Abstract

I. Stability and Variability in Aphasic Patients' Comprehension

I.A. Stability

The stability of sentence comprehension in aphasia has long been a subject of debate. A clear view is important here: an understanding of the underlying pathology would be hindered by unstable performance patterns, which in turn would render the design of treatment and evaluation protocols impossible. In an attempt to assess the degree of variability in Broca's aphasia, a retrospective quantitative literature survey was recently conducted, from which raw scores of a large group of Broca's aphasic patients were culled. The resulting database contains 233 data points, constructed from comprehension scores of 69 Broca's aphasic patients who received 5934 "semantically reversible" sentences of 14 different syntactic types (Drai & Grodzinsky, 2006). Analyses of this large-scale database with techniques that build on the beta-statistic indicate that cross-linguistic and cross-laboratory results give a stable picture once the correct method for partitioning impaired from preserved abilities is introduced. Of several candidate deficit analyses considered, one revealed robust structure: It appeals to the syntactic concept of Movement as the locus of comprehension deficit in Broca's aphasia, in line with the Trace-Deletion Hypothesis (TDH).

While a robust syntactic Movement effect is evident, further empirical investigations of the database uncover new sources of variability. These are the topic of the current presentation.

I.B. Cross-Linguistic Comprehension Variability: Active and Passive

Central to the above view are comprehension results of English experiments on active and passive sentences. Comprehension of active (–Movement) sentences is far superior to that of passive (+Movement), which seems to be at chance. However, a further analysis of the Drai-Grodzinsky database reveals an odd, persistent, and previously unnoticed variability that transcends the ±Movement distinction: While –Movement active sentences are universally comprehended at above-chance levels, cross-linguistic results of experiments that use +Movement passives present a highly variable picture. An array of data from 8 languages (Dutch, English, German, Hebrew, Italian, Japanese, Korean and Spanish) results in a picture that has the following qualitative character (in parentheses – group performance level per sentence type in a given language group):

(1) English (Spanish, and Hebrew)
a. active:
The man pushed the woman (above chance level)
b. Passive:
The man was pushed by the woman (chance level)

(2) Italian
a. active:
Il ragazzo abbraccia la ragazza (slightly above chance)
The boy hugs the girl
b. Passive:
La ragazza è abbracciata dal ragazzo (almost at chance)
The girl is hugged by the boy

(3) Dutch (and German)
a. active:
De man redt de vrouw (above chance level)
The man saves the woman
b. Passive:
De vrouw wordt door de man gered (above chance level)
The woman is by the man saved

(4) Japanese (and Korean)
a. active:
Taro-ga Hanako-o nagu-ta (above chance level)
Taro-NOM Hanako-ACC hit-past
(Taro hit Hanako)
b. Passive:
Hanako-ga Taro-ni nagu-rare-ta (chance level)
Hanako=NOM Taro-DAT hit-PASS-past
(Hanako was hit by Taro)

II. Some Statistical Effects
Space limitations force a brief quantitative illustration, with only a small selection of our numerical results (mu and sigma are parameters of beta-distributions, given in addition to p-values):
II.A. English speaking patients scored significantly higher on actives than on passive sentences: The hypothesis that the 2 sets of scores come from the same beta-distribution was rejected (n=27; mu-EngAct =0.829; sigma-EngAct =0.133; mu-EngPass=0.630; sigma-EngPass=0.2057; p=0.0014).
II.B. Dutch patients get high scores on both active and passive sentences: the hypothesis that the 2 sets of scores come from different distribution is not rejected (n=13; mu-DuAct=0.83; sigma-DuAct=0.21; mu-DuPass=0.71; sigma-DuPass=0.239; p=0.4).
II.C. Dutch and German patients (n=18) score significantly higher on passive than their English (n=27) counterparts (mu-DuGerPass=0.83; sigma-EngPass=0. 63; mu-DuGerPass=0.13; sigma-EngPass=0.2; p=0.003).
II.D. Italian patients (n=38) score similarly, and slightly above chance, on active and on passive (n=38; mu-ItAct =0.77; sigma-ItAct=0.137; mu-ItPass=0.69; sigma-ItPass=0.167; p=0.167).

The presentation will provide more results, displayed in a format especially prepared for visualization. The picture we are facing is quite complex, and resists immediate understanding, let alone a linguistic account. I will try to grapple with this newly discovered set of problems.

III. Preliminary Hints Regarding a multi-Factorial Syntactic Account?
III.A. A Very Mixed Picture
To begin with, this new variation is only found between languages, and not within speakers of a language. That is, wherever the size of a patient group is large enough to make

measurements meaningful (i.e., English, Dutch/German, and Italian), the results suggest relative performance uniformity within the group. We are thus led in a linguistic direction, headed toward a new cross-linguistic account of comprehension in Broca's aphasia.

A first-pass description of the emerging picture groups performances by language type with respect to basic word-order: a. SVO (verb-initial) languages provide split performance, as English, Spanish and Hebrew speaking patients present a significant difference between active and passive (above-chance, chance), whereas for Italians, no significant active/passive difference is measured, and the overall performance level is slightly above chance. B. For speakers of SOV (verb-final) languages, split performance is also observed, with Dutch and German patients yielding overall above chance performance, and Japanese and Korean patients being above chance level on actives, and at chance in passive. Could a linguistic account be constructed, which utilizes cross-linguistic differences that go beyond word-order?

III.B. A Sketch of a multi-Factorial Account
The Trace-Deletion Hypothesis (TDH) focuses on Movement. However, passive in Dutch and German is derived by Movement, and is nonetheless comprehended at high levels by Broca's aphasic patients. One leading idea here is to account for this puzzle by appealing to basic word order differences – it will be shown that the TDH can be maintained, if it is taken to accommodate the contrast between SVO English-type languages and Dutch-type SOV languages.

Next, I will ask 2 questions that regard additional complications:
1. Like English, Italian is SVO, yet performance level on active is relative low, indistinguishable from passive. What sets Italian apart from English? I will suggest that cliticization processes, available in Italian but not English, are the cause of the difference. In this vain, I will bring in additional data from Italian aphasia, in which patients' success in comprehending clitic constructions is very partial.

2. Like Dutch and German, Japanese and Korean are SOV. By contrast, however, performance level of Japanese and Korean Broca's aphasics on passive is chance, significantly lower than active. What sets these 2 groups of languages apart? An attempt to answer will consider 3 dimensions along which differences are found: a. German/Dutch, but not Japanese and Korean, use auxiliary verbs in passive. b. German/Dutch, but not Japanese and Korean, are V2 languages, featuring a range of positions in which verbs can be found. c. While German and Dutch use a by-phrase, Japanese uses the dative case marker –ni, whose status as a by-phrase is questionable.

The presentation will elaborate on these factors, and try to present a unified account of the comprehension deficit in Broca's aphasia, in which the performance variation above follows from systematic, well-understood cross-linguistic differences.

IV. Linguistic and Clinical Implications
I will discuss the implications of the new picture, putting a special emphasis on the it relevance to the theory of word-order parameters, our view of the nature of by-phrases,

and auxiliaries. I will also consider clinical implications, mostly to the cross-linguistic assessment and diagnosis of aphasia.