

Ali Idrissi^a & R. Muralikrishnan^b^a United Arab Emirates University, ^b New York University Abu Dhabi

r.muralikrishnan@nyu.edu

Introduction

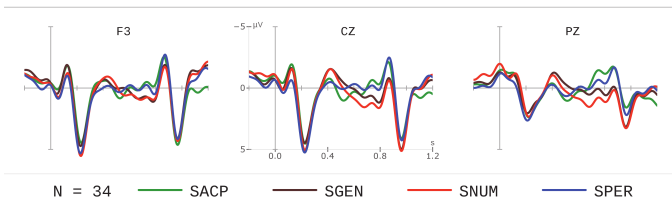
Plural subjects in Arabic are idiosyncratic in that they require full agreement (Person, Number and Gender) in the subject-verb order, whereas in the verb-subject order, verb agreement should be partial (Person and Gender only) when the subject is overt, and full if it is dropped. Thus, the Number feature has a significant syntactic role in Arabic, in that it interacts with word-order in a complex way, requiring different agreement patterns depending on word-order.

In this ERP study, we investigated whether the processing system treated violations of P vs. N vs. G agreement differently at the position of the verb in SV intransitive sentences. Any differences in the ERPs for the three types of violation would suggest prominence differences between the agreement features. However, there is initial evidence that agreement is processed for singular versus plural subjects qualitatively differently [1]. Therefore, we hypothesise that differences, if any, in the feature distance might as well be differential between singular and plural subjects. It remains to be seen what these differences would exactly be.

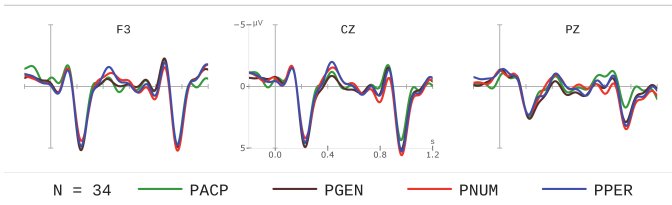
Results

ERPs at the position of the Verb

Sentence with Singular Subjects



Sentences with Plural Subjects



Results

- Negativity: 400 – 600 ms
 - Singular : NUM, GEN > PER > ACP
 - Plural : NUM, PER > GEN > ACP
- Late-Positivity: 700 – 850 ms
 - Singular : NUM > GEN > PER > ACP
 - Plural : NUM > PER, GEN > ACP
- Acceptability ratings (%)
 - Singular : SACP (90) > SPER (47) > SNUM (25) > SGEN (23)
 - Plural : PACP (91) > PGEN (67) > PPER (51) > PNUM (33)
- No LAN for singular violations, in contrast to our previous study [1].

Methods

Participants:

- 34 right-handed native speakers of Arabic

EEG Data:

- Recorded using ActiCap fixed at the scalp; 25 Ag / AgCl electrodes
- Reference: Left-mastoid; Re-referenced to linked mastoids offline
- Ground electrode: AFZ; Offline filter: 0.3 – 20 Hz band-pass

Procedure:

- Rapid serial visual presentation of stimulus sentence
- Tasks: Acceptability judgement followed by Probe detection

Materials:

- Sentences of the form: Adverb of time – Subject – Verb – PP.
- Adverb indicated past tense; Verb tense agreed with the adverb
- Subject noun : masculine / feminine animate common noun
- 8 Critical Conditions (36 Sentences per condition per participant)
 - 2 Subject-Types: Singular or Plural
 - 4 Condition-Types: Acceptable, violation of P, or of N, or of G
 - No combined violations
- Critical position for ERPs: Verb

في الكلية.	حاضرًا	الأستاذة	بالأُس	PACP	من اليوم.	استيقظت	البنت	بالأُس	SACP
'al-kulliyya	fi	HaaDar-uu	'al-'asaatidha	bi-l-'ams	'al-nawm	min	'istayqaDH-at	'al-bint	bi-l-'ams
[DEF-college]	[in]	[lecture]	[DEF-teachers]	[yesterday]	[DEF-college]	[from]	[teach]	[DEF-girl]	[in-DEF-yesterday]
*Yesterday, the teachers lectured in the college'.									
في الكلية.	حاضرًا	الأستاذة	بالأُس	* PPER	من اليوم.	استيقظت	البنت	بالأُس	* SPER
'al-kulliyya	fi	HaaDar-naa	'al-'asaatidha	bi-l-'ams	'al-nawm	min	'istayqaDH-tu	'al-bint	bi-l-'ams
[DEF-college]	[in]	[lecture]	[DEF-teachers]	[yesterday]	[DEF-college]	[from]	[teach]	[DEF-girl]	[in-DEF-yesterday]
**Yesterday, the girl woke-up from sleep'.									
في الكلية.	حاضرًا	الأستاذة	بالأُس	* PNUM	من اليوم.	استيقظت	البنت	بالأُس	* SNUM
'al-kulliyya	fi	HaaDar-na	'al-'asaatidha	bi-l-'ams	'al-nawm	min	'istayqaDH-a	'al-bint	bi-l-'ams
[DEF-college]	[in]	[lecture]	[DEF-teachers]	[yesterday]	[DEF-college]	[from]	[teach]	[DEF-girl]	[in-DEF-yesterday]
*Yesterday, the teachers lectured in the college'.									
في الكلية.	حاضرًا	الأستاذة	بالأُس	* PGEN	من اليوم.	استيقظت	البنت	بالأُس	* SGEN
'al-kulliyya	fi	HaaDar-na	'al-'asaatidha	min	'al-nawm	min	'istayqaDH-a	'al-bint	bi-l-'ams
[DEF-college]	[in]	[lecture]	[DEF-teachers]	[yesterday]	[DEF-college]	[from]	[teach]	[DEF-girl]	[in-DEF-yesterday]
**Yesterday, the girl woke-up from sleep'.									

Discussion

Our results suggest that, whilst the Feature Hierarchy Hypothesis [2,3] generally holds true, the exact hierarchy is rather language-specific. Thus, given the important role Number plays in Arabic syntax, it is the most informative feature and ranks higher in prominence than Gender and Person in Arabic. It is not surprising then, that it also turns out to be the least-violable feature. As for P & G, they seem to have differing prominence depending upon whether the noun in singular or plural. Further, the differential graded effects in both the N400 and P600 time-windows indicate that each feature is assessed differentially when processing Arabic agreement, both in early [3] and late [4] stages.

Acceptability differences between the two subject-types seem to be a direct consequence of the idiosyncratic behaviour of plural subjects, such that agreement violations involving plural subjects seem to be treated as less severe, and thus more acceptable. Less fine-grained ERP differences and, albeit significant, smaller amplitudes for the plural conditions support such an interpretation. The absence of a LAN may not be surprising, given reliable LAN effects are evoked only by 40 – 74% of studies involving subject-verb agreement violations [5].

Taken together, our results provide evidence to the differential prominence of the agreement features in Arabic, and suggest that, even within a given language, owing to specific properties of the language with regard to the agreement features, the feature distances could be substantially different between singular and plural subjects.

[1] Muralikrishnan, R., & Idrissi, I. (2013). An ERP study on agreement violations in Arabic. Poster presented at CUNY 2013.

[2] Greenberg, J. (1963). Universals of language. Cambridge: MIT Press.

[3] Carminati, M.N. (2005). Processing reflexes of hierarchy (P>N>G) and implications for linguistic theory. Lingua, 115(3), 259–285.

[4] Faussart, C., Jacobowicz, C., & Costes, M. (1995). G & N processing in spoken Fr. and Sp. Rivista di Linguistica, 11(1), 75–101.

[5] Molinaro, N., Barber, H.A., & Carreiras, M. (2011). Grammatical agreement processing in reading. Cortex, 47(8), 908–930.