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Reference to the Past in Broca’s Aphasia: Inflectional and Semantic Complexity

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Introduction

One defining feature of sentence production in agrammatic Broca’s aphasia is the omission and substitution of free and bound grammatical morphemes in simple and complex sentence structures (e.g., Caramazza & Berndt, 1985). Profound difficulties with production of sentences that refer to the past (compared to non-past) have been shown for many languages including Turkish (e.g., Yarbay Duman & Bastiaanse, 2009; Bastiaanse et.al., 2011).

This study tested impact of inflectional complexity on time-reference in Turkish agrammatic aphasia. Reference to the past and present were tested for morphologically simple past (‐DI) and simple present (‐IYOR) and production of sentences with these inflections was compared to the sentences referring to the past with morphologically complex verbs (‐MISDI for past perfect & –IYORDU for past progressive). From a general inflectional complexity perspective, morphologically complex verb forms (‐MISDI & –IYORDU) are expected to be more difficult to produce than morphologically simple verb forms (‐DI & –IYOR) for individuals with agrammatic Broca’s aphasia. However, according to Yarbay Duman & Bastiaanse (2009), morphologically simple past tense (perceptual –DI) is the semantically most difficult form to produce for individuals with Turkish agrammatic aphasia, since this verb form indicates highest degree of epistemic-speaker certainty as to the happening of a past event and, agrammatic speakers are uncertain in this respect. If semantic complexity plays a role in sentence production in agrammatic aphasia, morphologically simple but semantically complex past tense verbs can be expected to be as difficult as inflectionally complex verb forms referring to the past. That is, an effect of inflectional complexity would not necessarily be seen for semantically complex past verbs but for semantically simple present verbs. In terms of semantic complexity, this study also questioned whether the ease with simple progressive would make sentences with past progressive easier than sentences with past perfect. Overall, nature of errors to the target verb inflection in the test was examined for all past tense forms.
Methods

Participants
Seventeen Turkish individuals (3 females, 14 males, MA: 54.17, SD: 13.50) clinically diagnosed with Broca’s aphasia by Turkish Aphasia Assessment Test (ADD: Maviş & Toğram, 2009) participated in the study. All patients had a left hemisphere lesion and had suffered a single cerebrovascular accident (except for two who had single Traumatic Brain Injury) at least 3 months prior to testing. Seventeen agematched Turkish speakers with no speech and language impairment history served as the control group.

Materials
A pictorial sentence completion test was developed by using a similar methodology of The Test for Assessing Reference of Time (TART: Bastiaanse, Jonkers, & Thompson, 2008). In 4 test conditions, present progressive (–IYOR); simple past (–DI), past perfect (–MISDI), past progressive (–IYORDU) were tested. There were 15 sentences per condition. Time-adverbs (shortly after, shortly before, now) were used to manipulate a specific reference time. An example is given below (in the test, two pictures describing the two sentences were used for each test item). The patients’ task was to complete the sentence with a verb.

Example test sentence:
Biraz önce kadın muzu soydu. Şimdi kadın portakalı… (Participant: soyuyor)
Shortly before the woman-nom the banana-acc peeled. Now the woman-nom the orange-acc…
(Participant: is peeling)
‘The woman peeled the banana shortly before. The woman is peeling the orange now’

Results
The control group performed at ceiling on producing target verb inflections in the test. Thus, their data were not considered for statistical analyses. For the agrammatic group, a repeated measures ANOVA with Condition (simple past, simple progressive, past perfect, past progressive) as the within participants variable indicated a significant main effect for Condition ($F(1.62, 25.98)=38.54$, $p < .001$, $\eta^2 = .70$, with a Greenhouse-Geisser correction because sphericity assumption was violated). Figure 1a shows accuracy data. Pairwise comparisons with Bonferroni correction indicated that the mean difference between –DI & –IYOR (–7.64); –MISDI & –IYOR (–11.82) and, –IYORDU & –IYOR (-11.82) was significant ($p = .001$ for all comparisons). However, the mean difference between –DI & –MISTI (4.17) and –DI & –IYORDU (4.17) was not significant ($p=.205$; $p=.104$ respectively). The mean difference between –MISTI & –IYORDU (.000) was not significant either ($p=1.000$). Error data analyses revealed that the patients produced nontarget past tense inflections (see Figure 1b) to refer to the past: for –DI: –MIS: $M= 6.7$; –MISDI: $M=1.4$; for –MISDI: –MIS: $M=6.9$; –DI: $M=5.8$; for –IYORDU: –MIS: $M=1.0$; –DI: $M=1.9$).
Figure 1a. Accuracy Means for Target Verb Inflections per Condition

Figure 1b. Reference to the past with nontarget verb inflections per past tense conditions
Discussion

The study has several findings. First, morphologically simple past (–DI), as shown in earlier studies on Turkish, was more difficult to produce than morphologically simple progressive (–IYOR). Second, morphologically complex verb forms inflected for –DI (past perfect: –MISDI & past progressive: –IYORDU) was equally difficult, indicating that presence of progressive aspect does not ease production of morphologically complex verb forms, at least when –DI is present. Finally, morphologically simple past (–DI) was as difficult as difficult as morphologically complex verb forms (–MISTI & –IYORDU). These findings suggest that reference to the past is difficult for the patients and semantic complexity involved in –DI (problems attributing epistemic certainty when there is reference to the past, see Yarbay Duman & Bastiaanse, 2009) makes this verb form as difficult as morphologically complex verb forms.

Error data indicated that when the target inflection required production of –DI in the test, the patients often produced a nontarget past inflection (e.g. –MIS for –DI; –MIS or –DI for –MISDI). The difference between –DI and –MIS in Turkish is that –MIS indicates indirect or hearsay evidence and, as such, involve a lower degree of speaker and event certainty compared to the perceptual –DI. Thus, the problems with past time-reference can be due speaker’s uncertainty as to the happening of the event (Yarbay Duman & Bastiaanse, 2009). A similar idea has recently been proposed by Tosun et.al. (2013) for healthy Turkish adults that their epistemic certainty degrees of a past event impact their interpretations of these past tense forms, which leads overgeneralizations of epistemically more reliable –DI in source judgement tests. We are currently investigating varying degrees of speaker and event certainty in past time comprehension in aphasia since such an overgeneralization would indicate sentence production-comprehension asymmetry in domain of epistemic certainty in aphasia.

References


