Faculty of Language Broad (FLB): includes all the mental processes that are both necessary and sufficient to support language

Faculty of Language Narrow (FLN): includes only those mental processes that are unique to language and unique to humans
Human language, like other open-ended cognitive abilities (e.g., mathematics, music, morality), depends upon the use of a finite set of discrete elements to create a potentially infinite array of meaningful expressions. This internal computation must interface with other aspects of the mind.
First claim

Although nonhuman animals behave according to abstract rules, these rules lack the open ended and expressive power of those operating in human language. Simply, there is nothing like a grammar for animal calls, nor the capacity to learn a grammar from human instruction or exposure.
Although nonhuman animals lack the grammatical computations of our language faculty, and may have a limited capacity to produce word-like utterances, they share with humans core aspects of our sensory-motor and conceptual-intentional systems. In other words, they have either homologous or analogous mechanisms of speech perception and conceptual representation. These systems did not, therefore, evolve for language.
Word learning & statistical rules:

Familiarize 8-month olds to continuous speech stream: tiladopagotudapikupodita

Test with:
“Words”: tilado, dapiku
“Non-words”: bidaku
“Part-words”: pikupa

Result: Look more to Non-words & Part-words than to Words
Response with no reward:

1. Pre-playback
2. Playback start
3. Orient to spkr

Familiarize to continuous speech for 21 mi

Test with words: tiladu, dapiku
partwords: dapiba
nonwords: latido
What other statistical rules?

Non-adjacent syllables
[rare in natural languages, Tagalog]

<table>
<thead>
<tr>
<th></th>
<th>Mean % Correct Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human adults</td>
<td>100</td>
</tr>
<tr>
<td>p &gt; 0.05</td>
<td></td>
</tr>
<tr>
<td>Tamarins</td>
<td>0</td>
</tr>
<tr>
<td>p &lt; 0.008</td>
<td></td>
</tr>
</tbody>
</table>

What about phonemes?

Non-adjacent consonants
“Hebrew”, “Arabic”

C<sub>1</sub>V<sub>n</sub>C<sub>2</sub>V<sub>n</sub>C<sub>3</sub>V<sub>n</sub>

Mean % Correct Responses

- Human adults: 100% correct responses, \( p < 0.001 \)
- Tamarins: \( p > 0.05 \)

What about vowels?

Non-adjacent vowels
“Turkish” [vowel harmony]

Cₙᵥ₁Cₙᵥ₂Cₙᵥ₃

Mean %
Correct Responses

Human adults
100

0

Human adults

0

Mean %
Correct Responses

Tamarins
100

0

p < 0.001

p < 0.002

Finite state grammars: Lowest level of Chomsky hierarchy; characterized by local dependencies between symbols/variables.

Phrase structure grammars: Next level of Chomsky hierarchy; can generate arbitrary long-distance dependencies (if x THEN y) with embedding.

Fitch & Hauser, 2004
Finite State Grammar:

Finite state grammar: ABn->ABABAB

Rule: A before B, equal numbers (n) of AB;
  • 4 A tokens, 4 B tokens;
  • each token = unique CV syllable

Habituate: A₁B₁A₂B₂; A₁B₂A₃B₁A₃B₄…

Test: A₃B₄ (GOOD); A₁B₄A₃ (BAD) B₂A₁ (BAD)
Phrase Structure Gramma

Phrase structure: $A^n B^n \Rightarrow (A(A(AB)B)B)$

Rule: A before B, equal numbers (n) of As and Bs; 4 A tokens, 4 B tokens; each token = unique CV syllable

Habituate: $A_1 A_2 B_1 B_2; A_1 A_2 A_1 B_1 B_1 B_2; A_3 A_4 B_1 B_4 …$

Test: $A_3 A_2 B_4 B_1$ (GOOD); $A_1 A_3 B_3$ (BAD); $B_3 B_2 A_1 A_2$ (BAD)
Faculty of Language

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Future directions

1. Extending the range of rules tested
2. Extending the range of methods
3. Extending the range of species