convincing.

Another result of the experiment is that Lana was claimed to master the ability to use names. Through training, Lana learned the names of seven incentives including her favourites “banana slices and M & M candies”, therefore assumed to acquire the abstract concept that things can have names (Rumbaugh, 1977, p. 177). Names are available for ready reference to things and events, whether past, present, or future, which is important in language (R. A. Gardner & B. T. Gardner, 1969). The ability to use names can be therefore seen as the referential skill. This claimed ability is convincing because it assembles the skill to acquire vocabulary like Washoe mentioned above. Both skills can be explained that Lana also has the “conceptual-intentional system”, which provide her with the potential to master the concept and use of names (Hauser et al., 2002, p. 1569).

## Conclusion

In conclusion, in terms of general methodologies, firstly, R. A. Gardner and B. T. Gardner and Terrance use ASL as learning material while Rumbaugh and Savage-Rumbaugh use Yerkish. ASL can be a helpful substitute for the verbal language but seems less representative while Yerkish can record and analyse utterances easily but is rather different from normal human language due to artificial lexicon and grammar. Secondly, limitation as a training method was used in three experiments. However, this training method is different from

how children acquire language although delayed limitation may appear in child language acquisition. Thirdly, Terrace raised Nim at home while the rest of experimenters raised their chimps in laboratories. Raising at home may provide a more similar child learning environment for chimps than in labs, therefore improving the persuasion of the experiment because of fewer variants. In terms of convincement of experiments results, firstly, Washoe's vocabulary, differentiation, and transfer skills seem convincing while its motivation for communication seems not. Secondly, Nim is not expected to produce sign combinations by grammar but its utterances are somewhat different from those of children. Thirdly, Lana's ability to perform communication is not convincing but she could master the ability to use names.

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