Turkish Adults "Know" the Prosody of Scrambled vs. Non-Scrambled Sentences

M. Yarkın Ergin & Karin Stromswold

Rutgers University - New Brunswick

Introduction. Turkish has flexible word order with the default being SOV. OVS sentences *are* grammatical, but are used to focus or highlight the object. Previous work suggests that OVS and SOV sentences differ prosodically (redacted). We investigated whether Turkish adults can distinguish between scrambled vs. default word order sentences based solely on prosody.

Methods. Twenty-two native Turkish-speaking adults participated in two experiments, with at least one month elapsing between them. In Experiment 1, they listened to 144 sentences that were created by orthogonally crossing word order (SOV vs. OVS) and case-marking (accusatively case-marked (O_{acc}) vs. bare ($O_{ø}$). Both nouns in Experiment 1 were animate. Experiment 2 was identical to Experiment 1 except there were 240 sentences that were created by crossing word order and case-marking with the additional variable of object animacy. All sentences were said without context by a native Turkish speaker who was blind to the purpose of the experiment. Sentences were low-pass filtered for frequencies above 400Hz. This ensured that no phonemic, lexical, or morphological information was present. Participants listened to each band-pass filtered sentence and reported whether it had 'scrambled' (*devrik*) or 'default' (*düz*) word order. They were told to go as fast as they could without sacrificing accuracy. No feedback was given.

Results. In both experiments, participants were remarkably accurate and fast at determining word order. Accuracy rates were analyzed using mixed-effects logistic regression and RTs were analyzed with mixed-effects linear regression with participant and item as random factors. In Experiment 1, the overall accuracy in judging word order was 84.1% with no main effects of word order or case. However, word order and case interacted ($z = 5.46$, $p < .001$), with greater accuracy for $O_{ø}VS$ and $SO_{acc}V$ than $O_{acc}VS$ and $SO_{ø}V$ sentences (Fig. 1, left panel). People were very quick at judging word order (Mean = 1037 ms), and RT results generally mirrored the accuracy results with shorter RTs for $O_{ø}VS$ and $SO_{acc}V$ ($t = 2.61$, $p < .01$, Fig. 1, left side). In Experiment 2, the overall accuracy rate was 84.6%, with main effects of case, word order, and object animacy. However, these are best understood in the context of the significant three-way interaction among the factors ($z = 2.39$, $p < .05$, Fig. 2, left panel). For sentences with animate objects, the pattern was the same for Expt 2 as Expt 1, but for sentences with *inanimate* objects, case-marking increased accuracy for both OVS and SOV sentences. Again, the participants were fast (Mean = 775 ms), and RT results largely mirrored the accuracy results (Fig. 2, right side).

Discussion. These findings show Turkish adults are extremely sensitive to the prosodic signatures of default and scrambled word order sentences. That participants were better at judging the word order of $O_{ø}VS$ and $SO_{acc}V$ sentences probably reflects that the prosodic contours of these sentences were particularly distinctive (see Fig. 3). Furthermore, when the object was inanimate, distinct performance patterns regarding case-marking and word order appeared. This suggests that participants are sensitive to the subtle prosodic differences related to object animacy. Participants varied considerably in their ability to classify sentences (Expt 1 range 65%-92%, Expt 2 range 72%-95%). In addition, some participants performed the worst on $O_{acc}VS$ sentences while others performed the best on these sentences. This is consistent with different participants using different acoustic/prosodic cues to judge word order. Notably, during debriefing, almost all participants reported very low confidence in their responses, and said that they felt they were 'guessing.' The disparity between participants' subjective and objective performance and the rapidity with which they correctly classified sentences suggest that the use of prosodic information to determine word order occurs at a subconscious level. Our results suggest that, in Turkish, there is a correspondence between prosodic and syntactic structure *and* that this correspondence varies according to the semantics/context of the sentence. It is generally agreed that Turkish SOV and OVS sentences differ pragmatically. Thus, our finding that SOV and OVS sentences differ prosodically is more consistent with theories that claim prosody can directly affect syntactic structure (e.g., Richards, 2010), rather than those that argue that syntactic reordering of phrases occurs solely during syntactic spell-out (e.g., Agbanyani et al., 2015).

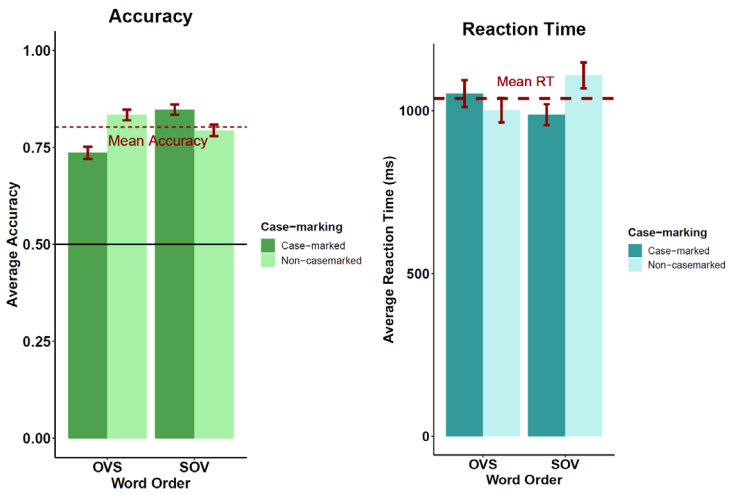

Fig 1. Accuracies and RTs for the 4 sentence types in Expt 1. Error bars are standard errors.

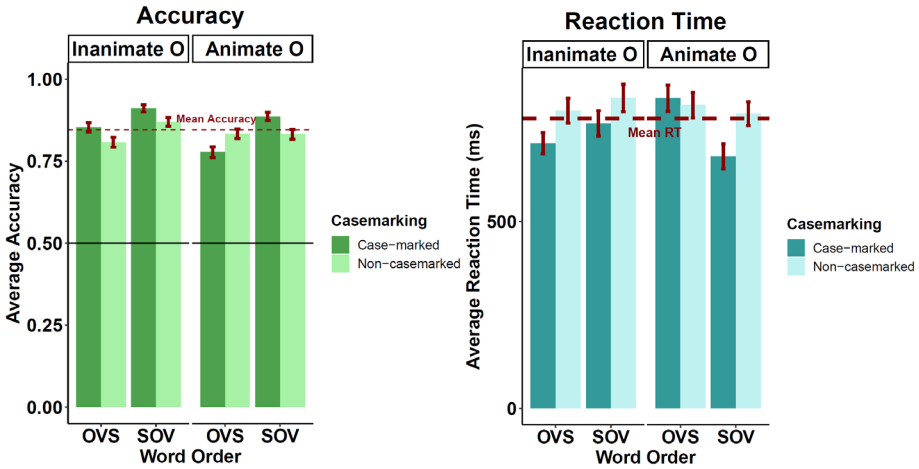

Fig 2. Accuracies and RTs for the 8 sentence types in Expt 2. Error bars are standard errors.

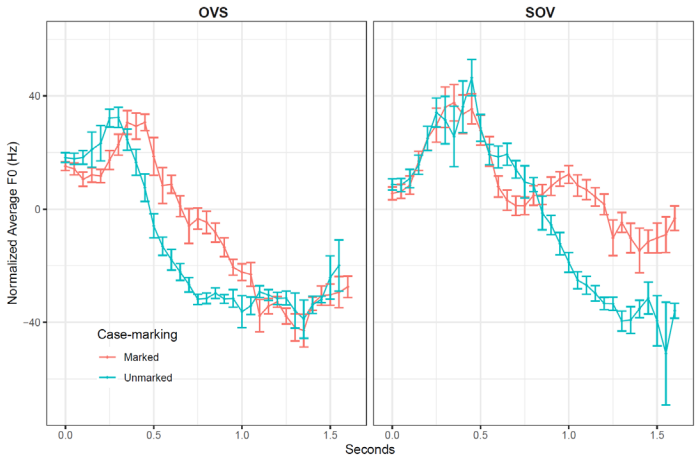

Fig 3. Mean F0 contours of the stimuli sentences in Experiment 1. Error bars are standard errors.