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The interaction of Animacy and Morphosyntax in Arabic

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Abstract of the Dissertation

The interaction of Animacy and Moropho-syntax in Arabic

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The topic of this dissertation concerns the ways that (IN)ANIMACY distinctions interact with various sub-systems of the human language faculty, in particular, morpho-syntax. In Modern Standard Arabic (MSA), morpho-syntax and ANIMACY can be pit against each other directly on the same set of target words, allowing a close inspection of the time-course of the availability of different information in the integration of words into phrasal level structure. Although animate and inanimate singular nouns and plural animate nouns require matching GENDER and NUMBER agreement (e.g., on demonstratives, adjectives, finite verbs … etc.), plural inanimate nouns trigger feminine singular agreement. This state of affairs presents the language comprehension mechanism with a conflict in which the ANIMACY properties of specific nouns render grammatical what would otherwise be a morpho-syntactic violation.

Findings from two experiments (a web experiment and an ERP experiment) show that whereas singulars and animate plurals demonstrate uniform response accuracy and short latencies and replicate previous ERP findings (a LAN) from similar paradigms (Barber & Carreiras, 2003, 2005; Gunter et al., 2000)), our inanimate plurals (mismatch cases), show longer latency effects and a striking polarity reversal of a LAN-type response for the CORRECT but morpho-syntactically mismatched cases. To that end, I argue that during the early stages of parsing and sentence processing, morpho-syntax and conceptual/ lexical-semantic features are both available but completely independent and the locus of the interaction between morpho-syntactic and lexico-

semantic features is post-lexical in the integration stage (in the sense of Friederici (2002)), where override processes are evoked and result in consequently licensing the mismatch cases and rendering them grammatical. If we understand ANIMACY as a conceptual semantic feature, this could be viewed as consistent with the "syntax first" accounts (Marslen-Wilson & Tyler, 1980; Frazier, 1987; Friederici, 1995, 2002; De Vincenzi, Job, Di Matteo, Angrilli, Penolazzi, Ciccarelli & Vespignani, 2003) in which syntax and conceptual semantics are argued to initially act independently; but also incorporates some aspects of the "interactive" accounts (MacDonald, Pearlmutter & Seidenberg, 1994) in arguing that both systems are available immediately.

Dedication Page

To my ever-supporting husband Abdulrahman,

My parents Faiza and Abdulaziz,

And my kids Khalid and Daim.

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List of Abbreviations (Leipzig)

MSA	Modern Standard Arabic
+HUM	+Human
-HUM	-Human
SG	Singular
PL	Plural
DU	Dual
1	First Person
2	Second Person
3	Third Person
F	Feminine
M	Masculine
N	Neuter
ACC	Nominative
NOM	Accusative
GEN	Genitive
ASP	Aspect
PFV	Perfective
IPFV	Imperfective
PAST	Past

SVO	Subject Verb order
VSO	Verb Subject order
COL	Collective noun
MSPL	Masculine Suffixed Plural
FSPL	Feminine Suffixed Plural
BPL	Broken Pural

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Chapter 1

وما التَّأنيثُ لاسمِ الشَّمْسِ عَيبٌ...
ولا التَّذكيرُ فَخـرٌ للهِلاَلِ...

- أبو الطيِّب المُتَنبِّي

It's not a demotion for the Sun to be feminine…
Nor is it an honor for the Moon to be masculine…

- ʔabuu atˁ-tˁajjib almutanabbii.

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1. Introduction

The animate/inanimate distinction is a fundamental feature of cognition that has an arguably deep role in our evolutionary history, in human cognitive neuroscience and neuropsychology, and in language. For example, we see its effect in activating similar clusters of the inferior temporal cortex in both humans and macaques during tasks involving visual processing of (IN)ANIMACY distinctions (Kriegeskorte, Mur, Ruff, Kiani, Bodurka, Esteky, Tanaka, & Bandettini, 2008). We see it implicating differentiated underlying brain mechanisms as suggested by double-dissociations in patient groups (Caramazza & Shelton, 1998), and activation patterns seen in fMRI studies (Grewe, Bornkessel-Schlesewsky, Zysset, Wiese, von Cramon, & Schlesewsky, 2007). The

animate/inanimate division is observable early on in human development (Rakison & Poulin-Dubois, 2001) and is among the last conceptual distinctions to be lost in patients with Alzheimer disease (Saffran & Schwartz, 1994; Hodges, Graham & Patterson, 1995).

A range of important sub-distinctions arise as well between living/non-living, sentient/non-sentient, human/non-human, among others. Investigations of the influences of ANIMACY in language have revealed more fine-grained distinctions corresponding to familiar hierarchies, as in (1):

(1) a. human>animal>inanimate (Comrie, 1989; Dahl, 2000; Croft, 1988)
b. 1>2>3>kin>human>animate>inanimate (Corbett, 2000; following Smith-Stark, 1974)
c. 1>2>3> proper names>kin>human>animate>inanimate (Silverstein, 1976)
d. Speaker > Addressee > 3rd Person > Kinship terms > Other Humans > Higher animals > Lower animals > Discrete inanimates > Nondiscrete inanimates. (Haspelmath, 2013)

Though the details differ across accounts, there is broad consensus that these hierarchies permeate human language in numerous ways that can vary cross-linguistically. ANIMACY can influence a range of grammatical properties like thematic role organization, word order, CASE, and agreement (Corbett, 2000).

The topic of this dissertation concerns the ways that (IN)ANIMACY distinctions interact with morpho-syntax in particular. In the paradigm from Modern Standard Arabic (MSA) under investigation here, morpho-syntax and ANIMACY can be pit against each other directly on the same set of target words, allowing a close experimental inspection of the time-course of the availability of different information in the integration of words into phrasal level structure. This paradigm is provided below:

(2) a. haaʔulaaʔi al-ʔawlaad-u al-wasiim-uuna wasˁal-uu (+HUMAN)
this.**PL** the-boys.**PL-NOM** the-handsome-**M.PL.NOM** arrived-**M.PL**
'These handsome boys arrived'

b. haaʔulaaʔi al-ban-aat-u al-ʒamiil-aat-u wasˁal-na (+HUMAN)
this.**PL** the-girls-**PL-NOM** the-beautiful-**F.PL-NOM** arrived-**F.PL**
'These beautiful girls arrived'

(3) a. haaðihi /*haaʔulaaʔi al-kutub-u al-ʒadiid-at-u wasˁal-at (-HUMAN)
this.**F.SG** /*this.**PL** the-books.**M.PL-NOM** the-new.**F.SG-NOM** arrived-**F.SG**
'These new books arrived'

b. haaðihi /*haaʔulaaʔi al-tˁaawil-aat-u al-ʒadiid-at-u wasˁal-at (-HUMAN)
this.**F.SG** /*this.**PL** the-table.**F-PL-NOM** the-new.**F.SG-NOM** arrived-**F.SG**
'These new tables arrived'

MSA exhibits agreement across the nominal and the verbal paradigms.[1] Thus, demonstratives and adjectives (both attributive and predicative), for example, must agree with the GENDER and NUMBER features of the associated noun, and similar agreement patterns are enforced in relationships with finite verbs. However, MSA agreement paradigms are also conditioned by whether nouns refer to +HUMAN or -HUMAN entities. Whereas plural +HUMAN nouns pattern like the singulars (2), -HUMAN PLURALS instead uniformly trigger *feminine singular* agreement (3). Thus, for -HUMAN PLURALS, mismatching agreement marking which is otherwise ungrammatical in the language is rendered licit due to noun-specific lexical/conceptual properties. And, conversely, what is otherwise a matching/licit agreement pattern (i.e., plural demonstrative with plural nouns) is illicit with -HUMAN plurals.

Note, however, that this mismatch is only present when the noun is pluralized. With singular nouns, regular agreement always holds:

[1] Modifiers in Arabic agree in ϕ-features (Gender, Number, and Person), Case, and Definiteness (with attributive adjectives only).

(4) a. haaðaa al-walad-u al-wasiim-u wasˁal-a (+HUMAN)
this.**M.SG** the-boy.**SG-NOM** the-handsome.**M.SG-NOM** arrived-**M.SG**
'This handsome boy arrived'

b. haaðihi al-bint-u al-ʒamiil-at-u wasˁal-at (+HUMAN)
this.**F.SG** the-girl.**SG-NOM** the-beautiful-**F.SG-NOM** arrived-**F.SG**
'This beautiful girl arrived'

(5) a. haaðaa al-kitaab-u al-ʒadiid-u wasˁal-a (-HUMAN)
this.**M.SG** the-book.**M.SG-NOM** the-new.**M.SG-NOM** arrived-**M.SG**
'This new book arrived'

b. haaðihi al-tˁaawilat-u al-ʒadiid-at-u wasˁal-at (-HUMAN)
this.**F.SG** the-table.**F.SG-NOM** the-new-**F.SG-NOM** arrived-**F.SG**
'This new table arrived'

Note that in MSA the case of regular agreement in the plural does not necessarily hold for animate nouns in general but for those that have +HUMAN referents. That is, nouns that refer to animals and plants do not belong to the same class and may not have the same agreement dependencies.[2] Therefore, a better distinction to use with the Arabic case is the +HUMAN vs. -HUMAN distinction.

The interaction between ANIMACY and agreement is not unique to MSA. In Russian, for instance, a Q(uantified) N(umeral) P(hrase) QNP triggers plural agreement with the verb only when the QNP is animate. Inanimate QNP requires NEUTER agreement:

(6) a. pjat' studentov prišli/ prišlo (Animate)
five students.**GEN** came.**PL/NEUT**
'Five students came.'

b. pjat' pisem ??prišli/prišlo (Inanimate)

[2] In fact, those nouns share some similarities with –HUMANS but also allow other agreement patterns depending on some semantic properties, I discuss that in chapter 2. However, in the stimuli presented in this dissertation only [-HUMAN, -ANIMATE] nouns (nouns denoting artifacts) were included.

five letters.**GEN** arrived**??PL/NEUT**

'Five letters arrived.'

(From Glushan, 2013)

This agreement phenomenon is not only interesting from a cross-linguistic point of view, but also from the perspective of theoretical accounts on agreement and the perspective of the dynamics of language comprehension mechanisms. The main questions posed by this dissertation are as follows:

(i) Is the feminine singular agreement that is triggered by –HUMAN nouns actually feminine singular or there is something else triggering this agreement?

(ii) How does the language comprehension system handle this mismatch?

(iii) What is the time-course of the processing of ANIMACY features relative to features like GENDER and NUMBER, and how do these features interact with one another?

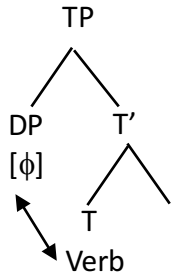
Several proposals are made by this dissertation. First, in terms of theoretical accounts, I argue that the –HUMAN nouns case is a case where agreement is obtained with an intervener (instead of the noun) that projects between the NP an DP and is either morphologically or semantically motivated. That is those nouns are not lexically encoded as singular feminine nor they are a case where what appears to be morphologically singular feminine is underlyingly plural.

Second, in terms of language dynamics, I argue that during the early stages of parsing and sentence processing, both morpho-syntactic and lexical-semantic features are activated but that both streams are completely independent and the locus of their interaction is in the integration stage (in the sense of Friederici (2002)), where the detection of a morpho-syntactic violation elicits an override process that results in licensing the mismatch cases and rendering them grammatical. If we understand ANIMACY as a conceptual semantic feature, this could be viewed as consistent

with the "syntax first" accounts (Marslen-Wilson & Tyler, 1980; Frazier, 1987; Friederici, 1995, 2002; De Vincenzi, Job, Di Matteo, Angrilli, Penolazzi, Ciccarelli & Vespignani, 2003) in which syntax and conceptual semantics are argued to initially act independently; but also incorporates some aspects of the "interactive" accounts (MacDonald, Pearlmutter & Seidenberg, 1994) in arguing that both systems are available immediately.

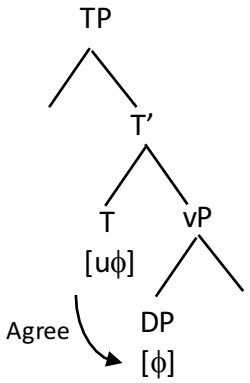
The mismatches presented in (2) - (3), are also puzzling when viewed through the lens of theoretical syntactic accounts that take agreement to be a relationship between feature sets of two elements in particular syntactic configurations. Whether one adopts a Spec/head or a Probe/ Goal analysis (Chomsky 1995, 2001), these grammatical agreement mismatches are difficult to accommodate. A Spec/ Head view of subject/verb agreement, for example, is said to hold between Spec-TP and its head:

(7) Spec-head agreement



Under this locality condition, the subject and the verb (associated with T) can enter in an agreement relation that results in the Head expressing the ϕ-features contributed by the nominal. On a probe/goal view (Chomsky 2001), some features enter the derivation with an interpretable value and others do not. A Head that carries uninterpretable features *Probes* to *value* its features against a *Goal* (e.g., a nominal) with interpretable features under its c-command domain using the operation *Agree* (where overt movement to the Spec-TP position would then need to be driven by other properties).

(8) Probe-Goal valuation



However, on either of these views of the configurations/operations underlying agreement, it is unclear how to admit as grammatical cases where ϕ-features between the elements in such relationships do not match.

So, turning back to the examples form MSA (2)/(3), the main problem is that *Agree* is expected to apply whenever uninterpretable features are available on a *Probe*. The immediate result of its application is *valuation*. If features are not valued, the derivation is expected to *crash*. Hence, in the case of –HUMAN plurals in MSA, it is unclear how agreeing elements end up valued for singular feminine features when dissimilar features appear to be available on the noun.

1.1. Other cases of (dis)agreement in Arabic

The agreement mismatches that arise for –HUMAN plural nouns in MSA plausibly must be distinguished from other cases where agreement exhibits only partial matches. One of these structures is the case of Subject-Verb agreement in VSO order. In particular, verbs in MSA agree with a preverbal subject in all ϕ-features (PERSON, GENDER and NUMBER), while with a post-verbal subject, they agree in PERSON and GENDER only. Consider the examples in (9):

(9) a. al-ʔawlaad-u qaraʔ-**u** al-dars-a (SVO order/ full agreement)
the-boy**s**.**PL-NOM** read.**3.M.PL** the-lesson-ACC
'The boys read the lesson'

b. qaraʔ-**a** al-ʔawlaad-u al-dars-a (VSO order/ partial agreement)
read.**3.M.SG** the-boy**s**.**PL-NOM** the-lesson-ACC
'The boys read the lesson'

c. al-ban-aat-u qaraʔ-**na** al-dars-a (SVO order/ full agreement)
the-girls-**PL-NOM** read.**3.F.PL** the-lesson-ACC
'The girls read the lesson'

d. qaraʔ-**at** al-ban-aat-u al-dars-a (VSO order/ partial agreement)
read-**3.F.SG** the-girls-**PL-NOM** the-lesson-ACC
'The girls read the lesson'

In examples (9)a, the verb *qaraʔ-**uu*** 'read.**3.M.PL**' fully agrees with preverbal subject *al-ʔawlaad-u* 'the-boy**s- PL-NOM**' as the plural masculine morphology shows. This is also the case for the verb *qaraʔ-**na*** 'read.**3.F.PL**'in (9)c, which fully agrees with the feminine plural subject al-ban-aat-u 'the girls-**PL-NOM**'. In (9)b and (9)d, however, the verb is singular *qaraʔ-**a*** 'read-**3.M.SG**', *qaraʔ-**at*** 'read-**3.F.SG**' despite the plural subject.

Partial agreement is not unique to MSA, though. Other languages, as North Italian dialects (Trentino and Fiorention; Brandi & Cordin, 1989), Welsh (Bahloul & Herbert; Rouveret, 1991) and Biblical Hebrew (Doron, 2010) also exhibit the same asymmetry.

So, for the cases in (9), if we assume standard Probe/ Goal, where the structural requirement of *Agree* is met, *Agree* applies and values the unvalued features, and there is DP movement to Spec TP, then what explains the absence of plural agreement with post-verbal subjects?

The same agreement and word order interaction is also found with conjoined subjects or what is called First Conjunct Agreement (FCA). Consider the data in (10):

(10) a. ðahab-**at** -il-ban-aat-u wa xaalid-un ʔila -l-madrasat-i
went-**3.F.SG** the-girls-**PL-NOM** and Khalid.**M-NOM** to the-school-ACC
'Khalid and the girls went to school'

b. al-ban-aat-u wa xaalid-un ðahab-**uu** ʔila -l-madrasat-i
the-girls-**PL-NOM** and Khalid.**M-NOM** went-**3.M.PL** to the-school-ACC
'Khalid and the girls went to school'

c. ðahab-**a** -l-ʔawlaad-u wa hind-un ʔila -l-madrasat-i
went-**3.M.SG** the-boys.**PL-NOM** and Hind.**F-NOM** to the-school-ACC
'Khalid and the boys went to school'

d. al-ʔawlaad-u wa hind-un ðahab-**uu** ʔila -l-madrasat-i
the-boys.**PL-NOM** and Hind.**F-NOM** went-**3.M.PL** to the-school-ACC
'Khalid and the boys went to school'

As seen in (10)a and (10)c the verb agrees with the FIRST CONJUNCT only in PERSON and GENDER, while in examples (10)b and (10)d, it simply agrees with the whole conjunction displaying features according to Feature Resolution Rules of Corbett (1983). In other words, in SVO order, the verb agrees with the conjoined subject, but in VSO order it agrees only with the first conjoined subject.

Another case of interest in MSA is present in NUMERALS. The relationship between nouns and NUMERALS in MSA is, in fact, more of a polarity effect for GENDER. That is, when the noun is feminine, the NUMERAL exhibits masculine morphology. Alternatively, when the noun is masculine, the NUMERAL carries feminine morphology. The examples below provide more illustration:

(11) a. qaraʔ-tu xamsa-ta kutubin
read-I five-**F** books.**M**.PL
'I read five books'

b. qaraʔ-tu xamsa maʒallaatin
read-I five.**M** magazines.**F**.PL
'I read five magazines

In addition to that, NUMERALS from 3-10 combine with a plural noun as in (11)a and (11)b above, while NUMERALS >10 combine with a singular noun as in (12) below (see Ouwaydah, 2014 for discussion).

(12) a. qaraʔ-t**u** xamsan wa xamsiina kitaab-an
read-I five.**M** and fifty book.**M.SG-ACC**
'I read five books'

So how do standard accounts of agreement account for these mismatches? There have been many proposals to address cases of partial agreement, especially for the cases involving VSO order (Mohammad 1989, 1990; Ouhalla 1994; Aoun, Benmamoun & Sportiche 1994; Fassi-Fehri 1993; Soltan 2007; Aoun, Benmamoun & Choueiri 2010). However, our central case of interest in the present work involving grammatical disagreement and –HUMAN plurals appears to be different, as we will briefly sketch next.

1.2. The case of -HUMAN plurals

The case of –HUMAN nouns looks different from foregoing cases. First, consider anaphor binding:

(13) a. al-riʒaal-u ju-ħibb-uuna ʔanfus-a-hum (SVO order)
the-men.**M.PL-NOM** **3.M**-love-**M.PL** selves-ACC-them.**M.PL**
b. ju-ħibb-u al-rijaal-u ʔanfus-a-hum (VSO order)
3.M-love-**M.SG** the-men.**M.PL-NOM** selves-ACC-them.**M.PL**
'Men love themselves'

As evident from (13)a, b, despite the singular morphology on the verb in the post-verbal subject configuration in (13)b, the anaphor demonstrates plural agreement with the subject. In contrast, plural –HUMAN nouns do not license a plural reflexive pronoun, but a feminine singular one, as shown in (14).

(14) a. al-ʔajjaam-u ʔ-3aad-at nafs-a-ha (SVO order)
the-days.**M.PL-NOM** **3**-love-**F.SG** selves-ACC-it.**F.SG**
b. ʔ-3aad-at al-ʔajjaam-u nafs-a-ha (VSO order)
3-love-**F.SG** the-days.**M.PL-NOM** selves-ACC-it.**F.SG**
'The days repeated themselves'

Note that –HUMAN nouns do not interact with word order as +HUMAN nouns do as (14) also shows; instead, the feminine singular agreement triggered in these cases is independent of word order. In addition, –HUMAN nouns enforce a mismatch both in NUMBER and GENDER unlike partial agreement cases which only involves NUMBER. Note also that the GENDER enforced is *feminine* not masculine.

On standard assumptions, it is unclear why –HUMAN plurals would trigger feminine singular agreement if the features were not available on the target noun. One might suggest that this is an instance of agreement failure resulting in the employment of a *default* marking (see, e.g., Preminger 2009). This would view the singular feminine morphology as a last-resort solution. But, while this reference to default specification may make sense with respect to the NUMBER properties

in MSA, appealing to such an account does not explain why the *default* GENDER would be feminine not masculine, given that MSA makes use of *default* masculine GENDER in other structures (as in the case of inclusive/ exclusive GENDER, agreement with conjoined subjects in SVO order…etc.).

Alternatively, one might suggest that that the feminine GENDER in these cases is not a case of default features; rather, given that grammatical GENDER is semantically empty, perhaps a plural –HUMAN noun *changes* its GENDER to feminine when pluralized. This would be to say that *all* plural –HUMAN nouns in MSA are somehow converted to feminine. However, this is inconsistent with the case of NUMERALs discussed above where the GENDER of the singular noun (not the plural) is in fact retained.

Another possibility, considering the demonstrative-noun case, might be to think that this mismatch simply exists due to the lack of a plural –HUMAN demonstrative form in the language and that the feminine singular demonstrative *haaðihi* represents a case of syncretism where two morphemes happen to look alike (Ouwaydah, 2014). But this argument is also not motivated because the same agreement phenomenon exists across the verbal and adjectival paradigms and with other agreeing elements like pronouns, complementizers, clitics…etc. If the modifiers of these –HUMAN nouns carry a plural feature that just happens to be expressed identically to the singular feminine morpheme, what explains why the plural morpheme have to look like a feminine singular morpheme in all of its different forms? (That is, *-at* with verbs, *-a* with adjectives and *-ha* with pronouns, complementizers and clitics). Further, the feminine singular demonstrative marking does not involve suffixation as other plural morphemes do. If the feminine singular agreement were a case of syncretism we would expect the same form of the morpheme to appear everywhere and that is not the case. Finally, it is well attested that most of the modern dialects

have naturalized the NUMBER and GENDER features in the case of partial agreement to plural, and –HUMAN nouns are no different. In fact, many varieties of Arabic allow both a feminine singular morphology and plural morphology with –HUMAN nouns. If this process is a possibility in the language, why does MSA not make use of it? In sum, our central case involving the triggering of feminine singular agreement with –HUMAN plurals appears to require a treatment in terms of what we may call "grammatical disagreement". Understanding these cases, then, will involve some understanding of how animacy distinctions (±HUMAN) interact with morpho-syntax.

1.3. Dissertation road map

In what follows we discuss the issues related to this type of mismatch across the features involved in the lexical/conceptual and morpho-syntactic dimensions of the organization of human language. This dissertation is laid out as follows: Chapter 2 discusses the interest of these phenomena from a linguistic/representational point-of-view and a processing point-of-view and lays out some theoretical possibilities regarding the relevant structures and agreement relations. Chapter 3 explores the morphology of other noun classes in Arabic arguing against treating the –HUMAN cases as a case of syncretism and lays out possible proposals for the processing and handling of the mismatch. Chapter 4 reports findings from Experiment 1 involving both acceptability judgment and semantic judgment tasks with word pairs, which I have carried out using *Ibex farm* to investigate how the –HUMAN cases are tolerated by the language comprehension system both in the nominal and verbal paradigms. Experiment 2, discussed in Chapter 5, used Event-Related Potentials (ERPs) to examine the dynamics of ANIMACY/morpho-syntactic interactions in the real-time processing of MSA from an electrophysiological perspective and to

extend and replicate the findings from Experiment 1. Finally, Chapter 6 wraps up and poses further questions to guide future research.

Chapter 2

2. Theoretical Background on features

2.1. The representation of NUMBER, GENDER and ANIMACY

Agreement and morpho-syntactic information are both important cues for processing and computing grammatical relations among the different component parts of a syntactic structure. As discussed in chapter 1, agreement typically involves the so-called ϕ-features (relevant here are GENDER and NUMBER). Many attempts have been put forward to explain the internal representation of these features and whether they come as a bundle or have separate projections. In this chapter, I review some existing accounts on the representation of ϕ-features both from theoretical perspectives and through the lens of processing. Then, I discuss how a feature like ANIMACY, which may or may not belong to the class of morpho-syntactic features, figures in.

2.1.1. NUMBER

NUMBER and GENDER have long been argued to have different representations. This follows form the very difference between them as to where the feature information originally comes from. NUMBER is typically part of the conceptual NUMBER specification that the speaker is trying to

convey and can be variable according to the context. GENDER, however, "is an inherent property of a noun, somehow encoded as part of the native speaker's knowledge of the nouns in his or her language" van Berkum (1997, p116).

NUMBER has been argued to be the head of a separate projection by many linguists (Ritter, 1988, 1991, 1993; Corbett, 1991, 2000; Carstens, 1991; Shlonsky, 1989; Melebari & Seely, 2011; Pesetsky, 2013). Ritter (1988, 1991, 1993), for instance, is amongst the first to argue that NUMBER and GENDER have distinct internal structure. Her argument is based on the semantic distinction between NUMBER and GENDER in Hebrew where Ritter compares two types of noun phrases: (i) Construct State and (ii) free Genitives. Although the object noun raises in both constructions, in the Construct State case, the noun raises to D, while in the free Genitive case, there is no landing site. Accordingly, Ritter proposes that the landing site for the noun is a NumP:

(15) a. bejt ha-mora < t >

house the-teacher

b. ha-bajit ʃel ha-mora < t >

the-house of the-teacher

'the teacher's house'

(From Ritter, 1991)

Ritter also argues that since NUMBER is always variable, it is available to be separately selected from the lexicon. Therefore, she proposes that NUMBER, unlike GENDER, projects separately between NP and DP and heads its own projection. This assumption has the implication that since it is a head, it becomes eligible to undergo syntactic operations like agreement,

movement …etc., while GENDER does not. There are other accounts that take this position too (see Carstens 1991, and Melebari & Seely 2011 for Bantu languages and MSA respectively).

A slightly different account is taken by Pesetsky (2013) for CASE and NUMBER mismatches in Russian Paucal numerals. Pesetsky argues that a noun can either bear NUMBER as part of its lexical property in which it can be [± SING], or can alternatively be numberless. If the noun is numberless, it merges with a separate number head. This NUMBER projection for Pesetsky, unlike other proposals, is located inside NP and not between NP and DP.

In this dissertation, I follow Ritter's assumptions on NUMBER being a separate projection. NumP in Arabic is located between DP and NP. Since post-nominal modifiers always agrees with the noun, I also assume that post-nominal modifiers are generated between NumP and DP. Demonstratives, on the other hand, are proposed to be located above DP following Kremers (2003) and Bardeas (2009).

2.1.2. GENDER

Unlike NUMBER, GENDER is more widely perceived as a lexical property of the noun (Corbett, 1991, 2000; Harris, 1991; Carstens, 1991; Ritter, 1988, 1991, 1993; Faussart, Jakubowicz & Costes, 1999). For Ritter, however, GENDER can be either variable or invariable depending on parametric differences among languages. In Spanish, for example, GENDER is variable therefore it is realized on NumP in which it combines with the NUMBER feature of the noun; hence, Spanish marks GENDER on plural suffixes.[3] In languages like Hebrew, where GENDER is not necessarily

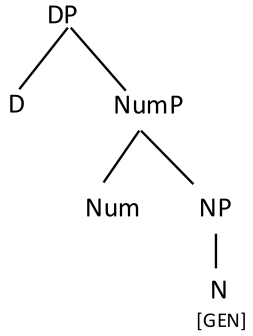
[3] Spanish marks GENDER on singular nouns too, but relevent to this argument is plural marking.

marked by a suffix (just like the case of the Arabic +HUMAN feminine noun *bint* 'girl'), GENDER is invariable and therefore it is a lexical property of the noun.

Despite the obvious differences between the behavior of NUMBER and GENDER in many languages, there are proposals that argue for a separate projection for GENDER as well (Picallo, 1991; Shlonsky, 1989). Picallo (1991) argues for GenP for Catalan to derive the right order of multiple noun argument cases, where the noun always precedes the argument. For Picallo, GenP is dominated by NumP and both are located above NP (Num > Gen > N). There are other accounts, however, that argue against her proposal claiming that the same order can be achieved without employing a GenP (see Kramer, 2015). Shlonsky (1989) similarly argues for a more articulate structure of all agreement features (AgrP) in which each feature heads its own projection but that order may vary to account for cases of partial agreement in a range of languages like MSA, Hebrew and French.

Since an approach to GENDER processing as Picallo's or Shlonsky's would treat NUMBER and GENDER as equals, while experimental research suggests otherwise (see §**Error! Reference source not found.**), I follow Ritter (for Hebrew) and Carstens in assuming that GENDER is a property of the noun, while NUMBER is a functional projection located between NP and DP:

(16) Ritter (1988, 1991, 1993), Carstens (1991)



This distinction is further supported by ERP results that show difference in processing between those features (Barber & Carrieras, 2005; Gunter, Friederici & Schriefers, 2000) in which the lexical identification step, where GENDER is processed, precedes the integration process, where NUMBER is processed; hence, the violation of these features requires different reanalysis processes (Faussart, Jakubowicz & Costes, 1999); Friederici, 1995), **Figure *2-1*** (find a thorough discussion of the model in §**Error! Reference source not found.** next).

2.1.3. ANIMACY

The nature of the ANIMACY feature is still debated in the current linguistics accounts. In most of the work in the literature, the influence of the ANIMACY feature is exerted in at least three ways: (i) how it is closely connected to semantic gender (biological gender), (ii) how it is highly associated with syntactic/ semantic structures as for thematic role assignment (Kuperberg, 2007), word order (Pacynski & Kuperberg, 2011; Cooper and Ross, 1975) and double objects (Aissen, 2003). Despite that, many morphological accounts indicate that the ANIMACY hierarchy is not directly connected to the biological dimensions of ANIMACY. Rather, ANIMACY is more of a graded scale that varies according to certain properties of the language with no clear boundaries (Dahl, 2000). Even in languages that follow a fine-gained scale of the animate/inanimate distinction, there is some fuzziness in how that is realized (Dahl, 2000). For example, in Fox, an Algonquian language, the noun “raspberry” is assigned animate gender whereas “strawberry” is not (de Swart, Lamers & Lestrade, 2008). And as Carnie (2005) points out, in some formal frameworks such hierarchies are being rejected on theoretical basis; they are often accused of not having grammatical or primitive basis.

Being involved in the grammars of many languages, some lexical features as ANIMACY have been proposed to have a subset of a "grammaticalized" version as opposed to their lexical semantic versions (see Pinker (1989).

2.2. The Processing of NUMBER, GENDER and ANIMACY

2.2.1. NUMBER and GENDER

Like the representational perspectives from theoretical linguistics, in the processing literature we also find reasons to distinguish between NUMBER, GENDER, and ANIMACY properties in the organization of languages. Consider a study reported in Faussart, Jakubowicz & Costes (1999). The authors conducted two auditory experiments (one on French and the other on Spanish) in which a determiner, a demonstrative, or a possessive was followed by a noun that was either congruent or incongruent in NUMBER or GENDER. An example of the stimuli for French is below:

(17)	a.	le	metal	(Congruent/ NUMBER)
		the-**SG**	metal-**SG**	
	b.	les	metal	(Incongruent/ NUMBER)
		the-**PL**	metal-**SG**	
	c.	le	vendeur	(Congruent/ GENDER)
		the-**M**	seller-**M**	
	d.	la	vendeur	(Incongruent/ GENDER)
		the-**F**	seller-**M**	

(From Faussart, Jakubowicz & Costes, 1999)

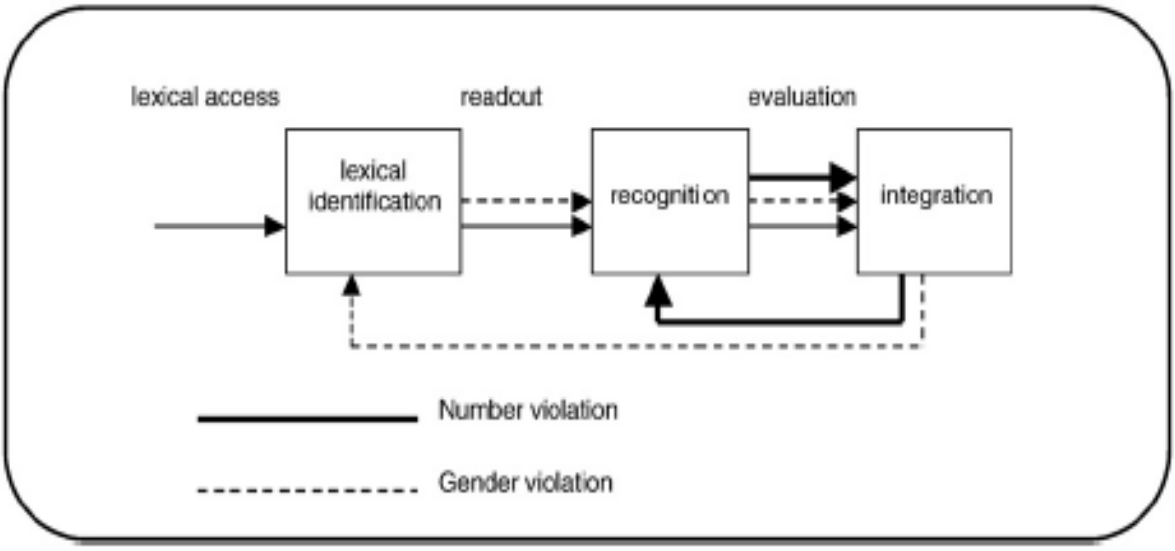


Figure 2-1: Model proposed by Faussart, Jacubowicz & Costes (1999) (From Molinaro, Vespignani & Job (2008))

The authors measured reaction times for each condition and found variation between French and Spanish, with French showing sensitivity towards violation type while Spanish showing no difference. More interestingly though is that they reported that the congruency effect for the GENDER violation was larger than the NUMBER violation in both languages. Based on these results, the authors conclude that the number of operations involved in the reanalysis or re-processing stage for each violation type may be more for GENDER compared to NUMBER.

Faussart, Jakubowicz & Costes (1999) hypothesize a model for the (re-)processing of GENDER and NUMBER agreement violations. The model suggests that the processing of each word undergoes three stages (see **Figure *2-1***): (i) a stage of 'lexical access' in which the word is selected, (ii) a stage of 'readout' where semantic properties and features are computed and made available to the processor and (iii) a third stage of 'evaluation or integration' in which morpho-syntactic and

grammatical properties are checked. This final stage of re-processing is only relevant if a mismatch is detected. The model then predicts that if GENDER and NUMBER both project separately, they should be checked at the same stage and should show no difference in processing. However, if GENDER is a lexical property of the noun while NUMBER is a functional projection, they should be checked at different stages.

Building on this model, more recent series of studies were conducted by Barber and Carreiras (2003, 2005) comparing GENDER vs. NUMBER in Spanish using the ERP technique. As their findings demonstrate, ERPs may provide us with information that we might not get from behavioral investigations. In their (2003) study, Barber and Carreiras manipulated GENDER and NUMBER agreement in ADJECTIVE-NOUN pairs:

(18)	a.	faro	alto	(Congruent)
		'lighthouse.**M.SG'**	'tall.**M.SG'**	
	b.	faro	alta	(Incongruent/ GENDER)
		'lighthouse.**M**.SG'	'tall.**F**.SG'	
	c.	faro	altos	(Incongruent/ NUMBER)
		'lighthouse.M.**SG'**	'tall.M.**PL'**	
	d.	faro	altas	(Incongruent/ GENDER+NUMBER)
		'lighthouse.**M.SG'**	'tall.**F.PL'**	

(From Barber and Carreiras, 2003)

Inconsistent with Faussart, Jakubowicz & Costes's (1999) model, Barber and Carreiras found an N400 effect for both violations. That iswhile no real distinction between NUMBER and GENDER was noticed except for a longer P300 latency reported for the GENDER violation. The N400 ERP response is typically understood as an index of lexical/conceptual semantic processing, either reflecting access/retrieval or integration mechanisms (see Kutas & Federmeier, 2011 for review).

In contrast, P300-type effects of the type reported (so-called P3b effects) are traditionally conceived as reflecting context updating (though see Polich, 2007 for review). Barber & Carrieras attribute the P300 effect in their study to categorization and 'reanalysis' processes which seem to be 'costlier' in the case of GENDER since it requires going back to stage (i) while number requires going back to stage (ii) only.

Most closely related to our study of MSA, is the reported findings in Barber and Carrieras (2005) where they examined DP-internal GENDER/ NUMBER violations with ARTICLE-NOUN pairs and ADJECTIVE-NOUN pairs (is the latter a replication of the (2003) study), both in isolation and embedded within sentences. An example for the stimuli the first study where word pairs were presented in isolation is as follows:

(19)	a.	el	piano	(Congruent)
		'the **M.SG'**	'piano.**M.SG'**	
	b.	los	piano	(Incongruent/ NUMBER)
		'the.M.**PL**'	'piano.M.**SG**'	
	c.	la	piano	(Incongruent/ GENDER)
		'the.**F**.SG'	'piano **M**.SG'	

(From Barber and Carrieras, 2005)

For the second study, they used the same ARTICLE-NOUN stimuli and the ADJECTIVE-NOUN stimuli from their (2003) study but in sentence context (initial position (ARTICLE-NOUN), and middle position (ADJECTIVE-NOUN). The examples below are for the ADJECTIVE-NOUN cases:

(20)	a.	el	faro	es	alto	y	luminoso	(Congruent)
		the	'lighthouse.**M.SG'**	is	tall.**M.SG**	and	bright	
	b.	el	faro	es	alta	y	luminoso	(Incongruent/ GENDER)
		the	'lighthouse.**M.SG'**	is	'tall.**F.SG'**	and	bright	

c. el faro es altos y luminoso (Incongruent/ NUMBER)
the 'lighthouse.**M.SG**' is 'tall.**M.PL**' and bright
'The lighthouse is high and bright'

(From Barber and Carrieras, 2005)

GENDER/ NUMBER violations for the word pairs showed an N400-type effect, associated with lexical integration, while only the ARTICLE-NOUN pairs revealed a left-anterior-negativity (LAN) –usually linked to morpho-syntactic processing (see Molinaro, Vespignani & Job, 2008 for a recent survey), in addition to the N400.

In sentence context, the authors reported an N400 followed by a P600 (note the P600 is typically linked with processing of syntactic complexity, ambiguity, and ungrammaticality – see Chapter 5 for further discussion). Moreover, Barber and Carrieras found that GENDER violations showed a similar P300 effect reported in their previous study. The P600 for their GENDER violation in sentence context was greater than the NUMBER violation. The authors interpret the LAN effect seen in their first study as connected to the syntactic constituent present in the case of ARTICLE-NOUN pairs, and the P600 effect to be connected to syntactic parsing and 'repair' processes that, based on the Faussart, Jakubowicz & Costes (1999) model, require more steps in the case of GENDER violation. Their results from this study support their previous conclusion.

Finally, there seems to be more evidence from error production studies for the assumption that NUMBER has an independent projection. Igoa, García-Albea, and Sánchez-Casas (1999) argue that while grammatical gender is part of the lemma, NUMBER is independent (their Dissociation Hypothesis). The authors conducted a production word-exchange error experiment on Spanish to test that. They argue that if GENDER is part of the lemma, then it should be less likely for speakers to erroneously exchange two words without their real GENDERs when they produce errors, while

it would be more likely to attach NUMBER to the wrong word. The example in (21) will help illustrate the point:

(21) a. *he cantado líneo y binga
I-have cried line.**M** and bingo.**F**
I-have cried line.**F** and bingo.**M**

As Igoa, García-Albea, and Sánchez-Casas (1999) point out, errors in word exchange stranding the GENDER of the noun also produce a non-word (which is not the case for NUMBER). The results showed that errors mostly affect NUMBER suffixes or NUMBER /GENDER suffixes but never pure GENDER suffixes. In a subsequent study, they asked participants to switch two nouns in a complex NP (22) and examined the morphemes that get stranded in the switching process:

(22) a. unos gatos de la nin˜a
some.**M.PL** cats.**M.PL** of the.**F.SG** girl.**F.SG**
'Some cats of the girl (belonging to the girl)'

They noticed again that the GENDER morpheme moves with the noun while the NUMBER morpheme does not. Interestingly, they also noticed differences among the two types of GENDER; semantic gender and grammatical gender in which semantic gender was more stranded than grammatical gender. This indicates that these features are processed differently from one another (we discuss the difference between semantic and grammatical gender in the next section).

In addition to the discussed studies, there are other studies that compare GENDER violations to semantic violations. In what follows, I review some of these studies.

2.2.2. Grammatical gender vs. semantic gender

Given that MSA contains both grammatical and semantic gender, I summarize in this section two studies that may be of interest. The first study is an ERP grammaticality judgment study conducted on Hebrew by Deutsch and Bentin (2001). Hebrew, being a Semitic language like Arabic, marks both grammatical and semantic gender on agreeing elements. The authors argue that if grammatical gender is licensed by semantic gender, then agreement mismatches in Hebrew should elicit an N400 and a P600. To that end, they tested Subject-verb agreement in embedded clauses. In their stimuli, Deutsch and Bentin (2001) contrasted GENDER agreement on singular masculine verbs which do not *mark* agreement, with plural verbs which *mark* agreement, and combined them with a noun that is either congruent or incongruent in GENDER, but did not manipulate NUMBER:

(23)	a.	The woman saw that the boy.**M.SG** had fallen-**M-SG** into the pond.	(Correct)
	b.	The woman saw that the girl.**F.SG** had *fallen-**M-SG** into the pond.	(Semantic Gender Violation /Unmarked Verb)
	c.	The woman saw that the diamond.**M.SG** had fallen-**M-SG** into the pond.	(Correct)
	d.	The woman saw that the necklace.**F.SG** had *fallen-**M-SG** into the pond.	(Grammatical Gender Violation /Marked Verb)
	e.	I enjoyed seeing how the actors-**M-PL** were enchanting-**M-PL** the tired audience.	(Correct)
	f.	I enjoyed seeing how the actresses-**F-PL** were *enchanting-**M-PL** the tired audience.	(Semantic Gender Violation /Unmarked Verb)
	g.	I enjoyed seeing how the movies-**M-PL** were enchanting-**M-PL** the tired audience.	(Correct)
	h.	I enjoyed seeing how the pictures-**F-PL** were *enchanting-**M-PL** the tired audience.	(Grammatical Gender Violation /Marked Verb)

Their results showed an N400 for cases modulated by ANIMACY and a P600 for the cases where GENDER agreement violation was on a marked verb (the plural cases). Grammatical gender both on the MARKED and UNMARKED verbs did not elicit a separate effect. They interpret their results as supporting an interactive language comprehension model that involves continuous cross-talk between semantic and syntactic processing.

Different results were obtained by Barber, Sallilas & Carrieras (2003) from a grammaticality judgment ERP study on Spanish. The authors, in that study wanted to see if semantic and grammatical gender elicit different effects. Their conditions consisted of GENDER incongruence between nouns that contain grammatical gender and agreeing adjectives as those from the Barber and Carrieras (2005) study (examples (20)a, b, c) compared to GENDER incongruence between nouns that contain semantic gender and agreeing adjectives as the ones below (24)a, b:

(24)	a.	el	abuelo	estaba	delgad**o**	y	débil	(Correct)
		the.**M.SG**	grandfather.**M.SG**	was	slim.**M.SG**	and	weak	
	b.	*el	abuelo	estaba	delgad**a**	y	débil	(Semantic Gender
		The.**M.SG**	grandfather.**M.SG**	was	slim.**F.SG**	and	weak	Violation)
		'The grandfather was thin and weak'						

The effects reported from this study are a LAN effect for all GENDER violations, followed by a P600 that had an anterior distribution for the case of semantic gender violations as compared to grammatical gender violations.

Since the singular masculine verb in Arabic is not morphologically unmarked as is the case in Hebrew as feminine GENDER agreement on the verb for instance involves replacing the masculine GENDER/person prefix with the feminine one, we do not expect to see the same effects in our study with respect to a difference between grammatical and semantic gender. In contrary,

since Arabic marks these morpho-syntactic features in a similar way to Spanish, we may expect similar results to those of Barber, Sallilas and Carrieras (2003).

2.2.3. ANIMACY

As for ANIMACY, the processing literature have either focused on the influence of ANIMACY on syntactic structure or the processing of that feature with respect to the so-called "semantic P600" effects (henceforth "sP600"). Traditional psycholinguistic models have differed in their claims about whether such features can in principle play a guiding role in syntactic processing or not (Rayner, Carlson & Frazier, 1983; Ferreira & Clifton, 1986; MacDonald, Pearlmutter & Seidenberg, 1994; Trueswell & Tanenhaus, 1994). On serial "syntax first" models (Marslen-Wilson & Tyler, 1980; Frazier, 1987; MacDonald, Pearlmutter & Seidenberg, 1994; Freiderici, 1995; De Vincenzi, Job, Di Matteo, Angrilli, Penolazzi, Ciccarelli & Vespignani, 2003), ANIMACY information is expected to influence only the outputs of an encapsulated syntactic parser. In contrast, a range of alternative approaches have long argued against the primacy of syntactic information in sentence comprehension (e.g., constraint-based models), and argued for views where ANIMACY information can in principle influence parsing decisions at the earliest stages of processing (Hagoort, 2005; MacDonald, Pearlmutter & Seidenberg, 1994; Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1995; Gunter, Friederici & Schriefers, 2000; Schmitt, Lamers, & Münte, 2002). And, as we will briefly discuss below, the status of ANIMACY in processing has also received recent attention in the ERP literature concerning sP600 effects for cases of thematic role reversal (Kim & Osterhout 2005; Kuperberg, Sitnikova, Caplan & Holcomb 2003; van Herten, Chwilla & Kolk, 2006; see Kuperberg, Kreher, Sitnikova, Caplan & Holcomb,

2007; Bornkessel-Schlesewsky & Schlesewsky, 2008; Brouwer, Fitz & Hoeks, 2012 for review discussions).

One of these studies involve (now) classic contrasts from English like those illustrated in (25) – (28):

(25) a. At breakfast the boys would eat…
b. At breakfast the eggs would *eat… (Kuperberg, Sitnikova, Caplan & Holcomb, 2003)

(26) a. The hearty meal was devoured…
b. The hearty meal was *devouring… (Kim and Osterhout, 2005)

(27) a. De muizen die voor de kat vluchtten….
The mice that from the cate fledplural ..
'The mice that fled from the cat…..'

b. De kat die de muizen vluchtte….
The cat that from the mice fledsingular ..
'The cat that fled from the mice….' (Kolk, Chwilla, van Herten & Oor, 2003)

(28) a. De speer werd door de atleten geworpen
The javelin was by the athletes thrown.
'The javelin was thrown by the athlete'
b. De speer heeft de atleten geworpen.
The javelin has the athletes thrown.
'The javelin has thrown by the athlete' (Hoeks, Stowe & Doedens, 2004)

(From Kuperberg, 2007)

These cases gained initial attention given that the initial expectation was that a/b comparisons would produce an N400 response, which has a long history of being linked to lexical/conceptual-semantic processing. Instead, these cases yielded only P600 responses, and no N400. Such findings have been argued to make a case for sentence processing architectures which permit combinatoric semantic operations to independently generate expectations that subsequently guide syntactic

processing (i.e., semantically driven syntactic predictions that turn out to be in error; but see Chow & Phillips, 2013 for critical discussion). Debate about the nature of these cases has been investigated cross-linguistically, and has spawned a range of accounts aiming to address the full range of findings (for reviews see Kuperberg, 2007; Bornkessel-Schlesewsky & Schlesewsky 2008; Brouwer, Fitz & Hoeks, 2012).

Taking a step back, it is important to note that while many studies have documented clear influences of ANIMACY in sentence processing, there is little agreement about how it is, precisely, that ANIMACY information exerts its influence. Part of the problem is the inherent difficulties involved in saying something concrete about what CONCEPTS are in general. Though there are lots of ideas about this that are baked in to existing theories of concepts in the language and cognitive sciences (Fodor 1998), there is little in the way of consensus about *basic* questions. What *are* concepts, and what does it mean to possess them? Are concepts amodal atoms ("cat" means CAT, "dog" means DOG; Fodor,1975)? Are they decomposably derived from more primitive inventories of features (e.g., [± ANIMATE], [± HUMAN], etc.)? Are concepts inherently connected to (modal) perceptual-level experience and representation?

But setting aside the thorny problems involved in adopting a working theory of concepts, it is nonetheless reasonable to consider some plausible general possibilities about how (IN)ANIMACY influences sentence processing that can yield testable predictions for experimental inquiry. For example, Pacynski & Kuperberg (2011) lay out three possibilities which, though not mutually exclusive, help to organize this space. First, animate nominal expressions may simply be more salient, demanding greater allocation of attentional resources independent of their specific role or position in sentences. Second, it may be that ANIMACY matters specifically for linear order in sentences. Third, ANIMACY may exert its influence in terms of specific mapping regularities

involving distinctions in grammatical function (subjects tend to be animate) and/or thematic roles (agents of events must be animate). In all three accounts nouns higher in ANIMACY seem to win. That is, because animate nouns are more salient than inanimate nouns, they tend to appear in more prominent positions including sentence initially. And because they are more prominent, they are usually assigned agent role. This shows a direct relationship between saliency, prominence, argument and ANIMACY.

Several findings of interest emerge from their studies. For example, they show (their Experiment 1) that inanimate nominals show some facilitation in processing relative to animates in direct object position (whereas other studies have shown the opposite for (in)animate subjects, e.g., see Weckerly & Kutas, 1999). Such findings show that animates are not *generally* privileged independent of ordering or grammatical/thematic role functions. To investigate this latter issue (i.e., the possibility that ANIMACY is implicated in the system of thematic role distinctions directly) in their second study, they contrasted ERP responses for cases like those in (29) and (30):

(29) a. At the homestead the farmer *penalized* the **laborer** for laziness. (Correct)

b. *At the homestead the farmer penalized the meadow for laziness. (Selection Restriction Violation/ PATIENT)

(30) a. At the homestead the farmer *interested* the **laborer** in some work. (Correct)

b. *At the homestead the farmer interested the meadow in some work. (Selection Restriction Violation/ EXPERIENCER)

Here both of the b-cases constitute violations in the selection restrictions of the relevant verbs in (29) and (30) but the thematic roles assigned by these verbs differ (i.e., PATIENT for (29), and EXPERIENCER for (30). Paczynski and Kuperberg report only violation main effects for these

contrasts (a uniform N400/P600 profile for b-cases relative to the well-formed a-cases), with no interaction involving thematic role. They conclude that their findings support the first approach in which ANIMACY processing is dependent on linear order (also see Cooper & Ross, 1975).

However, a subsequent study examined thematic role differences in subject position (Bourguignon, Drury, Valois & Steinhauer, 2012), contrasting cases like those in (31) and (32). Here, like Paczynski and Kuperberg (2011), the violation b-cases differ across (31) and (32) in whether they involve a class with an AGENT role (in (31)) or EXPERIENCER role (in (32)):

(31) a. The boys have eaten the fries too quickly. (Correct)
b. The fries have *eaten the boys too quickly. (Thematic Violation)
(32) a. The judges have despised the movies at the festival. (Correct)
b. The movies have *despised the judges at the festival. (Thematic Violation)

In conflict with the Paczynski and Kuperberg (2011) findings that thematic role differences did not influence the processing of selection violations turning on (IN)ANIMACY, Bourguignon, Drury, Valois & Steinhauer (2012) found qualitatively distinct patterns for the (29) and (30) contrasts (while both cases elicited P600s, only the SUBJECT-EXPERIENCER verbs like (30) elicited a prior N400 response).

Another study was run by Szewczyk and Schriefers (2010) to investigate whether or not ANIMACY is processed like other semantic features. Animate and inanimate nouns in a sentence-final position formulated to either violate an ANIMACY condition or a semantic condition, showed that both the ANIMACY and semantic violations elicited an N400 followed by a P600 type effect. The ANIMACY violation, however, elicited higher P600 amplitude. They interpret this as that the comprehension system seems to be more sensitive towards ANIMACY violations compared to semantic violations.

2.2.4. The difference between these features

It is apparent from the previous discussion that NUMBER, GENDER and ANIMACY are indeed not features of the same species. Their internal structure which is also reflected in the way they are processed highlight that difference. One work that discusses the difference between NUMBER, GENDER and ANIMACY is Rappaport (2006). Examining cases of agreement mismatches from Russian, Rappaport emphasizes that both GENDER and NUMBER are morpho-syntactic features but NUMBER is different from GENDER in that it is also a facultative feature that is assigned by the speaker pragmatically. ANIMACY, on the other hand, is argued to be a lexico-semantic feature. Rappaport then points out that the difference between GENDER in the one hand and ANIMACY in the other hand lies in a two-layer feature proposal; a referential level and a formal level, that in away connects ANIMACY to semantic gender. Whereas the referential and formal features of semantic gender are the same; the referential and formal features of grammatical gender are different and arbitrary. And since ANIMACY is lexico-semantic feature, the representation of ANIMACY is similar to that of semantic gender in that both the referential and formal feature of ANIMACY are always the same. However, ANIMACY is also semantically distilled; therefore, considering ANIMACY and semantic gender them to be of the same type or expecting them to behave similarly "would be to miss with an obvious generalization of the language" (Rappaport, 2006, p.g 18).

In sum, conclusions from the studies summarized above regarding the nature of these features and how exactly they are handled by the language comprehension system are variable leaving the debate about how they can in principle interact still open.

Chapter 3

إنَّ قَوْمِي تَجَمَّعُوا.. وَ بِقَتلِي تَحدَّثُوا..
لا أُبَالِي بِجَمعِهِم.. كُلَّ جَمعٍ مُؤَنَّثُ..

- الزَّمخشري

My people have grouped and decided to assassinate me..
It does not matter if they group.. All groups "plurals" in Arabic are feminine..

- Az-zamakhshari

---

3. Arabic Morpho-syntax

In this chapter, I argue against treating –HUMAN nouns as a case of syncretism or an instance where the GENDER feature of the noun is overwritten to feminine in plurals. I also discuss a few possible arguments of how agreement works in this structure in relation to other agreement structures in Arabic involving collective nouns, mass nouns and [-HUMAN] nouns referring to animals and plants. I start by providing a brief illustration of Arabic morphology and the way morpho-syntactic features are realized on both the noun and its modifiers. Finally, I mention some relevant issues concerning plural types of Arabic.

3.1. Arabic nouns

3.1.1. DEFINITENESS and CASE

Nouns in Arabic are marked for GENDER, NUMBER, DEFINITENESS and CASE. I will leave the discussion of the first two features for the next sections and first comment briefly on DEFINITENESS and CASE. Definiteness in Arabic is marked by the definite article /al-/ prefixed to the beginning of nouns as in *al-kitaab* 'the-book'. This definite article has a few allophones conditioned by the presence of specific sounds as in *aʃ-ʃams* 'the-sun'. Despite the rich inflectional system of Arabic, the definite article is marked for neither NUMBER nor GENDER as is the case with other highly inflectional languages (e.g., Spanish, Italian, French ...etc.). Indefiniteness, on the other hand, is widely believed to be marked using *tanwiin* 'nunation' by adding /-n/ to the end of nouns (Shlonsky, 2004; Kremers, 2003; also see Fassi-Fehri,1999 for a different point of view) but there is an ongoing debate on the exact morpheme expressing indefiniteness because in pausal speech, 'nunation' can be absent, in which it is replaced by the suffix /–a/ (or a mora) as Hoberman (1995) argues. What is clear though is that the absence of the definite article is an indication of indefiniteness and this is supported by the case of most of the modern dialects where 'nunation' all together has disappeared (except for some adverbs) and indefiniteness is basically marked by the absence of the definite article.

Arabic nouns also inflect for CASE (Ryding, 2005). For singulars, CASE marking is realized by a vowel suffix that is /-u/ for Nominative, /-a/ for Accusative and /-i/ for Genitive. In dual nouns, CASE is realized using an ablaut kind of vowel change to indicate Nominative as /-aan/ and Accusative and Genitive as /-ajn/. Dual demonstratives have the following forms GENDER-marked forms for Nominative *hað-aani* 'this.M-DUAL.NOM', *haat-aani* 'this.F-DUAL.NOM' and *haa-ðajni*

'this.M-DUAL.ACC', *haat-ajni* 'this.F-DUAL.ACC' for Accusative and Genitive. Masculine Suffixed Plural nouns, as will be discussed below, also mark CASE using the ablauted suffix /-uun/ for Nominative and /-iin/ for Accusative and Genitive. This CASE system gets more complex inside DP, because it involves CASE assigned by Construct State, Addressee and some adjectives. I omit the details of this part due to its irrelevance to this dissertation. As is the case with many languages, CASE is no longer realized in the colloquial dialects of Arabic and is gradually disappearing from MSA.

In the next two sections, I briefly sketch the basic morphology of GENDER and NUMBER in Arabic.

3.1.2. GENDER morphology in Arabic

GENDER in Arabic is always syntactic/ grammatical. However, it can be predicted semantically or cognitively based on its referent. Gender referring to female referents is realized with a suffix /-a/ added to the base of a masculine noun. That being said, not all feminine nouns that end with /-a/ are derived from a masculine noun (33)a, only nouns carrying semantic gender are (33)b, although there are also nouns that carry semantic gender but do not end with /-a/ as for the word *bint* 'girl' and nouns that are totally different from their masculine counterpart (34)c:

(33)	a.	sayyar**a**	vs.	*sayyar
		'car.**F**'	vs.	?
	b.	tˁifl	vs.	tˁifl-a
		'baby.**M**'	vs.	'baby-**F**'
	c.	ʔasad	vs.	labwa
		'lion'	vs.	'lioness'
	d.	ʃams	vs.	qamar
		'sun. **F**'	vs.	'moon.**M**'
	e.	maktab	vs.	maktab**a**
		'desk.**M**'	vs.	'library.**F**'

(From Ouwayda, 2014)

As for grammatical gender, masculine and feminine nouns usually have totally different forms (34)d because they cannot be derived from each other as in the case with semantic gender. There are cases, however, where two nouns seem to share the same stem but have nouns have totally different denotations as in (33)e, and cases where feminine nouns carrying grammatical gender end with /-a/, as for *ʃam3-a* 'a candle-**F**'.

3.1.3. NUMBER morphology in Arabic

Arabic nouns make a three-way number distinction; Singular, Dual and Plural (Saiegh-Haddad, Hadieh & Ravid, 2012). Singular nouns do not overtly mark singular. Dual nouns are marked using one of the two case-inflected NUMBER suffixes /-aani/ in (34)a and /-ajni/ in (34)b below:

(34) a. al-kitaab-aani mumtiʕ-aani (Nominative)
the-book.**M-DUAL.NOM** enjoyable.**M-DUAL.NOM**
'The two books are enjoyable'

b. ʃtaraj-tu kitaab-ajni (Accusative)
bought-I book.**M-DUAL.ACC**
'I bought two books'

Plural nouns are more complex, consisting of three types: Masculine Suffixed Plural (glossed MSPL), Feminine Suffixed Plural (glossed FSPL) and Broken Plural (glossed BPL). Suffixed plural (the first two types) is formed by suffixation. Masculine Suffixed Plural combines only with [+HUMAN, +MASC] nouns and its suffixes are case-marked as in (35)a for Nominative and (35)b

for Accusative and Genitive. Feminine Suffixed Plural combines with [+HUMAN, -MASC] nouns (35)c and [-ANIMATE] nouns in general regardless of GENDER (35)d:

(35) a. haaʔlaaʔi tˤabbaax-uun (Masculine Suffixed Plural)
these chefs.**M-MSPL.NOM**
'These [are] chefs (M)'

b. raʔaj-tu al-tˤabbaax-iin (Masculine Suffixed Plural)
saw-I the-chefs.**M-MSPL.ACC**
'I saw the chefs (M)'

c. haaʔlaaʔi tˤabbaax-a-at (Feminine Suffixed Plural)
these chef-**F-FSPL**
'These [are] chefs (F)'

d. haaðihi maktaba-at-un/ ʔttisaal-aat-un (Feminine Suffixed Plural)
This.**F.SG** library-**F-FSPL-NOM** phone call.**M-FSPL-NOM**
'These [are] libraries'

Broken Plural, on the other hand, is formed by fitting root consonants of singular forms into a specific vowel-identified plural pattern that has as many as 33 patterns. Those patterns involve some regularity in formation in that they can be formed by the insertion of a long vowel, some consonants in addition to the root consonants or gemination (Holes, 2004; Ravid & Farah, 1999; Boudelaa & Gaskell, 2002). Unlike other plural types, Broken Plural is less restricted; it can combine with a [+MASC, +HUMAN] (36)a, a [+MASC, -HUMAN] noun (36)b, and a [-MASC, -HUMAN] noun (36)c. For [-MASC, +HUMAN] nouns, in contrary, broken plural is not as productive, only a few words are available in the language (36)d:

(36) a. raʒul → riʒaal (+MASC, +HUMAN)
'man' 'men'

b. kursi → karaasi (+MASC, -HUMAN)

	‘chair’		‘chairs’	
c.	hˤaqiiba	→	hˤaqaaʔib	(-MASC, -HUMAN)
	‘purse’		‘purses’	
d.	ʔimraʔah	→	nisaaʔ[4]	(-MASC, +HUMAN)
	‘woman’		‘women’	

The selection of plural type (whether Suffixed or Broken) largely depends on the noun’s morpho-phonological properties (Ghalayiini, 1912). That is, nouns of certain templates are more likely to take a Broken Plural form than a Suffixed Plural one as in the case of a CaCC template or a CiCaaC template (Salaah, 2010):

(37)	a.	bahˤr	→	bihˤaar
		CaCC	→	CiCaaC
		‘sea’		‘seas’
	b.	ðiraaʕ	→	ʔaðruʕ
		CiCaaC		CaCuC
		‘arm’		‘arms’

Interestingly, some nouns can take more than one plural type or have ‘competing’ forms. In most cases this would be (i) a Suffixed Plural form and a Broken Plural form (38)a, (ii) but there are also cases where a noun could have more than one Broken Plural form (38)b, or even (iii) a Suffixed Plural form and more than one Broken Plural form (38)c, d (Siibawayh, 796; Ghalayiini, 1912; Salaah, 2010):

(38)		**FSPL**	**MSPL**	**BPL 1**	**BPL 2**	**BPL 3**

[4] This example is also an example of suppletion where the form completely changed when pluralized.

a.	ʃaʒara ‘tree’	→	ʃaʒaraat ‘trees’		ʔʃʒaar ‘trees’		
b.	bahˁr ‘sea’	→			buhˁuur ‘seas’	bihˁaar ‘seas’	ʔabhˁur ‘seas’
c.	ɣariib ‘stranger’	→		ɣarib-uunn ‘strangers’	ɣurabaaʔ ‘strangers’	ʔaɣraab ‘strangers’	
d.	sahˁaaba ‘cloud’	→	sahˁaabaat ‘clouds’		sahˁaab ‘clouds’	suhˁub ‘clouds’	

It has been argued that the existence of more than one plural form in the language is rather redundant unless those words are semantically different (Aronoff, 2016). Such views are mainly based on minimalist views where economy is considered an important factor. On the basis of such views, nouns that have more than plural types should have distinctive meanings. In fact, looking at the work of Arab grammarians as Siibawayh (796), Ghalayiini (1912) and Salaah (2010), some Broken Plural templates as ʔaCCuC *ʔanfus* ‘souls’ are said to mean ‘few’ and other templates as CuCuuC *nufuus* ‘souls’ are said to mean ‘more’ (what is referred to in traditional grammar as ʒam*ʕu al-qilla* and ʒam*ʕu al-kaθra*, respectively). This distinguishable meaning may possibly still be the case in MSA, but it indeed became less salient in the modern dialects where multiple plurals do exist but without a divergent meaning between them.

3.1.4. Is Broken Plural irregular?

All plural types in Arabic are qualitatively productive which makes it hard to determine which type constitutes a ‘regular’ plural. This issue has spiked an ongoing debate on the productivity and regularity of Arabic plural types. In the work of McCarthy & Prince (1990), for instance, the Arabic plural system is referred to as a ‘minority-default’ system where the ‘regular’ affixal type of plural (Suffixed plural) is used with less nouns while the ‘irregular’ type of plural (Broken

Plural) is more productive.[5] In this sense, a regular or default plural is defined as involving affixation as opposed to other word formation processes that may involve more complexity.

Boudelaa & Gaskell (2002), on the contrary, provide data suggesting otherwise. They argue that despite the fact that the two types of plural could be considered *qualitatively* productive, Suffixed Plural is *quantitatively* more productive. A form is *qualitatively* productive if it is conditioned by certain phonological, syntactic and semantic factors (Anshen & Aronoff, 1999; Aronoff, 1976; Baayen, 1992; Bauer, 1983). A quantitatively productive form is then less conditioned and thereby applies freely to a larger set of words (Aronoff & Anshen, 1998). In other words, the former is more productive relative to a certain set of words, and the latter is more productive in being able to apply to a wider range of words.

The definition of regular vs. irregular is rather not clear in the literature. Regular could either mean productive (as per the discussion above), frequent, consistent, rule-based, or affixal. This definition, however, does not hold for Arabic plurals. The more *frequent* in Arabic is Suffixed Plural with a difference of 18% (59% for Suffixed vs. 41% for Broken Plural), (Kouloughli, 1992). The more *consistent* is hard to tell, since both involve some consistency in the way they are formed (Idrissi, 1997; Ratcliffe, 1998). In addition, both of them seem to involve some sort of a rule-based word formation process except that one comprises suffixation while the other comprises an internal modification. Finally, if we take that regular has to do with whether a form is formed using a process of *affixation*, then 'regular' plural in Arabic is Suffixed Plural.[6]

[5] McCarthy and Prince's work (1990) is based on information from *The Wehr Arabic Dictionary* (Wehr, 1976).

[6] The debate also raises the question of whether or not both patterns are processed similarly. There are at least three models for the processing and acquisition of inflectional morphology. One theory assumes that all (both regular and irregular) forms are listed in the lexicon (Bybee, 1988). This theory has been further abandoned by the dual model and the connectionist model. The "dual model" posits that there are two distinct systems for regular and irregular forms. Regular forms are compositional and rule-based, therefore are processed 'online'. Irregular forms, however, are stored in the associative memory (Pinker & Prince, 1988; Prasada & Pinker, 1993; Clahsen, 1999) in which connections based on clusters and similarity link them with other similar forms (Prasada &Pinker, 1993). The connectionist model, on the other hand, assumes that all forms are stored in the associative

The difference between the plural types in Arabic is closely relevant to this dissertation since it is only the Suffixed Plural (in the form of Feminine Suffixed Plural) and that Broken Plural that can be used in the case of -HUMAN nouns, while all three types can be used with +HUMAN nouns. This issue and how it relates to the stimuli in the studies conducted here are discussed in Chapter 4 §4.1.2.2 and Chapter 5 §5.3.1.2.

In the followings sections, I discuss other relevant noun classes in Arabic and their agreement paradigms.

3.2. Agreement inside the noun phrase

All NP/ DP internal post-nominal modifiers agree with the noun in Arabic. This includes adjectives, ordinal numerals[7], quantifiers and demonstratives. As is the case with pre-verbal subjects, pre-nominal adjectives, quantifiers, determiners do not agree with the head noun:

memory but entries consist of a bundle of features that overlap with features in other entries creating connections between them. Each acquisition of a new entry strengthens or weakens these connections. The model learning is strongly affected by factors as frequency, consistency and similarity (Rumelhart & McClelland, 1986).

[7] Cardinal numerals have a more complex structure. The reader is referred to the discussion in chapter 1 §1.1 and the following references (Bardeas, 2009; Ouwaidah, 2014)

(39) a. kull-u al-ʔawlaad-i
all-**NOM** the-boys.**M.PL-GEN**
'all of the boys'

b. al-awlaad-u kullu-hum
the-boys.**M.PL-NOM** all-them.**M.PL**
'The boys, all'

c. ʔaxir-u al-ʔawalad-i
last-**NOM** the-boys.**M.PL.GEN**
'The last of the boys'

d. al-awalad-u al-ʔaxir-uun
the-boys.**M.PL-NOM** The-last-**M.PL.NOM**
'The last boys'

Although demonstratives in Arabic can appear both pre-nominally and post-nominally, they are the only modifier inside DP that appears in a pre-nominal position with agreement morphology. Pre-nominal demonstratives also do not impose CASE on the head noun as other pre-nominal modifiers do (Shlonsky, 2004; Kremers, 2003; Bardeas, 2009). Therefore, syntactic accounts in the literature (Shlonsky, 2004; Kremers, 2003; Bardeas, 2009) do not consider pre-nominal demonstratives similar to other modifiers. Post-nominal demonstratives, on the other hand, resemble other inside DP modifiers in their position and agreement.

It is worth noting too that agreement features on the demonstrative are not realized as affixes as is the case with other modifiers. Rather, the entire form of the demonstrative changes both phonologically and morphologically:

(40) a. haaðaa
'This.M.SG'

b. haaðihi
   'This.F.SG'
c. haaʔulaaʔi
   'These.PL'

In addition, the plural demonstrative as mentioned before (see §3.1) does not inflect for GENDER (40)c and can only occur with a plural +HUMAN noun.

Since definite articles do not inflect for NUMBER and GENDER in Arabic, demonstratives fit as a great testing target for agreement because they show agreement in a position where the noun is not yet presented to the speaker. Therefore, in Experiment 1 (Chapter 4), we use DEMONSTRATIVE-NOUN pairs and compare them to NOUN-VERB pairs to investigate the case of –HUMAN nouns. In Experiment 2, we test demonstratives again but using a different technique that allows us to examine the real-time processing of agreement (Chapter 5).

Next, I provide a brief description of other agreement paradigms present with other noun classes in Arabic.

3.3. Other agreement paradigms

3.3.1. Collective nouns and mass nouns

Collective nouns (called *ismu al-ʒamʕ)* and mass nouns (*ismu al-ʒins)* in Arabic have their own form and trigger their own agreement but show some resemblance to the case of –HUMAN nouns. A collective noun is a noun that denotes a group and has no singular form as in (41). In terms of GENDER, agreement with a collective noun depends on the GENDER of the noun. It can

be feminine as in (41)a, or masculine as in (41)b, c. As for NUMBER, however, these nouns are treated as singular nouns, but they can also trigger plural agreement:

(41) a. haaðihi/ haaʔlaaʔi al-ʕaaʔila
this.**F.SG**/ these ‘the-family’
‘This/ These family’

b. haaða/ haaʔlaaʔi al-qawm
this.**M.SG**/ these ‘the-nation’
‘This/ These nation’

c. haaða/ haaʔlaaʔi al-qatiiʕ
this.**M.SG**/ these ‘the-herd’
‘This/ These herd’

In English, such cases can also trigger both agreements depending on whether the speaker is referring to the group or to the individual members of that group. The first is referred to as “semantic agreement” and the latter is called “grammatical agreement”. An example of this from English is:

(42) a. The family has decided. (American English)
b. The family have decided. (Bristish English)

This variability may be more common with verbs while with adjectives it is more restrictive because adjectives sometimes cannot refer to the individuals in the group; e.g., *The family is big* does not mean that every member in that family is big; rather, *The family,* as a unit, is big (Dror, 2016).

Under a continuum or hierarchy of collectiveness to 'individuation' as Brustad (2000) calls it, agreement can range between the two cases depending on pragmatic effects. That is, agreement here is not dependent on the lexical properties of the word; rather, it is relative to the speaker's choice of the semantic and pragmatic content of the noun that in turn selects the related agreement morphology (Brustad, 2000). Thus, the use of feminine singular agreement expresses collectiveness and generality while the use of plural agreement expresses distributivity and specificity (Brustad, 2000; also see Ouwaidah, 2014 for Lebanese Arabic). This may also be more evident in pre-Islamic and Qur'anic Arabic where with –HUMAN nouns feminine singular (43)a and plural agreement (43)b was acceptable (Belnap & Shabaneh, 1992). Consider the example from Siibawayh (796):

(43) a. ʔa-kal-at-ni al-baraaɣiiθ
1.SG.eat.**F.SG**.me the-fleas.**F.PL**
b. ʔa-kal-uu-ni al-baraaɣiiθ
1.SG.eat.M.**PL**.me the-fleas.F.**PL**
'The fleas bit me'

The same phenomenon is now present in the modern dialects. Many colloquial varieties of Arabic allow both agreements, in which it is believed that the distinctive meanings/ readings still exist. The following examples are from Brustad (2000) on Syrian Arabic, Kuwaiti Arabic and Egyptian Arabic:

(44) **(Syrian Arabic)**

a. laʔann-u tt-awwar-at il-ʕalam ma ʕad-it mitil ʔawwal
because-it.**M.SG** **3.F**-developed-**F.SG** the-world.**COL** not **3.**remained-**F.SG** as before
'…Because people developed, they are no longer as they were before'

b. fii ʕalam haik o ʕalam haik ʕalam bi-ji-ʔbal-u…..
there world**.COL** like.this And world.**COL** like.that world.**COL** **ASP-3.M**-accept-**M.PL**
'There are people like this and people like that, people who accept it….'

(Kuwaiti Arabic)

c. fiih naas bi-t-fakkir inn-u ʃai ʕaadi
there people.**COL** who-**F.SG**- think that-it.M.SG thing O.K.
'There [are]people who think that it is O.K.'

d. ba-ʕrif naas bi-j-safr-uu kill sana
ASP-1.know.SG people.**COL** ASP-**3.M**-travel-**M.PL** every year.F.SG
'I know people who go abroad every year'

(Egyptian Arabic)

e. kull in-naas ʕajjaan-a bis-s-ukkar wi-bi-juʔʕud-u li-wahˤduhum
every the-people.**COL** sick-**F.SG** with-the-diabetes and-ASP-**3.M**-sit- **M.PL** by-themselves.**M.PL**
'All people are sick with diabetes and they live by themselves'

As we can see in example (44)a from Syrian Arabic, using the feminine singular agreement refers to 'people' (in general) changing from one state to another, while using the masculine plural agreement as in (44)b refers to specific 'people' who accept the matter. Similarly in Kuwaiti Arabic, (44)c refers to an unspecific group of people who think it is fine to do such a thing, while (44)d refers to a specific group of people who travel annually. We can also see from the Egyptian Arabic example (44)e, that the two agreements can co-exist in the same construction if their denotees are different; in the adjective, referring to 'all people sick with diabetes' is feminine

singular and in the verb + the reflexive pronoun referring to individual ‘people living alone’ is masculine plural.

The distributive/ collective contrast is not limited to the case of collective nouns in Arabic. It is in fact far more complicated in structure than it seems to be. This variable interpretation can also be signaled by the plural type of the noun as in (45), allowing multiple plural types for the same noun:

(45)				
	a. FSPL	haaðihi this.**F.SG**	smak-aat/ ‘fish-**FSPL**’ =distributive/few	zahr-aat ‘flowers-**FSPL**’ =distributive/ few
	b. BPL 1	haaðihi this.**F.SG**	ʔasmaak/ ‘fish.**BPL**’ =types of fish	ʔazhaar ‘flowers.**BPL**’ =types of flowers
	c. BPL 2	haaðihi this.**F.SG**		zuhuur ‘flowers.**BPL**’=many
	d. Mass	haaða this.**M.SG**	samak/ ‘fish’ =collective	zahr ‘flowers’ =collective
			‘This is fish’	‘These are flowers’

The examples in (45) illustrate the difference between the use of plurals with count vs. mass nouns. As can be seen in (45)a, b both the use of Feminine Suffixed Plural and Broken Plural yields an interpretation of some distributivity and they both require a feminine singular demonstrative. The forms in (45)d, in contrary, are interpreted as mass or collective and they require a singular masculine demonstrative instead. Even among the Feminine Suffixed Plural nouns and the Broken Plural nouns there seems to be a distinction in meaning between whether it is ‘few’ or ‘many’ (see the discussion in §3.1.3). Evidence that the nouns in (45)d are indeed interpreted as a batch comes from *true* mass nouns examples in which agreement with those nouns ((46) below) resembles the one in (45)d (singular masculine):

(46) a. haaða zajt
this.**M.SG** ‘oil’
‘This is oil’

b. haaða ðahab
this.**M.SG** ‘gold’
‘This is gold’

c. haaða ruzz
this.**M.SG** ‘rice’
‘This is rice’

So, this continuum of collectiveness to individuation is present in Arabic in more than one location and it seems that it is one of the important pragmatic distinctions that the language makes. Narrowing that back to our –HUMAN cases, it seems plausible to think of the agreement present with these cases of the same way, especially that we find good support from the co-existence of both instances in the modern dialects. In order to better understand the nature of this agreement, I discuss the agreement pattern associated with the case of [+ANIMATE, -HUMAN] nouns in the following section.

3.3.2. [+ANIMATE, -HUMAN] nouns

We have seen above that nouns in Arabic follow an ANIMACY hierarchy that not only distinguishes ANIMATEs form INANIMATEs but further distinguishes +HUMANs form -HUMANs. We have also seen how this distinction is evident in the grammatical properties of the language across the nominal and verbal paradigms **(2) - (3)**. The focus of this section is to examine the class of [+ANIMATE/ -HUMAN] nouns and compare it to the class of [-ANIMATE/ -HUMAN]. Consider the examples in (47):

		Singular			Plural	
(47)	a.	haaða	hˤisaan	c.	haaðihi	ʔahˤsina
		this.**M.SG**	horse.**M.SG**		this.**F.SG**	horses.**M.BPL**
		‘This is a horse’			‘These are horses’	
	b.	haaðihi	qitˤtˤa	d.	haaðihi	qitˤatˤ
		this.**F.SG**	cat.**F.SG**		this.**F.SG**	cats.**F.BPL**
		‘This a cat’			‘These are cats’	

With the [+ANIMATE, -HUMAN] nouns in (47), the demonstrative agrees with the singular noun in GENDER and NUMBER as in (47)a, b while it takes feminine singular morphology with those nouns in the plural (47)c, d. The agreement that the modifiers exhibit with this class of nouns looks very similar to the class of [-ANIMATE, -HUMAN] nouns, but seems also to allow the formation of mass nouns resulting in permitting the agreement pattern associated with mass nouns (masculine singular) too:

		Singular		Plural		Mass	
(48)	a.	haaða	ʒamal	haaðihi	ʒimaal	haaða	ʔibil
		this.**M.SG**	camel.**M.SG**	this.**F.SG**	camels.**M.BPL**	this.**M.SG**	camels.**M.MASS**
		‘This is a camel’		‘These are camels’			
	b.	haaðihi	baqara	haaðihi	ʔabqaar/ baqaraat	haaða	baqar
		this.**F.SG**	cow.**F.SG**	this.**F.SG**	cows.**F.BPL**/cows.**F.FSPL**	this.**M.SG**	cows.**F.MASS**
		‘This a cow’		‘These are cows’			

It is worth noting, however, that not all [+ANIMATE, -HUMAN] nouns allow the formation of a mass noun. It seems that only nouns that denote uncountable entities as ‘ants’, ‘flies’, ‘bees’ and some insects in addition to animals whose meat can be consumed as ‘sheep’, ‘chicken’, ‘pigeon’,

'goat' fall into this class. On the other hand, animals as 'dogs', 'lions', 'tigers', 'birds', 'squirrels'… etc.) do not have a mass noun form.

So, if collective –HUMAN plurals trigger variant agreement (either masculine singular or feminine singular depending on the form of the noun) and mass nouns trigger masculine singular, then can –HUMAN nouns be a sub-class of collective nouns with collective interpretation? Is it possible that those nouns do not refer to the entities they denote as individual but as a batch? If that is so, we can think of those nouns as involving some kind of a "null" classifier that triggers the associated agreement. And if such a classifier is present, then it sounds reasonable to assume that what modifiers can see is the features on that classifier (apparently feminine singular here). That also means that we should assume their semantics to be unlike the semantics of other plural nouns[8] in that they are not interpreted as being simply plural, but more as a batch or "a group of entities". Again, this gains support from the association of the singular feminine agreement in the case of collective nouns with collectiveness and plural agreement with distributivity both in pre-Islamic/ Qur'anic Arabic and the modern dialects (see §3.3.1), although it seems a little puzzling to find this very distinction highlighted in more than one morphological /morpho-syntactic position (that is, in the plural type AND agreement) (see example (45)).

Presenting the other agreement patterns associated with different classes of nouns aims to show that the case of [+ANIMATE, -HUMAN] nouns is not a case of syncretism resulting from some diachronic change, and not a case of idiosyncrasy or irregularity either. Rather, the phenomenon is present in several structures in the language including with [+ANIMATE, -HUMAN] nouns and

[8] In this case, by 'other plural nouns' we mean +HUMAN nouns because they trigger 'normal' agreement

with different modifiers that make use of distinctive phonological morphemes as pronouns, relative clauses and complementizers.[9]

In the next section, I briefly describe the realization of the agreement features in the verbal paradigm explaining how these features are parsed when combined with tense and mood.

3.4. Arabic verbs

Verbs in Arabic inflect for tense (or aspect), agreement and mood. [10] [11] A good description of the verbal inflection in Arabic is found in Aoun, Benmamoun & Choueiri (2010). As they point out, although agreement on the verb is expressed through concatenative morphology, it does not involve a one-to-one relationship:

(49)	a.	qaraʔ-**u**		b.	qaraʔ-**tum**
		read-**3.M.PL.PERF**			read-**2.M.PL.PERF**
		'They.**M.PL** read'			'You.**M.PL** read'

[9] Singular feminine agreement is also present in relative clauses, pronouns and quantifiers (1)a and complemintizers (1)b:

(1) a. qaraʔ-tu -l-kutub-a -ll-atii ʃtaraj-tu-ha min -al-maktaba-ta kulla-ha
1.read-1.SG the-books-ACC that.**F.SG** 1.bought-1.SG-**it.F.SG** from the-bookstore.F.SG-ACC all-**F.SG**
'I read all the books that I bought from the bookstore'

b. saqatˁa-t -il-kutub-u laʔann-ha θaqiil-a
fell-**F.SG** the-books-NOM because-it.**F.SG** heavy-**F.SG**
'The books fell because they are heavy'

[10] For Benmamoun (2000) and Aoun, Benmamoun & Chouieri (2010), tense, which can either be perfective and imperfective, is an abstract morpheme that is neither realized as an affix nor as a vocalic melody as previously proposed by McCarthy (1979). Their argument is based on cases where a perfective verb as *na:m-**a*** 'he slept-**3.M.SG**' carries the same suffix as the negative particle *lajs-**a*** 'neg-**3.M.SG**' and the aspectual particle *la:za:l-**a*** 'still-**3.M.SG**'. Therefore, they argue that since not only verbs carry this suffix, then it is an agreement suffix not a tense suffix. Moreover, in sentences that include *lajs-**a*** and *laza:l-**a*** tense is never perfective:

(2) a. lajs-**a** al-ʔawlaad-u mariidˁ-**iina**
Neg-**3.M.SG** the-boys.**M.PL**-NOM sick-**M.PL**.ACC
'The boys are not sick'

They argue that if tense in sentences like the one is (22) cannot be variable, then how is it possible to consider the suffix to be related to tense?

[11] Arabic verbs also inflect for mood which can either be subjunctive, indicative or jussive. The mood system in Arabic is rather complex and its details are irrelevant to this dissertation.

In the perfective form in (49), NUMBER, GENDER and PERSON features are fused into one suffix, while in the imperfective (50) PERSON is a prefix, NUMBER is a suffix and GENDER is spread into both.

(50) a. **ja**-qraʔ-**uuna**
3.M-read-**M.PL.IMPERF**
'They read'

b. **ta**-qraʔ-**uuna**
2.M-read-**M.PL.IMPERF**
'You read'

In the verbal paradigm, ϕ features are also realized on auxiliaries, predicative adjectives (as seen in (2) - (3) and below on (51)c, d), the negative particle *lajs-a* and the aspectual particle *laazaal-a*:

(51) a. al-ʔawlaad-u kan-u ja-lʕab-uun
the-boys.**M.PL-NOM** were-**M.PL** **3.M**-playing-**M.PL**
'The boys were playing'

b. al-fataja-at-u kunna ja-lʕab-na
the-girls-**F.PL-NOM** were.**F.PL** **3.M**-playing-**F.PL**
'The girls are sick'

c. al-ʔawlaad-u laazaal-**u/** lajs-**u** mariidˁ-**iina**
the-boys.**M.PL-NOM** **3**.still-**.M.PL**/**3.**not-**M.PL** sick-**M.PL**.ACC
'The boys are still/not sick'

d. al-fataja-at-u laazil-**na/** lajs-**na** mariidˁ-**aat**
the-girls-**F.PL-NOM** **3**.still-**F.PL**/ **3.**not-**F.PL** sick-**F.PL**.ACC
'The girls are still/not sick'

Note also that agreement in DEFINITENESS for the examples of predicative adjectives (51)c, d) converts the structure to attributive adjectives (see **(2)** – **(3)** from chapter 1). Looking at the distribution of ϕ features in verbs we could infer that PERSON, being part of the lexical properties

of the noun, seem to occur as a prefix not a suffix, while NUMBER, considering it has a separate functional projection, is always a suffix not a prefix. We notice also that GENDER does not have a morpheme of its own; rather is spread on both. This may indirectly relate to the debate on whether or not GENDER is basically part of PERSON or NUMBER, but does not seem to have further support here.

3.5. Diglossia

One distinctive characteristic of Arabic is the case of diglossia. Diglossia is a situation when two varieties of the same language co-exist in a single speech community (Ferguson, 1959). This case, despite not being very common, is not unique to Arabic. Ferguson (1959) considers German-Swiss + German in Switzerland and Creole + French in Haiti to be of the same type. Typically, one of the two varieties is used in a daily basis for everyday informal interactions while the other is reserved for official use, education, media, writing and other formal activities. As Diab & Habash (2007) put it, MSA is perceived as "the language of the mind" while dialectal Arabic is the "language of the heart". Although Arabic dialects are only used for conversational purposes, the use of spoken Arabic in writing is increasingly developing with the use of social media and internet blogs.

Considering that the Arabic community is diglossic is an important variable for studies conducted on Arabic for two reasons: (i) almost no native-speaker of Arabic sustains continuous production of MSA (Diab & Habash, 2007), (ii) recent studies have shown that speakers of Arabic do not in fact use the co-existing languages as registers of the same language. Rather, they are

treated as separate lexicons with distinctive grammars where the speaker code-switches between them freely (Khamis-Dakwar & Froud, 2007, 2014).

So, diglossia is not the only obstacle when studying Arabic, but also the degree of linguistic distance among the Arabic dialects themselves. How close are these varieties and how distinct are they? In the lens of sociolinguistics, a variety of a language is a system or grammar that shares the same aspects of the main language, but with minimal differences phonologically, syntactically, and morphologically or lexically. Now, with regard to the Arabic case, how are the boundaries between MSA and the spoken varieties of Arabic identified? The dialects of Arabic can be seen as widely different or very similar. An example of how MSA and dialect are so close comes from the preservation of most syntactic structures: as pro-drop, free word order, root-and-pattern morphology and most lexical items. At the same time, the spoken dialects have diverged from MSA in several aspects. One is the integration of other sounds to replace original MSA sounds as in the case of /q/, some pharyngeal and some emphatics. Another is the nueterization (or categorization) of partial agreement in MSA to full or full plus default in the spoken dialects. It is also worth noting that spoken Arabic has a substantial impact on the phonology, semantic and pragmatics of MSA itself, which indirectly results in various versions of the standard variety MSA depending on where exactly it is spoken, starting from the west of the Arab world to the east.

We return to the issue of diglossia in Chapter 4 where the sample for experiment 1 includes speakers of multiple varieties of Arabic including Levantine, Egyptian and Gulf Arabic. The purpose of having this sample is to address the topic of diglossia, how it is reflected in the lexicon of Arabic speakers and whether or not it may affect their judgment on stimuli presented in MSA.

3.6. Is agreement with –HUMAN plurals 'normal' or

‘defective’?

We conclude from the discussion on Arabic agreement paradigms with other noun classes (and the representation of ϕ-features and ANIMACY from Chapter 2) that the agreement with –HUMAN nouns may involve one of these possibilities:

(i) That it is a case of ‘normal’ agreement where Agree successfully applies and results in feminine singular morphology. That is, the agreement configuration does not involve any conflict, rather -HUMAN plurals trigger feminine singular morphology on modifiers but it is a coincidence that morphology looks like the morphology of feminine singular nouns while in fact it is plural (an instance of syncretism). And since this is how it looks morpho-phonologically, that is what Agree ends up getting. We would expect those cases to be processed exactly as their +HUMAN plural counterparts, because in both cases Agree is successful and participants should judge those correctly and fast, just like singulars and +HUMANs.

(ii) Or a case of ‘normal’ agreement where Agree successfully applies and finds these valued features in its search domain on an intervener somewhere between NP and DP. This intervener could be either semantically or morphologically motivated. Agree values its unvalued features against those available on the intervener. Again, we expect no difference between those and +HUMAN and singulars and native speakers are expected to judge those correctly and fast.

(iii) It is a case of ‘Failed’ agreement which should induce failure or crash showing an effect that you would expect to see in a violation case. These cases would be judged as “bad” or considered “out” for a native speaker, but would probably be judged also fast and correct. In this way, we would expect our correct –HUMAN violation cases to elicit

exactly the same effect elicited by our +HUMAN violation cases, because they are both violations.

(iv) Or a case of 'Failed' agreement that eventually gets repaired by spelling out default features (in the sense of Preminger, 2009) either for all ϕ-features or partially for the parts that fail. Retrieving default features, we would expect, to be of additional processing cost, so participants may still be able to judge those correctly, but may take longer than the 'normal' agreement cases assuming that the 'repair' process will impose extra processing.

To further explore these possibilities, we conducted a series of studies that investigate the on-line processing of the relevant features using several experimental techniques including, a behavioral judgment task, a Wug test and finally an ERP study. The next chapter introduces the major tenents of experiment (1).

Chapter 4

4. The processing of ϕ-features and ANIMACY

Since the –HUMAN Arabic case will allow us to look at the processing of morpho-syntactic features and ANIMACY in the same target, we designed Experiment 1 to clearly document the phenomena of interest:

(i) How are the –HUMAN cases treated by the language comprehension system? Do we see any indication of some processing cost associated with grammatical agreement mismatches?

(ii) Do the same effects obtain across the nominal and verbal paradigms?

(iii) What is the locus of the ANIMACY morpho-syntax interaction? When does it happen?

(iv) Is the processing of these mismatches influenced by experimental task?

(v) Finally, does the diglossic nature of Arabic affect participants' judgment on MSA?

In order to answer these questions, we formed DEM-NOUN and NOUN-VERB pairs that appear in multiple tasks in a web experiment. The next sections illustrate the set-up of the experiment and discuss the details.

4.1. Present study overview

The current experiment is a multi-division online experiment that was hosted at *Ibex farm* (http://spellout.net/ibexfarm/, Drummond, 2011). The structure of the experiment contains three parts; (i) a judgment component consisting of two tasks; (a) a grammaticality task where participants distinguish correct conditions from deviant ones, and (b) a semantic task where they determine whether nouns in DEM-NOUN and NOUN-VERB word pairs is animate or inanimate; (ii) a *wug* test investigating demonstrative choices for novel +HUMAN and -HUMAN nouns.

4.1.1. Hypotheses and Predictions

Our predictions for this experiment fall under the sketched possible processing options at the end of Chapter 3, §**Error! Reference source not found.**. Taking that as a start, we could think of some possible outcomes. In principle, our results could reflect one of the two cases where Agree is successful ((i), (ii)) because we know that the mismatches are in fact grammatical cases which directly points to successful/ normal agreement. Recall, however, that (i) involves a case of syncretism while (ii) is a case where an intervener with such features is present. Building on these assumption, we consequently exclude option (iii) where agreement is not obtained in the first place. This leaves us with three options; (i), (ii), and (iv). We return to these options again in §4.1.2.5 where the possible results are discussed in detail right after the illustration of the experimental design.

4.1.2. Methods

4.1.2.1. Participants

Sixty-five speakers of different varieties of Arabic participated in this study. Their ages ranged between 18- 45 (mean= 30.6). Participants were recruited through word of mouth and author's personal contacts. They were neither paid nor did they receive any class credit. Fifty-four of the participants were speakers of some variety of Saudi Arabic (Hijazi, Najdi, Shergawi, Shamaali and Janoubi). Eleven of them were speakers of Levantine or Egyptian Arabic (6= Levantine, 5= Egyptian). Twenty-five of those were male and thirty-nine were female. Almost all participants had an equivalent of a college degree or higher and none reported any language impairment.

Since our participants were from various Arab countries and since some of those countries have suffered or are still struggling with war, participants were asked whether they have spent their childhood years (years of basic education) in the same country where they were born or whether they have moved to another country. By obtaining this information, we wanted to control for language (or variety) contact. None of our participants had spent a significant number of years away from their country of origin. Most of them were monolinguals, while three reported that they are bilinguals of Arabic and English. In addition to that, all our Saudi participants, at some point of their lives', have learned English as a second language, while most of our Levantine and Egyptian speakers reported learning both English and French as a second language. None of them though have been to an Arabic/ French dual immersion school. This last piece of information was important in the criteria for selecting participants since we wanted to avoid bilinguals in Arabic and French due to the possible influence of French morpho-syntax on Arabic, especially with respect to GENDER.

4.1.2.2. Material and design

4.1.2.2.1. Part one (Judgment task)

The first part of the experiment was a judgment task that consisted of a grammaticality judgment task and an animacy judgment task. The experiment has two core factors CORRECTNESS and ANIMACY crossed with GENDER and NUMBER yielding 8 conditions. Since we only see the mismatch of interest with plural nouns, we only included plural nouns (no singulars) in this design and used the same conditions across the DEM-NOUN and the NOUN-VERB paradigms. So, for the DEM-NOUN pairs, the conditions are illustrated below:

(52) **DEM-NOUN CONDITIONS**

A. **-HUMAN, CORRECT**

DEM.F.SG	هَذِهِ السُّفُن ship.F.PL هَذِهِ الكُتُب book.M.PL

B. **-HUMAN, VIOLATION**

DEM.**PL**	هَؤلاءِ السُّفُن ship.**F.PL** هَؤلاءِ الكُتُب book.**M.PL**

C. **+HUMAN, CORRECT**

DEM.**PL**	هَؤلاءِ النَّاشِطَات activist.**F.PL** هَؤلاءِ الجرَّاحُون activist.**M.PL**

D. **+HUMAN, VIOLATION**

DEM.**F.SG**	هَذِهِ النَّاشِطَات activist.**F.PL** هَذِهِ الجرَّاحُون activist.**M.PL**

Grammatical matches in (52)A and (52)C were mapped to their corresponding mismatch conditions in (52)B and (52)D by simply swapping the feminine singular and plural demonstratives. As a result, the +HUMAN noun mismatch condition (52)D included an even mix of NUMBER and

NUMBER/GENDER agreement clashes. Observe that the same mix of agreement marking occurs in (52)A, but in these cases the INANIMACY of the noun renders these pairs grammatical. Similarly, agreement marking is held constant across the other diagonal examples (52)B/ (52)C), with plural-marked demonstratives coupled with plural nouns. Note, of course, that this constitutes a grammatical match only for the +HUMAN nouns in (52)C.

The stimuli included 80 nouns, 40 +HUMAN and 40 -HUMAN, collected from *The Frequency Dictionary of Arabic: core vocabulary for learners* (Buckwalter & Parkinson, 2011), which includes the most frequent 5000 words in Arabic collected from newspapers. All our +HUMAN nouns were distinct forms for masculine and feminine. As for our –HUMAN plurals, all nouns denoting animal and plants were excluded for differences in agreement, as discussed in §3.3.2. It is important to note that all our feminine +HUMAN nouns had a gender-marking suffix /-a/ added to the masculine form (so the two words shared the same stem), while our feminine -HUMAN nouns although ended with the suffix /-a/ were, of course, not derived from the masculines.

Moreover, our process of item selection also had to take into consideration factors related to the complexity of the Arabic plural system (discussed in Chapter 3 §3.1.3). In particular, for +HUMAN words we only selected words that belong to the class of Regular Plural[12] so the GENDER of the plural form can be identified clearly and we excluded all Broken Plural forms. To be more precise, since Broken Plural forms are not explicitly marked for GENDER and in principle it has been argued that the use of Broken Plural can trigger feminine agreement, Broken plural was excluded from all +HUMAN nouns. However, following the same procedure does not work with

[12] Broken plural can be used with both. In some cases, using the Broken Plural form is more frequent than the Masculine Suffixed Plural form. Forms of this sort were excluded in order to make the gender feature more transparent in the forms.

-HUMAN nouns because a plural -HUMAN word can only be formed using a Feminine Suffixed Plural and/or a Broken Plural. Therefore, our item list included Feminine Suffixed Plural and Masculine Suffixed Plural forms for +HUMAN nouns, and Broken Plural forms for all our -HUMAN nouns.

Finally, throughout the stimuli, we only used singular and plural "near" (equivalent of English "this"/"these") demonstratives; absolutely no dual.[13] Also, all our nouns appeared with the definite determiner *ʔal* 'the' in order to minimize the activation of a sentential reading of the pairs where other agreement features are involved. This way our word pairs could only be interpreted as nominals (and not sentences).

The same design was then extended to include our NOUN-VERB pairs where we simply replaced the demonstratives with verbs. Note, however that there are two differences between agreement with demonstratives and agreement with verbs. First, (i) in the case of the demonstratives the plural demonstrative is genderless, which means that when it combines with plural -HUMAN nouns in the violation condition, we are not sure of the nature of the violation involved (better understood as a violation of ANIMACY). This undetermined agreement violation is not present in the case of verbs because the verb morphology of both +HUMAN and –HUMAN nouns is marked for GENDER/ NUMBER in all conditions. The total number of conditions comes now to 16. An example of the NOUN-VERB conditions is illustrated in (53):

[13] Dual has its own agreement pattern, where agreement is dependent on the gender of the dual nouns and is always obtained e.g.:

(3)	a.	haaðaani	al-kitaab-aani	(4)	a.	haataani	al-safiin-at-aani
		this.M.DUAL	the-book.M-DUAL			this.F.DUAL	The-ship-F-DUAL
		'These two dogs'				'These two ships'	
	b.	haaðaani	al-walad-aani		b.	haataani	al-bint-aani
		this.M.DUAL	the-boy-DUAL			this.F.DUAL	the-girl-DUAL
		'These two boys'				'These two girls'	

(53) **NOUN-VERB CONDITIONS**

A. **-HUMAN, CORRECT**

السُّفُن وَصَلَت
ship.**F.PL** VERB.**F.SG**
الكُتُب عَادَت
book.**M.PL** VERB.**F.SG**

B. **-HUMAN, VIOLATION**

السُّفُن وَصَلنَ
ship.**F.PL** VERB.**F.PL**
الكُتُب عَادُوا
book.**M.PL** VERB.**M.PL**

C. **+HUMAN, CORRECT**

الفنَّانات عُدنَ
artist.**F.PL** VERB.**F.PL**
الجرَّاحُون وَصَلُوا
surgeon.**M.PL** VERB.**M.PL**

D. **+HUMAN, VIOLATION**

الفنَّانات عَادَت
artist.**F.PL** VERB.**F.SG**
الجرَّاحُون وَصَلَت
surgeon.**M.PL** VERB.**F.SG**

The second difference (ii) between the DEM-NOUN and NOUN-VERB stimuli is the order in which the noun is presented. For the former, the demonstrative is presented first according to the default order[14] in Arabic. For the latter, however, the noun is presented first (=SVO order). The point from choosing this order over VSO order is because this is the only order where the verb shows full agreement with the noun (see discussion in chapter 1 §1.1). In addition, this order provides us with a case where the relevant agreement features are encountered after the noun is processed.

A master-list of 320 (40 x 8 conditions) NOUN-VERB pairs was created, filling in the cells of the masculine and feminine CORRECTNESS X ANIMACY designs illustrated in (52) and (53) and dividing the 40 collected nouns in half across the DEM-NOUN stimuli and NOUN-VERB stimuli (20

[14] Demonstratives can appear post-nominally, too (Bardeas 2009, Ouwaidah, 2014). See discussion in Chapter 3, 3.1.

each) such that every word appeared in every condition. The rotation of the nouns across conditions yielded two separate lists (L1, L2 in (54) below):

(54)

		L1	L2
DEM-NOUN	Correct	1. These books 2. These ships …. 20.	41. These cups 42. These goods …. 60.
	Violation	21. These rings 22. These boxes …. 40.	61. These storms 62. These spoons …. 80.
NOUN-VERB	Correct	41. the-cups fell 42. the-goods disappeared …. 60.	1. the-books fell 2. the-ships disappeared …. 20.
	Violation	61.the-storms disappeared 62. the-spoons fell …. 80.	21. the-rings disappeared 22. the-boxes fell …. 40.

After the lists in (54) were created, we shuffled DEM-NOUN and NOUN-VERB stimuli of each list one by one in the same order so that each stimulus type serves as a filler for the other. This way we lowered the chance for participants to develop an automatic strategy for answers:

(55)

L1	L2
1. These books	41. These cups
41. the-cups fell	1. the-books fell
2. These ships	42. These goods
42. the-goods disappeared	2. the-ships disappeared
21. These rings	61. These storms

61.the-storms disappeared ……	21. the-rings disappeared ……

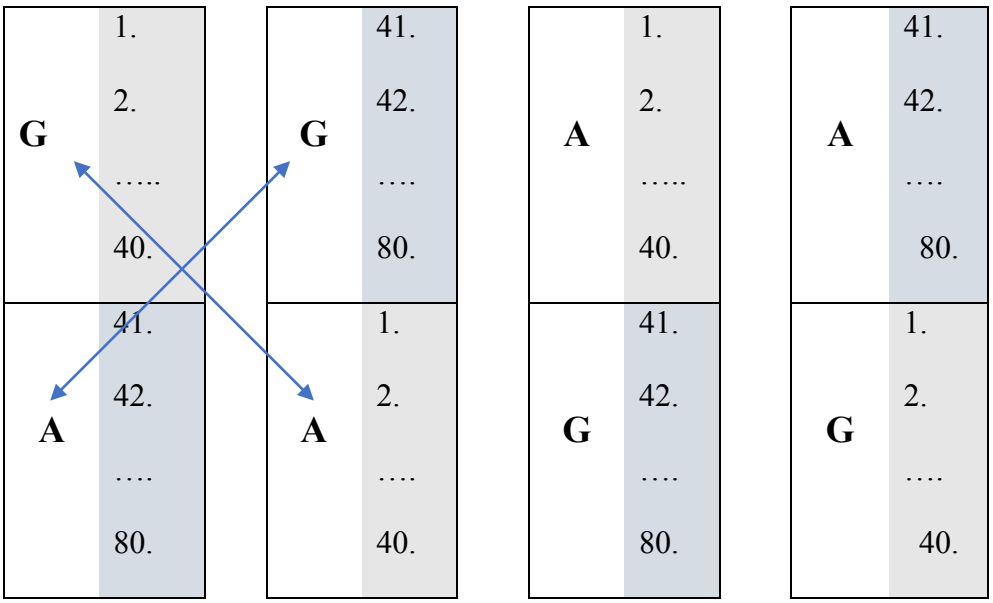
After shuffling the items, we doubled the lists and reordered the tasks so each list appears in a grammaticality and an animacy task. Our animacy task involves asking participants to decide whether the noun in the pair denotes a +HUMAN or -HUMAN entity instead of asking them to judge the pairs as correct or incorrect. But since we wanted all participants to do both tasks, we divided the 80 stimuli equally between both tasks (=20 mixed stimuli per task). The set yielded 4 lists in which L1 and L3 are the same but order of tasks is different (the same holds for L2 and L4). The table in (56) illustrates this last step.

Each of the 4 lists above has 4 sub-lists included in it, such that each stimulus appears in 4 conditions (COREECT, VIOLATION, DEM-NOUN, NOUN-VERB). We used the Latin square option implemented in *Ibex farm* to have the lists rotated assigned systematically across participants.

Because we wanted to control for stimulus size (two-word stimulus), in our verb selection for the experiment, we opted not to choose transitive verbs and selected UNACCUSATIVE verbs because they do not require a complement and that would keep our two-word design consistent. In addition, in order to keep our verbs uniform across both +HUMAN and –HUMAN nouns, we selected verbs that can co-occur syntactically with both +HUMAN and –HUMAN nouns, and can also combine semantically with both nouns classes.

(56)

L1	**L2**	**L3**	**L4**



10 verbs of this type were selected and rotated across all items and conditions, in which each verb occurs 8 times per list, once in each NOUN-VERB condition, and the none of the participants saw the same noun more than once.

Considering the nature of Arabic orthography, all items carried basic diacritics to avoid the possibility of confusing similarly written forms since our pairs were presented in isolation and thus had no context that could serve to disambiguate. The following examples in (57) show why including diacritic is important:

(57)

المَدْرَسَة	المُدَرِّسَة
al-madrasa	al-mudarrisa
‘The school’	‘The teacher’

Thus, the word for 'school' in (57) could be read in (at least) two ways without diacritics (unless provided with a semantic context that helps disambiguate it).

4.1.2.2.2. Part two (Wug test)

In the second part of the experiment, we formed a *Wug test* to confirm speakers' ability to distinguish the morpho-syntax associated with -HUMAN plurals from that of +HUMAN nouns and to further investigate if morpho-syntax guides the speakers' decision with nonce words that can be clearly identified as +HUMAN or -HUMAN.

For the *Wug test* conditions, we crossed two factors GENDER (feminine and masculine) x PLURAL TYPE (Suffixed Plural (feminine and masculine) and Broken Plural) forming the conditions in (58). (58) also shows an example of the actual Wugs used and how they resemble existing words (sharing the same singular and plural form templates):

(58)

	Noun in Singular		**Plural type**	**Wug**
a.	+HUM_SG_M_N	→	MSPL	marraas→ marraas-uun (e.g./ tabbaax → tabbaax-uun) 'cooks.M.PL'

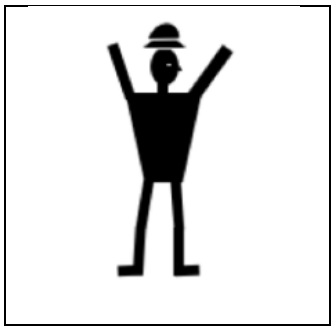
b.	+HUM_SG_M_N	→	BPL	sariim → suramaaʔ (e.g./ xabiir → xubaraaʔ 'experienced'
c.	+HUM_SG_F_N	→	FSPL	ħazzaala → ħazzaal-aat (e.g./tabbaaxa → tabbaax-aat) 'cooks.F.PL'
d.	+HUM_SG_F_N	→	∅	
e.	-HUM_SG_M_N	→	FSPL	mufalʕik → mufalʕik-aat (e.g./ mutahhir → mutahhir-aat) 'disinfectant'
f.	-HUM_SG_M_N	→	BPL	tabr → tibaar (e.g./ ħabl → ħibaal) 'robes'
g.	-HUM_SG_F_N	→	FSPL	dumla → duml-aat (e.g./ ʕumla → ʕuml-aat) 'currencies'
h.	-HUM_SG_F_N	→	BPL	bandala → banaadil (masʔala → masaaʔil 'issues'

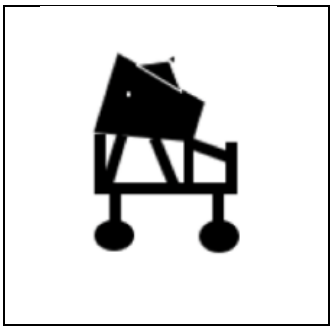
Because +HUMAN feminine nouns can rarely have a Broken Plural form (see (58)d, this condition was excluded. This brings up the total number of conditions to 7 (instead of 8), in which we generated 14 stimuli, 2 per condition. We formed the actual wug nouns using such highly frequent templates in Arabic, as CaCCaaC which refers to a profession as in (58)a, and sounds that phonetically and phonotactically matched Arabic nouns. All participants saw all Wugs.

The Wug pictures were then created using geometric shapes that matched in complexity across +HUMAN and –HUMAN pictures. The pictures presented clearly indicated either a +HUMAN or a –HUMAN entity. The +HUMAN pictures showed people doing something or holding something,

while the –HUMAN ones showed some type of machine or instrument. All pictures appeared in black with white background and matched in size and alignment. An example of these pictures is provided below:

(59)

a. 

b. 

4.1.2.3. Procedure

The experiment started with an instructions page informing the participants of how to participate and describing the core of the tasks. Participants were then presented with a demographic form asking for their basic information and education background, native language(s), acquired language(s) and whether they had lived in a different country or not. All participates electronically signed a consent and then were guided by detailed instructions on how to perform each task.

Finally, note that for accuracy purposes (Reaction Time, in particular), we did not make the experiment compatible with smart devices, since these would involve distractors that would affect the validity of our results.

4.1.2.3.1. Part one (Judgment tasks)

For the first part, participants who took the grammaticality task first started with a fixation mark "+" that appeared on the screen for 500 ms. to prepare the participant and was followed by the two-word stimuli. Each word appeared for 500 ms. Then, they were prompted with a question asking them whether the word pair was correct or incorrect. Participants pressed on one of two buttons on the screen (one for "yes" and one for "no"). For this session, we measured reaction time but in between stimuli participants had to press on a link that appeared on the screen to proceed when ready. In other words, participants were allowed to rest in between sessions if they wanted to:

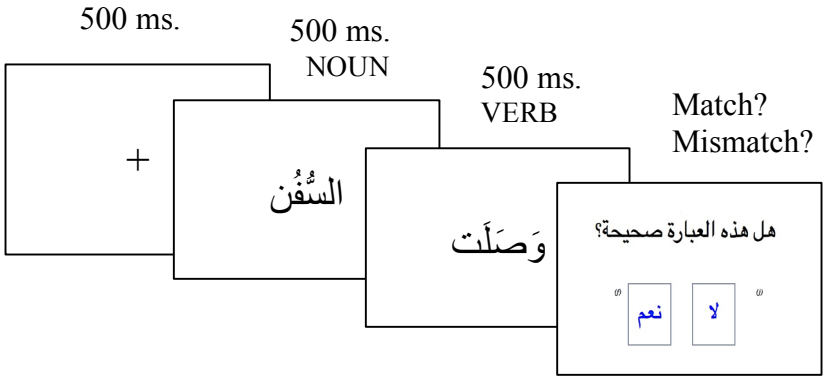


Figure 4-1: Session illustration for grammaticality judgment task**.**

For participants who took the animacy task first, the task also started with a fixation mark "+", followed by the word pairs. However, for this task, participants were asked whether the word pair denote a +HUMAN or –HUMAN entity. Again, they had to choose one of two buttons indicating

"Animate" and "Inanimate".[15] Reaction time was measured and they were led to the next session using the same instructions in the grammaticality task.

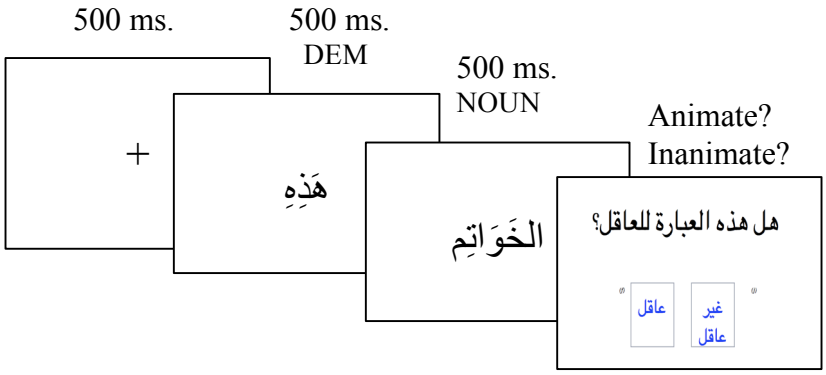


Figure 4-2: Session illustration for animacy judgment task**.**

In both tasks, the first 4 word-pairs were practice examples and were not included in the analysis. For each participant, the Latin square implemented in *Ibex farm* picked one of the four implemented conditions, so that all conditions were rotated. Participants also saw a progress bar on the top of the screen indicating how far along they were. At the end of the task, they were told that they could start the next part whenever they were ready.

4.1.2.3.2. Part two (Wug test)

In the Wug test, participants saw a picture referring to singular +HUMAN or –HUMAN entity with a sentence that says, "This is a Wug" in Arabic. The word replacing Wug was created

[15] The buttons exactly said "rational", "irrational" for Animate / Inanimate respectively because these are the familiar terms for Arabic speakers.

following the discussed conditions in §4.1.2.2.2. This was followed by three copies of the same picture and included a sentence that says "…… are Wugs", where the participant was expected to choose one of two provided demonstratives to fill in the blank. Participants always had to choose between a singular feminine demonstrative or a plural demonstrative, given that the answer is always one of those. The created plural Wugs appeared either in a FSPL, BPL, or MSPL form conforming to the conditions explained in §4.1.2.2.2. The choice for showing three copies of the picture and not two, for instance, was to avoid using the dual from for these Wugs (which is irrelevant to this dissertation). We only recorded behavioral results here, reaction time was not recorded and participants had as much time as they want to perform this task.

4.1.2.4. Data analysis

Response times for the grammaticality and semantic task were subjected to linear mixed effects regression analyses using the lme4 package in R. Maximally convergent random effects structures were employed (with random slopes for participants and items), following Barr, Levy, Scheepers, & Tilyc, (2013). Conditions were sum-coded so they could be interpreted as in traditional ANOVA. Grammaticality and animacy judgment responses, as well as the Wug test responses, were examined using logistic regression, following the same procedures.

4.1.2.5. Predictions

After presenting the experimental design, we now discuss how the possible structures for the mismatch cases (-HUMAN nouns) map into possible predictions. It is important to point out at this point that any interaction among the factors of the basic experimental design could in principle be represented either in the accuracy parameter or the latency parameter or both. The main assumption here is that accuracy and faster RTs go together, unless otherwise indicated.

In the following sections, I sketch the logical possibilities. I start first with my predictions for DEM-NOUN pairs and the NOUN-VERB pairs in the grammaticality judgment task followed by my predictions for the DEM-NOUN pairs and the NOUN-VERB pairs in the animacy task. To make the points clearer, I use some behavioral graphs to illustrate.

4.1.2.6. Grammaticality task

As mentioned earlier, in the grammaticality task, we wanted participants to judge the acceptability of a two-word pair that either matched or mismatched. This means that we are drawing participants' attention to judging the morpho-syntax. Despite that, we still think that since –HUMANs trigger their agreement based on their conceptual properties, this information will still need to be accessed from the conceptual system to make a judgment at the end. Now, considering the real-time processing of the relevant features, we can think of the comprehension system going through at least three stages depicted in the graph below:

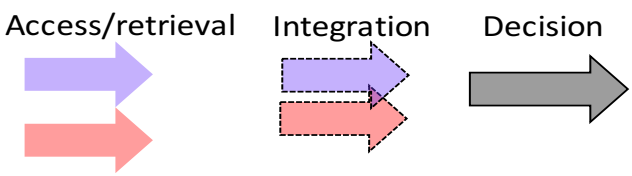


Figure 4-3: The three stages of processing

That is, processing could start with a stage of access and retrieval of the relevant information from both the morpho-syntactic and the ANIMACY systems; this is then followed by a stage of integration (interaction) and a final stage where a decision is finally taken.

For +HUMAN nouns, I would like to make a 'global' prediction. Because the agreement involved with +HUMAN nouns is regular, we do not make any distinctions between where ANIMACY and ϕ-features may interact because there are no conflicts. So, for +HUMAN plurals, features are retrieved, then the two systems interact and based on that, a decision is taken:

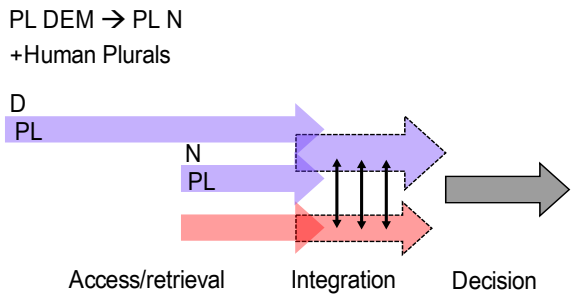


Figure 4-4: DEM+NOUN, Grammaticality task: prediction for +HUMAN nouns. (D= Demonstrative, N= Noun)

The only possible prediction we might make then is that, considering the morpho-syntactic features that get represented here, the cases that constitute a violation of both NUMBER and GENDER 'double violations' may demonstrate a processing advantage over 'single violations' visible in either accuracy, latency or both. An example of how that may look is below:

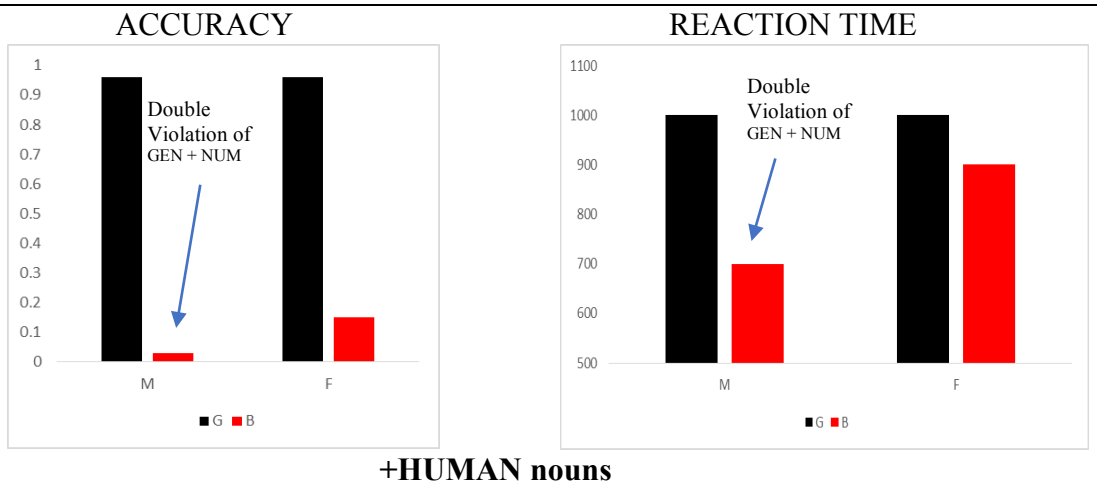


Figure 4-5: Grammatical task prediction for +HUMAN nouns. (M= Masculine, F= Feminine, G= Good, B= Bad)

This would be our prediction for +HUMAN nouns in general. Now, if we consider –HUMAN nouns, as far as we can see, for those nouns there is one high-level cut that has to do with whether the information associated with –HUMAN plural forms that is retrieved from working memory in virtue of their conceptual/ ANIMACY properties is retrieved with feminine singular as the property that matters to their combinatorics, despite their own morphology.

In a more concrete way then, we could in principle think of a possibility where you do not need to access both systems and that all the features involved belong to one system in which ANIMACY is basically part of morpho-syntax exactly as NUMBER and GENDER are:

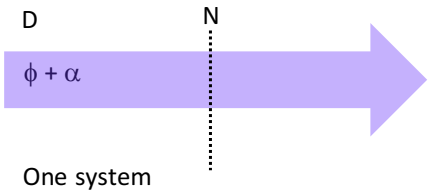


Figure 4-6: DEM+NOUN, Grammaticality task: predictions for -HUMAN nouns (One system aaproach)

or the possibility that there are two systems but the information retrieved from those systems could either be accessed at the initial stage (Access/ retrieval),

Figure 4-7 (a) or later at the integration stage

Figure 4-7 (b):

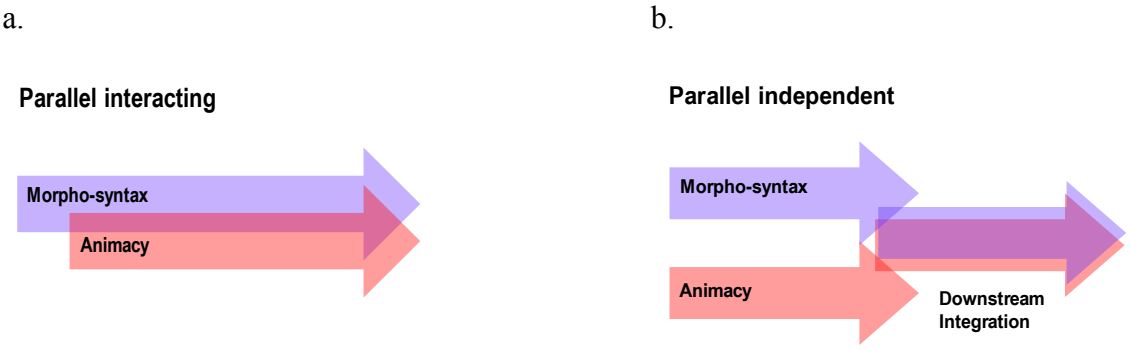


Figure 4-7: DEM+NOUN, Grammaticality task: predictions for -HUMAN nouns (Parallel systems, either interacting= (a) or independent= (b))

Building on that, we could think of the following logical possibilities:

1. **Prediction 1:** In principle, if all the relevant feature involved with these cases (NUMBER, GENDER and ANIMACY) are in the same bag, we would expect all features to be accessed at the same time. That would be the equivalent of the graph in
2. **Figure *4-6***. ANIMACY in this way then is a grammaticlized feature that matters for agreement the same way NUMBER and GENDER do (i.e., [± HUMAN] is "visible" to these checking mechanisms in a way similar to NUMBER or GENDER information). In this sense, we can think of the agreement associated with these nouns to be a cluster carrying feminine singular related to the ANIMACY feature in which an agreement "match" would involve a feminine singular demonstrative not a plural demonstrative. Thus, we might expect them to be treated as a case of regular agreement with high accuracy, fast reaction times and no

real effect of accessing the conceptual system, much more like processing a singular noun. If that is the case, our results then may look like this:

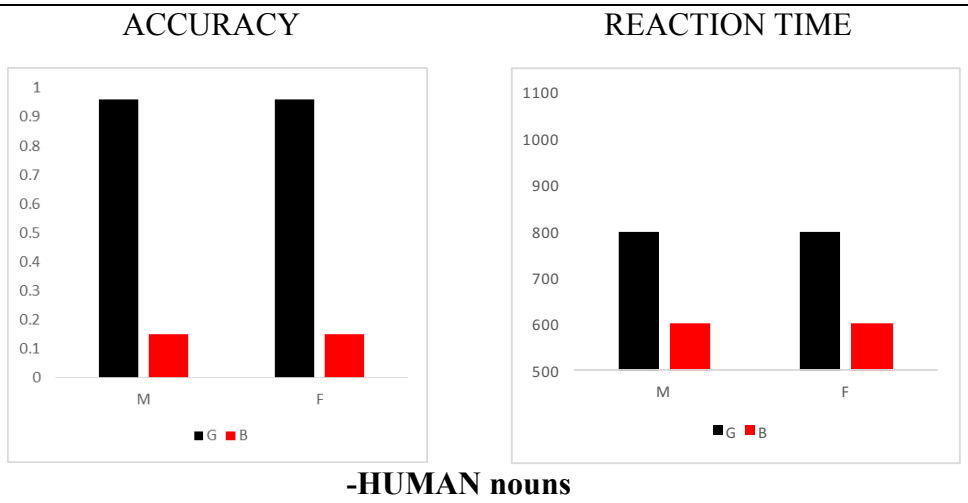


Figure 4-8: Grammaticality task, -HUMAN nouns (Prediction 1: gramaticalized ANIMACY).

However, if the two systems are parallel, we could think of the following:

3. **Prediction 2:** This could be a case of syncretism ((i) in §3.6), where agreement is basically regular and what looks like a mismatch is underlyingly a match. In that sense, the retrieval of the relevant features could happen at the retrieval/ access stage in which the two systems interact in an early stage (perhaps as soon as the noun is encountered) because agreement checking mechanisms consult item-specific lexical-semantic information in order to retrieve the morphology associated with it (feminine singular). Thus, ANIMACY information is basically available early enough, and can serve to "block" agreement mismatch responses:

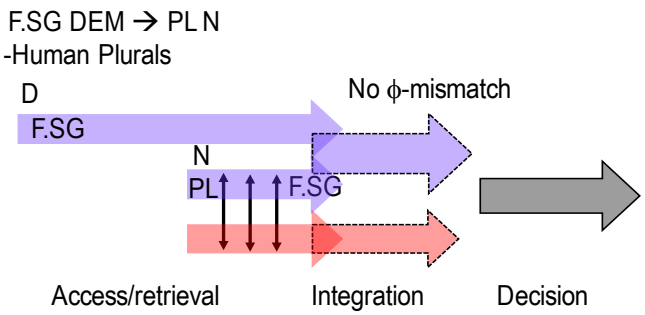


Figure 4-9: Grammaticality task, -HUMAN nouns (Prediction 2: parallel interacting approach, CORRECT condition)

Therefore, we would expect the comprehension system to treat the feminine singular morphology as matching agreement and participants would process feminine and masculine nouns (both constituting a single violation in this case) in both conditions similarly showing only a CORRECTNESS main effect. We would also expect them to be judged with high accuracy and have fast reaction times, resembling the +HUMAN feminine cases:

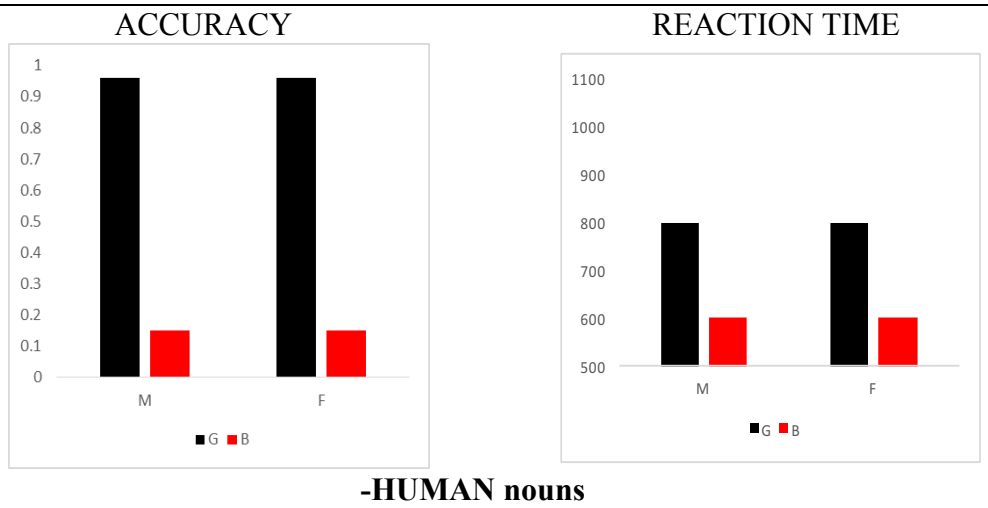


Figure 4-10: Grammaticality task, -HUMAN nouns (Prediction 2: parallel interacting approach)

Then, a violation condition for these cases (DEM.PL→ -HUM.N.PL) would elicit an effect normally associated with violations, and they will be judged as "bad":

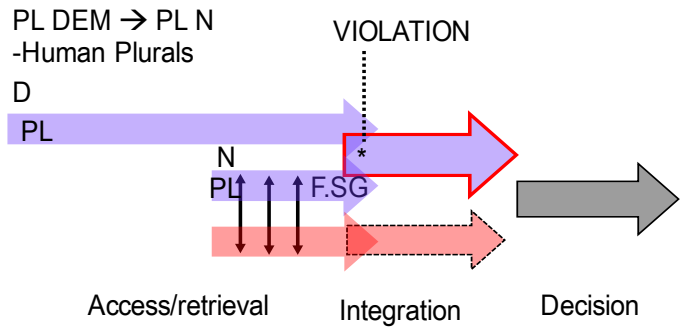


Figure 4-11: Grammaticality task, -HUMAN nouns (Prediction 2: parallel interacting approach, VIOLATION condition)

4. **Prediction 3:** Another possibility is that the feminine singular morphology could basically be the result of the presence of some sort of an intervener ((ii) §3.6) - an additional projection motivated by the semantics (like a classifier) or by the morphology (like the plural suffix). The features are then retrieved at the first stage but the agreement dependencies between them happen in the integration stage and yield a mismatch effect because agreement between a feminine singular demonstrative and a plural noun fails. Then, later in the integration stage, the interaction between the two systems (in which the features on the intervener are incorporated) override the failed agreement into a successful agreement.

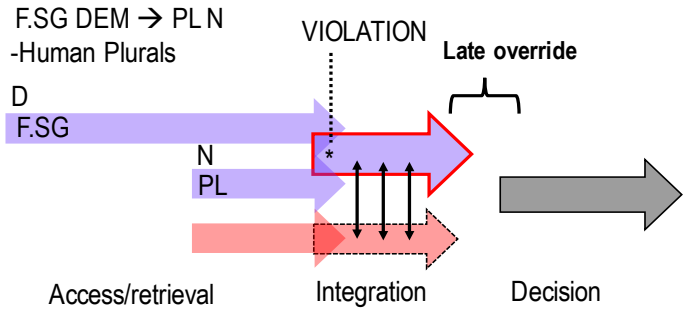


Figure 4-12: Grammaticality task, -HUMAN nouns (prediction 3: parallel independent approach, CORRECT condition)

In this case, we would expect the override process to be costly. The assumption here is that this cost would not be reflected in the accuracy parameter because the cases are judged correctly at the end. Thus, we would expect them to take long to process (cause a delay) but that delay may not show GENDER differences because both feminine and masculine nouns matter for processing the same way:

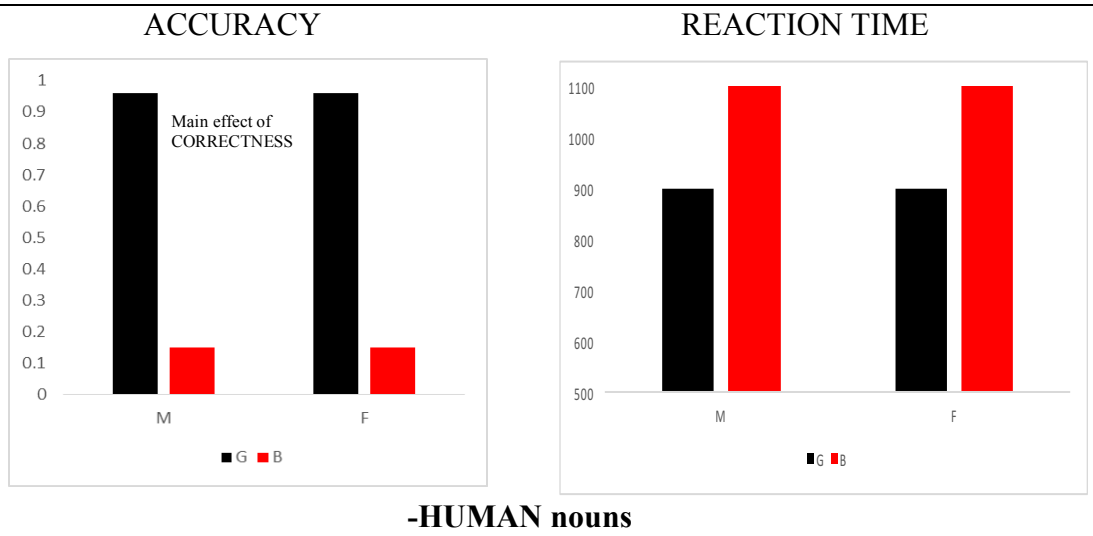


Figure 4-13: Grammaticality task, -HUMAN nouns (prediction 3: parallel independent approach)

In the violation condition then, a plural demonstrative followed by a plural –HUMAN noun constitute a 'match' that would require a process of 'reanalysis' in order to consider the case a mismatch. The effect elicited by the reanalysis process then is also represented in a delay (cost) in reaction time that would not differ with respect to GENDER:

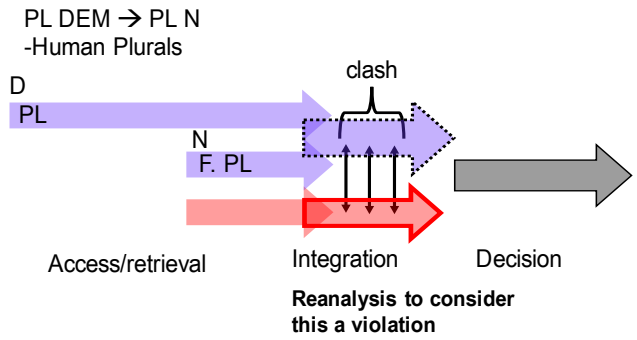


Figure 4-14: Grammaticality task, -HUMAN nouns (prediction 3: parallel independent approach VIOLATION condition)

As for NOUN–VERB pairs, those are only different with respect to the timing of the interaction because the noun, which carries all the features, is accessed first and early enough before the agreeing target is present. This means that when the agreement dependencies are processed, the features of the noun are already accessed. An example of how the NOUN+VERB stimuli would be handled by the comprehension system for +HUMAN nouns is provided in **Figure *4-15***:

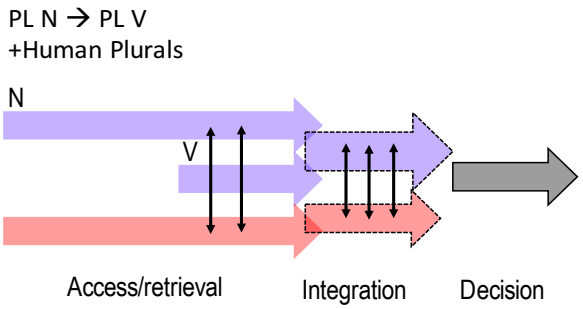


Figure 4-15: NOUN+VERB Grammaticality task, prediction for +HUMAN plurals. (N= Noun, V= Verb)

Since the noun is accessed first, we would expect both the morpho-syntactic and the animacy streams to be accessed in parallel, then once the verb is introduced agreement dependencies are licensed in the integration stage and a decision is taken.

For –HUMAN nouns, if the features belong to **"one system",** we would expect the same results from **Prediction 1** for the grammaticality task. The only difference would be that the noun is accessed before the agreeing target (the verb), but the same results should show up:

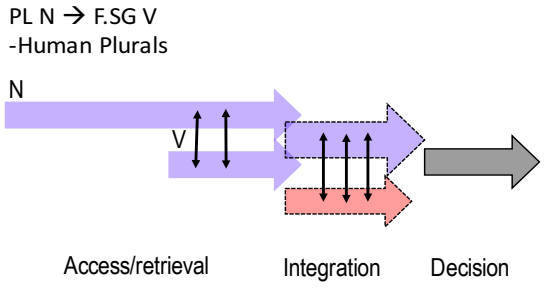


Figure 4-16: NOUN+VERB: Grammaticality task (prediction 1: One system approach, CORRECT condition)

Then when a violation is detected, the cases are rejected at the integration stage.

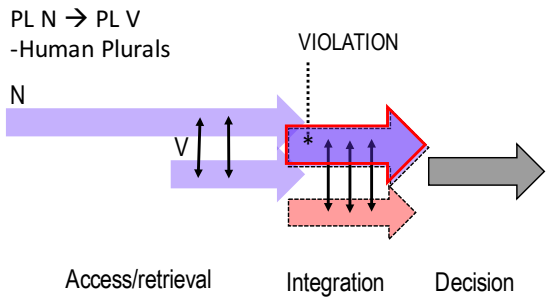


Figure 4-17: NOUN+VERB: Grammaticality task (prediction 1: One system approach, VIOLATION condition)

The same predictions from the "**parallel interacting approach**" (**Prediction 2**) would be predicted for the NOUN-VERB cases, where the interaction between the two systems is assumed to be at the initial retrieval stage. And again, because the noun is identified as feminine singular, we do not expect GENDER differences:

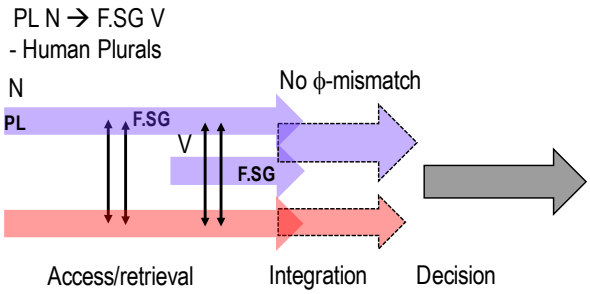


Figure 4-18: NOUN+VERB: Grammaticality task (prediction 2: Parallel interacting approach, CORRECT condition)

A plural verb occurring with those nouns would constitue a violation because the noun that has been accessed in the early stage has enforced feminine singular agreement:

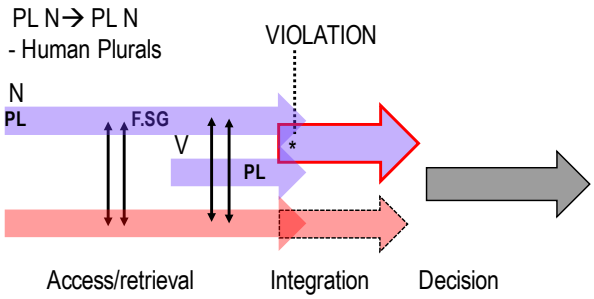


Figure 4-19: NOUN+VERB: Grammaticality task (prediction 2: Parallel interacting approach, VIOLATION condition)

Finally, if the "**parallel independent approach**" is correct, we would predict a dissociation between accuracy and reaction times, because although the nouns are judged correctly, they may take longer to process because they involve extra processing for both genders equally:

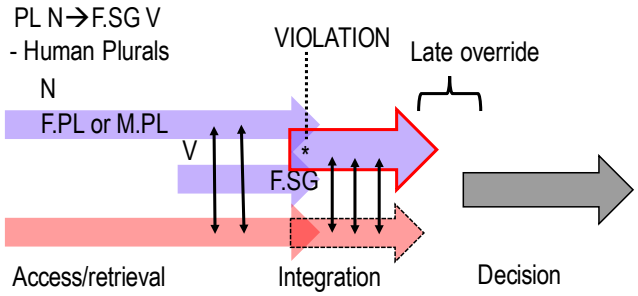


Figure 4-20: NOUN+VERB: Grammaticality task (prediction 3: Parallel independent approach, CORRECT condition)

A violation then will require a 'reanalysis' process to reconsider the cases as a violation. Those cases are expected to take longer than the CORRECT cases for that reason:

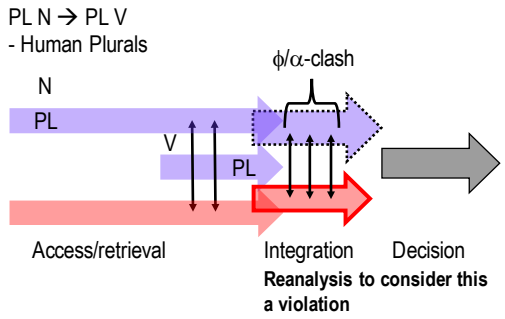


Figure 4-21: NOUN+VERB: Grammaticality task (prediction 3: Parallel independent approach, VIOLATION condition)

At this point, however, dialectal varieties may play a role because disambiguating the two registers will be hard based on the shared lexical form and verbal morphology between MSA and the spoken variety and the neutralization of these forms in the spoken varieties to the default masculine GENDER.

4.1.2.7. ANIMACY task

As we expected that morpho-syntactic features in the grammaticality task would influence native speakers' judgments, we minimally anticipated that the presence of morpho-syntactic violations might play an interfering role in categorizing nouns as +HUMAN versus –HUMAN. Further, just as double-violations in the +HUMAN masculine plurals were expected to influence grammaticality judgments, it may be that such double violations might also yield a greater degree of semantic categorization errors.

So, for the animacy task we are looking for instances where possible interactions between the two systems (morpho-syntax and lexical semantics) can emerge. Note, however, that we expect

this interaction, if present, to be evident in the violation conditions because they consisted of morpho-syntactic mismatches.

Considering that and assuming that processing takes the same stages of retrieval> integration > decision, for +HUMAN nouns, we predict a CORRECTNESS main effect in which, in the CORRECT condition, those nouns are accurately and quickly categorized compared to the VIOLATION condition where we expect morpho-syntactic mismatches to get in participants' way, showing less accuracy and slower reaction times:

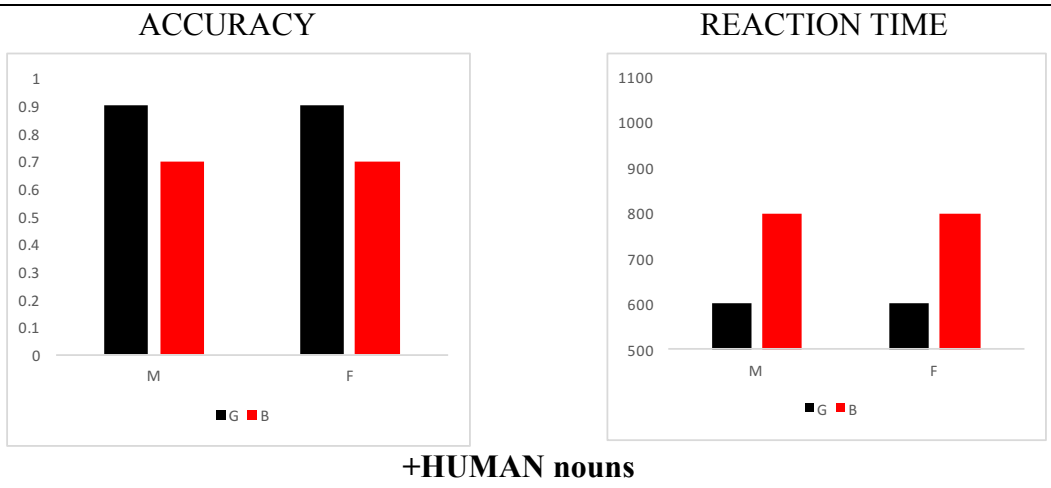


Figure 4-22: Animacy task, prediction +HUMAN nouns.

Again, this can be considered a global prediction for those cases because they constitute regular agreement. For –HUMAN nouns, on contrary, we predict one of the following:

1. **Prediction 1:** if the "**one system approach**" is correct, we would expect to see no effect of morpho-syntax on judgment in general because it is irrelevant to the information required to process the noun's animacy/ categorization task (just like our prediction for a singular noun). Under that assumption, we expect high accuracy and fast reaction times

across all conditions. This means that CORRECT vs. VIOLATION conditions do not show any differences:

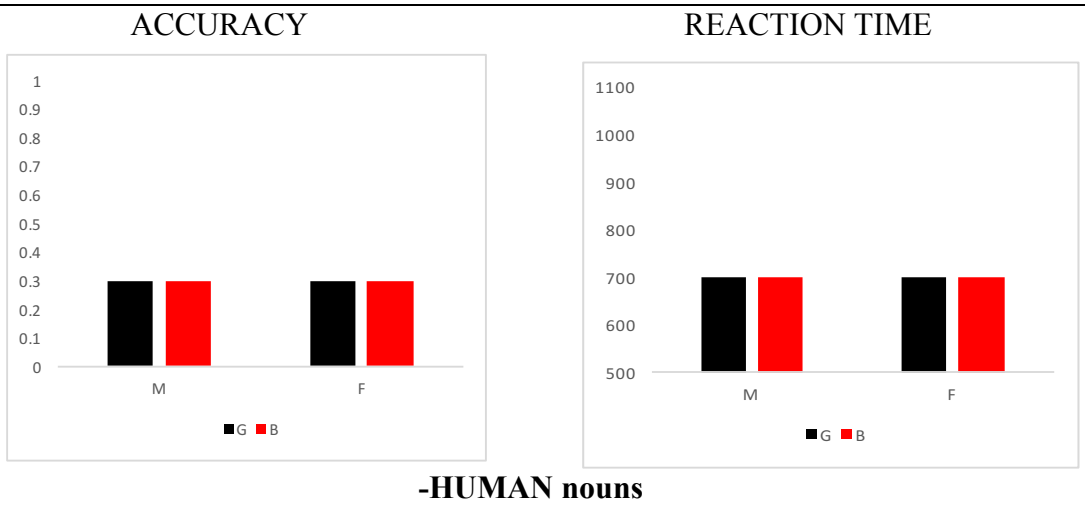


Figure 4-23: DEM-NOUN: Animacy task (prediction 1: One system approach)

2. **Prediction 2:** if the "parallel interacting approach" (syncretism) is correct, we would expect the two systems to interact continuously and very early: morpho-syntactic features are crucial to categorization processes and identifying a word's category is in fact affected by morpho-syntactic mismatches. Therefore, we predict a CORRECTNESS main effect (just like our prediction for +HUMAN nouns) in which CORRECT conditions show high accuracy and short reaction times while VIOLATION conditions show the opposite. Most importantly, we do not expect to see any effect of GENDER across conditions neither in the accuracy nor in the reaction time parameter simply because after the early interaction, both masculine and feminine nouns should appear as feminine singular and that what should matter for their processing:

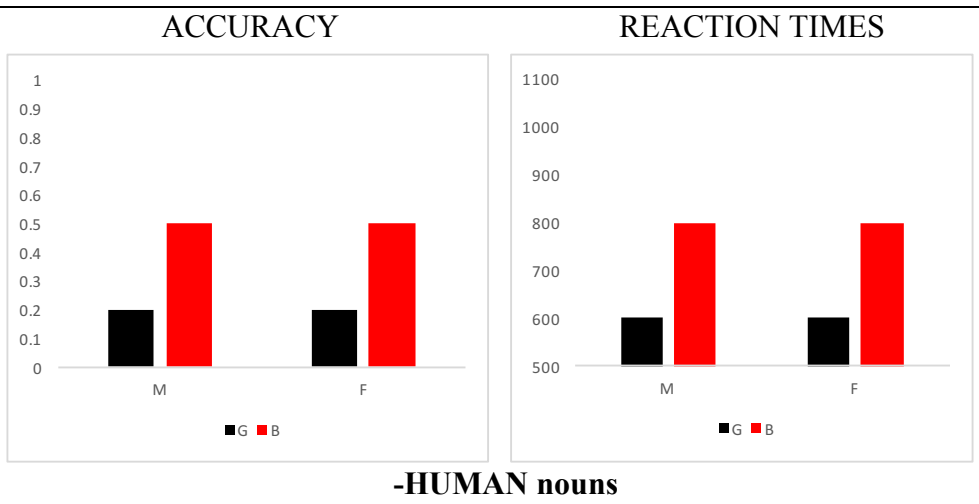


Figure 4-24: DEM-NOUN: Animacy task (prediction 2: Parallel interacting approach)

3. **Prediction 3:** However, if the "parallel independent approach" is correct, we would expect morpho-syntactic features to affect categorization processes because morpho-syntactic mismatches would get in participant's way of judging the nouns. In addition, we may see a dissociation between accuracy and reaction time giving way to a three-way interaction of GENDER x ANIMACY x CORRECTNESS. So, although all the nouns are judged accurately to whether they are +/-HUMAN, -HUMAN nouns may take longer:

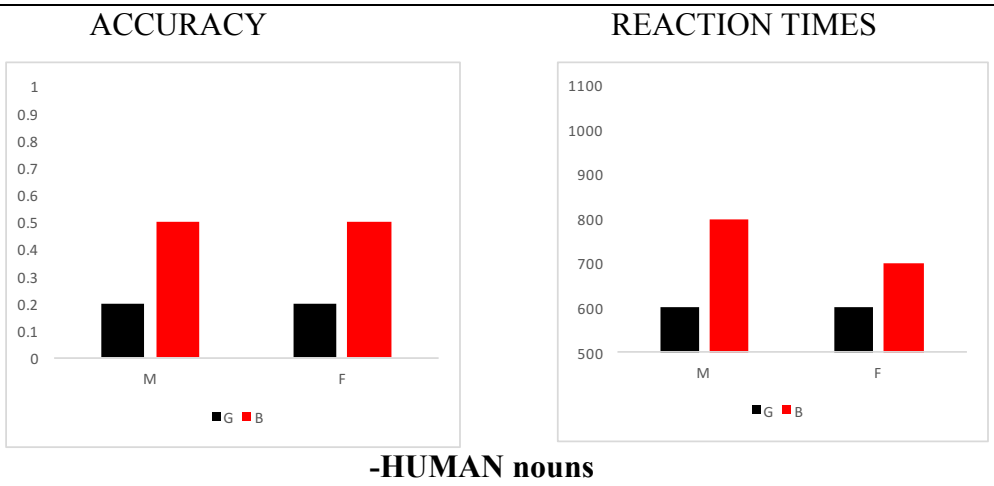


Figure 4-25: DEM-NOUN: Animacy task (prediction 3: Parallel independent approach)

As for the NOUN-VERB pairs in the animacy task, we follow the assumptions for the NOUN-VERB pairs in the grammaticality task, assuming specifically that the timing of access/ retrieval of features is different form the DEM-NOUN cases since the noun is processed first.

As for the last research question in §4 (iv), even though current research shows that speakers of Arabic speak MSA as a second language and not a mother tongue (Khamis-Dakwar, 2007, 2014), the nature of diglossic brains is still debated and we *do* assume that speakers of Arabic would behave as native speakers with regard to MSA and not otherwise.

4.1.3. Results

4.1.3.1. Judgement tasks: Acceptance rates

Results from the regression analysis for +HUMAN nouns examining response accuracy for the grammaticality judgment task are shown in **Table 4-1.** Recall that for these conditions we predicted an advantage for double-violations (masculine nouns), which should correspond to an interaction of CORRECTNESS (G.B) and GENDER (N.M/ N.F). As **Table 4-1** shows, in addition to the robust main effects of CORRECTNESS (G.B), there was a highly significant CORRECTNESS x GENDER interaction. This can be clearly seen in the plot of the acceptance rates in **Figure 4-26** (right-hand side).

Table 4-1. Grammaticality judgment accuracy for +HUMAN Conditions. (G= Good, B= Bad, c= condition, N= Noun, f= Feminine, m= Masculine, D= Demonstrative, V= Verb, A= Animate, I= Inanimate, NV.DN = Noun-Verb/ Demonstrative-Noun)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.032330	0.158633	0.204	0.8385	
G.Bc	2.488302	0.141138	17.630	< 2e-16	***
Nm.Nfc	0.214872	0.129923	1.654	0.0982	.
NV.DNc	-0.115525	0.109391	-1.056	0.2909	
G.Bc:Nm.Nfc	-0.461319	0.113487	-4.065	4.8e-05	***
G.Bc:NV.DNc	0.005152	0.107527	0.048	0.9618	
Nm.Nfc:NV.DNc	-0.246171	0.109144	-2.255	0.0241	*
G.Bc:Nm.Nfc:NV.DNc	-0.032935	0.106956	-0.308	0.7581	

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

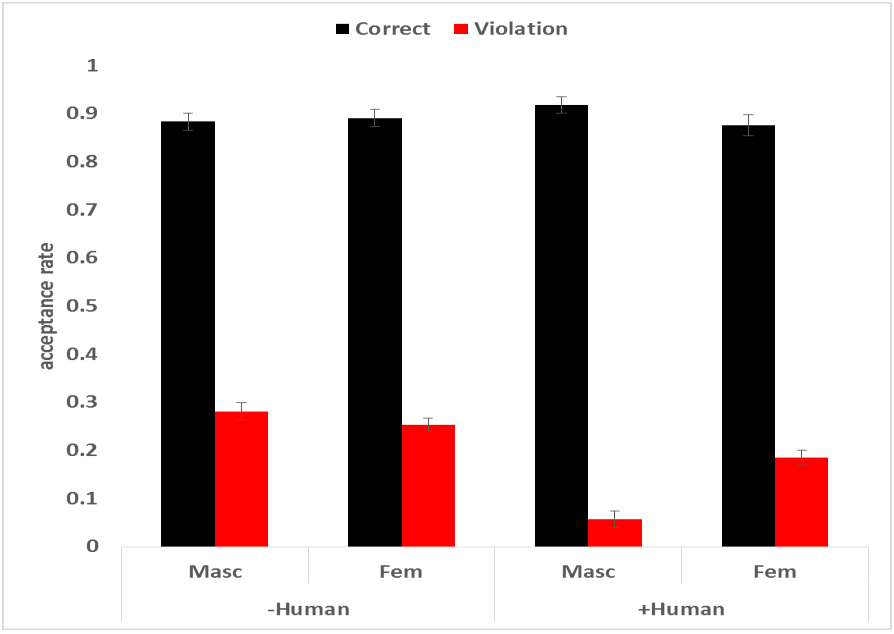


Figure 4-26. Response accuracy (acceptance rates) for the Grammaticality judgment task (N=64).

The corresponding comparisons for the -HUMAN nouns can be seen in the left-hand side of **Figure 4-26**, and the obvious main effect of CORRECTNESS, with no corresponding CORRECTNESS x GENDER interaction, was confirmed in our regression analysis, shown in **Table 4-2**.

Table 4-2. Grammaticality judgment accuracy for -HUMAN Conditions. **(G= Good, B= Bad, c= condition, N= Noun, f= Feminine, m= Masculine, D= Demonstrative, V= Verb, A= Animate, I= Inanimate, NV.DN = Noun-Verb/ Demonstrative-Noun)**

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.51441	0.12858	4.001	6.32e-05	***
G.Bc	1.76187	0.10198	17.277	< 2e-16	***
Nm.Nfc	0.01798	0.10150	0.177	0.859	
NV.DNc	-0.14677	0.09237	-1.589	0.112	
G.Bc:Nm.Nfc	0.02670	0.09178	0.291	0.771	
G.Bc:NV.DNc	0.65159	0.08953	7.278	3.39e-13	***
Nm.Nfc:NV.DNc	0.12981	0.09109	1.425	0.154	
G.Bc:Nm.Nfc:NV.DNc	0.08203	0.08851	0.927	0.354	

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Note that in these -HUMAN cases we also obtained an interaction between CORRECTNESS and CONDITION TYPE (DEM-NOUN/ NOUN-VERB), due to the fact that, in general, accuracy was lower in the NOUN-VERB conditions, as shown in **Figure *4-27*.**

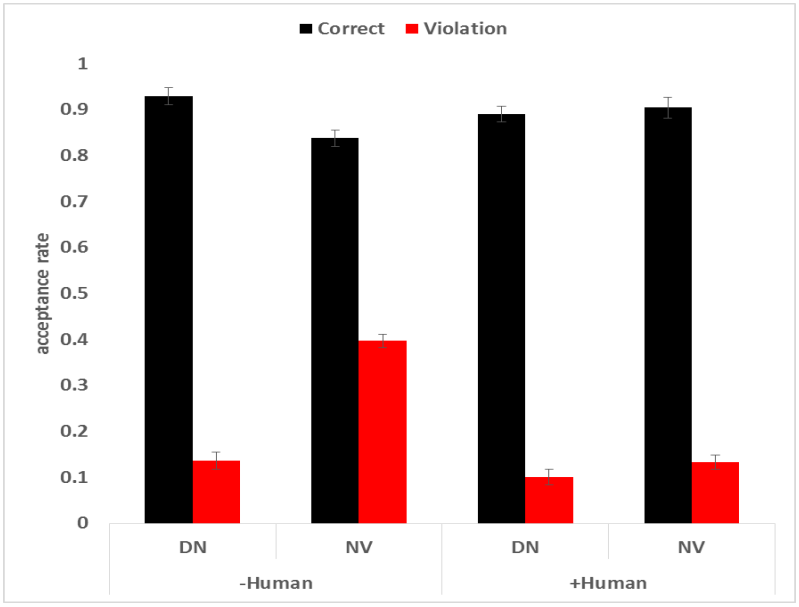


Figure 4-27. Grammaticality judgment. CORRECTNESS x CONDITION TYPE interaction for -HUMANs (but not +HUMANs). DN/NV = DEM-NOUN vs. NOUN-VERB.

Turning now to the ANIMACY (±Human) judgment task, regression results are presented for all sub-conditions in **Table 4-3**, and ANIMACY judgment rates are plotted in **Figure 4-28**.

As **Table 4-3** and **Figure 4-28** make plain, CORRECTNESS and ANIMACY interacted, with lower ANIMACY judgment rates for morpho-syntactic mismatch conditions (**Figure 4-28**), independent of GENDER.

Table 4-3. Animacy judgment accuracy (all sub-conditions). ((G= Good, B= Bad, c= condition, N= Noun, f= Feminine, m= Masculine, D= Demonstrative, V= Verb, A= Animate, I= Inanimate, NV.DN = Noun-Verb/ Demonstrative-Noun)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.105470	0.097512	-1.082	0.279427	
G.Bc	0.318347	0.085235	3.735	0.000188	***
A.Ic	2.668553	0.104598	25.513	< 2e-16	***
Nm.Nfc	-0.004865	0.092822	-0.052	0.958198	
NV.DNc	0.087326	0.084807	1.030	0.303147	
G.Bc:A.Ic	0.170841	0.085670	1.994	0.046132	*
G.Bc:Nm.Nfc	0.057302	0.085165	0.673	0.501055	
A.Ic:Nm.Nfc	0.019692	0.092954	0.212	0.832223	
G.Bc:NV.DNc	-0.044074	0.083811	-0.526	0.598978	
A.Ic:NV.DNc	0.107229	0.084437	1.270	0.204112	
Nm.Nfc:NV.DNc	0.029081	0.084605	0.344	0.731056	
G.Bc:A.Ic:Nm.Nfc	-0.062796	0.085517	-0.734	0.462758	
G.Bc:A.Ic:NV.DNc	-0.023809	0.083554	-0.285	0.775685	
G.Bc:Nm.Nfc:NV.DNc	0.073640	0.083669	0.880	0.378789	
A.Ic:Nm.Nfc:NV.DNc	0.083281	0.084512	0.985	0.324412	
G.Bc:A.Ic:Nm.Nfc:NV.DNc	0.017179	0.083808	0.205	0.837586	

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

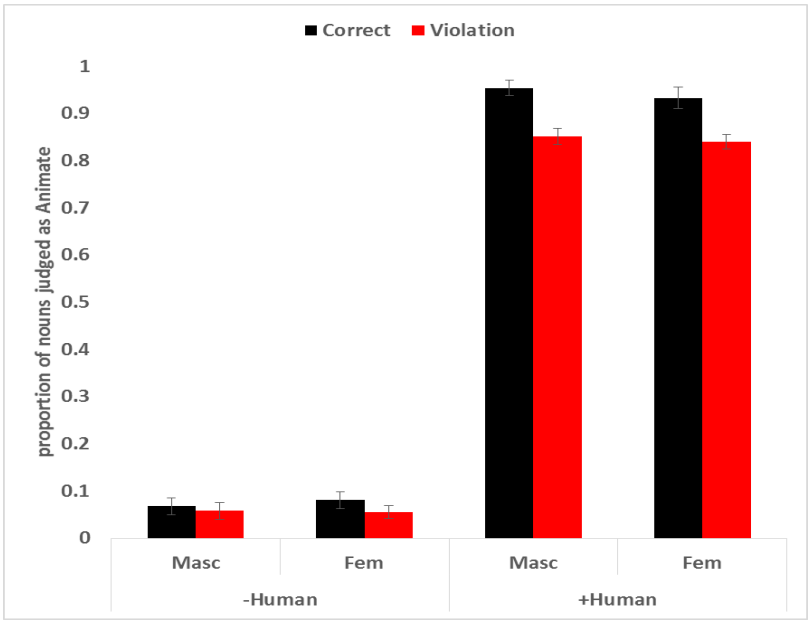


Figure 4-28. Animacy judgment, response accuracy rate: all sub-conditions.

4.1.3.2. Judgment tasks: Reaction times

Response latencies for the grammaticality judgment task are shown in **Table 4-4**. Most important in the effects seen in **Table 4-4** is the three-way interaction between ANIMACY (A.I), GENDER (Nm.Nf), and CORRECTNESS (G.B), which is visualized in **Figure *4-29*.**

Table 4-4. Grammaticality judgment response latency (ms); All conditions. **(G= Good, B= Bad, c= condition, N= Noun, f= Feminine, m= Masculine, D= Demonstrative, V= Verb, A= Animate, I= Inanimate, NV.DN = Noun-Verb/ Demonstrative-Noun)**

	Estimate	Std. Error	df	t value	Pr(>|t|)	
(Intercept)	2173.45	113.87	74.70	19.086	< 2e-16	***
NV.DNc	-189.43	40.21	1204.00	-4.711	2.75e-06	***
A.Ic	-105.11	52.00	69.60	-2.021	0.04708	*
Nm.Nfc	186.73	51.65	72.50	3.616	0.00055	***
G.Bc	-103.48	41.06	658.10	-2.520	0.01196	*
NV.DNc:A.Ic	102.78	39.52	1020.20	2.601	0.00944	**
NV.DNc:Nm.Nfc	-51.23	39.81	985.00	-1.287	0.19849	
A.Ic:Nm.Nfc	79.26	51.65	72.50	1.535	0.12925	
NV.DNc:G.Bc	71.35	38.65	1300.10	1.846	0.06509	.
A.Ic:G.Bc	113.64	41.32	669.30	2.750	0.00611	**
Nm.Nfc:G.Bc	-122.04	40.99	682.90	-2.977	0.00301	**
NV.DNc:A.Ic:Nm.Nfc	34.60	39.30	989.10	0.881	0.37875	
NV.DNc:A.Ic:G.Bc	-70.80	38.24	1294.70	-1.851	0.06435	.
NV.DNc:Nm.Nfc:G.Bc	29.30	38.23	1272.30	0.766	0.44367	
A.Ic:Nm.Nfc:G.Bc	-85.88	40.73	692.30	-2.108	0.03535	*
NV.DNc:A.Ic:Nm.Nfc:G.Bc	31.89	38.16	1278.20	0.836	0.40341	

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Follow-up analyses decomposing this three-way interaction confirmed the obvious pattern. For -HUMAN nouns there was a main effect of CORRECTNESS (t = -3.89, $p = 0.0001$) and no interaction with GENDER. In contrast, for the +HUMANs a CORRECTNESS X GENDER interaction obtained (t = -4.38, $p < 0.0001$) due to opposite direction effects of CORRECTNESS for the masculine (t = 3.90, $p = 0.0001$) and feminine nouns (t = -2.34, $p = 0.0205$).

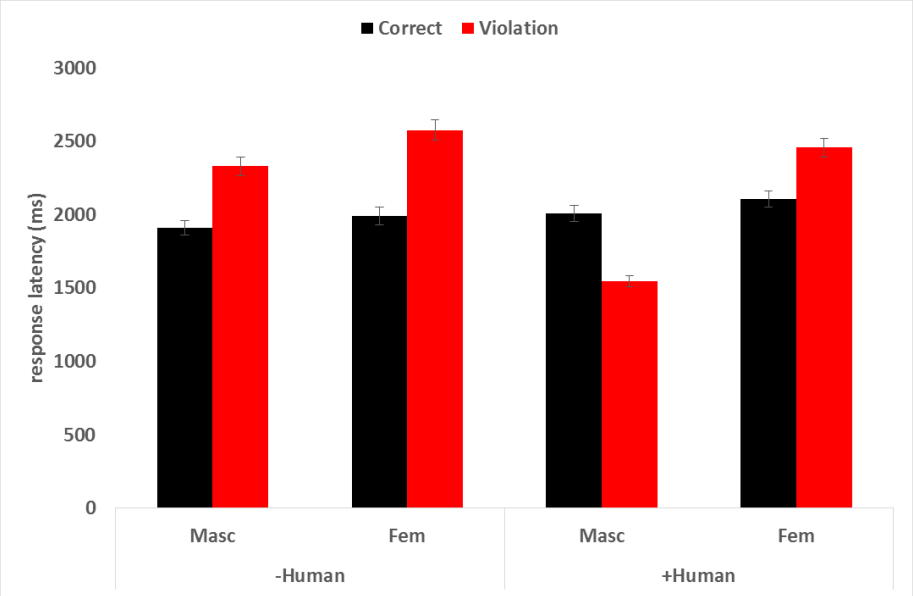


Figure 4-29. Grammaticality judgment response latencies: ANIMACY X GENDER X CORRECTNESS Interaction (bars = ±95% CIs).

Turning to the animacy judgment task, results of regression analyses for the response times are shown in **Table 4-5**. There the important thing to note is that a 4-way interaction was obtained.

Table 4-5. Animacy judgment task response latency analysis. (G= Good, B= Bad, c= condition, N= Noun, f= Feminine, m= Masculine, D= Demonstrative, V= Verb, A= Animate, I= Inanimate, NV.DN = Noun-Verb/ Demonstrative-Noun)

	Estimate	Std. Error	df	t value	Pr(>|t|)	
(Intercept)	1323.106	74.648	74.600	17.725	< 2e-16	***
NV.DNc	7.620	22.379	2374.500	0.341	0.733505	
A.Ic	84.969	35.063	73.400	2.423	0.017845	*
Nm.Nfc	-2.037	34.881	75.400	-0.058	0.953581	
G.Bc	-89.226	23.166	1394.900	-3.852	0.000123	***
NV.DNc:A.Ic	33.499	21.909	2070.700	1.529	0.126421	
NV.DNc:Nm.Nfc	-41.097	22.091	2053.300	-1.860	0.062983	.
A.Ic:Nm.Nfc	-12.534	34.644	78.600	-0.362	0.718485	
NV.DNc:G.Bc	2.304	21.698	2299.000	0.106	0.915459	
A.Ic:G.Bc	-70.638	23.293	1440.500	-3.033	0.002468	**
Nm.Nfc:G.Bc	1.809	23.116	1443.400	0.078	0.937629	
NV.DNc:A.Ic:Nm.Nfc	-2.444	21.925	2008.500	-0.111	0.911256	
NV.DNc:A.Ic:G.Bc	-13.660	21.480	2291.400	-0.636	0.524865	
NV.DNc:Nm.Nfc:G.Bc	-24.608	21.496	2270.800	-1.145	0.252441	
A.Ic:Nm.Nfc:G.Bc	-24.929	22.923	1470.900	-1.088	0.276980	
NV.DNc:A.Ic:Nm.Nfc:G.Bc	-58.090	21.459	2268.100	-2.707	0.006841	**

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

In order to probe the source of this interaction, we first examined the NOUN-VERB and DEM-NOUN sub-conditions separately. Results of these second level analyses are shown in **Table 4-6a/b**, with the corresponding effects plotted separately or the NOUN-VERB and DEM-NOUN conditions in **Figure *4-30*.**

Table 4-6a. Animacy judgment response times: NOUN-VERB **sub-conditions. (G= Good, B= Bad, c= condition, N= Noun, f= Feminine, m= Masculine, D= Demonstrative, V= Verb, A= Animate, I= Inanimate)**

	Estimate	Std. Error	df	t value	Pr(>|t|)	
(Intercept)	1344.776	94.920	43.800	14.167	<2e-16	***
A.Ic	58.064	46.253	70.200	1.255	0.2135	
Nm.Nfc	43.930	46.337	70.700	0.948	0.3463	
G.Bc	-89.758	35.351	429.600	-2.539	0.0115	*
A.Ic:Nm.Nfc	-8.872	46.261	70.100	-0.192	0.8485	
A.Ic:G.Bc	-44.500	35.611	427.800	-1.250	0.2121	
Nm.Nfc:G.Bc	13.146	34.957	400.900	0.376	0.7071	
A.Ic:Nm.Nfc:G.Bc	8.451	34.578	439.400	0.244	0.8070	

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Table 4-6b. Animacy judgment response times: DEM-NOUN **sub-conditions. (G= Good, B= Bad, c= condition, N= Noun, f= Feminine, m= Masculine, D= Demonstrative, V= Verb, A= Animate, I= Inanimate)**

	Estimate	Std. Error	df	t value	Pr(>|t|)	
(Intercept)	1323.75	76.91	70.10	17.212	< 2e-16	***
A.Ic	115.40	40.72	53.20	2.834	0.00648	**
Nm.Nfc	-53.69	41.00	53.40	-1.310	0.19597	
G.Bc	-78.85	32.83	376.20	-2.402	0.01680	*
A.Ic:Nm.Nfc	-16.51	40.59	52.80	-0.407	0.68579	
A.Ic:G.Bc	-80.27	32.36	387.90	-2.481	0.01354	*
Nm.Nfc:G.Bc	-20.57	32.82	361.10	-0.627	0.53124	
A.Ic:Nm.Nfc:G.Bc	-67.05	32.58	368.20	-2.058	0.04028	*

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

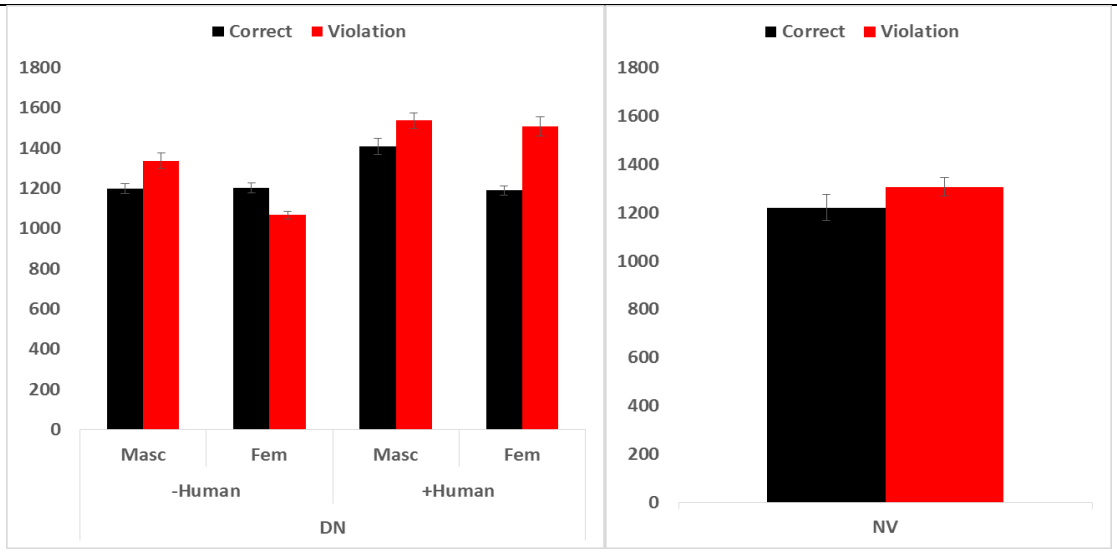


Figure 4-30. Animacy judgment task response latencies by sub-condition. (bars = ±95% CIs).

First, note that for the NOUN-VERB conditions only a main effect of CORRECTNESS (G.B) obtained (right-hand plot in **Figure 4-7**). In contrast, for the DEM-NOUN conditions a three-way interaction of ANIMACY (A.I), GENDER (N.M/ N.F) and CORRECTNESS (G.B) was significant. The source of this interaction can be clearly seen in the left-hand plot in **Figure 4-7**. Masculine and feminine -HUMAN nouns drove opposite direction response times with respect to the factor CORRECTNESS, with slower judgment times for masculine nouns when there was an agreement mismatch with the preceding demonstrative and *faster* decision times for the feminine nouns when there was a mismatch. In contrast, for the +HUMANs both masculine and feminine nouns were judged more slowly when there was a morpho-syntactic mismatch.

Finally, it should be noted that in general reaction times in the grammaticality and animacy judgment tasks differed considerably, with much more rapid responses for the latter.

4.1.3.3. Wug test

Results from the Wug test are shown in **Figure 4-8**, with corresponding regression analyses examining the influence of ANIMACY and GENDER in **Table 4-7a**, and sub-analyses of the effect of plural type within the -HUMANs shown in **Table 4-7b**.

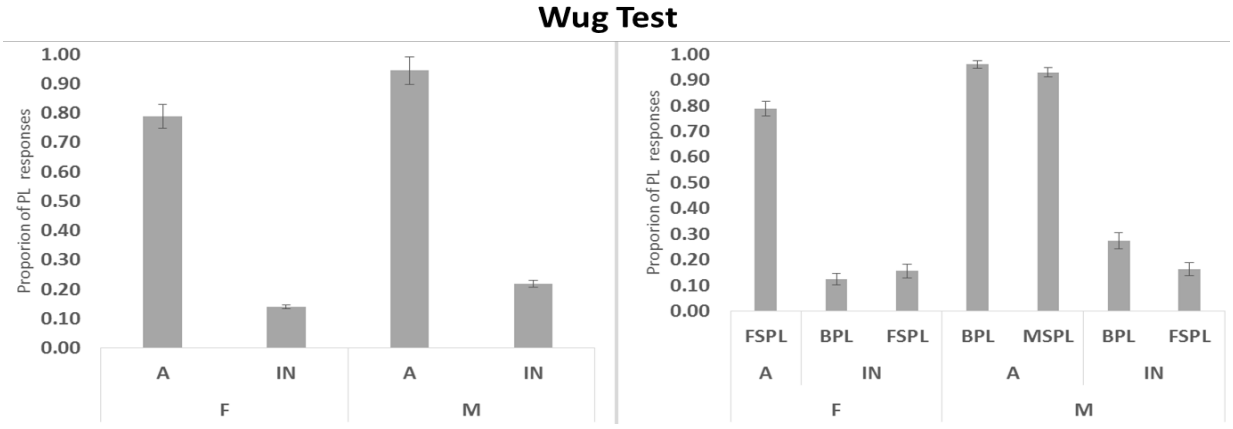


Figure 4-31. Wug test: Left-hand plot collapses over plural type differences. A= Animate, IN= Inanimate, F= Feminine, M= Masculine, BPL = Broken Plural, FSPL= Feminine Suffixed Plural, MSPL= Masculine Suffixed Plural.

In general, as can be seen in **Figure 4-8**, participants overall responded as expected and produced plural demonstratives for the +HUMAN cases, and feminine singular forms for the -HUMAN ones. There was a main effect of GENDER overall, as plural forms were more likely to be selected for the masculine nouns (whether +HUMAN or -HUMAN – the ANIMACY X GENDER interaction did not reach significance). Looking into the -HUMAN sub-conditions with respect to plural type, we find a plural type x gender interaction due to the fact that plural demonstratives were more likely to be selected for broken plurals in the -HUMAN masculine nouns relative to all other conditions.

Table 4-7a. Wug test Animacy x Gender. (A= Animate, I= Inanimate, Gen = Gender, PL Type= Plural Type)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.2951	0.1942	1.520	0.129	
A.I	2.1661	0.1666	13.004	< 2e-16	***
Gen	-0.5854	0.1459	-4.013	5.99e-05	***
A.I:Gen	-0.2670	0.1452	-1.838	0.066	.

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Table 4-7b. Plural type x Gender for Inanimate nouns only. . (A= Animate, I= Inanimate, Gen = Gender, PL Type= Plural Type)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-2.7845	0.5241	-5.313	1.08e-07	***
PL.Type	-0.3464	0.3354	-1.033	0.301698	
Gen	-0.8099	0.2426	-3.338	0.000842	***
PL.Type:Gen	0.7626	0.3395	2.246	0.024681	*

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

An examination of individual participant responses for the -HUMAN plurals revealed that responses varied, with some participants consistently supplying the feminine singular demonstrative for the -HUMAN plurals, while others occasionally supplied the plural form of the demonstrative (see **Figure 4-32**).

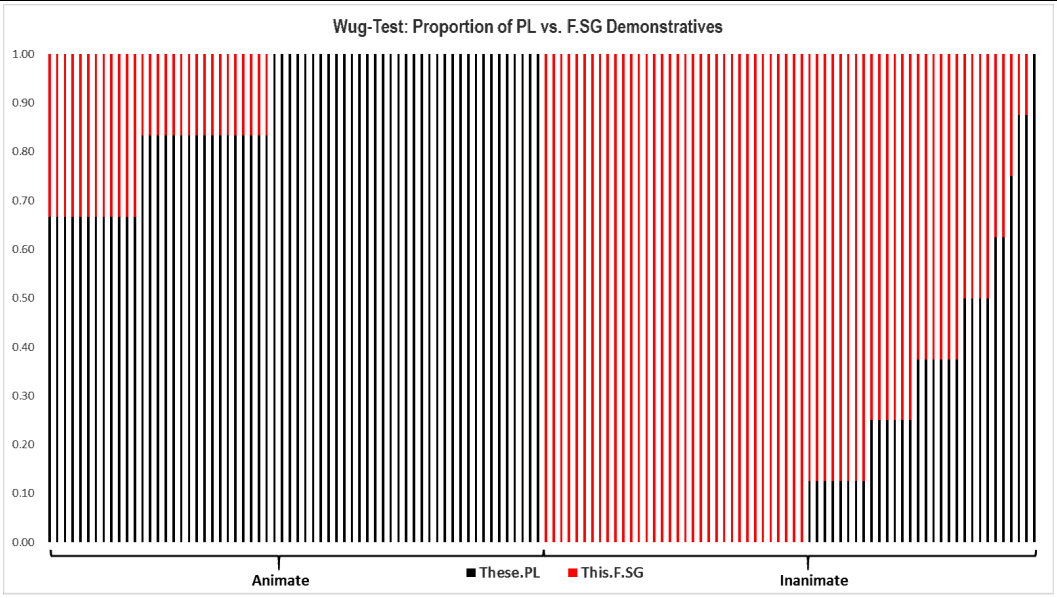


Figure 4-32. Proportion of PL / F.SG Demonstratives for +HUMAN and -HUMAN conditions: Individual participants

These patterns indicate some variability in the consistency with which the F.SG agreement is employed, perhaps related to dialectal differences. This raises the question of whether this variability also manifested in the judgment tasks. In order to evaluate this, we coded individual participants as "Wug-Consistent" if they always selected the F.SG form of the demonstrative for the -HUMAN cases, and "Wug-Inconsistent" if they sometimes selected the plural form. This factor was then included in a reanalysis of the grammaticality and animacy judgment task data, keeping all other aspects of the analyses reported above the same.

Considering the grammaticality judgment task data first, consistency on the Wug test did not interact with any factors for the +HUMAN nouns. However, interactions did arise for the -HUMAN nouns, as can be seen in **Table 4-8**.

Table 4-8. Grammaticality judgment: Wug-consistency x Condition Interactions. (G= Good, B= Bad, c= condition, N= Noun, f= Feminine, m= Masculine, D= Demonstrative, V= Verb, A= Animate, I= Inanimate, NV.DN = Noun-Verb/ Demonstrative-Noun)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	0.52967	0.13050	4.059	4.93e-05	***
Wug	0.12135	0.11680	1.039	0.2988	
G.B	1.78244	0.10488	16.996	< 2e-16	***
NV.DN	-0.14907	0.09512	-1.567	0.1171	
Nm.Nf	0.01291	0.10554	0.122	0.9026	
Wug:G.B	-0.22793	0.09121	-2.499	0.0125	*
Wug:NV.DN	0.14548	0.09146	1.591	0.1117	
G.B:NV.DN	0.65232	0.09236	7.063	1.63e-12	***
Wug:Nm.Nf	-0.07747	0.08833	-0.877	0.3805	
G.B:Nm.Nf	0.02828	0.09509	0.297	0.7662	
NV.DN:Nm.Nf	0.10475	0.09420	1.112	0.2661	
Wug:G.B:NV.DN	-0.01380	0.08953	-0.154	0.8775	
Wug:G.B:Nm.Nf	-0.17549	0.08873	-1.978	0.0480	*
Wug:NV.DN:Nm.Nf	0.04311	0.08879	0.486	0.6273	
G.B:NV.DN:Nm.Nf	0.06071	0.09161	0.663	0.5075	
Wug:G.B:NV.DN:Nm.Nf	-0.04085	0.08922	-0.458	0.6471	

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Interestingly, consistency on the Wug test interacted with CORRECTNESS (G.B) and yielded also a three-way interaction with CORRECTNESS (G.B) and Gender (N.M/ N.F). These patterns are

plotted in **Figure *4-33***. Follow-up analyses revealed no group differences for the masculine nouns (left-hand side of **Figure *4-33***), whereas feminine nouns showed a significant CONSISTENCY X CORRECTNESS (G.B) interaction ($t = -3.12$, $p = 0.0018$), with the Wug-Inconsistent group showing lower response accuracy (right-hand side of **Figure *4-33***).

Corresponding analyses were carried out for the animacy judgment task data, separately for the +HUMAN and -HUMAN nouns. +HUMAN nouns showed no influence of Wug-consistency, while -HUMAN nouns revealed a CONSISTENCY X GENDER (NOUN. M/ NOUN.F) interaction ($t = 2.03$, $p = 0.0451$). This interaction was due to the fact that the Wug-inconsistent participants were more likely to mis-categorize -HUMAN nouns when they were in morpho-syntactically correct agreement environments (i.e., when they occurred with agreeing demonstratives or verbs bearing F.SG). Follow-up analyses revealed Consistency x Correctness interactions for both masculine and feminine nouns (**Figure *4-34***).

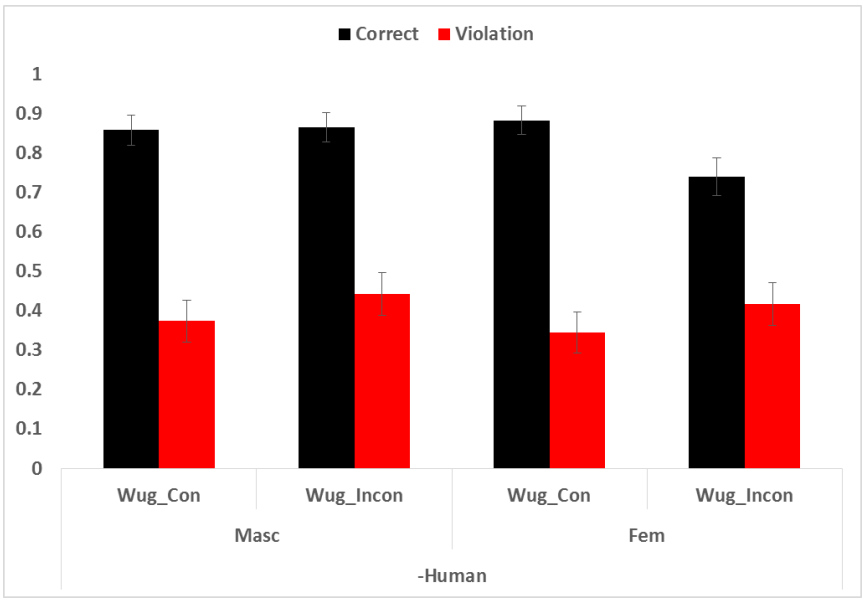


Figure 4-33. Grammaticality judgment task: Wug-consistency X CORRECTNESS X GENDER.

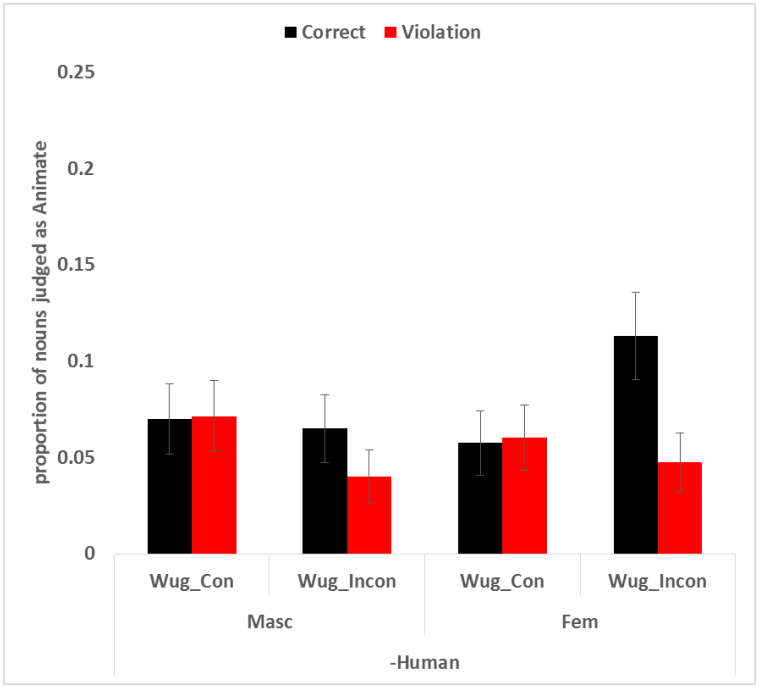


Figure 4-34. Wug-consistency effect on -HUMAN feminine noun animacy judgment.

4.1.4. Summary

4.1.4.1. Grammaticality judgment task

- **GENDER X CORRECTNESS interactions for +HUMAN nouns in response accuracy:** Masculine nouns were judged more accurately than feminine ones, as expected given that the masculine nouns clashed with the agreeing demonstratives and verbs in both NUMBER and GENDER marking, whereas the feminine nouns disagreed only in NUMBER.
- **Only main effects of CORRECTNESS for -HUMAN nouns in response accuracy**: GENDER did not influence agreement match/mismatch judgments for -HUMAN nouns.
- **NOUN-VERB conditions were less accurately judged than DEM-NOUN pairs when the nouns were -HUMAN.** This asymmetry did not arise for **+HUMAN** nouns.

- **ANIMACY X CORRECTNESS X GENDER interactions obtained for response times for +HUMAN nouns**: masculine nouns were judged more quickly when they occurred with disagreeing demonstratives and verbs than when they were correct; feminine **+HUMAN** showed the opposite profile.
- **-HUMAN nouns response times showed only main effects of CORRECTNESS:** all **-HUMAN** nouns were judged more slowly when they occurred with disagreeing elements.
- **Wug-test performance was related to variability in grammaticality judgment.** While there was no relationship between Wug-test performance and grammaticality judgments involving Animate nouns, inanimate feminine (but not masculine) nouns were judged less accurately by the Wug-inconsistent sub-group of participants.

4.1.4.2. Semantic judgment task

- **Grammaticality influenced semantic judgment accuracy for +HUMAN nouns.** Morpho-syntactic mismatches for +HUMAN nouns reduced the likelihood that they would be correctly categorized. There was no influence of GENDER on this response pattern. Judgment accuracy for -HUMAN nouns **was not** influenced by grammaticality.
- **Response times for semantic judgment varied depending on whether the nouns were in the DEM-NOUN or NOUN-VERB frame but only for –HUMAN nouns.** In both conditions for +HUMAN nouns, morpho-syntactic violations slowed ANIMACY judgments in general, and did not do so differently as a function of GENDER. For –HUMAN nouns, in the NOUN-VERB conditions, the presence of a morpho-syntactic mismatch slowed response times, with no influence of GENDER or ANIMACY. In the DEM-NOUN conditions, in contrast, a GENDER X

ANIMACY X CORRECTNESS interaction was present. Masculine and feminine -HUMAN nouns showed opposite direction response times with violations speeding response times for -HUMAN feminine nouns, and slowing responses for the masculine –HUMAN nouns.

- **Wug-test consistency also effected semantic judgment accuracy**. Participants who performed inconsistently with -HUMAN nouns in the Wug test were more likely to miscategorize -HUMAN nouns when they occurred in morpho-syntactically correct conditions.

4.1.4.3. Wug test

Beyond the variability noted above in performance on this task (i.e., where a subset of participants inconsistently chose the F.SG / PL forms of demonstratives for -HUMANs nouns), in general plural forms were more likely to be chosen for masculine relative to feminine nouns (overall, whether +HUMAN or -HUMAN). And, finally, -HUMAN condition responses were least consistent for feminine Broken Plural cases relative to all other plural types for -HUMANs.

4.2. Discussion

4.2.1. Grammaticality judgment task

In this behavioral study we wanted to investigate how the –HUMAN mismatch cases are tolerated by the language comprehension system and when in processing the mismatched features interact. We framed our predictions in light of the current assumptions on the processing and retrieval of morpho-syntactic and conceptual features investigating the real-time interaction of the morpho-syntax stream and the lexical-semantic stream.

As far as our predictions for the grammaticality task are concerned, our results are consistent with our expectations. Participants clearly discriminated correct/violation conditions. Furthermore, we found the expected pattern of faster and more accurate judgments for double as opposed to single morpho-syntactic violations for +HUMAN plurals. Interestingly, though we found only the anticipated main effects of correctness for the –HUMAN plurals (given that both masculine and feminine cases each involved only single violations), rejections of violations for these –HUMAN cases were less accurate compared to the +HUMAN single violation cases. We take this to indicate that, despite the fact that the disagreeing –HUMAN pairs are grammatical, there is nonetheless some conflict which is registered during their processing.

On the other hand, our results for -HUMAN nouns showed only CORRECTNESS main effect. Correct conditions were judged more accurately and faster than violation conditions, with no apparent effect of GENDER. Mapping those results to our predictions for the grammaticality task, the "one system approach" does not seem to be supported because despite that the cases were judged accurately, they still showed an effect of CORRECTNESS. This outcome is not what we would expect to see with singular nouns or if all features were on the same bag. But at the same time –HUMAN nouns did not show an effect of 'double violations' for the masculines as +HUMAN masculine plurals did. This indicates that the processing involved with the +HUMANs, -HUMANs and singulars is different. So, **Prediction 1** is excluded on this basis.

Turning now to **Prediction 2** the "parallel interacting approach" and **Prediction 3** the "parallel independent approach", in principle, both approaches seem to pattern with our accuracy data, which means that the two systems do interact. However, as relevant from the results, reaction times also show a CORRECTNESS main effect that was longer for violation conditions. It is not clear from the grammaticality data alone when exactly that happens because we do not see a

GENDER effect ('single' vs. 'double' violations). This means that the processing involved in these mismatches could in fact be either Parallel interacting or parallel independent. It is not very clear at this point which prediction is borne out.

It is also important, we believe, that –HUMAN plurals exhibited a difference across the NOUN-VERB vs. DEMONSTRATIVE-NOUN pairs with respect to judgment accuracy. This pattern might be understood in terms of a difference in the timing of processing stages at which ϕ-features can interact with ANIMACY information. That is, in the NOUN-VERB cases more time was available to sufficiently activate the animacy features of the noun before a conflict with morpho-syntactic information was encountered on the subsequent verb. In contrast, in the DEMONSTRATIVE-NOUN cases, both types of information must be registered in reaction to the same target word (i.e., the noun). This asymmetry would not be expected to obtain for the +HUMAN plurals, for which no such cross-talk between morpho-syntax and animacy is required in order to correctly categorize them as acceptable or deviant.

This could also be considered from a semantic/ pragmatic point of view as one of two rasons; (i) it could be potential interference from the spoken varieties, in which judgment is simply affected by the possible agreements associated with the different readings of these cases in the speaker's own spoken variety (feminine singular → collective), (plural→ distributive) as discussed in §3.3.1.. Put differently, if we consider the actual conditions in which these nouns were judged less accurately, we find that it is either a –HUM.N.M.PL followed by V.M.PL. or a –HUM.N.F.PL followed by V.F.PL, and if we consider the fact that plural agreement is in fact licensed as a cue for the distributive interpretation in the spoken dialects, it is reasonable to assume that the cases were confused on semantic/ pragmatic grounds. This is another way of saying that the spoken dialects *do* in fact affect people's judgment on MSA. Or alternatively (ii) it could be that after the

noun's features have been accessed, and considering that many lexical items are shared between MSA and the spoken varieties, we can expect either feminine singular agreement or plural agreement on the basis of ambiguity between the two language registers. In other words, at this point in the derivation, the two varieties are hard for the comprehension system to tell apart since they share the same lexical items and verbal agreement morphology. To the contrary, although demonstratives have been neutralized towards the plural form in most of the spoken Arabic dialects, the actual phonological forms of those demonstrative, unlike with verbs, are different from those of MSA (and from the other Arabic dialects).

As for the feminine plural morphology in the verb condition, which does not license any specific interpretation like the masculine verbs do, it is important to note that a significant percentage of our sample spoke Najdi Arabic where a feminine plural noun takes a feminine plural verb independent of ANIMACY (not a masculine plural verb like other varieties of Arabic), which means that this case also can be related to the previously discussed two reasons. What we know, however, is that will never be the case for the +HUMANs simply because neither the semantic/ pragmatic factors, nor the dialectal interference/ ambiguity factors are available for this asymmetry.

Finally, the variability in responses revealed by consideration of wug-test performance points towards a potentially important role of how these patterns work in particular dialects/idiolects. Participants that were less consistent in their demonstrative choices in the wug-test also showed lower accuracy in grammaticality judgment.

4.2.2. Animacy judgment task

For +HUMAN nouns, and in line with our predictions, our animacy task results show an interesting asymmetry, where agreement mismatches caused participants to make categorization errors for +HUMAN but not for –HUMAN plurals. In connection with this, it is important to note that this effect was not modulated by whether the mismatch involved a single or a double violation as it did in the grammaticality task. While this pattern certainly constitutes a type of morpho-syntax/ ANIMACY interference effect, the fact that it did not show sensitivity to the narrower distinctions involving NUMBER/ GENDER mismatches raises some further questions about the underlying source of the interference.

It is also important that in general, these semantic categorization judgments were on average rendered much more rapidly than the grammaticality judgments, where average reaction times for the slowest conditions of the former were near those for the fastest conditions for the latter. This makes sense given that these semantic judgments in no way depended upon grammaticality, though the grammaticality judgments do of course depend upon the semantics (i.e., ANIMACY).

Furthermore, that the effect of morpho-syntactic mismatches was only present for +HUMAN nouns as opposed to –HUMANs in that only +HUMANs were mis-judged as –HUMANs not the other way around, indicates that participants adhered to the ANIMACY hierarchy as discussed at the beginning of Chapter 1. In particular, this means that participants accepted, in principle, to downgrade an animate entity to that of an inanimate but it is hard for them to upgrade an inanimate entity to the grade of an animate. We find this finding quite interesting given the existing work of Nieuwland & van Berkum's (2006) study where they report cases as "The peanut was in love" being accepted by participants when they were context-relevant.

For –HUMAN nouns, however, and considering **Prediction 1** the "one system approach", as sketched in §4.1.2.5., we expected no significant influence of morpho-syntactic mismatches on ANIMACY judgment in general. However, and although our results showed no influence of morpho-syntactic mismatches in the accuracy parameter, we did see an interaction in the reaction time parameter. For that reason, **Prediction 1** cannot be the way these nouns are processed.

However, the interaction in the reaction time for –HUMANs is only present in the DEM-NOUN condition not the NOUN-VERB condition, and was in opposite directions. In the DEM-NOUN condition, our –HUMAN plurals showed a three-way ANIMACY x CORRECTNESS x GENDER interaction where masculine and feminine nouns displayed opposite direction response times with violations speeding response times for -HUMAN feminine nouns (= single violation), and slowing responses for the -HUMAN masculine nouns (= double violation). Recall that based on **Prediction 2** the "parallel interacting approach", 'single' and 'double' violation cases are predicted to be symmetric with regard to GENDER processing because after accessing ANIMACY both nouns retrieve feminine singular. This is also a prediction made by **Prediction 3** the **"**parallel independant approach" but with possible effect evident in the reaction time parameter.

Interestingly, this is the opposite of what we saw in the grammaticality task. We reason that this might suggest that there is something different involved in their processing. In particular, if we consider the related conditions, we find that interaction is evident only in the violation conditions which is either DEM.PL followed by -HUM.N.F.PL or DEM.PL followed by -HUM .N.M.PL, while in the correct condition they seem to be processed the same way. We could think of this interesting asymmetry as involving some GENDER expectations made when the plural demonstrative is encountered. In other words, it could be that because Arabic is a language that normally marks GENDER and it actually does mark GENDER on singular demonstratives, there is

some default GENDER (masculine) here that speakers base their ANIMACY expectations on. And those expectations are responsible for requiring extra processing that in fact differs between masculine and feminine nouns.

So, more precisely, if speakers are making ANIMACY expectations based on masculine GENDER, it sounds reasonable to think that when the task is to identify whether the noun is +/-HUMAN, they are already making some expectations once they see a demonstrative. And since that demonstrative is only associated with +HUMAN nouns and it does not carry GENDER, they assign it default GENDER and continue processing accordingly. However, as soon as the noun is accessed, the feminine singular morphology associated with those nouns is retrieved and the cases are reanalyzed to be considered a violation. That extra processing can be reflected in a delay that turns out to be subsequently longer for masculine nouns because for masculine nouns both NUMBER and GENDER are in fact a 'match' that is rendered ungrammatical based on the noun's category (= -HUMAN plural). This does not show up in the grammaticality task as reflecting a GENDER difference because speakers are not making ANIMACY expectations there (it is not the focus of the task) so they primarily focus on morpho-syntax and that just requires the last process of 'reanalysis'. We see this effect again in the Wug test with the association of the plural demonstrative with masculine nouns more.

Taken together, these patterns aross the two sub-experiments demonstrate ϕ-feature/ANIMACY processing interactions, and may be consistent with a relatively late stage locus in processing. However, the data from these experiments is insufficiently fine-grained to clearly draw conclusions about the precise locus of the interaction of these properties during language comprehension (to address this, we looked at a more fine-grained dependent measure in Chapter 5).

4.2.3. Wug test

Finally, for the Wug test, we wanted to know how consistent native-speakers' decisions are with respect to the –HUMAN mismatch case and in addition to the possible effect of plural type on processing. Comparing the consistency of participants' responses in both tasks (grammaticality and animacy) to their consistency in the Wug test, we found that the Wug-inconsistent group was also inconsistent in judging –HUMAN nouns in both tasks, showing less accuracy for those nouns in the grammaticality task and producing more mis-categorization errors when those nouns where mismatched. This indicates that morpho-syntactic mismatches affected native speakers' decisions, which again means that the two systems are independent and they interact at a later stage. The fact that plural forms were more likely to be chosen for masculine relative to feminine nouns (overall, whether +HUMAN or -HUMAN) indicates that, in the lack of a clear morpho-syntactic feature (the lack of the feminine feature in the plural demonstrative here), default features (masculine GENDER here) are assumed instead. And finally, although we do not discuss it as a factor in this study, our results showed that the plural type played a role. Again, in the absence of a clear gender-marked cue for processing, masculine is assumed in which Broken Plural, which lacks a gender-marked suffix, is treated as masculine.

4.2.4. Conclusion

Putting our findings from the three tasks together, we tentatively conclude that there is evidence that the two systems may be independent in the initial stages of processing and that interaction may rather happen downstream. This independence of both streams is relevant in that nowhere in our results do we see the –HUMAN cases behaving like a singular noun where we do

not expect to see an evidence for interactions, or like a +HUMAN noun, where there is regular agreement. So at this point, it seems that the two systems start independently and interact later but we still do not know when exactly this interaction happens in the integration stage; whether it takes place immediately or late close to the time when decision is made.

Chapter 5

5. ϕ-features and ANIMACY: ERP evidence

Our results from Experiment 1 motivated us to dig deeper into -HUMAN plurals. As you recall form Chapter 3, the feminine singular demonstrative in our design only appears in the mismatch/ correct condition (Dem.F.SG + -HUM. N.F/M.PL) or the match/ incorrect condition (Dem.F.SG + +HUM.N.F/M.PL), while it never appears in a match (correct) condition (Dem.F.SG + +HUM/ -HUM.N.F.SG). Building on that we thought that it would be sensible to look at the singulars.

Also, since in our results from Experiment 1 we only saw an effect of ANIMACY for -HUMAN plurals (no GENDER interaction in accuracy response) and it was not clear whether there are any differences among the feminine vs. masculine nouns in the –HUMAN conditions, we decided to replicate our experiment using the ERP technique. Using the ERP technique allows us to track the various features involved in the processing of the agreement mismatch present in -HUMAN case. The goal of this experiment is:

(i) To determine the time-course of accessing these features, the interaction between the two systems and the time when the conflicts are resolved.

(ii) Replicate the results obtained from Experiment 1 and extend it to include the singular conditions.

(iii) Investigate whether or not there is GENDER interaction (in addition to the ANIMACY interaction) in the –HUMAN cases.

In the next sections, I start with a brief introduction about the ERP technique used in this experiment and the interpretation of various ERP components. Then, I review the basic experimental design, the way the experiment was carried out, the sample, the stimuli and the results. This is followed by a thorough discussion of the results and their contribution to the main research questions.

5.1. Event-Related Potentials (ERPs)

Electroencephalography (EEG) is a technique used to measure the electrical activity of the brain. This electrical activity is generated by a group of neurons at different areas in the brain. Therefore, EEG is an effective way of monitoring what parts of the brain get involved in special tasks and associate them to specific cognitive processes. However, EEG data cannot be used in its raw version to interpret these cognitive processes since the recorded activity can also be related to other unrelated tasks at the same time including sensory and motor events. Isolating those events through averaging waveforms together and extracting them time-locked to the onset of specific events yields *Even-Related Potentials* (ERPs).

The use of the ERP technique has proven to be an effective way of examining the time-course of the processing of various events by monitoring the mean amplitude differences between conditions at various scalp locations and latencies from target word onset. So, the ERP technique is really useful for answering questions related to temporal (rather than spatial) resolutions (Luck, 2014). Compared to other experimental techniques, ERPs useful because the offer a record of

continuous activity from the earliest moments of processing in advance of behavioral task responses (Worden, Foxe, Wang, & Simpson, 2000; Mathewson, Gratton, Fabiani, Beck, & Ro, 2009; Vanrullen, Busch, Drewes, & Dubois, 2011). This technique is thus helpful in distinguishing which processes are affected by a particular experimental manipulation by comparing effects resulting from these processes and comparing them to effects reported from similar studies that a basic measurement of *reaction time* (RT) from a behavioral study, for instance, might not be able to tell.

The various effects generated by an ERP can be classified according to whether a specific component is present or not, its amplitude, its latency and location (topography) (Banon, 2013). Relevant to this study are components reported from similar studies that looked at grammatical mismatches cross-linguistically and ANIMACY processing (Barber & Carreiras, 2004, 2005; Gunter, Friederici & Schriefers, 2000; Friederici, Hahne, & Mecklinger, 1996; Molinaro, Vespignani, & Job, 2008; Coulson, King & Kurtas, 1998; Rayner, Carlson & Frazier, 1983; Ferreira & Clifton, 1986; MacDonald, Pearlmutter & Seidenberg, 1994; Trueswell & Tanenhaus, 1994; Kim & Osterhout 2005; Kuperberg, Sitnikova, Caplan & Holcomb 2003; van Herten, Chwilla & Kolk, 2006; see Kuperberg, Kreher, Sitnikova, Caplan & Holcomb, 2007; Bornkessel-Schlesewsky & Schlesewsky, 2008; Brouwer, Fitz & Hoeks, 2012 for review discussions). These components are the N400, Left Anterior Negativity (LAN), and P600 type effects. In the following sub-sections, I discuss these components separately.

5.2. Relevant ERP components

5.2.1. LAN

The Left Anterior Negativity (LAN) effect is a waveform seen mainly around 300-500 milliseconds in the anterior area of the scalp, mostly left lateralized although has also been reported to be more broadly distributed (see Steinhauer & Drury, 2012). This effect has been reported to index morpho-syntactic violations like CASE and agreement (Barber & Carreiras, 2005; Gunter, Friederici & Schriefers, 2000; Friederici, Hahne & Mecklinger, 1996; Molinaro, Vespignani & Job, 2008; Coulson, King & Kutas, 1998) as in the examples below:

(60) a. Every Monday he ***mows*** the lawn. (Subject-verb agreement)
b. Every Monday he ****mow*** the lawn

(61) a. The plane took ***us*** to paradise and back. (Pronoun CASE)
b. The plane took ****we*** to paradise and back.

(Coulson, King & Kurtas, 1998)

Both violations of agreement (60) and CASE (61) above elicited a LAN type effect (although in the case of Subject-Verb agreement it was interpreted more as an N400 that this author indicated might be due to English being morpho-syntactically impoverished. Hence, agreement is used as a cue by English speakers less than CASE, which yielded a more drastic violation due to its connection to Thematic role). LAN can also be an index of working memory load present with complexity or integration difficulty (Kluender & Kutas (1993), verb form (Osterhout & Nicol, 1999) and GENDER/ NUMBER agreement violations (Barber & Carrieras, 2003, 2005; Gutner Freiderici & Schriefers, 2000). It is important to point out, however, that some studies failed to report a LAN for morpho-syntactic violations (see Hagoort, (2003) among others). But as Freiderici (2008) emphasizes, it may be that the presence/ absence of LAN is directly connected to how crucial the information encoded in the morpho-syntactic markings in the language is to syntactic roles.

5.2.2. N400

The term N400 refers to a negative-going waveform peaking around 400 milliseconds after stimulus is presented, in which N = negative and 400 refers to 400 milliseconds (Kutas & Hillyard, 1980). N400 is known to be measured from electrodes located in the central area of the scalp. Across the late 20th century and early days of the present millennium and since its discovery in experiments targeting incongruent continuations in sentence reading as in (62), the N400 has become strongly tied to "semantic" dimensions of processing (Bentin, McCarthy & Wood, 1985; Fischler, Bloom, Childers, Roucos & Perry, 1983; Holcomb, 1988; Holcomb & Neville, 1990; Kutas & Hillyard, 1980, 1984, 1989; Neville, Kutas, Chesney & Schmidt, 1986; Rugg, 1985, 1987; van Petten & Kutas, 1987, 1990, 1991):

(62) a. He took a sip from the ***glass*.** (Congruent)
b. He took a sip from the ***transmitter.*** (Incongruent)
(From Kutas & Hillyard, 1980)

The sentences that contain a word that is semantically inappropriate as in (62)b elicited a negativity around 400 ms. In addition, there was a correlation between the level of semantic inappropriateness (moderate as in (63)a, or strong as in (63)b and the amplitude of N400. The more semantically inappropriate the word, the larger the N400 amplitude:

(63) a. He took a sip from the ***waterfall.*** (moderate/inappropriate)
b. He took a sip from the ***transmitter.*** (strong/ inappropriate)
(From Kutas & Hillyard, 1980)

N400 has also been variously argued to index underlying processes responsible for access/retrieval (or binding) of conceptual semantic information (Kutas, van Petter, & Kluender, 2006), semantic integration (Hagoort, 2007), or semantic inhibition as in priming studies where the target word and the prime do not share any semantic information as e.g., in the word 'dog' preceded by the word '*car' versus 'dog' preceded by a word like 'cat' (Bentin, McCarthy & Wood, 1985; Holcomb, 1988; Holcomb & Neville, 1990; Rugg, 1985, 1987).

Since N400 was associated with semantic incongruence, there were predictions that the same effect would arise with regard to thematic role violations, but recent findings have shown otherwise (see the discussion in Chapter 2 §2.1.3, also revisited briefly in the P600 discussion below). To wrap up, in general N400 was mostly associated with semantic or lexical semantic violations, and when it was reported with reference to morpho-syntax, it was due to possible interference between semantic and morpho-syntactic information in the tested stimuli (as in the case of biological gender for Deutsch & Bentin, 2001 in Hebrew).

5.2.3. P600

P600 has been the topic of many recent debates. The term P600 refers to a late positive deflection generated between 500-900 milliseconds after stimuli onset over posterior recording sites. In earlier studies, P600 (also called Syntactic Positivity Shift SPS) was reported for syntax-related violations, specifically 'repair' processes as argued for by Fredrieci (1995) (but also see Faussart, Jakubowicz & Costes, 1999); Barber and Carrieras, 2005; van Herten, Chwilla & Kolk, 2006) for cases of agreement mismatches as the one from German in (64):

(64) a. sie bereist ***den*** ****land*** auf einem kraftigen camel
she travels the-***M*** land-***NEUT*** on a strong camel
'She travels the land on a strong camel'

(Gunter, Friederici, & Schriefers, 2000)

The same effect has been shown for syntactic integration difficulty seen in the case of filler-gap processing, e.g., "Emily wondered ***who*** the performer in the concert had imitated ***t*** for the audience's amusement" (Kaan, Harris, Gibson & Holcomb, 2000), and for syntactic 'reanalysis' evident for the case of garden path sentences e.g., "The horse **raced** past the barn ***fell*****"** (Osterhout, Holcomb & Swinney, 1994).

However, as is now well-known, examples as in (25) - (28) from chapter 2 (a few are repeated as (65) - (66) below) that have been previously predicted to elicit an N400 effect have shown to elicit a qualitatively different ERP profile — which is typically interpreted as a member of the P600 family (Kuperberg, Sitnikova, Caplan & Holcomb, 2003; Kim & Osterhout, 2005; Kolk, Chwilla, van Herten & Oor, 2003; Hoeks, Stowe & Doedens, 2004):

(65) a. At breakfast the boys would eat… (Kuperberg, Sitnikova, Caplan & Holcomb, 2003)
b. At breakfast the eggs would *eat…

(66) a. The hearty meal was devoured…
b. The hearty meal was *devouring… (Kim and Osterhout, 2005)

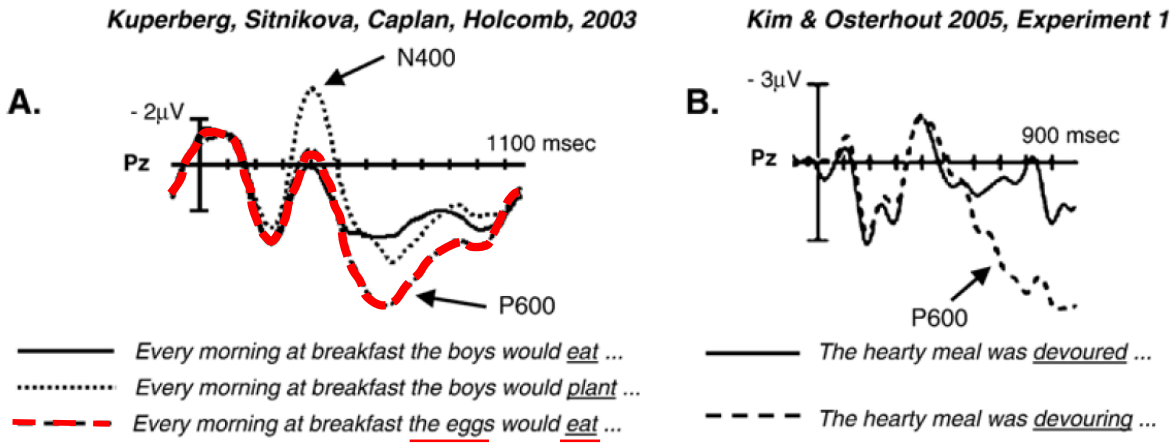


Figure 5-1: P600 effects for thematic role violations

As can be seen from the left-hand ERPs for three averaged conditions, the violation condition in (65)b is more positive-going than the other conditions as in (65)a. The fact that this response emerges for these cases has fueled subsequent debate about the etiology of N400 and P600 responses and about the architecture of language comprehension mechanisms. And, as noted above, these two issues are interrelated.

For example, if one maintains constant early ideas about the relationship between syntax and the P600 (Kaan, Harris, Gibson, Holcomb, 2000; Phillips, Kazanina, & Abada, 2005; Gouvea et al., 2009), then it is natural to interpret such findings as showing that semantic level processing can guide syntactic parsing decisions. In the examples in (65) - (66) one can argue that the INANIMACY of the subject derives a combination of lexical and structural expectations that subsequent incoming words will indicate a passive structure (e.g., *the eggs were eaten*...) – expectations which are then violated. This way of thinking about sP600 effects makes broader sense since P600 effects are more generally well-attested in contexts where morpho-syntactic expectations are violated with ungrammatical continuations (e.g., *He* ***will kicked***…). However,

this line of thinking could be said to require models in which independent semantic processing streams have a directing influence in determining syntactic level parsing predictions.[16] And, indeed, such arguments have been offered (Martín-Loeches, Nigbur, Casado, Hohlfeld & Sommer, 2006; Wicha, Moreno & Kutas, 2004)

In contrast, if we have a broader view of what kinds of underlying processing P600 effects index, which severs a special connection to syntax (Friederici, 2011), then there is nothing inevitable about conclusions that conceptual semantic level information guides syntactic level parsing decisions. In short, the position one takes regarding the etiology of ERP responses has consequences for theories of the architecture of sentence comprehension, and vice-versa.

In addition to that, several accounts in the P600 literature have connected differences in the P600 component (distribution, amplitude or timing) to the nature of the 'repair /re-analysis' process involved. For example, Friederici (1995) argues that the 'repair' analysis, in which syntactic re-checking happens to retrieve any mismatch resolving processes in a given language, is represented by the P600 component. Fronto-central distribution is patterned with the 'reanalysis P600' while centro-parietal distribution is patterned with the 'repair P600'. Similarly, The Conflict Monitoring Hypothesis of van Herten, Chwilla & Kolk, (2006) argues that P600 is evoked by 're-analysis processes', but also associates a higher P600 amplitude with 'stronger' violations.

A more recent hypothesis that also associates 'repair' analyses with the P600 component is the Extended Argument Dependency Model (eADM) of Bornkessel & Schlesewsky (2006) which is similar in a sense to the Faussart, Jakubowicz & Costes (1999) model. eADM proposes that processing takes three stages; (i) a stage in which the word category is selected and basic constituent structure is built, followed by (ii) a second stage in which the relevant features are

[16] Note that we actually do not think this conclusion follows, as will be discussed below.

extracted (2a) and computation is conducted (2b). (iii) The third stage consists of (3a) a *generalized mapping* process, in which grammatical relationships are configured between *verb/ argument* or a *noun/ modifier*, and (3b) a *well-formedness check* run to ensure that there are no clashes between both elements. When a violation is encountered, the structure apparently fails the *well-formedness check* and evokes a 'repair' process that elicits a P600 effect. (eADM) also assumes that a semantic violation will typically require going back to the *generalized mapping* stage while a violation connected to the lexical properties of the word would go to stage 2 (see **Figure** ***5-2*** for demonstration of the stages).

Despite the fact that each of the ERP components discussed above has been associated with a specific processing-related violation, their correlation with these violations are not definite or explicit. As we will see in the following study, our morpho-syntactic mismatch involves a combination of these effects.

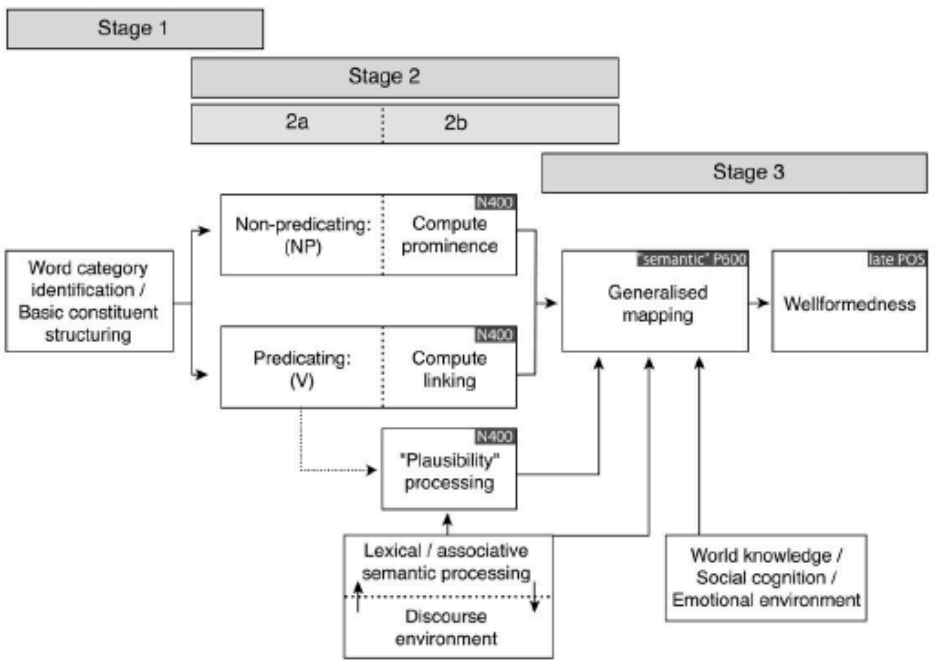


Figure 5-2: The Extended Argument Dependency Model (eADM) of Bornkessel & Schlesewsky (2006)

5.3. The present study

As discussed earlier, the present inquiry concerns the way that ANIMACY distinctions intertwine with various dimensions of organization in the human language faculty, viewed through the lens of cognitive electrophysiology.

To address this, we replicated the grammaticality judgment task form experiment 1 but in addition to recording response accuracy and latency, we also recorded EEGs. For simplicity, the participants in this study were presented only with the DEM-NOUN pairs, in which they were asked to make judgments about whether the pairs "matched", or not. As we have seen in Chapter 2 § 2.2.1, this kind of paradigm has been usefully employed in the study of agreement relationships in other languages (Barber & Carreiras, 2005; Gunter, Friederici & Schriefers, 2000; Friederici, Hahne & Mecklinger, 1996; Molinaro, Vespignani & Job, 2008; Coulson, King & Kutas, 1998; Banon, 2013). However, our study builds specifically on Barber & Carreiras's (2005) study that tested NUMBER/ GENDER agreement in DETERMINER-NOUN pairs from Spanish. Recall also that, as discussed in Chapter 2 §2.2.1, their NUMBER/ GENDER violations showed an N400-type effect and a (LAN) in addition to a P300 effect associated with GENDER violations only. Similar results have been shown in other word-pair (mis)match studies as well (Münte & Heinze, 1994 for German and Finnish; Barber & Carreiras, 2003 for ADJECTIVE-NOUN in Spanish; Osterhout & Mobley, 1995 for English; Faussart, Jakubowicz & Costes, 1999 for French and Spanish).

5.3.1. Methods

5.3.1.1. Participants

16 native speakers of Arabic (4 female/12 male) from Saudi Arabia participated in the study. In this experiment we, decided to restrict the sample to one variety of Arabic as an attempt to examine the effect of spoken varieties on MSA judgment (see Chapter 4 §4.1.2.1). Participants ranged in age from 19 to 36 (mean = 28.2), reported no history of neurological disorders and had normal or corrected to normal vision. All participants were right-handed as assessed by a modified (English) version of the Edinburgh Handedness Inventory (Oldfield, 1971), and had no left-handers in their immediate families. Participants were screened via phone/email contact with a member of the study team prior to scheduling a test session, to determine whether they meet the inclusion criteria. They gave informed consent, and were paid $10/hour.

5.3.1.2. Materials & Design

The design used for this experiment is the same design from experiment (1), consisting of the same two core factors CORRECTNESS x ANIMACY manipulated for plural nouns as illustrated in (67) below (repeated here for convenience):

(67) **PLURAL CONDITIONS**

A. **-HUMAN, CORRECT**

هَذِهِ السُّفُن
DEM.F.SG ship.F.PL
هَذِهِ الكُتُب
book.M.PL

B. **-HUMAN, VIOLATION**

هَؤلاءِ السُّفُن
DEM.**PL** ship.**F.PL**
هَؤلاءِ الكُتُب
book.**M.PL**

C. **+HUMAN, CORRECT**

هَؤلاءِ النَّاشِطَات
DEM.**PL** activist.**F.PL**
هَؤلاءِ النَّاشِطُون
activist.**M.PL**

D. **+HUMAN, VIOLATION**

هَذِهِ النَّاشِطَات
DEM.**F.SG** activist.**F.PL**
هَذِهِ النَّاشِطُون
activist.**M.PL**

However, in addition to the plural conditions in (67), we tested the same +HUMAN and -HUMAN nouns in singular form with GENDER matching or mismatching demonstratives, as in (68)A-D illustrates:

(68) **SINGULAR CONDITIONS**

A. **-HUMAN, CORRECT**

هَذِهِ السَّفِينَة
DEM.**F.SG** ship.**F.SG**
هَذَا الكِتَاب
DEM.**M.SG** book.**M.SG**

B. **-HUMAN, VIOLATION**

هَذَا السَّفِينَة
DEM.**M.SG** ship.**F.SG**
هَذِهِ الكِتَاب
DEM.**F.SG** book.**M.SG**

C. **+HUMAN, CORRECT** D. **+HUMAN, VIOLATION**

هَذِهِ النَّاشِطة هَذَا النَّاشِطَات

DEM.**F.SG** activist.**F.SG** DEM.**M.SG** activist.**F.PL**

هَذَا النَّاشِط هَذِهِ النَّاشِطُون

DEM.**M.SG** activist.**M.SG** DEM.**F.SG** activist.**M.PL**

The stimuli included 128 nouns, 64 human and 64 -HUMAN, also collected from *The Frequency Dictionary of Arabic: core vocabulary for learners* (Buckwalter & Parkinson, 2011). But contrary to experiment (1), to generate the +HUMAN noun set, 32 words which could appear in the two gender-marked versions were selected (e.g., *naaʃitˁ* 'activist.M.SG' is masculine and *naaʃitˁ-a* 'activist-F.SG' is feminine). Wedid this to control for items as possible and to see whether or not matching stems would affect our results. For, -HUMAN nouns, again we only included inanimates referring to artifacts (no animals/ plants). In line with experiment (1) also, all our feminine nouns (both +HUMAN and –HUMAN) for this study ended with the suffix /-a/ to control for items and syllable count.

A master-list of 512 (64 x 8 conditions) DEMONSTRATIVE-NOUN pairs was created, filling in the cells of the plural and singular CORRECTNESS x ANIMACY designs illustrated above in (67) and (68), such that every word appeared in every condition. Having twice as many distinct -HUMAN nouns was necessary so that the nouns from both the +HUMAN and -HUMAN sub-lists were repeated in a comparable way across the master-list (given that the 64 animates were generated by alternating masculine/feminine GENDER). Eight separate presentation lists were created, counterbalancing the order in which particular items appeared in given conditions of the experiment.

For the process of item selection with respect to the Arabic plural system for this experiment, and considering the same issues discussed above, our item list included Feminine Suffixed Plural and Masculine Suffixed Plural forms for +HUMAN nouns. For -HUMAN nouns this time, however, we used Feminine Suffixed Plural with feminine nouns and Broken Plural with masculine nouns to see if any of the effect is derived because of plural type. Finally, all items (Nouns and Demonstratives) carried basic diacritics for the reasons explained earlier (see Chapter 4 §4.1.2.2.1).

5.3.1.3. Procedure

After a brief oral and written summary of the protocol, participants gave informed consent, completed a brief questionnaire collecting demographic information, and underwent the handedness assessment prior to EEG cap setup. The experimental session itself involved participants silently reading the word pair stimuli from a seated position in an enclosed booth to reduce visual distractions. They were first presented with an instruction page and were asked to read it carefully and raise any inquiries. Stimuli were then displayed in the center of a computer monitor in white font against a black background (using Presentation, Neurobehavioral Systems). Each word appeared for 500 milliseconds, one word at a time. Acceptability (match/mismatch) judgments, indicated by pressing a mouse button, were required for every item (word pair). Participants also were instructed to avoid excessive movement and blinking while viewing stimuli, until a fixation mark "(--)" appeared (blink prompt), which appeared after every judgment response. Response latency and accuracy were recorded automatically throughout. An illustration of the experimental session is given in **Figure 5-3** below:

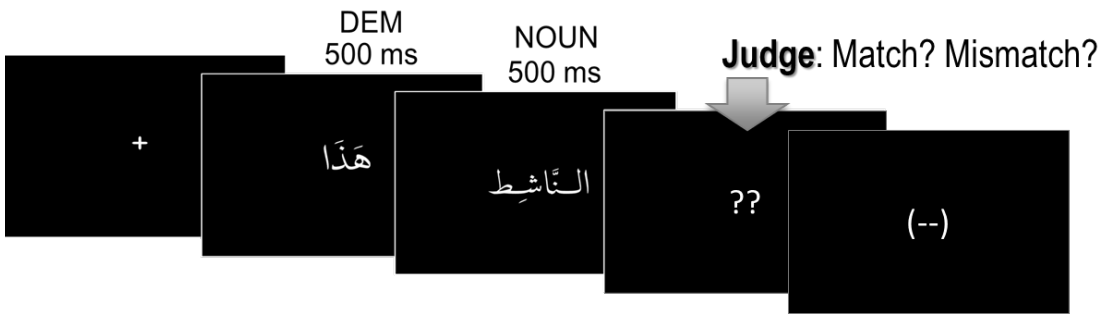


Figure 5-3: DEM-NOUN Agreement (mis)match paradigm

Each participant started with a practice session consisting of 8 word-pairs from conditions not included in this experiment. Running the experiment for each participant (including intake, set-up, experiment, and cleanup) took approximately 120 minutes.

5.3.2. Predictions

Considering the results from previous studies and the effects associated with similar paradigms, in addition to our results from experiment (1), we predict that DEM-NOUN pairs in a grammaticality task should replicate negative-going ERP violation response profiles (LAN) of the sort shown in previous experiments. And since this is a grammaticality task, it is morpho-syntax's call on whether it needs to access lexical/ semantic properties to process the mismatches or not. So, for our singular nouns, we expect to see no apparent interaction between the systems because it is a case where agreement regularly obtains. So, we expect a similar pattern from previous studies (a LAN) to arise. For +HUMAN plural nouns, we expect to see the same pattern. There may be some slight differences with respect to distribution or latency, but in general we think +HUMANS should elicit a LAN. For -HUMAN plurals, in contrast, our hope in conducting this experiment was to observe whether cases of grammatical disagreement versus ungrammatical agreement would

pattern like the rest of the violation/correct comparisons in this study, or not. We considered several possible outcomes, as follows:

1. **Prediction 1:** If all the features belong to "one system", we might expect to observe violation main effects (i.e., negative-going ERP responses throughout – as in (i) in **Figure 5-4**), in which their effect parallel those of singular nouns (no apparent sign of interaction).
2. **Prediction 2:** If the features belong to two different systems and lexical-conceptual level information (i.e., [± HUMAN]) is relevant for processing as early as the access/ retrieval stage "Parallel interacting approach", we would expect –HUMAN plurals to be treated as regular agreement cases because in terms of combinatorics the cases are retrieved as feminine singular. In this sense, those cases should not be any different from the +HUMAN cases, again showing a LAN type effect. ((ii) in **Figure 5-4).**
3. **Prediction 3:** If the features belong to two different systems but lexical-conceptual level information (i.e., [± HUMAN]) is irrelevant for processing until a later stage, and morpho-syntax is simply initially blind to the ANIMACY properties of these nouns "Parallel independent", we would expect that should elicit a *flip* of the response seen for the singulars and +HUMAN plurals, with the correct cases for the –HUMAN plurals more negative-going than the violation cases ((iii) **Figure 5-4**).
4. **Prediction 4:** In principle, we could also think of a case where morpho-syntax does access lexical semantic properties in which ANIMACY would be available to block agreement mismatch responses, but either the nature of such blocking processes or other factors involving distinct/additional underlying processing components like resolving a 'Failed'

Agree, or deploying a process of reanalysis, could conspire to yield some qualitatively distinct response profile for -HUMAN plurals (as in (iv), in **Figure 5-4**).

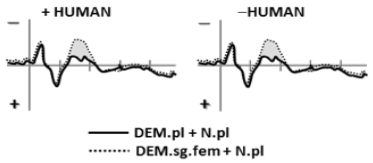
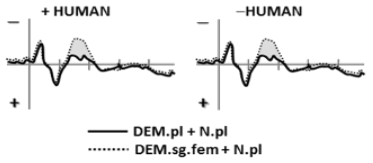
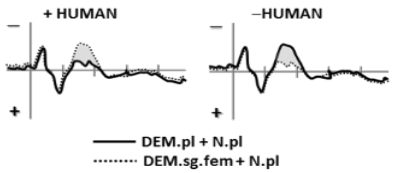
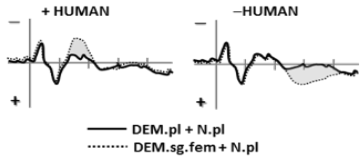
	Possible response patterns	Description	Interpretation
(i)		Violation main effects across all conditions; -HUMAN plurals pattern like singular and +HUMAN nouns	ANIMACY information is accessed/ retrieved and relevant to agreement processes like GENDER and NUMBER
(ii)		Violation main effects across all conditions; -HUMAN plurals pattern like singular and +HUMAN nouns	ANIMACY information is relevant early to block agreement mismatches
(iii)		-HUMAN plurals show a "flipped" violation response	Morpho-syntactic mismatch detection is initially blind to ANIMACY information
(iv)		No LAN-like responses for –HUMAN nouns, but some qualitatively different response pattern is elicited	ANIMACY information blocks morpho-syntactic mismatches but response involved some independent underlying system

Figure 5-4: Possible outcomes of the ERP study

As a brief aside and before turning to the details of our study, note that our schematic depiction of a possible qualitatively different response profile for -HUMAN nouns in ((iv) **Figure 5-4**) indicates a late positive-going ERP response. Though we did not make a strong prediction about this in advance, we did consider the possibility, given previous sP600 findings discussed above, that a similar effect could be observed here.

5.3.2.1. EEG recording, data processing, and statistical analyses

EEG was continually recorded via 32 cap mounted (active) electrodes (Biosemi Active two Amplifiers) with a 512 Hz sampling rate and online bandpass filtering at 0-128 Hz. Horizontal and vertical EOG was acquired via separate electrodes placed above and below the right eye and at the right/left canthi, and both left and right mastoid signals were also recorded. Raw EEG data were imported into the Matlab based platform EEGLAB with offline referencing to the average of the left and right mastoids. The data were then subjected to offline filtering (0.1 to 30 Hz bandpass) before trigger codes were assigned to condition coded bins for averaging. Measurement epochs of 1500 ms (-100 ms to 0 ms baseline interval), time-locked to the onset of the demonstratives, were extracted from the data[17]. Automatic artifact rejection procedures, followed with a by-hand inspection of every participants' individual trials, eliminated trials with evidence of blinks, horizontal eye-movements, muscle noise, or drift. The remaining trials were averaged within our experimental conditions to create individual subject ERP average files, which were then subjected to statistical analysis. Grand average ERPs were generated and low-pass filtered at 7 Hz for visualization purposes only (analyses were carried out over the unfiltered data).

5.3.2.2. Behavioral and ERP analyses

Behavioral data (acceptance rates and response latencies) and ERP data were subjected to repeated measures ANOVAs, separately for the singular and the plural target nouns. Given the

[17] Time-locking the effects to the onset of the noun would have yielded a misleading pattern because we, in fact, noted some qualitative processing differences among the three demonstratives before even the nouns were introduced. We were unable to interpret these differences given that the comprehension system is not expected to be able to make predictions prior to Noun onset and only by processing the demonstrative.

array of conditions included in the present study, many potentially informative comparisons are possible. In the present report, we focus on the straightforward prediction (see §5.3.2 above) that singular target nouns should elicit a uniform violation response, with no anticipated impact of GENDER or ANIMACY (i.e., no interactions of these factors with CORRECTNESS), whereas we expect both GENDER/ ANIMACY to interact with CORRECTNESS for the target plural nouns. All analyses included the three two-level condition factors CORRECTNESS (correct/violation), GENDER (masculine/feminine), and ANIMACY (+HUMAN/-HUMAN). ERP analyses were carried out separately for midline and lateral averaged regions of interest. Midline analyses involved the three-level factor ANTERIOR/POSTERIOR (AP) with each level consisting of an ROI averaging over three electrodes: mid-FC (Fz/FC1/FC2), mid-CENT (Cz/CP1/CP2) and mid-PO (Pz/PO3/PO4). Lateral analyses were similarly factored into three AP levels of averaged ROIs as well as two levels of Hemisphere (LEFT/ RIGHT).

5.3.3. Results

5.3.3.1. Behavioral results

ANOVA results for acceptance rates for singular and plural nouns are shown in **Table** ***5-1***.

Table 5-1. Grammaticality judgment task response accuracy: ANOVA results

Effect	DFn	DFd	F	p	p<.05	ges
SINGULARS						
2 GB	1	15	1.009805e+03	3.551073e-15	*	9.763412e-01
3 AI	1	15	5.075111e-02	8.248018e-01		2.074696e-04
4 Ng	1	15	1.466299e-01	7.071488e-01		7.357971e-04
5 GB:AI	1	15	3.629838e+00	7.610537e-02		1.676751e-03
6 GB:Ng	1	15	4.955181e-02	8.268477e-01		2.074696e-04
7 AI:Ng	1	15	4.303240e+00	5.566545e-02		6.691508e-03
8 GB:AI:Ng	1	15	6.956026e-04	9.793065e-01		1.010066e-06
PLURALS						
2 GB	1	15	189.3596974	6.515264e-10	*	0.810154168
3 AI	1	15	2.2082195	1.579910e-01		0.003644069
4 Ng	1	15	4.7130151	4.639302e-02	*	0.016334979
5 GB:AI	1	15	0.4387015	5.177978e-01		0.002350444
6 GB:Ng	1	15	21.8094143	3.020580e-04	*	0.077338486
7 AI:Ng	1	15	5.9257022	2.788899e-02	*	0.025089577
8 GB:AI:Ng	1	15	20.0464826	4.428734e-04	*	0.102687639

For the singulars, as expected, we obtained only main effects of CORRECTNESS (G/ B). For the plurals, in contrast, there was a three-way interaction between CORRECTNESS (G/ B), ANIMACY (AI) and GENDER (N.GEN). Follow-up analyses within the +HUMAN and -HUMAN conditions separately confirmed the replication of the judgment responses from the web-experiment reported in Chapter 4. That is, for +HUMAN we found a significant CORRECTNESS X GENDER interaction ($F(1,15) = 23.44$, $p = 0.0002$] in addition to the robust main effect of CORRECTNESS [$F(1,15) = 113.42$, $p < 0.0001$]. For -HUMAN, in contrast, we see only the main effects of CORRECTNESS [$F(1,15) = 224.23$, $p < 0.0001$]. These patterns are shown in **Figure 5-5.**

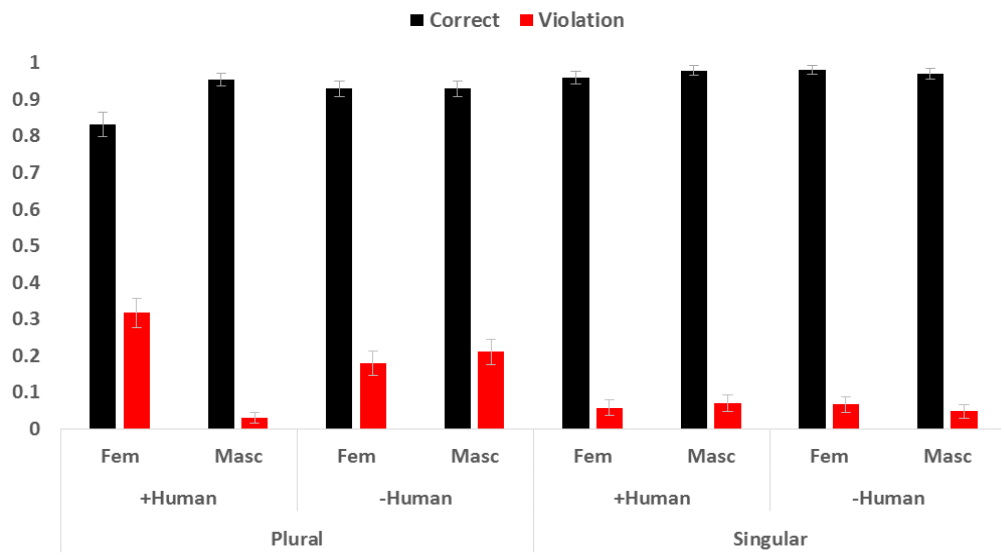


Figure 5-5. Response accuracy in grammaticality judgment task**.**

Response times are shown in **Figure 5-6**. There were no effects of ANIMACY or GENDER for the singular nouns (all F's < 1 or *p's* > 0.15).

However, like the response accuracy data, for plurals, response times yielded a three-way interaction of CORRECTNESS X ANIMACY X GENDER [$F(1,15) = 7.21$, $p < 0.0170$]. Also in line with the web-experiment data of Chapter 4, follow-ups within the +HUMAN and -HUMAN noun conditions separately showed an interaction of ANIMACY X GENDER for the +HUMAN [$F(1,15) = 7.10$, $p = 0.0176$] that was absent for the -HUMAN [$F<1$].

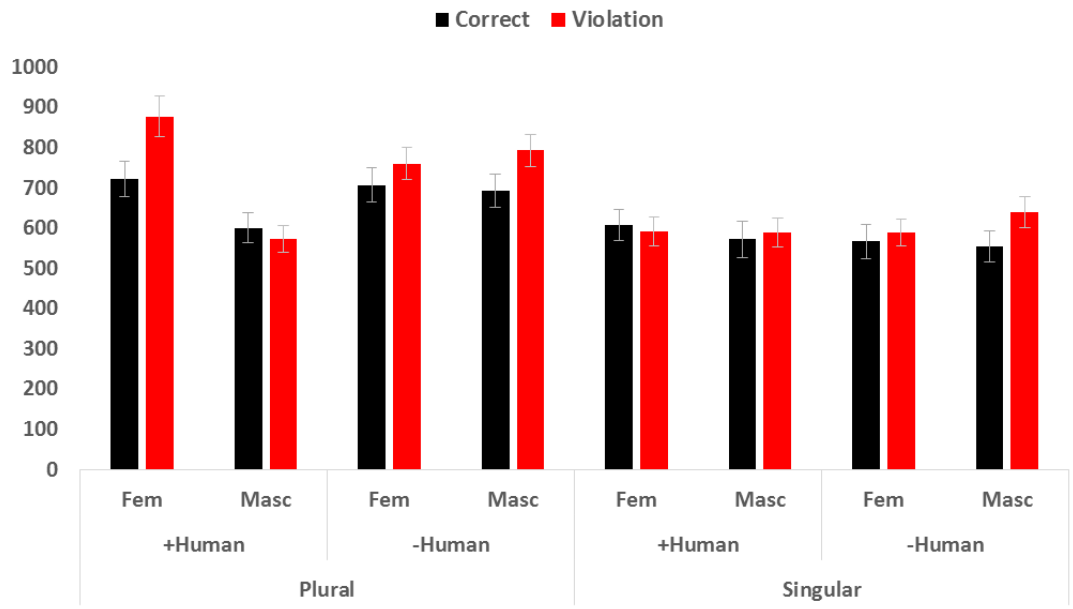


Figure 5-6. Response latency in grammatical judgment task (RT in ms; bars = ±95% CIs).

5.3.3.2. Event-Related potentials

Turning to the electrophysiological results, grand average ERPs for singular and plural +HUMAN/ -HUMAN, including both violation and control conditions for averaged sets of electrodes (regions of interest / ROIs), are shown in **Figure 5-7** (top panel). Scalp difference maps showing the subtraction of control conditions from the corresponding matched violation cases are shown separately for singular +HUMAN/ -HUMAN nouns (left bottom panel, **Figure 5-7**) and plural +HUMAN/ -HUMAN nouns (right bottom panel). Note that ERPs are plotted time-locked to the onset of the demonstrative (0 ms), so onset of the critical nouns is at the 500 ms mark (as indicated in **Figure 5-7)**. Scalp difference maps show selected time-windows after noun onset showing the effects of interest, indicating latency ranges relative to the demonstrative onset (with times relative to noun onset given parenthetically below).

Our behavioral results were further confirmed by our ERP results. As shown in **Figure 5-7**, VIOLATIONs for the singular nouns in general (+HUMAN/ -HUMAN) were more negative-going than CORRECT controls with an ANTERIOR maximum. For singular -HUMAN nouns, violations elicited a more broadly distributed anterior negativity lasting through the 1300-1500 time-window.

In contrast, and parallel to the general pattern revealed in the behavioral task, ERPs for the plurals revealed a complex array of significant interactions of CORRECTNESS with ANIMACY. Recalling the three possible options we discussed above regarding expectations for the critical -HUMAN plural nouns, our findings revealed an actual outcome that is something of a mix of options (iii), (iv) from **Figure 5-4**. As is evident from visual inspection of the data, while singular noun violations elicited negative-going ERP responses for both +HUMAN and -HUMAN sub-types although differing slightly with regard to scalp distribution (right lateralized) in the earlier time-windows, for the plurals we observe a striking polarity reversal for -HUMAN nouns (demonstrated in the flip of lines for the effects). While plural +HUMAN nouns behaved like the singulars, yielding a negative-going violation response, plural -HUMAN noun violations elicited a relative positivity. Thus, for the 900-1100ms and 1100-1300 ms time-windows, the -HUMAN plural case appeared to be a mirror image of all the other CORRECT/ VIOLATION comparison. However, slightly downstream in time in the 1300-1500 ms latency range, note that the effect broadens its scalp distribution and to more posterior regions.

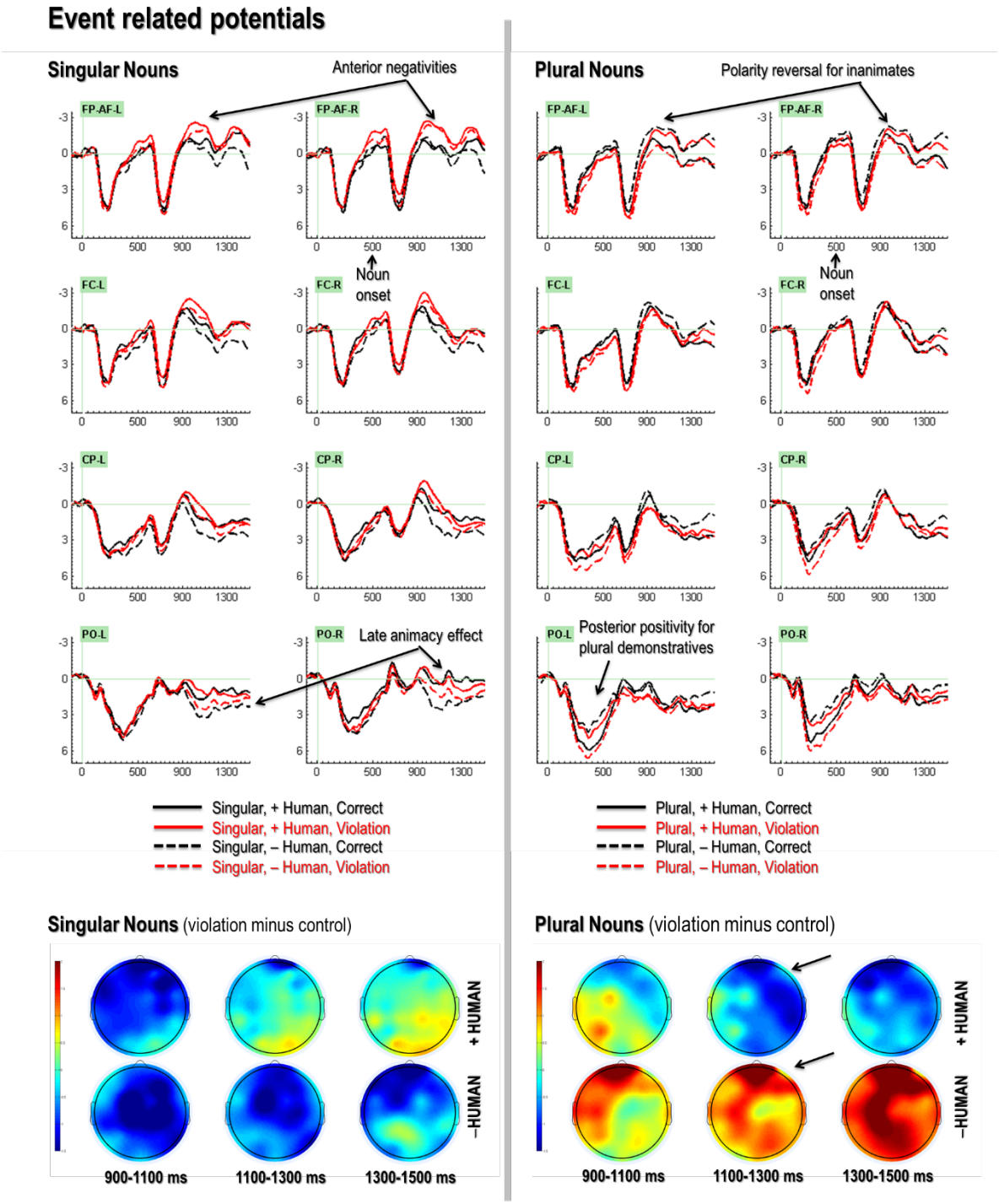


Figure 5-7: ERPs and scalp difference maps. Individual ERP plots show averaged regions of interest (FP-AF = fronto-polar/anterior-frontal; FC = fronto-central; CP = centro-parietal; PO = parietal/occipital; L/R = left/right hemisphere. Midline electrodes (Fz/Cz/Pz/Oz) are excluded. Note 0 ms marks the onset of the demonstratives; 500 ms marks the onset of the critical target nouns. Difference maps plotted for violation minus correct contrasts within sub-conditions as labeled, scaled from -1.5 to +1.5 μV.

5.3.3.2.1. Posterior positivity for plural demonstratives (250-450 ms).

As can be seen in **Figure 5-7**, in the plural noun comparisons a relative positivity arose in connection with the processing of plural versus singular demonstratives between 250-450 ms. This positivity yielded a main effect of Demonstrative-type (SG/PL) [$F(1,15) = 8.76$, $p = 0.0097$] and a robust Demonstrative-type x AP interaction [$F(3,45) = 21.30$, $p < 0.0001$].

Follow-up analyses showed these effects of Demonstrative-type, as is evident in the plotted ROIs in **Figure 5-7**, to be significant over posterior, but not anterior regions [ap1: $F(1,15) = 1.95$, $p = 0.1828$; ap2: $F(1,15) = 3.15$, $p = 0.0961$; ap3: $F(1,15) = 10.26$, $p = 0.0059$; ap4: $F(1,15) = 23.39$, $p = 0.0002$].

5.3.3.2.2. Violation responses at the critical nouns

Global repeated measures ANOVA results revealed interactions of ANIMACY, NUMBER, CORRECTNESS, and topographical factors (AP/HEMI) in both the 900-1100 ms (AI x SP x GB x AP x HEMI: $F(3,45) = 3.45$, $p = 0.0393$] and 1100-1300 ms time-windows [$F(3,45) = 4.06$, $p = 0.0218$]. The final 1300-1500 ms window also yielded marginal interactions of ANIMACY, NUMBER and CORRECTNESS [$F(1,15) = 3.26$, $p = 0.0910$] and NUMBER X CORRECTNESS X AP x HEMI ($F(3,45) = 2.63$, $p = 0.0615$]. Given these interactions and the visible patterns of interest in **Figure 5-7**, we moved to examine effects of ANIMACY and CORRECTNESS, separately for the singular and plural nouns, within each of the levels of ANTERIOR/ POSTERIOR.

Turning first to the singular nouns, results of repeated measures ANOVA for each of the three time-windows probing ANIMACY/ CORRECTNESS effects within the levels of ANTERIOR/ POSTERIOR are show in **Table *5-2*A/B** (no effects of ANIMACY/ CORRECTNESS were evident in the 1300-1500 ms time-window).

Table 5-2. ANOVA results for Singular Nouns (ANIMACY X CORRECTNESS).

(A) 900-1100 ms

	Effect	DFn	DFd	F	p	p<.05	ges
AP1							
2	AI	1	15	0.54434514	0.47202282		1.685737e-03
3	GB	1	15	5.42659472	0.03421294	*	1.284365e-02
5	AI:GB	1	15	0.23788718	0.63278814		6.370595e-04
6	AI:HEMI	1	15	2.08743175	0.16908081		6.947529e-04
7	GB:HEMI	1	15	1.05775889	0.32002674		2.422144e-04
8	AI:GB:HEMI	1	15	0.01995012	0.88955593		2.504527e-06
AP2							
2	AI	1	15	2.824784009	0.11351826		7.365417e-03
3	GB	1	15	5.162077002	0.03823369	*	1.611065e-02
5	AI:GB	1	15	0.009175463	0.92495646		3.293959e-05
6	AI:HEMI	1	15	0.165041558	0.69029340		1.288269e-04
7	GB:HEMI	1	15	0.520478504	0.48173248		7.980975e-05
8	AI:GB:HEMI	1	15	1.250108613	0.28111931		1.460356e-04
AP3							
2	AI	1	15	4.99176231	0.04111396	*	2.119585e-02
3	GB	1	15	8.10389784	0.01224712	*	2.250438e-02
5	AI:GB	1	15	0.07297578	0.79073361		5.460935e-04
6	AI:HEMI	1	15	1.01890357	0.32878578		1.682112e-04
7	GB:HEMI	1	15	0.18522212	0.67304284		5.226583e-05
8	AI:GB:HEMI	1	15	4.29127710	0.05596722		3.632664e-04
AP4							
2	AI	1	15	6.20430786	0.02495247	*	4.543335e-02
3	GB	1	15	2.59808739	0.12782978		9.842868e-03
5	AI:GB	1	15	0.09390579	0.76348175		9.767781e-04
6	AI:HEMI	1	15	3.87612342	0.06773964		8.867080e-04
7	GB:HEMI	1	15	0.00657039	0.93646753		1.916645e-06
8	AI:GB:HEMI	1	15	5.61782429	0.03161105	*	2.612787e-03

(B) 1100-1300 ms

	Effect	DFn	DFd	F	p	p<.05	ges
AP1							
2	AI	1	15	1.39257414	0.2563476		4.457085e-03
3	GB	1	15	3.01729065	0.1028648		7.558374e-03
5	AI:GB	1	15	0.23020007	0.6382964		8.337525e-04
6	AI:HEMI	1	15	0.89368733	0.3594603		2.997348e-04
7	GB:HEMI	1	15	1.54275625	0.2332779		4.065795e-04
8	AI:GB:HEMI	1	15	0.51365775	0.4845703		1.201886e-04
AP2							
2	AI	1	15	3.83098493	0.06918805		1.059622e-02
3	GB	1	15	0.81196898	0.38177918		3.952653e-03
5	AI:GB	1	15	0.57020803	0.46186912		2.740699e-03
6	AI:HEMI	1	15	0.04955713	0.82683854		5.795909e-05
7	GB:HEMI	1	15	0.53242716	0.47682928		1.228866e-04
8	AI:GB:HEMI	1	15	0.08781984	0.77103085		2.265358e-05

AP3						
2	AI	1	15	4.8324638	0.04403933	* 2.495798e-02
3	GB	1	15	0.7928086	0.38731077	3.780240e-03
5	AI:GB	1	15	0.5746313	0.46016912	4.631498e-03
6	AI:HEMI	1	15	2.1808689	0.16042090	5.799809e-04
7	GB:HEMI	1	15	0.0355243	0.85302752	1.410702e-05
8	AI:GB:HEMI	1	15	1.6759324	0.21504053	5.413891e-04
AP4						
2	AI	1	15	5.58351797	0.03206044	* 4.658984e-02
3	GB	1	15	0.27786672	0.60581195	9.118179e-04
5	AI:GB	1	15	0.68921388	0.41944938	6.730140e-03
6	AI:HEMI	1	15	5.56845373	0.03226010	* 1.298222e-03
7	GB:HEMI	1	15	0.01522858	0.90342543	9.237222e-06
8	AI:GB:HEMI	1	15	4.49135066	0.05116241	1.541742e-03

These results confirm the patterns evident by visual inspection of **Figure 5-7**: singular noun GENDER violations, whether +HUMAN or -HUMAN, gave rise to an anterior negativity in the 900-1100 ms time-window. At the same time, over posterior (but not anterior) scalp regions there was an independent main effect of ANIMACY, with -HUMAN nouns more positive-going. This ANIMACY effect, but not the morpho-syntactic violation response, persisted into the subsequent 1100-1300 ms time-window.

Significant or borderline interactions between ANIMACY and CORRECTNESS evident in these latency ranges appear to be driven by the fact that the negative-going violation response enjoyed a longer duration for the -HUMAN nouns relative to the +HUMAN ones, as is clear from the voltage maps at the bottom-left of **Figure 5-7**.

Turning to the plural nouns, the same set of analyses reveal striking interactions of ANIMACY and CORRECTNESS, first arising over the anterior recording sites in the 900-1100 ms time-window, and then broadly over the scalp throughout the remaining 1100-1500 ms ranges (**Table *5-3*A-C).**

Table 5-3. ANOVA results for Plural Nouns (ANIMACY X CORRECTNESS).

(A) 900-1100 ms

	Effect	DFn	DFd	F	p	p<.05	ges
AP1							
2	AI	1	15	0.008167847	0.92918410		0.0000236636
3	GB	1	15	1.990445975	0.17869659		0.0044923783
5	AI:GB	1	15	4.660299912	0.04747832	*	0.0153347674
6	AI:HEMI	1	15	0.040882151	0.84248232		0.0000133625
7	GB:HEMI	1	15	0.677874644	0.42321694		0.0002154756
8	AI:GB:HEMI	1	15	2.073071522	0.17046297		0.0007237953
AP2							
2	AI	1	15	0.09506410	0.7620757		1.538028e-04
3	GB	1	15	2.47751588	0.1363365		2.725895e-03
5	AI:GB	1	15	1.15943790	0.2985959		2.830261e-03
6	AI:HEMI	1	15	0.48460264	0.4969906		1.187924e-04
7	GB:HEMI	1	15	2.98798383	0.1044063		1.678678e-03
8	AI:GB:HEMI	1	15	0.05057598	0.8250990		1.760202e-05
AP3							
2	AI	1	15	0.198437149	0.66234710		2.555776e-04
3	GB	1	15	4.753840216	0.04557241	*	8.124436e-03
5	AI:GB	1	15	0.397223830	0.53801029		1.052145e-03
6	AI:HEMI	1	15	0.603749718	0.44923185		3.322298e-04
7	GB:HEMI	1	15	3.276606459	0.09035093		3.041326e-03
8	AI:GB:HEMI	1	15	0.001873391	0.96604711		7.511277e-07
AP4							
2	AI	1	15	0.01067517	0.91907714		3.396551e-05
3	GB	1	15	4.27323445	0.05642601		9.794189e-03
5	AI:GB	1	15	0.13713033	0.71632749		2.300776e-04
6	AI:HEMI	1	15	0.35566774	0.55981555		2.000423e-04
7	GB:HEMI	1	15	1.29779534	0.27248296		5.962187e-04
8	AI:GB:HEMI	1	15	0.17068354	0.68535047		1.022861e-04

(B) 1100-1300 ms

	Effect	DFn	DFd	F	p	p<.05	ges
AP1							
2	AI	1	15	0.006961380	0.93460904		1.638677e-05
3	GB	1	15	0.914730623	0.35402397		3.012810e-03
5	AI:GB	1	15	8.463246918	0.01079216	*	3.229621e-02
6	AI:HEMI	1	15	0.002565923	0.96026887		1.108240e-06
7	GB:HEMI	1	15	0.052475884	0.82190375		1.763618e-05
8	AI:GB:HEMI	1	15	0.255448090	0.62061000		5.383400e-05
AP2							
2	AI	1	15	0.3936495	0.53982134		0.0007039478
3	GB	1	15	0.6662806	0.42712470		0.0011192653
5	AI:GB	1	15	6.7092218	0.02049412	*	0.0127756731
6	AI:HEMI	1	15	2.3292370	0.14777132		0.0013948367
7	GB:HEMI	1	15	0.7769153	0.39199146		0.0005615811
8	AI:GB:HEMI	1	15	1.1939470	0.29177379		0.0006791687

	Effect	DFn	DFd	F	p	p<.05	ges
AP3							
2	AI	1	15	2.5527851	0.130947754		0.0028720128
3	GB	1	15	0.3624049	0.556164562		0.0011847021
4	HEMI	1	15	0.2706601	0.610482665		0.0019434024
5	AI:GB	1	15	12.5426643	0.002960029	*	0.0173012983
6	AI:HEMI	1	15	0.5368338	0.475042441		0.0003674013
7	GB:HEMI	1	15	2.7647898	0.117107738		0.0019640469
8	AI:GB:HEMI	1	15	0.5524185	0.468813289		0.0003840660
AP4							
2	AI	1	15	0.92860554	0.350504737		2.920369e-03
3	GB	1	15	0.49637837	0.491890606		1.027538e-03
4	HEMI	1	15	1.06968968	0.317403154		6.438645e-03
5	AI:GB	1	15	9.52051677	0.007536639	*	1.166877e-02
6	AI:HEMI	1	15	0.31131016	0.585109330		9.821807e-05
7	GB:HEMI	1	15	0.07155848	0.792724180		3.626495e-05
8	AI:GB:HEMI	1	15	0.90436713	0.356686169		7.620253e-04

(C) 1300-1500 ms

	Effect	DFn	DFd	F	p	p<.05	ges
AP1							
2	AI	1	15	0.16667294	0.68885407		6.023369e-04
3	GB	1	15	0.50318318	0.48898503		4.595928e-03
5	AI:GB	1	15	8.34774153	0.01123703	*	4.993616e-02
6	AI:HEMI	1	15	0.06263144	0.80577946		1.890929e-05
7	GB:HEMI	1	15	1.07677110	0.31586019		2.834008e-04
8	AI:GB:HEMI	1	15	0.31244185	0.58443493		1.313277e-04
AP2							
2	AI	1	15	0.541600039	0.473122599		2.565471e-03
3	GB	1	15	0.721945751	0.408863622		3.775561e-03
5	AI:GB	1	15	11.817708869	0.003663226	*	3.720152e-02
6	AI:HEMI	1	15	1.964934048	0.181339311		6.895536e-04
7	GB:HEMI	1	15	0.008185275	0.929108805		4.013360e-06
8	AI:GB:HEMI	1	15	0.003569680	0.953146045		2.588259e-06
AP3							
2	AI	1	15	1.76606081	0.203732228		0.0100272286
3	GB	1	15	1.85885485	0.192871477		0.0102777574
5	AI:GB	1	15	11.05888246	0.004611447	*	0.0294362042
6	AI:HEMI	1	15	0.76006452	0.397048521		0.0004672085
7	GB:HEMI	1	15	2.33186314	0.147558756		0.0008695702
8	AI:GB:HEMI	1	15	0.09766700	0.758950072		0.0001161245
AP4							
2	AI	1	15	0.59148499	0.453785880		4.265145e-03
3	GB	1	15	2.03265526	0.174429620		7.709350e-03
5	AI:GB	1	15	11.25453061	0.004342575	*	1.902573e-02
6	AI:HEMI	1	15	3.66250836	0.074927939		8.230539e-04
7	GB:HEMI	1	15	0.06908856	0.796244456		5.152484e-05
8	AI:GB:HEMI	1	15	0.15521643	0.699143426		1.328826e-04

These interactions, as can be clearly seen in **Figure 5-7**, arose in virtue of the fact that +HUMAN plural nouns gave rise to a negative-going deflection similar to what was seen for the

singular nouns, while -HUMAN plurals showed the complete opposite response, with a positive-going shift over the same scalp regions. Note that in later time-windows (see voltage maps for -HUMAN plurals in **Figure 5-7)**, the scalp distribution of this flipped response extends more broadly than in earlier latency ranges.

5.3.3.2.3. Exploratory analyses of Gender for Plurals

Given some of the GENDER related asymmetries we have seen in our behavioral data, we re-ran the foregoing analyses shown in **Table *5-3*** including the factor GENDER (M/ F). No interactions arose in any time-windows.

5.3.1. Summary

Behaviorally and in terms of online brain responses, CORRECTNESS did not interact with either GENDER or ANIMACY when the target nouns were singular. Participants were highly accurate in correctly accepting/rejecting the CORRECT/ VIOLATION word pairs, and ERPs revealed a sustained negativity (900-1500 ms) for the violation conditions that was generally larger over anterior than posterior recording sites.

Plural target nouns, in contrast, revealed interactions of CORRECTNESS with ANIMACY. First, +HUMAN nouns patterned with the singulars both behaviorally and in terms of brain responses. Second, and most striking of all the results, is that plural -HUMAN nouns showed an ERP response that is the complete opposite of the pattern seen for the +HUMAN nouns, with the violation more positive-going over roughly the same recording sites where effects appeared for the +HUMAN. In principle, this could be understood to index a qualitatively different response to these violations involving -HUMAN nouns *or* indicate a uniform brain response across the +HUMAN/

-HUMAN conditions which turns on the (mis)match of morpho-syntactic features in a way that essentially ignores ANIMACY. We return to this issue in §5.4 below.

5.4. General Discussion

As discussed at the beginning of this chapter, the main goal of this experiment was to examine when in time the morpho-syntactic and the conceptual systems in the case of –HUMAN nouns interact. One of our goals also was to examine the singulars cases in addition to the plural cases, replicate our behavioral results for the grammaticality task from Experiment 1 and finally to see if our plural nouns show any cost of GENDER processing. In line with our predictions and finding from Experiment 1, we observed that our behavioral results in this study show that +HUMAN masculine plurals were the most accurately judged and took the shortest time. This indicates an interaction of CORRECTNESS x ANIMACY x GENDER in the +HUMAN plural cases, which we predicted is due to the presence of a 'double' violation. +HUMAN feminine plurals, however, were less accurate and took longer to judge. We interpreted the 'double' violation effect in Experiment 1 as an index that facilitates the processing of these nouns because the violation concerns two dimensions (NUMBER and GENDER). Alternatively, from another perspective, +HUMAN feminine cases could be interpreted as being potentially confused with -HUMANs because they share the same GENDER. As suggested in Chapter 4, this seems to support an initial stage of syntactic processing that is done independent of the lexico-semantic processing.

Our behavioral findings for the GENDER differences among the +HUMAN plurals from both experiments could also indirectly add to the on-going debate on Arabic plural types (see discussion about plural types in Arabic in Chapter 3 §3.1.3). In particular, these differences could indicate

that nouns formed by Masculine Suffixed Plural belong to the class of 'regular' plurals, while those formed by Feminine Suffixed Plural (whether +HUMAN or –HUMAN) and Broken Plural belong to the class of 'irregular' plural; hence, they deploy different processing mechanisms.[18]

In addition, and as expected, this interaction (of all features) is absent for all the singulars both behaviorally and in terms of brain responses. So, we do not see interactions between features but we see two separate effects for both +/- HUMAN nouns one for CORRECTNESS (morpho-syntax) reflected in the early LAN effect, and one for ANIMACY, visualized in the (N400), both generated in parallel and across the same time window. This strongly suggests that both systems are available early and at the same time, but they are really independent and they do not interact until later, in the integration stage.

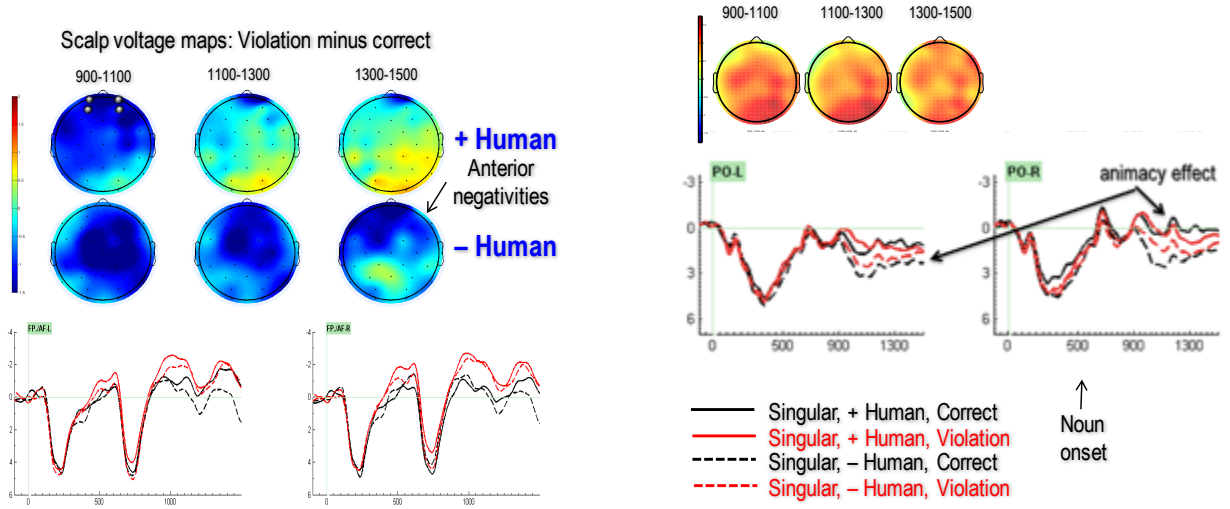


Figure 5-8: Correctness effect for +/- HUMANs (left-hand side) and a separate animacy effect (an N400) (right-hand side)

[18] Future studies are directed to examine the Broken Plural referring to human nouns in comparison to these in order to confirm this observation.

However, looking at the generated ERP effects, we can see a clear correlation between our +HUMAN plurals in general and the singulars, both showing strong negativities across the Anterior areas. We interpret this as the previously reported (LAN) effects from (Barber & Carrieras, 2005), which represent a uniform behavior connected to morpho-syntactic violations and syntactic integration (though the effect was a little delayed for the +HUMAN plural cases). According to Barber & Carrieras (2005), a LAN-type effect is generated for morpho-syntactic mismatches because word pairs that constitute an NP or an autonomous unit trigger syntactic integration as an attempt to build-up a syntactic structure, which fails afterward.

Despite that, looking at the sub-conditions for the +HUMAN plurals, we observe that the masculine case seems to derive the effect while the feminine cases are more diffuse. We do not think that this difference is significant though because it was not represented numerically and because when we collapse the sub-conditions over GENDER, the effect seems to vanish. In addition, the broad distribution of the negativity effect for those cases can still fit under the LAN distribution umbrella following current proposals (see Steinhauer & Drury (2012) regarding LANs).

Our –HUMAN nouns, on the other hand, did not show an effect of interactions in the behavioral data, exactly as reported from experiment 1 results. However, brain responses indicate that these cases are clearly not processed as in the same way as the singulars or the +HUMANs. Whereas we saw a sustained negativity for the singulars and the +HUMANs in the violation conditions, our –HUMAN plurals showed a strong positivity across the same scalp distribution.

Mapping these onto our ERP predictions for the mismatch, we anticipated one of four outcomes (**Figure 5-4**) that also map into our results from the web experiment. Recall that in that experiment, our results have already ruled out Prediction 1. Based on our ERP findings, we see a

flip of the response associated with the "match" cases. However, in the latest time window, we also saw a posterior positivity at around the 600-900 time-window. We interpret this pattern as consisting of a two-part effect. First, the initial relative positivity for the violation condition in the -HUMAN plurals may be understood to be instead a relative *negativity* for the "correct" (but morpho-syntactically mismatching) cases. That is, CORRECT pairs can be understood in these data to have yielded a VIOLATION response. If this is correct, our finding is consistent with outcome (iii) in **Figure 5-4** above where morpho-syntax is initially blind to the ANIMACY information processing the "correct" feminine singular demonstrative as a violation when a plural noun is encountered.

The second part of the effect, however, may be a *bona fide* violation response from the "incorrect" condition. Now, this interpretation is a little bit tricky, as observationally in the -HUMAN plural case there are two conditions which depart around the 900 ms mark, with the "incorrect" case more positive-going. Over the time-course of this relative positivity, it changes in scalp distribution from anterior (900-1300 ms) to posterior (in the 1300-1500 ms range; see bottom right difference maps in **Figure 5-7**. Thus, what we suggest is that the pattern seen in **Figure 5-7** may be a combination of an (earlier) anterior *negative*-going deflection for the "correct" condition, and a later *positive*-going effect for the "incorrect" condition (possibly related to "sP600" responses discussed above). This would suggest that the actual outcome was a combination of the predicted "flip" of the violation response (option (iii) in **Figure 5-4**), with a downstream qualitatively different response (option (iv), in **Figure 5-4**) tied to the detection of a clash involving ANIMACY. That this qualitatively different effect could be interpreted as a sP600 was a possibility that we reasoned, independent of whether such effects are best thought of in terms of conflict monitoring (van Herten, Chwilla & Kolk, 2006); Kaan, Harris, Gibson, Holcomb, 2000), the action of a

syntax-independent combinatorial-semantic processing stream (Bornkessel & Schlesewsky, 2006; Bornkessel- Schlesewsky & Schlesewsky, 2008a, 2009b), or in terms of other functional descriptions that have emerged in the sP600 literature.

Instead, the P600 effect we observed here could be an index of 'repair' or 'reanalysis' processes in the sense of Friederici (1995, 2002) who argues that in sentence processing, re-checking aims to retrieve the mismatch-resolving processes available in the language. For Faussart, Jacubowicz & Costes (1999), since different features are checked at different stages, a detection of violation of a grammatical feature as NUMBER requires the processor to go one step back to the *syntactic integration* stage, while a detection of violation of a lexical (as GENDER) or lexico-semantic feature (as ANIMACY) requires going two steps back to the *lexical access* stage. This cost is reflected in the P600 component as a higher latency and greater amplitude. Finally, for the Extended Argument Dependency Model eADM by Bornkessel and Schlesewsky (2006), the P600 effect would be elicited during the *well-formedness check.*

Although we realize that in order to know whether or not this interpretation of the pattern as a "two-part" effect is right we need further testing to evaluate, we still think that the clear and important empirical result that emerges from this study is that morpho-syntactic mismatches that are grammatical in virtue of the ANIMACY properties of the noun are, at least initially, treated by processing mechanisms as mismatches. One implication of this finding if replicated is that it would place an important constraint on models of sentence processing, as this strongly suggests that ϕ-feature processing acts independently relative to the access/retrieval of noun-specific (IN)ANIMACY information.[19]

[19] Note there are two other salient features of the ERP responses shown in **Figure 5-7**. One is an effect specific to the demonstratives themselves, consisting of a posterior (parietal/occipital) positivity for plural compared to singular demonstratives. The second is a late ANIMACY effect in the singular noun cases, consisting of a P600-like positivity for -HUMANs.

Chapter 6

6. Conclusions

This dissertation examined the real-time processing of morpho-syntactic features (like NUMBER and GENDER) and lexico-semantic features (like ANIMACY) by inspecting the conflict raised by the case of –HUMAN nouns in Arabic. The investigation of this interesting phenomenon is in fact an entrance to more global effect where ANIMACY invades many aspects of the language faculty. It interferes with inflectional morphology, controls word order, and interacts with CASE marking. So, taking this as an instance, this dissertation questioned the nature of ANIMACY and the way it exerts its influence on language.

Building on our results from the grammaticality and the animacy tasks in Experiment 1 and the grammaticality and ERP tasks in Experiment 2, and our investigation of the agreement licensing these cases, I argued that morpho-syntax and lexical-semantics are two independent systems that do not interact in the initial stages of processing and that the locus of this interaction happens post-lexically; in fact, at a very late stage in integration. The interaction results in evoking override processes responsible for resolving conflicts raised by cases of mismatches as a rescue.

The fact that native speakers interpret and accept these mismatch cases in their languages and judge them accurately (evident from our accuracy rates for all experimental tasks) suggests that no matter what mechanisms are deployed to process these cases, the cases are finally rendered

grammatical. This indicates that Agree ends up successful. However, the longer reaction times we observed for those cases and the robust ERP reversal effect indicate that they are not processed in the same way as other cases of regular agreement.

There are at least three pieces of evidence supporting that in the suggested initial stages of processing the two systems are independent. One is the confusion found in the accuracy rates for +HUMAN plurals in the VIOLATION condition for the animacy task, where the morpho-syntactic features on the demonstrative mislead participants' judgment. Second is the flipped brain response (LAN effect for CORRECT cases) we saw in the case of –HUMAN plurals and nowhere else. Finally, that this is the case is also relevant is the ANIMACY effect (N400) we observed in the case of the singulars independent of the (LAN), which indicates that the two systems are both available early enough but simply do not interact until later.

Fitting these results into the possible underlying representations for the processing mechanisms within current sentence processing models, and following the theoretical assumptions of the "parallel independent approach", it seems that in the case of –HUMAN, the initial mapping of the features fails because in the eyes of morpho-syntax they are in fact viewed as mismatches and because morpho-syntax acts alone without consulting lexical-semantic, but in the integration stage where both systems communicate some other processing attempts are evoked as an attempt to save the derivation. We can think of at least three possibilities of what the nature of the override processes may be.

First, this may be a combinatorial process to save the derivation by instantiating some *default* features as last resort. A motivation for such a process would be based on arguments like Preminger's (2009), where he argues that *Agree*'s application is mandatory but its valuation is not, in which *default* features are displayed instead. Contrary to the arguments made earlier with respect

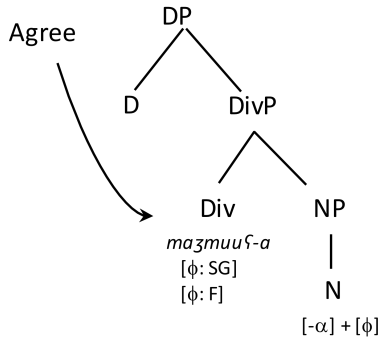
to the identity of *default* features in Arabic, we would like to make clear here that on the basis of the current unclarity about what default is and what features could be part of it, we can think of singular NUMBER as having enough support from other structures inside the language, while feminine GENDER, which may not be considered a default GENDER elsewhere in Arabic, does in fact have some support from other languages.

In particular, in Rumanian where there are three GENDER forms (masculine, feminine and neuter) but only two agreement morphemes (masculine and feminine), when two subjects carrying distinct GENDERs are conjoined, resolutions rules of Corbett (1983b) apply. So, in the case where two inanimate nouns are conjoined, if one or both nouns carry neuter or feminine GENDER (even in the case where one is masculine and one is feminine), the agreement that those nouns trigger is interestingly feminine (Corbett, 1991). But we also know that it is widely believed that resolution rules converge on *default* features so what the Rumanian case might be suggesting to us is that in the case of Inanimates feminine *can* in fact be default. So, on the assumption that a failed agreement (a detection of a mismatch) can instantiate default features, the override process could in principle be the mechanism associated with spelling out default features.

Another possibility is that the override process could be related to some intervener available in the syntactic structure of these nouns that is motivated by some semantic or pragmatic interpretations triggered or added later as an extra projection perhaps related to the collective/ distributive readings allowed in Arabic. We could think of this as a *null* classifier (or collectivizer) that projects and selects a –HUMAN noun to activate a collective reading. This *null* collectivizer could be the word *ʒamaaʕ-a* or *maʒmuuʕ-a* 'a group of' which is basically feminine singular and if we consider the discussion on agreement with collective nouns in Arabic from Chapter 3 §3.3.1,

we notice that GENDER agreement with these nouns involves agreeing with the form of the stem (if the stem carries *–a*, it is feminine, otherwise it is masculine), which may indicate that, with –HUMAN nouns, agreeing elements Agree with this collectivizer not the noun itself:[20]

(69) An intervener (collectivizer)

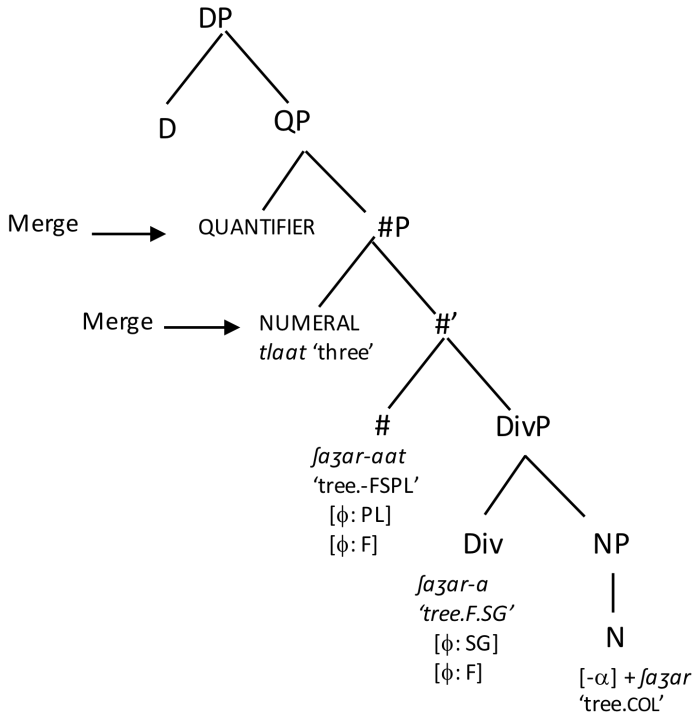


This analysis gains support from Ouwaidah's (2014) analysis for NUMERALs and NUMBER agreement in Arabic, where she argues that there several levels for forming a plural noun in Arabic each represented by its own projection. Under that analysis some noun starts life in the collective form as *ʃaʒar* 'tree.COL' and can then be singular/ count *ʃaʒar-a* 'tree-F.SG'by attaching the suffix *–a*, which she argues is a classifier, and out of this form a plural/ count noun can be formed *ʃaʒar-aat* by attaching the suffix *–at.* And NUMERALs and QUANTIFIERs can then Merge above these projections[21]:

[20] This assumption requires further investigation, since one could easily argue that the null collectivizer could in principle refer to another word for 'a group of' in Arabic as *ʒamaʕ* which is in fact masculine singular. In principle, if we allow such a representation, we should expect both GENDERs to be allowed with these nouns, but that's not borne out. In other words, there is not enough evidence on how to control for the features carried by this null classifier based on several possibilities.

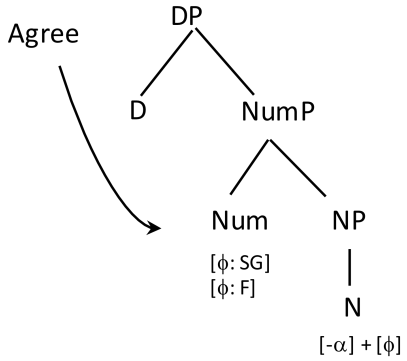
[21] Current proposals argue that GENDER and classifiers can co-exist in some languages (see Fedden and Corbett, 2017 for such an argument).

(70) Ouwaidah's (2014) argument for plural marking



Alternatively, this intervener could be morphologically motivated as a feminine singular marker or some sort of functional projection carrying those features and intervening between the noun and external agreeing elements. This proposal is supported by the fact that –HUMAN nouns trigger this mismatch only when they are pluralized, which means that it could be the result of the pluralization process:

(71) Intervener (functional projection)



Further support comes from the other cases of partial agreement discussed in Chapter 1 §1.1, where it is evident that mismatches in Arabic are always connected to NUMBER.

Now fitting these results in the broader frame of the assumptions made by the models of sentence processing (Frazier, 1987a; Friederici, 2002; Bates and MacWinney, 1989; MacDonald, Pearlmutter, & Seidenberg, 1994; Trueswell, Tanenhaus, & Garnsey, 1994a), our proposal takes some parts of the "syntax-independent" (also called syntax-first) or modular processing accounts (Farzier, 1987a; Friederici, 2002; Bates and MacWhinney, 1989) that argue that the initial stages of processing are independent, but also deploy some tenents of the "interactive" or "constraint-based" models (MacDonald, Pearlmutter, & Seidenberg, 1994; Trueswell, Tanenhaus, & Garnsey, 1994a) that argue that all information is available and used immediately and can affect initial processing. Although we do not see enough evidence in our results supporting the superiority of syntax processing being available first, we do see evidence of the two systems functioning without consulting each other. In that sense, and considering Friederici's (2002) model where the language comprehension system is heavily dependent on morpho-syntactic cues but the interaction between morpho-syntax and semantics is incremental and hybrid and takes place in the integration stage (stage (2)), our findings are consistent with her assumptions and fit in her stage (2) of sentence processing. However, our proposal provides a more fine-grained interpretation of how and when that interaction happens. Our findings are also in line with Friederici's proposal that the comprehension system has a self-operating repair strategy that functions when a violation is detected (stage (3)), in which in both our experiments, in the CORRECT cases this can be interpreted as a process of override and in the VIOLATION cases it may be interpreted as a process of reanalysis (for -HUMAN plurals).

Finally, and with respect to a broader question on the nature of the diglossic brain, our results in general do not seem to suggest an interference or influence form the spoken varieties of Arabic speakers on MSA. And what we saw as cases of confusion across CONDITION TYPES (NOUN+VERB cases), is not an indication that Arabic speakers are influenced by their local varieties when making MSA judgments. Rather, these cases were instances where ambiguity between two registers arose as a consequence of the shared lexical, morphological and syntactic structures between the two varieties. To sum up, Arabic speakers behaved exactly as we would expect native speakers of a language would.

In conclusion, although previous findings examining the influence of ANIMACY on the dynamics of language processing, in particular in the recent "semantic P600" literature, have been taken by some to argue in favor of architectures which permit semantic information to guide syntactic parsing decisions (e.g., Kim & Osterhout, 2005; but see Chow & Phillips, 2013), in the present study, we observed that one and the same target word made both morpho-syntactic and ANIMACY information available simultaneously, in ways that yielded conflicts. In contrast, previous studies examining violation paradigms where ANIMACY is implicated have employed comparisons where either ANIMACY is introduced first (e.g., nominals in subject position) and measured influences on downstream verbs, or the other way around (i.e., contrasting (in)animate nominals object position where they violate selection restrictions). What the data from this study reveal is a pattern consistent with the idea that morpho-syntactic level processing initially proceeds in ways that are blind to lexical-semantic ANIMACY information, only yielding an online conflict response downstream (possibly in the form of a late positivity related to semantic P600 effects). Thus, the present findings arguably make a strong case for the independence of the two streams.

Future work should capitalize on more cross-linguistic experiments to explore other such cases where morpho-syntax and ANIMACY distinctions can be pitted against each other in this way. The nature of the override processes involved in these mismatch cases both in Arabic (by exploring the discussed possibilities that may underlie the process in the case of –HUMAN nouns) and in other languages where similar mismatches exist should be examined and investigated. Future research is also directed to experimentally consider the other agreement peculiarities in Arabic (like, agreement word order asymmetry, and the case of polarity with numerals) in order to draw generalizations and obtain support of this proposal.

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Appendix 1
Stimuli for experiment (1)

	NOUN	DEM	English N	Arabic N	Arabic Dem
1	[-Hum].M.PL	this_SG_F	books_Pl_M	الكُتُب	هَذِه
	[-Hum].M.PL	this_SG_F	restaurants_Pl_M	المَطَاعِم	هَذِه
	[-Hum].M.PL	this_SG_F	hotels_Pl_M	الفَنَادِق	هَذِه
	[-Hum].M.PL	this_SG_F	dresses_Pl_M	الفَسَاتِين	هَذِه
	[-Hum].M.PL	this_SG_F	topics_Pl_M	المَوَاضِيع	هَذِه
2	[-Hum].F.PL	this_SG_F	capitals_Pl_F	العَواصِم	هَذِه
	[-Hum].F.PL	this_SG_F	machines_Pl_F	المَكَائِن	هَذِه
	[-Hum].F.PL	this_SG_F	gardens_Pl_F	الحَدَائِق	هَذِه
	[-Hum].F.PL	this_SG_F	papers_Pl_F	الأورَاق	هَذِه
	[-Hum].F.PL	this_SG_F	problems_Pl_F	المَشَاكِل	هَذِه
3	[-Hum].M.PL	these_Pl	chairs_Pl_M	الكَرَاسِي	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	planets_Pl_M	الكَواكِب	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	chances_Pl_M	الفُرَص	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	numbers_Pl_M	الأعْدَاد	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	shirts_Pl_M	القُمْصَان	هَؤُلَاءِ
4	[-Hum].F.PL	these_Pl	ships_Pl_F	السُّفُن	هَؤُلَاءِ

	[-Hum].F.PL	these_Pl	cities_Pl_F	المُدُن	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	newspapers_Pl_F	الصُّحُف	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	presents_Pl_F	الهَدَايَا	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	purses_Pl_F	الحَقَائِب	هَؤُلَاءِ
5	[+HUM].M.PL	this_SG_F	activists_Pl_M	النَّاشِطُون	هَذِه
	[+HUM].M.PL	this_SG_F	atheists_Pl_M	المُلْحِدُون	هَذِه
	[+HUM].M.PL	this_SG_F	player_Pl_M	اللاَّعِبُون	هَذِه
	[+HUM].M.PL	this_SG_F	drivers_Pl_M	السَّائِقون	هَذِه
	[+HUM].M.PL	this_SG_F	carpenter_Pl_M	النَّجَّارون	هَذِه
6	[+HUM].F.PL	this_SG_F	announcers_Pl_F	المُذِيعَات	هَذِه
	[+HUM].F.PL	this_SG_F	cooks_Pl_F	الطَبَّاخَات	هَذِه
	[+HUM].F.PL	this_SG_F	writer_Pl_F	الكَاتِبَات	هَذِه
	[+HUM].F.PL	this_SG_F	reader_Pl_F	القَارِئَات	هَذِه
	[+HUM].F.PL	this_SG_F	plaintiffs_Pl_F	المُدَّعِيَات	هَذِه
7	[+HUM].M.PL	these_Pl	agents_Pl_M	المَنْدُوبُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	attendees_Pl_M	الحَاضِرُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	painter_Pl_M	الرَسَّامُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	surgeon_Pl_M	الجَرَّاحُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	inviters_Pl_M	الدَّاعُون	هَؤُلَاءِ
8	[+HUM].F.PL	these_Pl	artists_Pl_F	الفَنَّانَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	believers_Pl_F	المُؤمِنَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	listeners_Pl_F	السَّامِعات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	farmers_Pl_F	الفَلَّاحَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	voters_Pl_F	النَّاخِبَات	هَؤُلَاءِ
1	[-Hum].M.PL	this_SG_F	chairs_Pl_M	الكَرَاسِي	هَذِه
	[-Hum].M.PL	this_SG_F	planets_Pl_M	الكَواكِب	هَذِه
	[-Hum].M.PL	this_SG_F	chances_Pl_M	الفُرَص	هَذِه
	[-Hum].M.PL	this_SG_F	numbers_Pl_M	الأعْدَاد	هَذِه
	[-Hum].M.PL	this_SG_F	shirts_Pl_M	القُمْصَان	هَذِه
2	[-Hum].F.PL	this_SG_F	ships_Pl_F	السُّفُن	هَذِه
	[-Hum].F.PL	this_SG_F	cities_Pl_F	المُدُن	هَذِه
	[-Hum].F.PL	this_SG_F	newspapers_Pl_F	الصُّحُف	هَذِه
	[-Hum].F.PL	this_SG_F	presents_Pl_F	الهَدَايَا	هَذِه

	[-Hum].F.PL	this_SG_F	purses_Pl_F	الحَقائِب	هَذِه
3	[-Hum].M.PL	these_Pl	books_Pl_M	الكُتُب	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	restaurants_Pl_M	المَطَاعِم	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	hotels_Pl_M	الفَنَادِق	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	dresses_Pl_M	الفَسَاتِين	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	topics_Pl_M	المَوَاضِيع	هَؤُلَاءِ
4	[-Hum].F.PL	these_Pl	capitals_Pl_F	العَواصِم	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	machines_Pl_F	المَكَائِن	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	gardens_Pl_F	الحَدَائِق	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	papers_Pl_F	الأورَاق	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	problems_Pl_F	المَشَاكِل	هَؤُلَاءِ
5	[+HUM].M.PL	this_SG_F	agents_Pl_M	المَنْدُوبُون	هَذِه
	[+HUM].M.PL	this_SG_F	attendees_Pl_M	الحَاضِرُون	هَذِه
	[+HUM].M.PL	this_SG_F	painter_Pl_M	الرَسَّامُون	هَذِه
	[+HUM].M.PL	this_SG_F	surgeon_Pl_M	الجَرَّاحُون	هَذِه
	[+HUM].M.PL	this_SG_F	inviter_Pl_M	الدَّاعُون	هَذِه
6	[+HUM].F.PL	this_SG_F	artists_Pl_F	الفَنَّانَات	هَذِه
	[+HUM].F.PL	this_SG_F	believers_Pl_F	المُؤمِنَات	هَذِه
	[+HUM].F.PL	this_SG_F	listener_Pl_F	السَّامِعات	هَذِه
	[+HUM].F.PL	this_SG_F	farmer_Pl_F	الفَلَّاحَات	هَذِه
	[+HUM].F.PL	this_SG_F	voters_Pl_F	النَّاخِبَات	هَذِه
7	[+HUM].M.PL	these_Pl	activists_Pl_M	النَّاشِطُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	atheists_Pl_M	المُلْحِدُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	player_Pl_M	اللاَّعِبُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	drivers_Pl_M	السَّائِقون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	carpenter_Pl_M	النَّجَّارون	هَؤُلَاءِ
8	[+HUM].F.PL	these_Pl	announcers_Pl_F	المُذِيعَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	cooks_Pl_F	الطَبَّاخَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	writers_Pl_F	الكَاتِبَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	reader_Pl_F	القَارِئَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	plaintiffs_Pl_F	المُدَّعِيَات	هَؤُلَاءِ
1	[-Hum].M.PL	this_SG_F	boxes_Pl_M	الصَّنَادِيق	هَذِه

	[-Hum].M.PL	this_SG_F	mosques_Pl_M	المَسَاجِد	هَذِه
	[-Hum].M.PL	this_SG_F	rings_Pl_M	الخَواتِم	هَذِه
	[-Hum].M.PL	this_SG_F	news_Pl_M	الأَخْبَار	هَذِه
	[-Hum].M.PL	this_SG_F	meetings_Pl_M	المَوَاعِيد	هَذِه
2	[-Hum].F.PL	this_SG_F	schools_Pl_F	المَدَارِس	هَذِه
	[-Hum].F.PL	this_SG_F	gifts_Pl_F	الجَوائِز	هَذِه
	[-Hum].F.PL	this_SG_F	spoons_Pl_F	المَلَاعِق	هَذِه
	[-Hum].F.PL	this_SG_F	poems_Pl_F	القَصَائِد	هَذِه
	[-Hum].F.PL	this_SG_F	smells_Pl_F	الرَّوَائِح	هَذِه
3	[-Hum].M.PL	these_Pl	boats_Pl_M	القَوارِب	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	moons_Pl_M	الأَقْمَار	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	knives_Pl_M	السَّكَاكِين	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	desks_Pl_M	المَكَاتِب	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	rockets_Pl_M	الصَّوَارِيخ	هَؤُلَاءِ
4	[-Hum].F.PL	these_Pl	storms_Pl_F	العَوَاصِف	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	cups_Pl_F	الفَنَاجِين	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	windows_Pl_F	النَّوَافِذ	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	goods_Pl_F	البَضَائِع	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	certificates_Pl_F	الوَثَائِق	هَؤُلَاءِ
5	[+HUM].M.PL	this_SG_F	tailors_Pl_M	الخَيَّاطُون	هَذِه
	[+HUM].M.PL	this_SG_F	builders_Pl_M	البنَّاؤون	هَذِه
	[+HUM].M.PL	this_SG_F	winners_Pl_M	الفَائِزُون	هَذِه
	[+HUM].M.PL	this_SG_F	theives_Pl_M	السَّارِقُون	هَذِه
	[+HUM].M.PL	this_SG_F	Qreaders_Pl_M	المُقرِئُون	هَذِه
6	[+HUM].F.PL	this_SG_F	Muslims_Pl_F	المُسلِمَات	هَذِه
	[+HUM].F.PL	this_SG_F	workers_Pl_F	العَامِلَات	هَذِه
	[+HUM].F.PL	this_SG_F	researchers_Pl_F	البَاحِثَات	هَذِه
	[+HUM].F.PL	this_SG_F	publishers_Pl_F	النَّاشِرَات	هَذِه
	[+HUM].F.PL	this_SG_F	visitors_Pl_F	الزَّائِرَات	هَذِه
7	[+HUM].M.PL	these_Pl	advisors_Pl_M	المُشْرِفُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	learners_Pl_M	الدَّارِسُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	losers_Pl_M	الخَاسِرُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	policeofficers_Pl_M	الشُّرْطِيُّون	هَؤُلَاءِ

	[+HUM].M.PL	these_Pl	pilot_Pl_M	الطَّيَّارُون	هَؤُلَاءِ
8	[+HUM].F.PL	these_Pl	sellers_Pl_F	البَائِعَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	musicians_Pl_F	المُطْرِبَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	criminals_Pl_F	المُجْرِمَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	refugees_Pl_F	اللَّاجِئَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	directors_Pl_F	المُخْرِجَات	هَؤُلَاءِ
1	[-Hum].M.PL	this_SG_F	boats_Pl_M	القَوارِب	هَذِه
	[-Hum].M.PL	this_SG_F	moons_Pl_M	الأَقْمَار	هَذِه
	[-Hum].M.PL	this_SG_F	knives_Pl_M	السَّكَاكِين	هَذِه
	[-Hum].M.PL	this_SG_F	desks_Pl_M	المَكَاتِب	هَذِه
	[-Hum].M.PL	this_SG_F	rockets_Pl_M	الصَّوَارِيخ	هَذِه
2	[-Hum].F.PL	this_SG_F	storms_Pl_F	العَوَاصِف	هَذِه
	[-Hum].F.PL	this_SG_F	cups_Pl_F	الفَنَاجِين	هَذِه
	[-Hum].F.PL	this_SG_F	windows_Pl_F	النَّوَافِذ	هَذِه
	[-Hum].F.PL	this_SG_F	goods_Pl_F	البَضَائِع	هَذِه
	[-Hum].F.PL	this_SG_F	certificates_Pl_F	الوَثَائِق	هَذِه
3	[-Hum].M.PL	these_Pl	boxes_Pl_M	الصَّنَادِيق	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	mosques_Pl_M	المَسَاجِد	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	rings_Pl_M	الخَوَاتِم	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	news_Pl_M	الأَخْبَار	هَؤُلَاءِ
	[-Hum].M.PL	these_Pl	meetings_Pl_M	المَوَاعِيد	هَؤُلَاءِ
4	[-Hum].F.PL	these_Pl	schools_Pl_F	المَدَارِس	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	gifts_Pl_F	الجَوائِز	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	spoons_Pl_F	المَلَاعِق	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	poems_Pl_F	القَصَائِد	هَؤُلَاءِ
	[-Hum].F.PL	these_Pl	smells_Pl_F	الرَّوَائِح	هَؤُلَاءِ
5	[+HUM].M.PL	this_SG_F	advisors_Pl_M	المُشْرِفُون	هَذِه
	[+HUM].M.PL	this_SG_F	learners_Pl_M	الدَّارِسُون	هَذِه
	[+HUM].M.PL	this_SG_F	losers_Pl_M	الخَاسِرُون	هَذِه
	[+HUM].M.PL	this_SG_F	policeofficers_Pl_M	الشُّرْطِيُّون	هَذِه
	[+HUM].M.PL	this_SG_F	pilot_Pl_M	الطَّيَّارُون	هَذِه
6	[+HUM].F.PL	this_SG_F	sellers_Pl_F	البَائِعَات	هَذِه

	[+HUM].F.PL	this_SG_F	musicians_Pl_F	المُطْرِبَات	هَذِه
	[+HUM].F.PL	this_SG_F	criminals_Pl_F	المُجْرِمَات	هَذِه
	[+HUM].F.PL	this_SG_F	refugees_Pl_F	اللَّاجِئَات	هَذِه
	[+HUM].F.PL	this_SG_F	directors_Pl_F	المُخْرِجَات	هَذِه
7	[+HUM].M.PL	these_Pl	tailors_Pl_M	الخَيَّاطُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	builders_Pl_M	البنَّاؤون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	winners_Pl_M	الفَائِزُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	theives_Pl_M	السَّارِقُون	هَؤُلَاءِ
	[+HUM].M.PL	these_Pl	Qreaders_Pl_M	المُقرِئُون	هَؤُلَاءِ
8	[+HUM].F.PL	these_Pl	Muslims_Pl_F	المُسلِمَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	workers_Pl_F	العَامِلَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	researchers_Pl_F	البَاحِثَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	publishers_Pl_F	النَّاشِرَات	هَؤُلَاءِ
	[+HUM].F.PL	these_Pl	visitors_Pl_F	الزَّائِرَات	هَؤُلَاءِ

Appendix 2
Wugs

هَذَا مَرَّاس Wug1

[haðaa marraass]

‘this is a marraass.M.SG’

مَرَّاسُون .....

[…….. marraasuun]

‘these are marraasuun (MSPL)’

هَذِه فَنْقَلَة Wug2

[haðihi fanqala]

‘this is a fanqala.F.SG’

فَنَاقِل .....

[……. fanaaqil]

‘these are fanaaqil (BPL)

هَذِه حَزَّالَة Wug3

[haðihi ħazzaala]

‘this is a ħazzaala.F.SG’

حَزَّالَات .....

[..... ħazzaala -aat]

‘these are ħazzaala –aat (FSPL)’

هَذَا مُفَلْعِك Wug4

[haðaa mufalʕik]

‘this is a mufalʕik’

مُفَلْعِكَات .....

[…… mufalʕikaat]

‘these are mufalʕikaat (FSPL)’

هَذِه بُقَلَة Wug5

[haðihi buqla]

‘this a buqla.F.SG’

.....بُقْلَات

[……. buqlaat]

‘these are buqlaat (FSPL)’

Wug6 هَذَا سَرِيم

[haðaa sariim]

‘this a sariim.M.SG’

…… سُرَمَاء

[…… suramaaʔ]

‘these are suramaaʔ (BPL)’

Wug7 هَذَا غَبْلْ

[haðaa ɣabl]

‘this a ɣabl.M.SG’

.....غِبَالْ

[…….. ɣibaal]

‘these are ɣibaal (BPL)’

Wug8 هَذِه معَّالَة

[haðihi maʕʕaala]

‘this is a maʕʕaala.F.SG’

..... مَعَّالَات

[..... maʕʕaala -aat]

‘these are maʕʕaala –aat (FSPL)’

Wug9 هَذَا طرَّاخ

[haðaa tˁarraax]

‘this is a tˁarraax.M.SG’

..... طرَّاخُون

[……..tˁarraaxuun]

‘these are tˁarraax-uun (MSPL)’

Wug10 هَذِه بَندَلَة

[haðihi bandala]

‘this is a bandala.F.SG’

.....بَنَادِل

[……. banaadil]

‘these are banaadil(BPL)

هَذَا مُسَربِك Wug11

[haðaa musarbik]

‘this is musarbik’

مُسَربِكَات .....

[…… musarbikaat]

‘these are musarbikaat (FSPL)’

هَذَا كَتِيف Wug12

[haðaa katiif]

‘this a katiif.M.SG’

كُتَفَاء ……

[…… kutafaaʔ]

‘these are kutafaaʔ (BPL)’

هَذِه دُملَة Wug13

[haðihi dumla]

‘this a dumla.F.SG’

دُمْلَات.....

[……. dumlaat]

‘these are dumlaat (FSPL)’

هَذَا تَبْر Wug 14

[haðaa tabr]

‘this a tabr.M.SG’

تِبَار .....

[…….. tibaar]

‘these are tibaar (BPL)’

Appendix 3

Stimuli for experiment (2)

		DEM	NOUN	TRANS(NOUN)	DEM-feature	NOUN-feature
1	1	هَؤُلَاءِ	اللاّعِب	player	Pl	SG_M
1	2	هَذَا	اللاّعِب	player	SG_M	SG_M
1	3	هَؤُلَاءِ	اللّاعِبَة	player	Pl	SG_F
1	4	هَذِهِ	اللّاعِبَة	player	SG_F	SG_F
1	5	هَؤُلَاءِ	اللاّعِبُون	players	Pl	Pl_M
1	6	هَذِهِ	اللاّعِبُون	players	SG_F	Pl_M
1	7	هَؤُلَاءِ	اللاّعِبات	players	Pl	Pl_F
1	8	هَذِهِ	اللاّعِبات	players	SG_F	Pl_F
2	1	هَؤُلَاءِ	الرَّائِد	pioneer	Pl	SG_M
2	2	هَذَا	الرَّائِد	pioneer	SG_M	SG_M
2	3	هَؤُلَاءِ	الرَّائِدَة	pioneer	Pl	SG_F
2	4	هَذِهِ	الرَّائِدَة	pioneer	SG_F	SG_F
2	5	هَؤُلَاءِ	الرَّائِدُون	pioneers	Pl	Pl_M
2	6	هَذِهِ	الرَّائِدُون	pioneers	SG_F	Pl_M
2	7	هَؤُلَاءِ	الرَّائِدَات	pioneers	Pl	Pl_F

2	8	هَذِهِ	الرَّائِدَات	pioneers	SG_F	Pl_F
3	1	هَؤُلَاءِ	الحَاكِم	ruler	Pl	SG_M
3	2	هَذَا	الحَاكِم	ruler	SG_M	SG_M
3	3	هَؤُلَاءِ	الحَاكِمَة	ruler	Pl	SG_F
3	4	هَذِهِ	الحَاكِمَة	ruler	SG_F	SG_F
3	5	هَؤُلَاءِ	الحَاكِمون	rulers	Pl	Pl_M
3	6	هَذِهِ	الحَاكِمون	rulers	SG_F	Pl_M
3	7	هَؤُلَاءِ	الحَاكِمَات	rulers	Pl	Pl_F
3	8	هَذِهِ	الحَاكِمَات	rulers	SG_F	Pl_F
4	1	هَؤُلَاءِ	الشّاهِد	witness	Pl	SG_M
4	2	هَذَا	الشّاهِد	witness	SG_M	SG_M
4	3	هَؤُلَاءِ	الشّاهِدَة	witness	Pl	SG_F
4	4	هَذِهِ	الشّاهِدَة	witness	SG_F	SG_F
4	5	هَؤُلَاءِ	الشّاهِدُون	witnesses	Pl	Pl_M
4	6	هَذِهِ	الشّاهِدُون	witnesses	SG_F	Pl_M
4	7	هَؤُلَاءِ	الشّاهِدَات	witnesses	Pl	Pl_F
4	8	هَذِهِ	الشّاهِدَات	witnesses	SG_F	Pl_F
5	1	هَؤُلَاءِ	الكَاتِب	writer	Pl	SG_M

5	2	هَذَا	الكَاتِب	writer	SG_M	SG_M
5	3	هَؤُلَاءِ	الكَاتِبَة	writer	Pl	SG_F
5	4	هَذِهِ	الكَاتِبَة	writer	SG_F	SG_F
5	5	هَؤُلَاءِ	الكَاتِبُون	writers	Pl	Pl_M
5	6	هَذِهِ	الكَاتِبُون	writers	SG_F	Pl_M
5	7	هَؤُلَاءِ	الكَاتِبَات	writers	Pl	Pl_F
5	8	هَذِهِ	الكَاتِبَات	writers	SG_F	Pl_F
6	1	هَؤُلَاءِ	الفَنَّان	artist	Pl	SG_M
6	2	هَذَا	الفَنَّان	artist	SG_M	SG_M
6	3	هَؤُلَاءِ	الفَنَّانَة	artist	Pl	SG_F
6	4	هَذِهِ	الفَنَّانَة	artist	SG_F	SG_F
6	5	هَؤُلَاءِ	الفَنَّانُون	artists	Pl	Pl_M
6	6	هَذِهِ	الفَنَّانُون	artists	SG_F	Pl_M
6	7	هَؤُلَاءِ	الفَنَّانَات	artists	Pl	Pl_F
6	8	هَذِهِ	الفَنَّانَات	artists	SG_F	Pl_F
7	1	هَؤُلَاءِ	السَّائِق	driver	Pl	SG_M
7	2	هَذَا	السَّائِق	driver	SG_M	SG_M
7	3	هَؤُلَاءِ	السَّائِقَة	driver	Pl	SG_F

7	4	هَذِهِ	السَّائِقَة	driver	SG_F	SG_F
7	5	هَؤُلَاءِ	السَّائِقون	drivers	Pl	Pl_M
7	6	هَذِهِ	السَّائِقون	drivers	SG_F	Pl_M
7	7	هَؤُلَاءِ	السَّائِقَات	drivers	Pl	Pl_F
7	8	هَذِهِ	السَّائِقَات	drivers	SG_F	Pl_F
8	1	هَؤُلَاءِ	الفَلّاح	farmer	Pl	SG_M
8	2	هَذَا	الفَلّاح	farmer	SG_M	SG_M
8	3	هَؤُلَاءِ	الفَلّاحَة	farmer	Pl	SG_F
8	4	هَذِهِ	الفَلّاحَة	farmer	SG_F	SG_F
8	5	هَؤُلَاءِ	الفَلّاحُون	farmers	Pl	Pl_M
8	6	هَذِهِ	الفَلّاحُون	farmers	SG_F	Pl_M
8	7	هَؤُلَاءِ	الفَلّاحَات	farmers	Pl	Pl_F
8	8	هَذِهِ	الفَلّاحَات	farmers	SG_F	Pl_F
9	1	هَؤُلَاءِ	المُدِير	manager	Pl	SG_M
9	2	هَذَا	المُدِير	manager	SG_M	SG_M
9	3	هَؤُلَاءِ	المُدِيرَة	manager	Pl	SG_F
9	4	هَذِهِ	المُدِيرَة	manager	SG_F	SG_F
9	5	هَؤُلَاءِ	المُدِيرُون	managers	Pl	Pl_M

9	6	هَذِهِ	المُدِيرُون	managers	SG_F	Pl_M
9	7	هَؤُلَاءِ	المُدِيرَات	managers	Pl	Pl_F
9	8	هَذِهِ	المُدِيرَات	managers	SG_F	Pl_F
10	1	هَؤُلَاءِ	المُشْرِف	advisor	Pl	SG_M
10	2	هَذَا	المُشْرِف	advisor	SG_M	SG_M
10	3	هَؤُلَاءِ	المُشْرِفَة	advisor	Pl	SG_F
10	4	هَذِهِ	المُشْرِفَة	advisor	SG_F	SG_F
10	5	هَؤُلَاءِ	المُشْرِفُون	advisors	Pl	Pl_M
10	6	هَذِهِ	المُشْرِفُون	advisors	SG_F	Pl_M
10	7	هَؤُلَاءِ	المُشْرِفَات	advisors	Pl	Pl_F
10	8	هَذِهِ	المُشْرِفَات	advisors	SG_F	Pl_F
11	1	هَؤُلَاءِ	القَرِيب	relative	Pl	SG_M
11	2	هَذَا	القَرِيب	relative	SG_M	SG_M
11	3	هَؤُلَاءِ	القَرِيبَة	relative	Pl	SG_F
11	4	هَذِهِ	القَرِيبَة	relative	SG_F	SG_F
11	5	هَؤُلَاءِ	القَرِيبُون	relatives	Pl	Pl_M
11	6	هَذِهِ	القَرِيبُون	relatives	SG_F	Pl_M
11	7	هَؤُلَاءِ	القَرِيبَات	relatives	Pl	Pl_F

11	8	هَذِهِ	القَرِيبَات	relatives	SG_F	Pl_F
12	1	هَؤُلَاءِ	الغَرِيب	stranger	Pl	SG_M
12	2	هَذَا	الغَرِيب	stranger	SG_M	SG_M
12	3	هَؤُلَاءِ	الغَرِيبَة	stranger	Pl	SG_F
12	4	هَذِهِ	الغَرِيبَة	stranger	SG_F	SG_F
12	5	هَؤُلَاءِ	الغَرِيبُون	strangers	Pl	Pl_M
12	6	هَذِهِ	الغَرِيبُون	strangers	SG_F	Pl_M
12	7	هَؤُلَاءِ	الغَرِيبَات	strangers	Pl	Pl_F
12	8	هَذِهِ	الغَرِيبَات	strangers	SG_F	Pl_F
13	1	هَؤُلَاءِ	الدَّاعِي	inviter	Pl	SG_M
13	2	هَذَا	الدَّاعِي	inviter	SG_M	SG_M
13	3	هَؤُلَاءِ	الدَّاعِيَة	inviter	Pl	SG_F
13	4	هَذِهِ	الدَّاعِيَة	inviter	SG_F	SG_F
13	5	هَؤُلَاءِ	الدَّاعُون	inviters	Pl	Pl_M
13	6	هَذِهِ	الدَّاعُون	inviters	SG_F	Pl_M
13	7	هَؤُلَاءِ	الدَّاعِيَات	inviters	Pl	Pl_F
13	8	هَذِهِ	الدَّاعِيَات	inviters	SG_F	Pl_F
14	1	هَؤُلَاءِ	الخَبِير	expert	Pl	SG_M

14	2	هَذَا	الخَبِير	expert	SG_M	SG_M
14	3	هَؤُلَاءِ	الخَبِيرَة	expert	Pl	SG_F
14	4	هَذِهِ	الخَبِيرَة	expert	SG_F	SG_F
14	5	هَؤُلَاءِ	الخَبِيرُون	experts	Pl	Pl_M
14	6	هَذِهِ	الخَبِيرُون	experts	SG_F	Pl_M
14	7	هَؤُلَاءِ	الخَبِيرَات	experts	Pl	Pl_F
14	8	هَذِهِ	الخَبِيرَات	experts	SG_F	Pl_F
15	1	هَؤُلَاءِ	العَامِل	worker	Pl	SG_M
15	2	هَذَا	العَامِل	worker	SG_M	SG_M
15	3	هَؤُلَاءِ	العَامِلَة	worker	Pl	SG_F
15	4	هَذِهِ	العَامِلَة	worker	SG_F	SG_F
15	5	هَؤُلَاءِ	العَامِلُون	workers	Pl	Pl_M
15	6	هَذِهِ	العَامِلُون	workers	SG_F	Pl_M
15	7	هَؤُلَاءِ	العَامِلَات	workers	Pl	Pl_F
15	8	هَذِهِ	العَامِلَات	workers	SG_F	Pl_F
16	1	هَؤُلَاءِ	المَرِيض	patient	Pl	SG_M
16	2	هَذَا	المَرِيض	patient	SG_M	SG_M
16	3	هَؤُلَاءِ	المَرِيضَة	patient	Pl	SG_F

16	4	هَذِهِ	المَرِيضَة	patient	SG_F	SG_F
16	5	هَؤُلَاءِ	المَرِيضُون	patients	Pl	Pl_M
16	6	هَذِهِ	المَرِيضُون	patients	SG_F	Pl_M
16	7	هَؤُلَاءِ	المَرِيضَات	patients	Pl	Pl_F
16	8	هَذِهِ	المَرِيضَات	patients	SG_F	Pl_F
17	1	هَؤُلَاءِ	العَالِم	scholar	Pl	SG_M
17	2	هَذَا	العَالِم	scholar	SG_M	SG_M
17	3	هَؤُلَاءِ	العَالِمَة	scholar	Pl	SG_F
17	4	هَذِهِ	العَالِمَة	scholar	SG_F	SG_F
17	5	هَؤُلَاءِ	العَالِمُون	scholars	Pl	Pl_M
17	6	هَذِهِ	العَالِمُون	scholars	SG_F	Pl_M
17	7	هَؤُلَاءِ	العَالِمَات	scholars	Pl	Pl_F
17	8	هَذِهِ	العَالِمَات	scholars	SG_F	Pl_F
18	1	هَؤُلَاءِ	المُطْرِب	musician	Pl	SG_M
18	2	هَذَا	المُطْرِب	musician	SG_M	SG_M
18	3	هَؤُلَاءِ	المُطْرِبَة	musician	Pl	SG_F
18	4	هَذِهِ	المُطْرِبَة	musician	SG_F	SG_F
18	5	هَؤُلَاءِ	المُطْرِبُون	musicians	Pl	Pl_M

18	6	هَذِهِ	المُطْرِبُون	musicians	SG_F	Pl_M
18	7	هَؤُلَاءِ	المُطْرِبَات	musicians	Pl	Pl_F
18	8	هَذِهِ	المُطْرِبَات	musicians	SG_F	Pl_F
19	1	هَؤُلَاءِ	المُذِيع	announcer	Pl	SG_M
19	2	هَذَا	المُذِيع	announcer	SG_M	SG_M
19	3	هَؤُلَاءِ	المُذِيعَة	announcer	Pl	SG_F
19	4	هَذِهِ	المُذِيعَة	announcer	SG_F	SG_F
19	5	هَؤُلَاءِ	المُذِيعُون	announcers	Pl	Pl_M
19	6	هَذِهِ	المُذِيعُون	announcers	SG_F	Pl_M
19	7	هَؤُلَاءِ	المُذِيعَات	announcers	Pl	Pl_F
19	8	هَذِهِ	المُذِيعَات	announcers	SG_F	Pl_F
20	1	هَؤُلَاءِ	الخَادِم	servant	Pl	SG_M
20	2	هَذَا	الخَادِم	servant	SG_M	SG_M
20	3	هَؤُلَاءِ	الخَادِمَة	servant	Pl	SG_F
20	4	هَذِهِ	الخَادِمَة	servant	SG_F	SG_F
20	5	هَؤُلَاءِ	الخَادِمُون	servants	Pl	Pl_M
20	6	هَذِهِ	الخَادِمُون	servants	SG_F	Pl_M
20	7	هَؤُلَاءِ	الخَادِمَات	servants	Pl	Pl_F

20	8	هَذِهِ	الخَادِمَات	servants	SG_F	Pl_F
21	1	هَؤُلَاءِ	الزَّائِر	visitor	Pl	SG_M
21	2	هَذَا	الزَّائِر	visitor	SG_M	SG_M
21	3	هَؤُلَاءِ	الزَّائِرَة	visitor	Pl	SG_F
21	4	هَذِهِ	الزَّائِرَة	visitor	SG_F	SG_F
21	5	هَؤُلَاءِ	الزَّائِرُون	visitors	Pl	Pl_M
21	6	هَذِهِ	الزَّائِرُون	visitors	SG_F	Pl_M
21	7	هَؤُلَاءِ	الزَّائِرَات	visitors	Pl	Pl_F
21	8	هَذِهِ	الزَّائِرَات	visitors	SG_F	Pl_F
22	1	هَؤُلَاءِ	البَاحِث	researcher	Pl	SG_M
22	2	هَذَا	البَاحِث	researcher	SG_M	SG_M
22	3	هَؤُلَاءِ	البَاحِثَة	researcher	Pl	SG_F
22	4	هَذِهِ	البَاحِثَة	researcher	SG_F	SG_F
22	5	هَؤُلَاءِ	البَاحِثُون	researchers	Pl	Pl_M
22	6	هَذِهِ	البَاحِثُون	researchers	SG_F	Pl_M
22	7	هَؤُلَاءِ	البَاحِثَات	researchers	Pl	Pl_F
22	8	هَذِهِ	البَاحِثَات	researchers	SG_F	Pl_F
23	1	هَؤُلَاءِ	المَدْعُوّ	invitee	Pl	SG_M

23	2	هَذَا	المَدْعُوّ	invitee	SG_M	SG_M
23	3	هَؤُلَاءِ	المَدْعُوَّة	invitee	Pl	SG_F
23	4	هَذِهِ	المَدْعُوَّة	invitee	SG_F	SG_F
23	5	هَؤُلَاءِ	المَدْعُوُّون	invitees	Pl	Pl_M
23	6	هَذِهِ	المَدْعُوُّون	invitees	SG_F	Pl_M
23	7	هَؤُلَاءِ	المَدْعُوَّات	invitees	Pl	Pl_F
23	8	هَذِهِ	المَدْعُوَّات	invitees	SG_F	Pl_F
24	1	هَؤُلَاءِ	الفَائِز	winner	Pl	SG_M
24	2	هَذَا	الفَائِز	winner	SG_M	SG_M
24	3	هَؤُلَاءِ	الفَائِزَة	winner	Pl	SG_F
24	4	هَذِهِ	الفَائِزَة	winner	SG_F	SG_F
24	5	هَؤُلَاءِ	الفَائِزُون	winners	Pl	Pl_M
24	6	هَذِهِ	الفَائِزُون	winners	SG_F	Pl_M
24	7	هَؤُلَاءِ	الفَائِزَات	winners	Pl	Pl_F
24	8	هَذِهِ	الفَائِزَات	winners	SG_F	Pl_F
25	1	هَؤُلَاءِ	الخَاسِر	loser	Pl	SG_M
25	2	هَذَا	الخَاسِر	loser	SG_M	SG_M
25	3	هَؤُلَاءِ	الخَاسِرَة	loser	Pl	SG_F

25	4	هَذِهِ	الخَاسِرَة	loser	SG_F	SG_F
25	5	هَؤُلَاءِ	الخَاسِرُون	losers	Pl	Pl_M
25	6	هَذِهِ	الخَاسِرُون	losers	SG_F	Pl_M
25	7	هَؤُلَاءِ	الخَاسِرَات	losers	Pl	Pl_F
25	8	هَذِهِ	الخَاسِرَات	losers	SG_F	Pl_F
26	1	هَؤُلَاءِ	المُضِيف	host	Pl	SG_M
26	2	هَذَا	المُضِيف	host	SG_M	SG_M
26	3	هَؤُلَاءِ	المُضِيفَة	host	Pl	SG_F
26	4	هَذِهِ	المُضِيفَة	host	SG_F	SG_F
26	5	هَؤُلَاءِ	المُضِيفُون	hosts	Pl	Pl_M
26	6	هَذِهِ	المُضِيفُون	hosts	SG_F	Pl_M
26	7	هَؤُلَاءِ	المُضِيفَات	hosts	Pl	Pl_F
26	8	هَذِهِ	المُضِيفَات	hosts	SG_F	Pl_F
27	1	هَؤُلَاءِ	النَّاقِد	critic	Pl	SG_M
27	2	هَذَا	النَّاقِد	critic	SG_M	SG_M
27	3	هَؤُلَاءِ	النَّاقِدَة	critic	Pl	SG_F
27	4	هَذِهِ	النَّاقِدَة	critic	SG_F	SG_F
27	5	هَؤُلَاءِ	النَّاقِدُون	critics	Pl	Pl_M

27	6	هَذِهِ	النَّاقِدُون	critics	SG_F	Pl_M
27	7	هَؤُلَاءِ	النَّاقِدَات	critics	Pl	Pl_F
27	8	هَذِهِ	النَّاقِدَات	critics	SG_F	Pl_F
28	1	هَؤُلَاءِ	المَنْدُوب	agent	Pl	SG_M
28	2	هَذَا	المَنْدُوب	agent	SG_M	SG_M
28	3	هَؤُلَاءِ	المَنْدُوبَة	agent	Pl	SG_F
28	4	هَذِهِ	المَنْدُوبَة	agent	SG_F	SG_F
28	5	هَؤُلَاءِ	المَنْدُوبُون	agents	Pl	Pl_M
28	6	هَذِهِ	المَنْدُوبُون	agents	SG_F	Pl_M
28	7	هَؤُلَاءِ	المَنْدُوبَات	agents	Pl	Pl_F
28	8	هَذِهِ	المَنْدُوبَات	agents	SG_F	Pl_F
29	1	هَؤُلَاءِ	النَّاشِر	publisher	Pl	SG_M
29	2	هَذَا	النَّاشِر	publisher	SG_M	SG_M
29	3	هَؤُلَاءِ	النَّاشِرَة	publisher	Pl	SG_F
29	4	هَذِهِ	النَّاشِرَة	publisher	SG_F	SG_F
29	5	هَؤُلَاءِ	النَّاشِرُون	publishers	Pl	Pl_M
29	6	هَذِهِ	النَّاشِرُون	publishers	SG_F	Pl_M
29	7	هَؤُلَاءِ	النَّاشِرَات	publishers	Pl	Pl_F

29	8	هَذِهِ	النَّاشِرَات	publishers	SG_F	Pl_F
30	1	هَؤُلَاءِ	الشَّرْطِيّ	police-officer	Pl	SG_M
30	2	هَذَا	الشَّرْطِيّ	police-officer	SG_M	SG_M
30	3	هَؤُلَاءِ	الشَّرْطِيَّة	police-officer	Pl	SG_F
30	4	هَذِهِ	الشَّرْطِيَّة	police-officer	SG_F	SG_F
30	5	هَؤُلَاءِ	الشَّرْطِيُّون	police-officers	Pl	Pl_M
30	6	هَذِهِ	الشَّرْطِيُّون	police-officers	SG_F	Pl_M
30	7	هَؤُلَاءِ	الشَّرْطِيَّات	police-officers	Pl	Pl_F
30	8	هَذِهِ	الشَّرْطِيَّات	police-officers	SG_F	Pl_F
31	1	هَؤُلَاءِ	السَّائِح	tourist	Pl	SG_M
31	2	هَذَا	السَّائِح	tourist	SG_M	SG_M
31	3	هَؤُلَاءِ	السَّائِحَة	tourist	Pl	SG_F
31	4	هَذِهِ	السَّائِحَة	tourist	SG_F	SG_F
31	5	هَؤُلَاءِ	السَّائِحُون	tourists	Pl	Pl_M
31	6	هَذِهِ	السَّائِحُون	tourists	SG_F	Pl_M
31	7	هَؤُلَاءِ	السَّائِحَات	tourists	Pl	Pl_F
31	8	هَذِهِ	السَّائِحَات	tourists	SG_F	Pl_F
32	1	هَؤُلَاءِ	الصَّانِع	maker	Pl	SG_M

32	2	هَذَا	الصَّانِع	maker	SG_M	SG_M
32	3	هَؤُلَاءِ	الصَّانِعَة	maker	Pl	SG_F
32	4	هَذِهِ	الصَّانِعَة	maker	SG_F	SG_F
32	5	هَؤُلَاءِ	الصَّانِعُون	makers	Pl	Pl_M
32	6	هَذِهِ	الصَّانِعُون	makers	SG_F	Pl_M
32	7	هَؤُلَاءِ	الصَّانِعَات	makers	Pl	Pl_F
32	8	هَذِهِ	الصَّانِعَات	makers	SG_F	Pl_F
33	1	هَؤُلَاءِ	النَّاخِب	voter	Pl	SG_M
33	2	هَذَا	النَّاخِب	voter	SG_M	SG_M
33	3	هَؤُلَاءِ	النَّاخِبَة	voter	Pl	SG_F
33	4	هَذِهِ	النَّاخِبَة	voter	SG_F	SG_F
33	5	هَؤُلَاءِ	النَّاخِبُون	voters	Pl	Pl_M
33	6	هَذِهِ	النَّاخِبُون	voters	SG_F	Pl_M
33	7	هَؤُلَاءِ	النَّاخِبَات	voters	Pl	Pl_F
33	8	هَذِهِ	النَّاخِبَات	voters	SG_F	Pl_F
34	1	هَؤُلَاءِ	المُجْرِم	criminal	Pl	SG_M
34	2	هَذَا	المُجْرِم	criminal	SG_M	SG_M
34	3	هَؤُلَاءِ	المُجْرِمَة	criminal	Pl	SG_F

34	4	هَذِهِ	المُجْرِمَة	criminal	SG_F	SG_F
34	5	هَؤُلَاءِ	المُجْرِمُون	criminals	Pl	Pl_M
34	6	هَذِهِ	المُجْرِمُون	criminals	SG_F	Pl_M
34	7	هَؤُلَاءِ	المُجْرِمَات	criminals	Pl	Pl_F
34	8	هَذِهِ	المُجْرِمَات	criminals	SG_F	Pl_F
35	1	هَؤُلَاءِ	القَاتِل	murderer	Pl	SG_M
35	2	هَذَا	القَاتِل	murderer	SG_M	SG_M
35	3	هَؤُلَاءِ	القَاتِلَة	murderer	Pl	SG_F
35	4	هَذِهِ	القَاتِلَة	murderer	SG_F	SG_F
35	5	هَؤُلَاءِ	القَاتِلُون	murderers	Pl	Pl_M
35	6	هَذِهِ	القَاتِلُون	murderers	SG_F	Pl_M
35	7	هَؤُلَاءِ	القَاتِلَات	murderers	Pl	Pl_F
35	8	هَذِهِ	القَاتِلَات	murderers	SG_F	Pl_F
36	1	هَؤُلَاءِ	اللّاجِئ	refugee	Pl	SG_M
36	2	هَذَا	اللّاجِئ	refugee	SG_M	SG_M
36	3	هَؤُلَاءِ	اللّاجِئَة	refugee	Pl	SG_F
36	4	هَذِهِ	اللّاجِئَة	refugee	SG_F	SG_F
36	5	هَؤُلَاءِ	اللّاجِئُون	refugees	Pl	Pl_M

36	6	هَذِهِ	اللّاجِئُون	refugees	SG_F	Pl_M
36	7	هَؤُلَاءِ	اللّاجِئَات	refugees	Pl	Pl_F
36	8	هَذِهِ	اللّاجِئَات	refugees	SG_F	Pl_F
37	1	هَؤُلَاءِ	النّاطِق	spokesperson	Pl	SG_M
37	2	هَذَا	النّاطِق	spokesperson	SG_M	SG_M
37	3	هَؤُلَاءِ	النّاطِقَة	spokesperson	Pl	SG_F
37	4	هَذِهِ	النّاطِقَة	spokesperson	SG_F	SG_F
37	5	هَؤُلَاءِ	النّاطِقُون	spokespersons	Pl	Pl_M
37	6	هَذِهِ	النّاطِقُون	spokespersons	SG_F	Pl_M
37	7	هَؤُلَاءِ	النّاطِقَات	spokespersons	Pl	Pl_F
37	8	هَذِهِ	النّاطِقَات	spokespersons	SG_F	Pl_F
38	1	هَؤُلَاءِ	العَاجِز	disabled person	Pl	SG_M
38	2	هَذَا	العَاجِز	disabled person	SG_M	SG_M
38	3	هَؤُلَاءِ	العَاجِزَة	disabled person	Pl	SG_F
38	4	هَذِهِ	العَاجِزَة	disabled person	SG_F	SG_F
38	5	هَؤُلَاءِ	العَاجِزُون	disabled persons	Pl	Pl_M
38	6	هَذِهِ	العَاجِزُون	disabled persons	SG_F	Pl_M
38	7	هَؤُلَاءِ	العَاجِزَات	disabled persons	Pl	Pl_F

38	8	هَذِهِ	العَاجِزَات	disabled persons	SG_F	Pl_F
39	1	هَؤُلَاءِ	المُخْرِج	director	Pl	SG_M
39	2	هَذَا	المُخْرِج	director	SG_M	SG_M
39	3	هَؤُلَاءِ	المُخْرِجَة	director	Pl	SG_F
39	4	هَذِهِ	المُخْرِجَة	director	SG_F	SG_F
39	5	هَؤُلَاءِ	المُخْرِجُون	directors	Pl	Pl_M
39	6	هَذِهِ	المُخْرِجُون	directors	SG_F	Pl_M
39	7	هَؤُلَاءِ	المُخْرِجَات	directors	Pl	Pl_F
39	8	هَذِهِ	المُخْرِجَات	directors	SG_F	Pl_F
40	1	هَؤُلَاءِ	المَبْعُوث	delegate	Pl	SG_M
40	2	هَذَا	المَبْعُوث	delegate	SG_M	SG_M
40	3	هَؤُلَاءِ	المَبْعُوثَة	delegate	Pl	SG_F
40	4	هَذِهِ	المَبْعُوثَة	delegate	SG_F	SG_F
40	5	هَؤُلَاءِ	المَبْعُوثُون	delegates	Pl	Pl_M
40	6	هَذِهِ	المَبْعُوثُون	delegates	SG_F	Pl_M
40	7	هَؤُلَاءِ	المَبْعُوثَات	delegates	Pl	Pl_F
40	8	هَذِهِ	المَبْعُوثَات	delegates	SG_F	Pl_F
41	1	هَؤُلَاءِ	المُدَّعِي	plaintiff	Pl	SG_M

41	2	هَذَا	المُدَّعِي	plaintiff	SG_M	SG_M
41	3	هَؤُلَاءِ	المُدَّعِيَة	plaintiff	Pl	SG_F
41	4	هَذِهِ	المُدَّعِيَة	plaintiff	SG_F	SG_F
41	5	هَؤُلَاءِ	المُدَّعُون	plaintiffs	Pl	Pl_M
41	6	هَذِهِ	المُدَّعُون	plaintiffs	SG_F	Pl_M
41	7	هَؤُلَاءِ	المُدَّعِيَات	plaintiffs	Pl	Pl_F
41	8	هَذِهِ	المُدَّعِيَات	plaintiffs	SG_F	Pl_F
42	1	هَؤُلَاءِ	السَّامِع	listener	Pl	SG_M
42	2	هَذَا	السَّامِع	listener	SG_M	SG_M
42	3	هَؤُلَاءِ	السَّامِعَة	listener	Pl	SG_F
42	4	هَذِهِ	السَّامِعَة	listener	SG_F	SG_F
42	5	هَؤُلَاءِ	السَّامِعُون	listeners	Pl	Pl_M
42	6	هَذِهِ	السَّامِعُون	listeners	SG_F	Pl_M
42	7	هَؤُلَاءِ	السَّامِعات	listeners	Pl	Pl_F
42	8	هَذِهِ	السَّامِعات	listeners	SG_F	Pl_F
43	1	هَؤُلَاءِ	القَارِئ	reader	Pl	SG_M
43	2	هَذَا	القَارِئ	reader	SG_M	SG_M
43	3	هَؤُلَاءِ	القَارِئة	reader	Pl	SG_F

43	4	هَذِهِ	القَارِئة	reader	SG_F	SG_F
43	5	هَؤُلَاءِ	القَارِئُون	readers	Pl	Pl_M
43	6	هَذِهِ	القَارِئُون	readers	SG_F	Pl_M
43	7	هَؤُلَاءِ	القَارِئَات	readers	Pl	Pl_F
43	8	هَذِهِ	القَارِئَات	readers	SG_F	Pl_F
44	1	هَؤُلَاءِ	الجَرَّاح	surgeon	Pl	SG_M
44	2	هَذَا	الجَرَّاح	surgeon	SG_M	SG_M
44	3	هَؤُلَاءِ	الجَرَّاحَة	surgeon	Pl	SG_F
44	4	هَذِهِ	الجَرَّاحَة	surgeon	SG_F	SG_F
44	5	هَؤُلَاءِ	الجَرَّاحُون	surgeons	Pl	Pl_M
44	6	هَذِهِ	الجَرَّاحُون	surgeons	SG_F	Pl_M
44	7	هَؤُلَاءِ	الجَرَّاحات	surgeons	Pl	Pl_F
44	8	هَذِهِ	الجَرَّاحات	surgeons	SG_F	Pl_F
45	1	هَؤُلَاءِ	الطَبَّاخ	cook	Pl	SG_M
45	2	هَذَا	الطَبَّاخ	cook	SG_M	SG_M
45	3	هَؤُلَاءِ	الطَبَّاخَة	cook	Pl	SG_F
45	4	هَذِهِ	الطَبَّاخَة	cook	SG_F	SG_F
45	5	هَؤُلَاءِ	الطَبَّاخُون	cooks	Pl	Pl_M

45	6	هَذِهِ	الطَبَّاخُون	cooks	SG_F	Pl_M
45	7	هَؤُلَاءِ	الطَبَّاخَات	cooks	Pl	Pl_F
45	8	هَذِهِ	الطَبَّاخَات	cooks	SG_F	Pl_F
46	1	هَؤُلَاءِ	الرَسَّام	painter	Pl	SG_M
46	2	هَذَا	الرَسَّام	painter	SG_M	SG_M
46	3	هَؤُلَاءِ	الرَسَّامَة	painter	Pl	SG_F
46	4	هَذِهِ	الرَسَّامَة	painter	SG_F	SG_F
46	5	هَؤُلَاءِ	الرَسَّامُون	painters	Pl	Pl_M
46	6	هَذِهِ	الرَسَّامُون	painters	SG_F	Pl_M
46	7	هَؤُلَاءِ	الرَسَّامَات	painters	Pl	Pl_F
46	8	هَذِهِ	الرَسَّامَات	painters	SG_F	Pl_F
47	1	هَؤُلَاءِ	الخَيَّاط	tailor	Pl	SG_M
47	2	هَذَا	الخَيَّاط	tailor	SG_M	SG_M
47	3	هَؤُلَاءِ	الخَيَّاطَة	tailor	Pl	SG_F
47	4	هَذِهِ	الخَيَّاطَة	tailor	SG_F	SG_F
47	5	هَؤُلَاءِ	الخَيَّاطُون	tailors	Pl	Pl_M
47	6	هَذِهِ	الخَيَّاطُون	tailors	SG_F	Pl_M
47	7	هَؤُلَاءِ	الخَيَّاطَات	tailors	Pl	Pl_F

47	8	هَذِهِ	الخَيَّاطَات	tailors	SG_F	Pl_F
48	1	هَؤُلَاءِ	البَائِع	sales-person	Pl	SG_M
48	2	هَذَا	البَائِع	sales-person	SG_M	SG_M
48	3	هَؤُلَاءِ	البَائِعَة	sales-person	Pl	SG_F
48	4	هَذِهِ	البَائِعَة	sales-person	SG_F	SG_F
48	5	هَؤُلَاءِ	البَائِعُون	sales-persons	Pl	Pl_M
48	6	هَذِهِ	البَائِعُون	sales-person	SG_F	Pl_M
48	7	هَؤُلَاءِ	البَائِعَات	sales-person	Pl	Pl_F
48	8	هَذِهِ	البَائِعَات	sales-person	SG_F	Pl_F
49	1	هَؤُلَاءِ	المَانِح	donor	Pl	SG_M
49	2	هَذَا	المَانِح	donor	SG_M	SG_M
49	3	هَؤُلَاءِ	المَانِحَة	donor	Pl	SG_F
49	4	هَذِهِ	المَانِحَة	donor	SG_F	SG_F
49	5	هَؤُلَاءِ	المَانِحُون	donors	Pl	Pl_M
49	6	هَذِهِ	المَانِحُون	donors	SG_F	Pl_M
49	7	هَؤُلَاءِ	المَانِحَات	donors	Pl	Pl_F
49	8	هَذِهِ	المَانِحَات	donors	SG_F	Pl_F
50	1	هَؤُلَاءِ	الدَّارِس	learner	Pl	SG_M

50	2	هَذَا	الدَّارِس	learner	SG_M	SG_M
50	3	هَؤُلَاءِ	الدَّارِسَة	learner	Pl	SG_F
50	4	هَذِهِ	الدَّارِسَة	learner	SG_F	SG_F
50	5	هَؤُلَاءِ	الدَّارِسُون	learners	Pl	Pl_M
50	6	هَذِهِ	الدَّارِسُون	learners	SG_F	Pl_M
50	7	هَؤُلَاءِ	الدَّارِسَات	learners	Pl	Pl_F
50	8	هَذِهِ	الدَّارِسَات	learners	SG_F	Pl_F
51	1	هَؤُلَاءِ	الحَافِظ	keeper	Pl	SG_M
51	2	هَذَا	الحَافِظ	keeper	SG_M	SG_M
51	3	هَؤُلَاءِ	الحَافِظَة	keeper	Pl	SG_F
51	4	هَذِهِ	الحَافِظَة	keeper	SG_F	SG_F
51	5	هَؤُلَاءِ	الحَافِظُون	keepers	Pl	Pl_M
51	6	هَذِهِ	الحَافِظُون	keepers	SG_F	Pl_M
51	7	هَؤُلَاءِ	الحَافِظَات	keepers	Pl	Pl_F
51	8	هَذِهِ	الحَافِظَات	keepers	SG_F	Pl_F
52	1	هَؤُلَاءِ	الحَاضِر	attendee	Pl	SG_M
52	2	هَذَا	الحَاضِر	attendee	SG_M	SG_M
52	3	هَؤُلَاءِ	الحَاضِرَة	attendee	Pl	SG_F

52	4	هَذِهِ	الحَاضِرَة	attendee	SG_F	SG_F
52	5	هَؤُلَاءِ	الحَاضِرُون	attendees	Pl	Pl_M
52	6	هَذِهِ	الحَاضِرُون	attendees	SG_F	Pl_M
52	7	هَؤُلَاءِ	الحَاضِرَات	attendees	Pl	Pl_F
52	8	هَذِهِ	الحَاضِرَات	attendees	SG_F	Pl_F
53	1	هَؤُلَاءِ	النَّاشِط	activist	Pl	SG_M
53	2	هَذَا	النَّاشِط	activist	SG_M	SG_M
53	3	هَؤُلَاءِ	النَّاشِطَة	activist	Pl	SG_F
53	4	هَذِهِ	النَّاشِطَة	activist	SG_F	SG_F
53	5	هَؤُلَاءِ	النَّاشِطُون	activists	Pl	Pl_M
53	6	هَذِهِ	النَّاشِطُون	activists	SG_F	Pl_M
53	7	هَؤُلَاءِ	النَّاشِطَات	activists	Pl	Pl_F
53	8	هَذِهِ	النَّاشِطَات	activists	SG_F	Pl_F
54	1	هَؤُلَاءِ	المُسلِم	Muslim	Pl	SG_M
54	2	هَذَا	المُسلِم	Muslim	SG_M	SG_M
54	3	هَؤُلَاءِ	المُسلِمَة	Muslim	Pl	SG_F
54	4	هَذِهِ	المُسلِمَة	Muslim	SG_F	SG_F
54	5	هَؤُلَاءِ	المُسلِمُون	Muslims	Pl	Pl_M

54	6	هَذِهِ	المُسلِمُون	Muslims	SG_F	Pl_M
54	7	هَؤُلَاءِ	المُسلِمَات	Muslims	Pl	Pl_F
54	8	هَذِهِ	المُسلِمَات	Muslims	SG_F	Pl_F
55	1	هَؤُلَاءِ	المُشرِك	polytheist	Pl	SG_M
55	2	هَذَا	المُشرِك	polytheist	SG_M	SG_M
55	3	هَؤُلَاءِ	المُشرِكَة	polytheist	Pl	SG_F
55	4	هَذِهِ	المُشرِكَة	polytheist	SG_F	SG_F
55	5	هَؤُلَاءِ	المُشرِكُون	polytheists	Pl	Pl_M
55	6	هَذِهِ	المُشرِكُون	polytheists	SG_F	Pl_M
55	7	هَؤُلَاءِ	المُشرِكَات	polytheists	Pl	Pl_F
55	8	هَذِهِ	المُشرِكَات	polytheists	SG_F	Pl_F
56	1	هَؤُلَاءِ	المُلْحِد	atheist	Pl	SG_M
56	2	هَذَا	المُلْحِد	atheist	SG_M	SG_M
56	3	هَؤُلَاءِ	المُلْحِدَة	atheist	Pl	SG_F
56	4	هَذِهِ	المُلْحِدَة	atheist	SG_F	SG_F
56	5	هَؤُلَاءِ	المُلْحِدُون	atheists	Pl	Pl_M
56	6	هَذِهِ	المُلْحِدُون	atheists	SG_F	Pl_M
56	7	هَؤُلَاءِ	المُلْحِدَات	atheists	Pl	Pl_F

56	8	هَذِهِ	المُلْحِدَات	atheists	SG_F	Pl_F
57	1	هَؤُلَاءِ	المُؤمِن	believer	Pl	SG_M
57	2	هَذَا	المُؤمِن	believer	SG_M	SG_M
57	3	هَؤُلَاءِ	المُؤمِنَة	believer	Pl	SG_F
57	4	هَذِهِ	المُؤمِنَة	believer	SG_F	SG_F
57	5	هَؤُلَاءِ	المُؤمِنُون	believers	Pl	Pl_M
57	6	هَذِهِ	المُؤمِنُون	believers	SG_F	Pl_M
57	7	هَؤُلَاءِ	المُؤمِنَات	believers	Pl	Pl_F
57	8	هَذِهِ	المُؤمِنَات	believers	SG_F	Pl_F
58	1	هَؤُلَاءِ	المُقرِئ	reader of Qur'an	Pl	SG_M
58	2	هَذَا	المُقرِئ	reader of Qur'an	SG_M	SG_M
58	3	هَؤُلَاءِ	المُقرِئَة	reader of Qur'an	Pl	SG_F
58	4	هَذِهِ	المُقرِئَة	reader of Qur'an	SG_F	SG_F
58	5	هَؤُلَاءِ	المُقرِئُون	readers of Qur'an	Pl	Pl_M
58	6	هَذِهِ	المُقرِئُون	readers of Qur'an	SG_F	Pl_M
58	7	هَؤُلَاءِ	المُقرِئَات	readers of Qur'an	Pl	Pl_F
58	8	هَذِهِ	المُقرِئَات	readers of Qur'an	SG_F	Pl_F
59	1	هَؤُلَاءِ	المُذنِب	guilty	Pl	SG_M

59	2	هَذَا	المُذنِب	guilty	SG_M	SG_M
59	3	هَؤُلَاءِ	المُذنِبَة	guilty	Pl	SG_F
59	4	هَذِهِ	المُذنِبَة	guilty	SG_F	SG_F
59	5	هَؤُلَاءِ	المُذنِبُون	guilty.Pl	Pl	Pl_M
59	6	هَذِهِ	المُذنِبُون	guilty.Pl	SG_F	Pl_M
59	7	هَؤُلَاءِ	المُذنِبَات	guilty.Pl	Pl	Pl_F
59	8	هَذِهِ	المُذنِبَات	guilty.Pl	SG_F	Pl_F
60	1	هَؤُلَاءِ	الشَّارِد	escapee	Pl	SG_M
60	2	هَذَا	الشَّارِد	escapee	SG_M	SG_M
60	3	هَؤُلَاءِ	الشَّارِدَة	escapee	Pl	SG_F
60	4	هَذِهِ	الشَّارِدَة	escapee	SG_F	SG_F
60	5	هَؤُلَاءِ	الشَّارِدُون	escapees	Pl	Pl_M
60	6	هَذِهِ	الشَّارِدُون	escapees	SG_F	Pl_M
60	7	هَؤُلَاءِ	الشَّارِدَات	escapees	Pl	Pl_F
60	8	هَذِهِ	الشَّارِدَات	escapees	SG_F	Pl_F
61	1	هَؤُلَاءِ	العَاقِل	sane	Pl	SG_M
61	2	هَذَا	العَاقِل	sane	SG_M	SG_M
61	3	هَؤُلَاءِ	العَاقِلَة	sane	Pl	SG_F

61	4	هَذِهِ	العَاقِلَة	sane	SG_F	SG_F
61	5	هَؤُلَاءِ	العَاقِلُون	sane.Pl	Pl	Pl_M
61	6	هَذِهِ	العَاقِلُون	sane.Pl	SG_F	Pl_M
61	7	هَؤُلَاءِ	العَاقِلَات	sane.Pl	Pl	Pl_F
61	8	هَذِهِ	العَاقِلَات	sane.Pl	SG_F	Pl_F
62	1	هَؤُلَاءِ	الرافِض	refuser	Pl	SG_M
62	2	هَذَا	الرافِض	refuser	SG_M	SG_M
62	3	هَؤُلَاءِ	الرافِضَة	refuser	Pl	SG_F
62	4	هَذِهِ	الرافِضَة	refuser	SG_F	SG_F
62	5	هَؤُلَاءِ	الرافِضُون	refusers	Pl	Pl_M
62	6	هَذِهِ	الرافِضُون	refusers	SG_F	Pl_M
62	7	هَؤُلَاءِ	الرافِضَات	refusers	Pl	Pl_F
62	8	هَذِهِ	الرافِضَات	refusers	SG_F	Pl_F
63	1	هَؤُلَاءِ	العَاطِل	unemployed	Pl	SG_M
63	2	هَذَا	العَاطِل	unemployed	SG_M	SG_M
63	3	هَؤُلَاءِ	العَاطِلَة	unemployed	Pl	SG_F
63	4	هَذِهِ	العَاطِلَة	unemployed	SG_F	SG_F
63	5	هَؤُلَاءِ	العَاطِلُون	unemployed.Pl	Pl	Pl_M

63	6	هَذِهِ	العَاطِلُون	unemployed.Pl	SG_F	Pl_M
63	7	هَؤُلَاءِ	العَاطِلَات	unemployed.Pl	Pl	Pl_F
63	8	هَذِهِ	العَاطِلَات	unemployed.Pl	SG_F	Pl_F
64	1	هَؤُلَاءِ	السَّارِق	thief	Pl	SG_M
64	2	هَذَا	السَّارِق	thief	SG_M	SG_M
64	3	هَؤُلَاءِ	السَّارِقَة	thief	Pl	SG_F
64	4	هَذِهِ	السَّارِقَة	thief	SG_F	SG_F
64	5	هَؤُلَاءِ	السَّارِقُون	thieves	Pl	Pl_M
64	6	هَذِهِ	السَّارِقُون	thieves	SG_F	Pl_M
64	7	هَؤُلَاءِ	السَّارِقَات	thieves	Pl	Pl_F
64	8	هَذِهِ	السَّارِقَات	thieves	SG_F	Pl_F
1	1	هَؤُلَاءِ	الكُرْسِيّ	chair	Pl	SG_M
1	2	هَذَا	الكُرْسِيّ	chair	SG_M	SG_M
1	3	هَؤُلَاءِ	الدِّرَاسَة	study	Pl	SG_F
1	4	هَذِهِ	الدِّرَاسَة	study	SG_F	SG_F
1	5	هَؤُلَاءِ	الكَرَاسِي	chairs	Pl	Pl_M
1	6	هَذِهِ	الكَرَاسِي	chairs	SG_F	Pl_M
1	7	هَؤُلَاءِ	الدِّرَاسَات	studies	Pl	Pl_F

1	8	هَذِهِ	الدِّرَاسَات	studies	SG_F	Pl_F
2	1	هَؤُلَاءِ	الكَوْكَب	planet	Pl	SG_M
2	2	هَذَا	الكَوْكَب	planet	SG_M	SG_M
2	3	هَؤُلَاءِ	الصَّحِيْفَة	newspaper	Pl	SG_F
2	4	هَذِهِ	الصَّحِيْفَة	newspaper	SG_F	SG_F
2	5	هَؤُلَاءِ	الكَواكِب	planets	Pl	Pl_M
2	6	هَذِهِ	الكَواكِب	planets	SG_F	Pl_M
2	7	هَؤُلَاءِ	الصُّحُف	newspapers	Pl	Pl_F
2	8	هَذِهِ	الصُّحُف	newspapers	SG_F	Pl_F
3	1	هَؤُلَاءِ	الطَّلَب	request	Pl	SG_M
3	2	هَذَا	الطَّلَب	request	SG_M	SG_M
3	3	هَؤُلَاءِ	التَّنُّورَة	skirt	Pl	SG_F
3	4	هَذِهِ	التَّنُّورَة	skirt	SG_F	SG_F
3	5	هَؤُلَاءِ	الطَّلَبَات	requests	Pl	Pl_M
3	6	هَذِهِ	الطَّلَبَات	requests	SG_F	Pl_M
3	7	هَؤُلَاءِ	التَّنُّورَات	skirts	Pl	Pl_F
3	8	هَذِهِ	التَّنُّورَات	skirts	SG_F	Pl_F
4	1	هَؤُلَاءِ	المَدْخَل	entrance	Pl	SG_M

4	2	هَذَا	المَدْخَل	entrance	SG_M	SG_M
4	3	هَؤُلَاءِ	الجَامِعَة	university	Pl	SG_F
4	4	هَذِهِ	الجَامِعَة	university	SG_F	SG_F
4	5	هَؤُلَاءِ	المَدَاخِل	entrances	Pl	Pl_M
4	6	هَذِهِ	المَدَاخِل	entrances	SG_F	Pl_M
4	7	هَؤُلَاءِ	الجَامِعَات	universities	Pl	Pl_F
4	8	هَذِهِ	الجَامِعَات	universities	SG_F	Pl_F
5	1	هَؤُلَاءِ	الجَبَل	mountain	Pl	SG_M
5	2	هَذَا	الجَبَل	mountain	SG_M	SG_M
5	3	هَؤُلَاءِ	المَدِيْنَة	city	Pl	SG_F
5	4	هَذِهِ	المَدِيْنَة	city	SG_F	SG_F
5	5	هَؤُلَاءِ	الجِبَال	mountains	Pl	Pl_M
5	6	هَذِهِ	الجِبَال	mountains	SG_F	Pl_M
5	7	هَؤُلَاءِ	المُدُن	cities	Pl	Pl_F
5	8	هَذِهِ	المُدُن	cities	SG_F	Pl_F
6	1	هَؤُلَاءِ	المَطْعَم	restaurant	Pl	SG_M
6	2	هَذَا	المَطْعَم	restaurant	SG_M	SG_M
6	3	هَؤُلَاءِ	السَّفِينَة	ship	Pl	SG_F

6	4	هَذِهِ	السَّفِينَة	ship	SG_F	SG_F
6	5	هَؤُلَاءِ	المَطَاعِم	restaurants	Pl	Pl_M
6	6	هَذِهِ	المَطَاعِم	restaurants	SG_F	Pl_M
6	7	هَؤُلَاءِ	السُّفُن	ships	Pl	Pl_F
6	8	هَذِهِ	السُّفُن	ships	SG_F	Pl_F
7	1	هَؤُلَاءِ	الخَطَأ	mistake	Pl	SG_M
7	2	هَذَا	الخَطَأ	mistake	SG_M	SG_M
7	3	هَؤُلَاءِ	المَرْكَبَة	vehicle	Pl	SG_F
7	4	هَذِهِ	المَرْكَبَة	vehicle	SG_F	SG_F
7	5	هَؤُلَاءِ	الأَخْطَاء	mistakes	Pl	Pl_M
7	6	هَذِهِ	الأَخْطَاء	mistakes	SG_F	Pl_M
7	7	هَؤُلَاءِ	المَرْكَبَات	vehicles	Pl	Pl_F
7	8	هَذِهِ	المَرْكَبَات	vehicles	SG_F	Pl_F
8	1	هَؤُلَاءِ	السَّرِيْر	bed	Pl	SG_M
8	2	هَذَا	السَّرِيْر	bed	SG_M	SG_M
8	3	هَؤُلَاءِ	الحَافِلَة	bus	Pl	SG_F
8	4	هَذِهِ	الحَافِلَة	bus	SG_F	SG_F
8	5	هَؤُلَاءِ	الأَسِرَّة	beds	Pl	Pl_M

8	6	هَذِهِ	الأَسِرَّة	beds	SG_F	Pl_M
8	7	هَؤُلَاءِ	الحَافِلَات	buses	Pl	Pl_F
8	8	هَذِهِ	الحَافِلَات	buses	SG_F	Pl_F
9	1	هَؤُلَاءِ	الزَّمَن	time	Pl	SG_M
9	2	هَذَا	الزَّمَن	time	SG_M	SG_M
9	3	هَؤُلَاءِ	الشَّاحِنَة	truck	Pl	SG_F
9	4	هَذِهِ	الشَّاحِنَة	truck	SG_F	SG_F
9	5	هَؤُلَاءِ	الأزمِنَة	times	Pl	Pl_M
9	6	هَذِهِ	الأزمِنَة	times	SG_F	Pl_M
9	7	هَؤُلَاءِ	الشَّاحِنَات	trucks	Pl	Pl_F
9	8	هَذِهِ	الشَّاحِنَات	trucks	SG_F	Pl_F
10	1	هَؤُلَاءِ	الفُنْدُق	hotel	Pl	SG_M
10	2	هَذَا	الفُنْدُق	hotel	SG_M	SG_M
10	3	هَؤُلَاءِ	العَرَبَة	cart	Pl	SG_F
10	4	هَذِهِ	العَرَبَة	cart	SG_F	SG_F
10	5	هَؤُلَاءِ	الفَنَادِق	hotels	Pl	Pl_M
10	6	هَذِهِ	الفَنَادِق	hotels	SG_F	Pl_M
10	7	هَؤُلَاءِ	العَرَبَات	carts	Pl	Pl_F

10	8	هَذِهِ	العَرَبَات	carts	SG_F	Pl_F
11	1	هَؤُلَاءِ	الخَبَر	news	Pl	SG_M
11	2	هَذَا	الخَبَر	news	SG_M	SG_M
11	3	هَؤُلَاءِ	السَيَّارَة	car	Pl	SG_F
11	4	هَذِهِ	السَيَّارَة	car	SG_F	SG_F
11	5	هَؤُلَاءِ	الأَخْبَار	news Pl	Pl	Pl_M
11	6	هَذِهِ	الأَخْبَار	news Pl	SG_F	Pl_M
11	7	هَؤُلَاءِ	السَيَّارَات	cars	Pl	Pl_F
11	8	هَذِهِ	السَيَّارَات	cars	SG_F	Pl_F
12	1	هَؤُلَاءِ	المَسْجِد	mosque	Pl	SG_M
12	2	هَذَا	المَسْجِد	mosque	SG_M	SG_M
12	3	هَؤُلَاءِ	المَدْرَسَة	school	Pl	SG_F
12	4	هَذِهِ	المَدْرَسَة	school	SG_F	SG_F
12	5	هَؤُلَاءِ	المَسَاجِد	mosques	Pl	Pl_M
12	6	هَذِهِ	المَسَاجِد	mosques	SG_F	Pl_M
12	7	هَؤُلَاءِ	المَدَارِس	schools	Pl	Pl_F
12	8	هَذِهِ	المَدَارِس	schools	SG_F	Pl_F
13	1	هَؤُلَاءِ	القَمَر	moon	Pl	SG_M

13	2	هَذَا	القَمَر	moon	SG_M	SG_M
13	3	هَؤُلَاءِ	المَحَطّة	station	Pl	SG_F
13	4	هَذِهِ	المَحَطّة	station	SG_F	SG_F
13	5	هَؤُلَاءِ	الأَقْمَار	moons	Pl	Pl_M
13	6	هَذِهِ	الأَقْمَار	moons	SG_F	Pl_M
13	7	هَؤُلَاءِ	المَحَطّات	stations	Pl	Pl_F
13	8	هَذِهِ	المَحَطّات	stations	SG_F	Pl_F
14	1	هَؤُلَاءِ	الحِذَاء	shoe	Pl	SG_M
14	2	هَذَا	الحِذَاء	shoe	SG_M	SG_M
14	3	هَؤُلَاءِ	الطّائِرَة	airplane	Pl	SG_F
14	4	هَذِهِ	الطّائِرَة	airplane	SG_F	SG_F
14	5	هَؤُلَاءِ	الأَحْذِيَة	shoes	Pl	Pl_M
14	6	هَذِهِ	الأَحْذِيَة	shoes	SG_F	Pl_M
14	7	هَؤُلَاءِ	الطّائِرَات	airplanes	Pl	Pl_F
14	8	هَذِهِ	الطّائِرَات	airplanes	SG_F	Pl_F
15	1	هَؤُلَاءِ	العَدَد	number	Pl	SG_M
15	2	هَذَا	العَدَد	number	SG_M	SG_M
15	3	هَؤُلَاءِ	العَاصِمَة	capital	Pl	SG_F

15	4	هَذِهِ	العَاصِمَة	capital	SG_F	SG_F
15	5	هَؤُلَاءِ	الأَعْدَاد	numbers	Pl	Pl_M
15	6	هَذِهِ	الأَعْدَاد	numbers	SG_F	Pl_M
15	7	هَؤُلَاءِ	العَواصِم	capitals	Pl	Pl_F
15	8	هَذِهِ	العَواصِم	capitals	SG_F	Pl_F
16	1	هَؤُلَاءِ	الكِتَاب	book	Pl	SG_M
16	2	هَذَا	الكِتَاب	book	SG_M	SG_M
16	3	هَؤُلَاءِ	الرِّيَاضَة	sport	Pl	SG_F
16	4	هَذِهِ	الرِّيَاضَة	sport	SG_F	SG_F
16	5	هَؤُلَاءِ	الكُتُب	books	Pl	Pl_M
16	6	هَذِهِ	الكُتُب	books	SG_F	Pl_M
16	7	هَؤُلَاءِ	الرِّيَاضَات	sports	Pl	Pl_F
16	8	هَذِهِ	الرِّيَاضَات	sports	SG_F	Pl_F
17	1	هَؤُلَاءِ	التَّارِيخ	date	Pl	SG_M
17	2	هَذَا	التَّارِيخ	date	SG_M	SG_M
17	3	هَؤُلَاءِ	الشَّبَكَة	network	Pl	SG_F
17	4	هَذِهِ	الشَّبَكَة	network	SG_F	SG_F
17	5	هَؤُلَاءِ	التَّوارِيخ	dates	Pl	Pl_M

17	6	هَذِهِ	التَّوارِيخ	dates	SG_F	Pl_M
17	7	هَؤُلَاءِ	الشَّبَكَات	networks	Pl	Pl_F
17	8	هَذِهِ	الشَّبَكَات	networks	SG_F	Pl_F
18	1	هَؤُلَاءِ	القَمِيص	shirt	Pl	SG_M
18	2	هَذَا	القَمِيص	shirt	SG_M	SG_M
18	3	هَؤُلَاءِ	الدَّائِرَة	circle	Pl	SG_F
18	4	هَذِهِ	الدَّائِرَة	circle	SG_F	SG_F
18	5	هَؤُلَاءِ	القُمْصَان	shirts	Pl	Pl_M
18	6	هَذِهِ	القُمْصَان	shirts	SG_F	Pl_M
18	7	هَؤُلَاءِ	الدَّوَائِر	circles	Pl	Pl_F
18	8	هَذِهِ	الدَّوَائِر	circles	SG_F	Pl_F
19	1	هَؤُلَاءِ	الخَاتِم	ring	Pl	SG_M
19	2	هَذَا	الخَاتِم	ring	SG_M	SG_M
19	3	هَؤُلَاءِ	المَكْتَبَة	library	Pl	SG_F
19	4	هَذِهِ	المَكْتَبَة	library	SG_F	SG_F
19	5	هَؤُلَاءِ	الخَوَاتِم	rings	Pl	Pl_M
19	6	هَذِهِ	الخَوَاتِم	rings	SG_F	Pl_M
19	7	هَؤُلَاءِ	المَكْتَبَات	libraries	Pl	Pl_F

19	8	هَذِهِ	المَكْتَبَات	libraries	SG_F	Pl_F
20	1	هَؤُلَاءِ	الحِزَام	belt	Pl	SG_M
20	2	هَذَا	الحِزَام	belt	SG_M	SG_M
20	3	هَؤُلَاءِ	الطَّاوِلَة	table	Pl	SG_F
20	4	هَذِهِ	الطَّاوِلَة	table	SG_F	SG_F
20	5	هَؤُلَاءِ	الأَحْزِمَة	belts	Pl	Pl_M
20	6	هَذِهِ	الأَحْزِمَة	belts	SG_F	Pl_M
20	7	هَؤُلَاءِ	الطَّاوِلَات	tables	Pl	Pl_F
20	8	هَذِهِ	الطَّاوِلَات	tables	SG_F	Pl_F
21	1	هَؤُلَاءِ	الفُسْتَان	dress	Pl	SG_M
21	2	هَذَا	الفُسْتَان	dress	SG_M	SG_M
21	3	هَؤُلَاءِ	الحَدِيقَة	garden	Pl	SG_F
21	4	هَذِهِ	الحَدِيقَة	garden	SG_F	SG_F
21	5	هَؤُلَاءِ	الفَسَاتِين	dresses	Pl	Pl_M
21	6	هَذِهِ	الفَسَاتِين	dresses	SG_F	Pl_M
21	7	هَؤُلَاءِ	الحَدَائِق	gardens	Pl	Pl_F
21	8	هَذِهِ	الحَدَائِق	gardens	SG_F	Pl_F
22	1	هَؤُلَاءِ	المَكْتَب	desk	Pl	SG_M

22	2	هَذَا	المَكْتَب	desk	SG_M	SG_M
22	3	هَؤُلَاءِ	الحَقِيبَة	purse	Pl	SG_F
22	4	هَذِهِ	الحَقِيبَة	purse	SG_F	SG_F
22	5	هَؤُلَاءِ	المَكَاتِب	desks	Pl	Pl_M
22	6	هَذِهِ	المَكَاتِب	desks	SG_F	Pl_M
22	7	هَؤُلَاءِ	الحَقائِب	purses	Pl	Pl_F
22	8	هَذِهِ	الحَقائِب	purses	SG_F	Pl_F
23	1	هَؤُلَاءِ	الحِجَاب	hijab	Pl	SG_M
23	2	هَذَا	الحِجَاب	hijab	SG_M	SG_M
23	3	هَؤُلَاءِ	الوَرَقَة	paper	Pl	SG_F
23	4	هَذِهِ	الوَرَقَة	paper	SG_F	SG_F
23	5	هَؤُلَاءِ	الحِجَابَات	hijabs	Pl	Pl_M
23	6	هَذِهِ	الحِجَابَات	hijabs	SG_F	Pl_M
23	7	هَؤُلَاءِ	الأورَاق	papers	Pl	Pl_F
23	8	هَذِهِ	الأورَاق	papers	SG_F	Pl_F
24	1	هَؤُلَاءِ	الحَائِط	wall	Pl	SG_M
24	2	هَذَا	الحَائِط	wall	SG_M	SG_M
24	3	هَؤُلَاءِ	الجَمْعِيَّة	association	Pl	SG_F

24	4	هَذِهِ	الجَمْعِيَّة	association	SG_F	SG_F
24	5	هَؤُلَاءِ	الحِيطَان	walls	Pl	Pl_M
24	6	هَذِهِ	الحِيطَان	walls	SG_F	Pl_M
24	7	هَؤُلَاءِ	الجَمْعِيَّات	associations	Pl	Pl_F
24	8	هَذِهِ	الجَمْعِيَّات	associations	SG_F	Pl_F
25	1	هَؤُلَاءِ	المَنْزِل	house	Pl	SG_M
25	2	هَذَا	المَنْزِل	house	SG_M	SG_M
25	3	هَؤُلَاءِ	القَصِيدَة	poem	Pl	SG_F
25	4	هَذِهِ	القَصِيدَة	poem	SG_F	SG_F
25	5	هَؤُلَاءِ	المَنَازِل	houses	Pl	Pl_M
25	6	هَذِهِ	المَنَازِل	houses	SG_F	Pl_M
25	7	هَؤُلَاءِ	القَصَائِد	poems	Pl	Pl_F
25	8	هَذِهِ	القَصَائِد	poems	SG_F	Pl_F
26	1	هَؤُلَاءِ	الشَّارِع	street	Pl	SG_M
26	2	هَذَا	الشَّارِع	street	SG_M	SG_M
26	3	هَؤُلَاءِ	البُحَيْرَة	lake	Pl	SG_F
26	4	هَذِهِ	البُحَيْرَة	lake	SG_F	SG_F
26	5	هَؤُلَاءِ	الشَّوارِع	streets	Pl	Pl_M

26	6	هَذِهِ	الشَّوارِع	streets	SG_F	Pl_M
26	7	هَؤُلَاءِ	البُحَيْرَات	lakes	Pl	Pl_F
26	8	هَذِهِ	البُحَيْرَات	lakes	SG_F	Pl_F
27	1	هَؤُلَاءِ	الصُّنْدُوق	box	Pl	SG_M
27	2	هَذَا	الصُّنْدُوق	box	SG_M	SG_M
27	3	هَؤُلَاءِ	المُبَارَاة	game	Pl	SG_F
27	4	هَذِهِ	المُبَارَاة	game	SG_F	SG_F
27	5	هَؤُلَاءِ	الصَّنَادِيق	boxes	Pl	Pl_M
27	6	هَذِهِ	الصَّنَادِيق	boxes	SG_F	Pl_M
27	7	هَؤُلَاءِ	المُبَارَيَات	games	Pl	Pl_F
27	8	هَذِهِ	المُبَارَيَات	games	SG_F	Pl_F
28	1	هَؤُلَاءِ	المَطَار	airport	Pl	SG_M
28	2	هَذَا	المَطَار	airport	SG_M	SG_M
28	3	هَؤُلَاءِ	الثَّلّاجَة	refrigerator	Pl	SG_F
28	4	هَذِهِ	الثَّلّاجَة	refrigerator	SG_F	SG_F
28	5	هَؤُلَاءِ	المَطَارَات	airports	Pl	Pl_M
28	6	هَذِهِ	المَطَارَات	airports	SG_F	Pl_M
28	7	هَؤُلَاءِ	الثَّلّاجَات	refrigerators	Pl	Pl_F

28	8	هَذِهِ	الثَّلّاجَات	refrigerators	SG_F	Pl_F
29	1	هَؤُلَاءِ	الصَّارُوخ	rocket	Pl	SG_M
29	2	هَذَا	الصَّارُوخ	rocket	SG_M	SG_M
29	3	هَؤُلَاءِ	العَاصِفَة	storm	Pl	SG_F
29	4	هَذِهِ	العَاصِفَة	storm	SG_F	SG_F
29	5	هَؤُلَاءِ	الصَّوَاريخ	rockets	Pl	Pl_M
29	6	هَذِهِ	الصَّوَاريخ	rockets	SG_F	Pl_M
29	7	هَؤُلَاءِ	العَوَاصِف	storms	Pl	Pl_F
29	8	هَذِهِ	العَوَاصِف	storms	SG_F	Pl_F
30	1	هَؤُلَاءِ	القِطَار	train	Pl	SG_M
30	2	هَذَا	القِطَار	train	SG_M	SG_M
30	3	هَؤُلَاءِ	الشّرِكَة	company	Pl	SG_F
30	4	هَذِهِ	الشّرِكَة	company	SG_F	SG_F
30	5	هَؤُلَاءِ	القِطَارَات	trains	Pl	Pl_M
30	6	هَذِهِ	القِطَارَات	trains	SG_F	Pl_M
30	7	هَؤُلَاءِ	الشّرِكَات	companies	Pl	Pl_F
30	8	هَذِهِ	الشّرِكَات	companies	SG_F	Pl_F
31	1	هَؤُلَاءِ	المِيْنَاء	seaport	Pl	SG_M

31	2	هَذَا	المِيْنَاء	seaport	SG_M	SG_M
31	3	هَؤُلَاءِ	الكَلِمَة	word	Pl	SG_F
31	4	هَذِهِ	الكَلِمَة	word	SG_F	SG_F
31	5	هَؤُلَاءِ	المَوَانِئ	seaports	Pl	Pl_M
31	6	هَذِهِ	المَوَانِئ	seaports	SG_F	Pl_M
31	7	هَؤُلَاءِ	الكَلِمَات	words	Pl	Pl_F
31	8	هَذِهِ	الكَلِمَات	words	SG_F	Pl_F
32	1	هَؤُلَاءِ	الجِهَاز	device	Pl	SG_M
32	2	هَذَا	الجِهَاز	device	SG_M	SG_M
32	3	هَؤُلَاءِ	المُشْكِلَة	problem	Pl	SG_F
32	4	هَذِهِ	المُشْكِلَة	problem	SG_F	SG_F
32	5	هَؤُلَاءِ	الأَجْهِزَة	devices	Pl	Pl_M
32	6	هَذِهِ	الأَجْهِزَة	devices	SG_F	Pl_M
32	7	هَؤُلَاءِ	المَشَاكِل	problems	Pl	Pl_F
32	8	هَذِهِ	المَشَاكِل	problems	SG_F	Pl_F
1	1	هَذَا	البَحَّار	sailor	SG_M	SG_M
1	2	هَؤُلَاءِ	البَحَّارُون	sailors	PL_M	PL_M

1	3	هَذَا	النَّجَّار	carpenter	SG_M	SG_M
1	4	هَؤُلَاءِ	النَّجَّارُون	carpenters	PL_M	PL_M
2	1	هَذِهِ	المُعَلِّمَة	teacher	SG_F	SG_F
2	2	هَؤُلَاءِ	المُعَلِّمَات	teachers	PL_F	PL_F
2	3	هَذِهِ	المُسَاعِدَة	assistant	SG_F	SG_F
2	4	هَؤُلَاءِ	المُسَاعِدَات	assistants	PL_F	PL_F
3	1	هَذَا	القَبْر	grave	SG_M	SG_M
3	2	هَذِهِ	القُبُور	graves	SG_M	PL_M
3	3	هَذَا	الضَّوْء	light	SG_M	SG_M
3	4	هَذِهِ	الأَضْوَاء	lights	SG_M	PL_M
4	1	هَذِهِ	المَائِدَة	banquet	SG_F	SG_F
4	2	هَذِهِ	المَوَائِد	banquets	SG_F	PL_F
4	3	هَذِهِ	الكُرَة	ball	SG_F	SG_F
4	4	هَذِهِ	الكُرَات	balls	SG_F	PL_F