English and Lexigram Comprehension of Language-Enculturated Bonobo (*Pan paniscus*)

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Background

Kanzi was reared in a unique language-rich environment and learned to communicate with spoken English and lexigrams, a novel symbol-based language system. While Kanzi's linguistic capabilities have been well documented (Savage-Rumbaugh et al, 1993; Savage-Rumbaugh et al, 1984), the published research of his language comprehension has not been maintained with recent experimental methods.

Research Questions

1. What is Kanzi's relative comprehension of spoken English and lexigrams?
2. What is Kanzi's comprehension of individual words?
3. How does mode of communicative input affect Kanzi's vocabulary?

Methods

Study Site: Ape Cognition and Conservation Initiative, Des Moines, IA

Data Collection: Kanzi participated in three computerized tasks to test his ability to match a (1) picture to spoken English, (2) lexigram to spoken English, and (3) picture to lexigram symbol. All tasks tested an identical list of 120 nouns, and their corresponding pictures and lexigrams that are commonly encountered in his environment. The tests were randomized throughout the 8 month testing period, and a minimum of 50 exposures were included for each word.
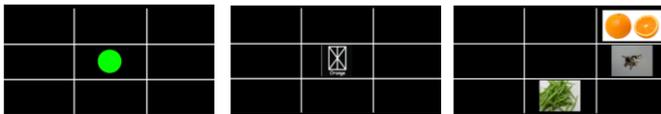

Figure 1. An example of Kanzi's Lexigram to Picture test. Trials began with a green circle, initiating the task when touched. The subject is then presented with a sample stimulus, followed by the target and distractor choices, from which an answer was chosen.

Results

Kanzi performed above chance in all three tasks, although his average score was significantly higher in both tasks with a spoken English stimulus than the Lexigram to Picture test (p<0.01). The average overall word score ranges from 22.7% correct ("can") to 97.3% ("peanut"), and the next highest scored words are "banana" and "Matata." Word accuracy was also largely dependent on type of linguistic input.

	Trials Correct	Total Trials	Average %	St. Error
Eng to Pic	5202	6663	76.2	0.009
Eng to Lex	4954	6749	73.4	0.007
Lex to Pic	4463	6779	65.4	0.005

Table 1. Average percent correct for test sessions in English to Picture, English to Lexigram, and Lexigram to Picture tasks.
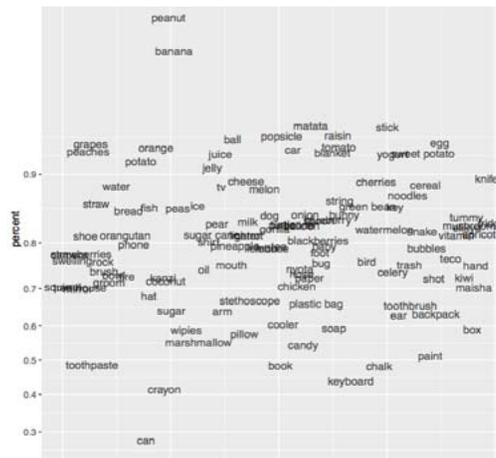
Figure 2: Kanzi's average word accuracies for full 120 word set over three tasks
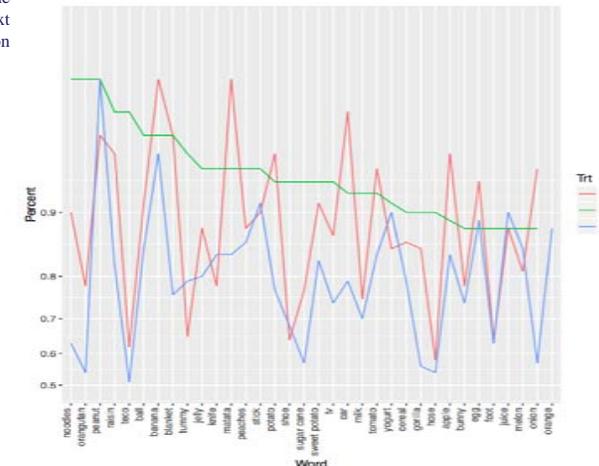
Figure 3. Percent correct of highest 25 words in English to Picture test, compared to scores in English to Lexigram and Lexigram to Picture.

Discussion

It is unsurprising that Kanzi scored higher English stimulus tests than the Lexigram to Picture test, as he is constantly surrounded by spoken English, both in direct human-bonobo interaction and from the human conversation at ACCI. Although people do use lexigrams to communicate, it is nearly always paired with spoken English. Lexigrams are not the most efficient strategy for people, but they are quite effective for Kanzi to inform his caretakers of simple requests and needs.

We can infer that he is more likely to understand words that are important in his daily life, which is consistent with the highest scoring words being for two strongly preferred food items and for his mother, Matata. An unexpected finding of this study is that individual word accuracy scores varied depending on task type, despite the assumption that Kanzi have similar scores across treatments based on his overall comprehension of that word or concept.

Future Directions

This study clearly assesses Kanzi's individual word comprehension in multiple linguistic formats. We cannot guarantee that he will regularly use the high scoring words in conversation, but he is unlikely to correctly use words with lower scores. Examining Kanzi's word comprehension is an important step in identifying his overall linguistic capabilities, as well as his perception of his environment.

Once confident in his knowledge of a word and its meaning, we can further analyze Kanzi's ability to understand that word in the context of larger linguistic units. His capabilities for complex language make him a valuable resource in appreciating the linguistic and cognitive capabilities shared between our closely related species.

Works Cited
Savage-Rumbaugh ES, Lewin R. 1994. Kanzi: The Ape at the Brink of the Human Mind. New York: Willey.
Savage-Rumbaugh ES, Murphy J, Sevcik RA, Brakke KE, Williams SL, Rumbaugh DM. 1993. Language comprehension in ape and child. Monographs of the Society for Research in Child Development 58(3/4):1-221