Psychology of Language and Communication 2013, Vol. 17, No. 2

VERSITAOPEN

DOI: 10.2478/plc-2013-0013

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INFLECTIONAL CHANGE PATTERNS IN ARABIC

Most approaches to inflectional morphology propose a single-default representation. This research on Jordanian Arabic offers an analysis having more than one default inflection. This is accomplished by showing that unlike previous morphological accounts like the single-mechanism model, dual-mechanism model, and the schema model (cf. Pinker, 1990; Rumelhart & McClelland, 1986; and Bybee, 1985), the current research relies upon the 'openness' mechanism to define defaultness. Openness is thus defined as the ability of the inflectional process to accept new forms into a language. The corpus used in this research contains diminutives, verbal nouns, derivatives, and loan words used in JA. Other defining factors are modified in this research, such as regularity (rule-based mechanism) and productivity (type frequency). The findings of this research indicate that there are two possible defaults in Jordanian Arabic ordered in terms of openness: the sound feminine plural and the iambic broken plural. The findings have the implication that a language's grammar can have a multi-default system.

Key words: Arabic language, inflection, grammar, language patterns

Introduction

The study of inflectional morphology has been the subject of much debate between the symbolic accounts (Pinker & Prince, 1988; Marcus et al., 1992; Marcus et al., 1995; Clahsen, 1996; Pinker, 1998) and associative accounts of cognition (Rumelhart & McClelland, 1986; McWhinny & Leinbach, 1991; Plunkett & Marchmann, 1993; Stemberger, 1994; Bybee, 1995). Both theories converge on the proposal that irregular inflection is processed in associative memory, while the difference between them is in their treatment of regular inflection. According to the associative single-mechanism model, both regular and irregular forms are processed in the associative memory, hence being explicable by associations

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between specific token and type frequencies. This proposal is supported by Bybee (1995) in the schema model of inflection treatment. On the other hand, proponents of the symbolic model attribute regular inflection to a symbolic process working over variables.

The current study examines these accounts of inflectional morphology using evidence from Jordanian Arabic (JA). I will first present the models of language processing with a brief discussion of how the notions of 'regularity', 'productivity' and 'defaultness' are treated in each model.

Models of morphological representation

Several accounts have been proposed to look into the architecture of the lexicon. The theory of generative phonology offered by Chomsky and Halle (1968) and Halle and Mohanan (1984) extends to a mechanism proper for the irregular morphology in which only morphemes were stored in the lexicon and all words with more than one morpheme were formed by rules that concatenate morphemes (Pinker, 1998). Thus there are minor rules that create irregular patterns. For instance, for English past tense formation, rules are assumed to generate both regular and irregular forms: the rule "add *-ed*" applies to a verb that generates regular past tense forms and "change *i* into *a*" applies to a verb that generates one of the irregular past tense patterns.

The associative approach, on the other hand (Rumelhart & McClelland, 1986; McWhinny & Leinbach, 1991; and Plunkett & Marchmann, 1993), maintains that regular and irregular forms are inflected using a pattern associator mechanism and no separate default process is assumed to exist to deal with regular novel forms. It is assumed that the emergence of 'regularity' is due to the fact that similar items in the associative memory share features and they are partly superimposed in the memory representation. Based upon this account, the network's response to a novel form basically depends upon that word's phonological similarity to an already existing item.

The single-mechanism assumptions also offer an account for 'productivity' in language grammar in terms of explaining the tight relationship between productivity and type frequency. Therefore, forms that have high type frequency are productive.

Defaultness, according to the single-mechanism accounts, has to do with the high type frequency hypothesis. In other words, the emergence of default inflection is correlated with the high type frequency of regular forms in the language (e.g. the high frequency past form *-ed* in English – Rumelhart &McClelland, 1986; Plunkett & Marchmann, 1993; Dougherty & Seidenberg, 1992). In English, for example, default inflection applies to the majority of nouns and verbs, so the probability of any novel word activating, by default, access to regular forms in the lexicon is higher than the probability of it activating access to irregular forms.

The dual-mechanism account (Pinker & Prince, 1988; Marcus et al., 1992; Marcus et al., 1995; Clahsen, 1996; and Pinker, 1998) assumes that a symbolic concatenation process attempts to inflect all forms, while the associative memory, or pattern associator, attempts to identify the exceptions to the rule, for example add *-ed* (the past tense marker) and block this application if there is access to the lexical memory (Pinker, 1998; Berent et al., 1999).

Defaultness, according to the dual-mechanism model, results from the fact that regular inflection applies to mental variables which are abstract labels, 'VERB' or 'NOUN' (Marcus, 1998, 1999; Pinker & Prince, 1988). Marcus (1995) views 'defaultness' as an operation which applies not to particular sets of stored items or to their frequent patterns, but to any item whatsoever, as long as it is not listed in the lexical memory.

Evidence of regular inflection as a default can be observed with the inflection which is assigned to borrowings, names and denominals in English and Hebrew, all of which fail to trigger default irregular patterns as a stored association, because these default forms lack a canonical root which is defined as an *"address or distinct identity as a word in the language; a part-of-speech category, subcategory features (e.g., transitive or intransitive for verbs, count or mass for nouns); a semantic representation and a phonological representations"* (Berent, 1999; Kim et al., 1991, 1994; and Marcus et al., 1995).

It is crucial to state that the notion of 'productivity' is not clearly defined in the dual-mechanism literature in terms of whether it refers to high type frequency or to the ability of an inflection to be extended to new forms coming into the language. But according to Pinker (1999) 'productivity' is defined in terms of regularity, i.e. he assumes that only 'regulars' are productive while lower degrees of productivity are assigned to 'irregulars'.

Bybee (1985, 1988, 1995, and 2001) has proposed models of grammar that are based on usage. This approach is based upon the assumption that both fully inflected regular and irregular forms are represented in the memory. In the schema models, words entered into the lexicon are not segmented into constituent morphemes, but rather morphological properties emerge from associations among lexical items.

Bybee's (1995) definition of 'regularity' is associated with 'productivity'; i.e. type frequency, and it is similar to the articulation of 'regularity' provided by the symbolic accounts in terms of suffixation criteria. She proposes that high type frequency regular words are stored in the lexicon, while low-frequency regulars are derived in the lexicon by applying the strongest schema to base forms. Thus, in this model regular forms have a totally productive schema together which suggests that they can apply to any inflected form because there is a standard operation for forming the derived item from the base one.

Productivity, according to Bybee (1995), is determined by two major factors: type frequency and the extent to which the defining schema of the pattern is

open to a wide variety of phonological forms in the grammar. Bybee (1995) views 'defaultness' as the pattern that applies when all else fails and these default forms can be open to other lexical forms in the language. In this sense, defaultness has the same implications as those indicated by the notion of the 'elsewhere condition' proposed by Kiparsky (1973).

Plurals in Jordanian Arabic (JA)

Jordanian Arabic (JA) displays two sound plurals: the sound feminine plural and the sound masculine plural. The sound plural is generally formed through suffixation where a plural suffix is attached to the singular stem to form the plural depending upon the gender of the singular noun: the suffix *-een* for masculine, (e.g. *sawwaag / sawwaag-een* 'a driver/drivers'); and the suffix *-aat* for feminine, (e.g. *ṯaawl-a / ṯaawlaat* 'a table/tables' – El-Yasin, 1985).

JA also has what are called 'broken plural' forms, which are very similar to the broken plurals in Modern Standard Arabic. This kind of plural is formed through a non-linear pattern shift referred to as the broken plural in which the consonantal root is retained as the singular form but vowels are changed non-linearly between the consonants in accordance with a strict pattern or template (El-Yasin, 1985). For example, the singular *kursi* 'a seat' of the root *krs* has the iambic plural pattern *karaasi* CVCVVCV 'seats'. According to Hammond (1988) and McCarthy & Prince (1990), there are three shape-defined prosodic categories: *iambic patterns* CVCVV, *trochaic patterns* CVCVC and *monosyllabic* plural patterns.

The last type of plural displayed in JA is that of collectives. Collectives form a separate morphological category used to refer to uncountable entities or to living things like fruit, animals etc. In JA, the collective plural form seems to be used less, with the plural replacing it in collective contexts and there is a tendency towards the development of the analytic singular/ plural distinction by using free lexemes like "one, a piece of, a single item of, a single example of" etc. (Suleiman, 1986). Another way of forming collectives in JA is the deletion of the singular feminine marker *-a* (e.g. *samaka / samak* "one fish/ fish").

In terms of frequency, according to Kouloughli (1992) there are two high type frequency forms in JA: the trochaic broken plural (45%) and the sound feminine plural (24%). On the other hand, the sound masculine plural has a type frequency of about 7%, and finally there is the iambic broken plural which has a type frequency of 17%.

The research predictions

1. JA consists of four regular (rule-governed) plural patterns
   a) Sound feminine plural (e.g. *faas/faas-aat* 'an axe/axes') *suffixation*; type frequency is 24% (Kouloughli, 1992).

b) Sound masculine plural (*muhandis/muhandis-een* 'an engineer/engineers') *suffixation*; type frequency is 7% (Kouloughli, 1992).
c) Iambic broken plural (*qalam / ?iqlaam* 'a pen/pens') *internal vowel change*; type frequency is 17% (Kouloughli, 1992).
d) Trochaic broken plural *(kitab/kutub* 'a book/books') *internal vowel change*; type frequency is 45% (Kouloughli, 1992).

2. JA has a continuum of multi-default grammar with the following architecture: the sound feminine plural as the most open, followed by the iambic broken plural as a less open form.
3. There is no role of productivity, type frequency and phonological similarity observed for the emergence of default forms in JA.
4. Regularity is a rule-based not suffix concatenation.
5. Regularity and Productivity are necessary but not sufficient for Defaultness.
6. A continuum of graded openness can be predicted for plural inflection in JA and this graded system of 'openness' gives rise to the emergence of a multiple-default representation.

The sound feminine plural: Default I

Introduction

In the data below, we will provide evidence of the role of the sound feminine plural as a default in JA. This comes through the presentation of data containing derivatives, names and loan words that are sound feminine plural inflected. The results support the degree of openness that this inflection displays towards having new words inflected with the sound feminine plural.

Derived nouns

The category of derived nouns includes diminutives and derivatives or participles, which are formed from other words by rules of morphological derivation. Derived nouns in JA have the property of having a default inflection in the plural. According to the data shown in data set (1), these derived forms take the sound feminine plural (*-aat*) due to the fact that these forms – when derived – have no canonical root; hence they have no access to the memory of JA and thus fall into the "elsewhere" category. In this section we will discuss the status of two sorts of derived nouns: diminutives (Table 1 and 2) and derivatives (Table 3). The data is taken from Suleiman (1985) and El-Yasin (1985).

Diminutives in JA provide converging evidence on the existence of a symbolic system which calls for the default inflection if access to the lexical memory is blocked. Thus, this default inflection process works for diminutives. Most nouns in JA have a diminutive form and this derived form is sound feminine plural inflected regardless of the plural inflection of the non-diminutive form.

Table 1. Nouns that are not sound feminine plural inflected but their diminutive counterparts are (Suleiman, 1985; El-Yasin, 1985)

Noun	Non-sound feminine plural	Diminutive form	Plural diminutive	Gloss
kitaab	kutub	kutayib	kutayib-aat	'a book'
xaatim	xawaatim	xuwaytim	xuwaytim-aat	'a ring'
jisim	?ajsam	jusayim	jusaym-aat	'a body'
juzu?	?jzaa?	juzay?	juzay?-aat	'a small part, a molecule'
jabal	jibaal	jubayl	jubayl-aat	'a mountain'

Table 2. Nouns as well as their diminutive counterparts take the sound feminine inflection (Suleiman, 1985)

Noun	Regular plural	Diminutive form	Plural diminutive	Gloss
mataar	mataraat	mutayr	mautayraat	'an airport'
jarraar	jarraraat	jurayreer	jurayreeraat	'a tractor'
muharrik	muharrikaat	muhayreek	muhayreekaat	'an engine'
jawaaz	jawazaat	jwayz	jwayzaat	'a passport'

In Table 1 we notice that the nouns in the non-diminutive form take a non-sound feminine plural while the same nouns in the diminutive form all have the sound feminine inflection. For instance, for the noun *jaba/jibaal* 'a mountain/mountains', the plural of its diminutive form *jubayl* is *jubayl-aat* with the suffix *-aat* added across the board in the plural. On the other hand, in Table 2 the nouns are sound feminine inflected in both the non-diminutive and the diminutive (dim.) forms (e.g. *maṯaar/ maṯaraat*; *mutayr* (dim.) / *mautayr-aat* 'airport/airports').

Thus, the data for JA (Table 1 and 2) shows that there is no evidence of similarity effects for the plural inflection of the diminutives of non-sound feminine plural inflected words. For example, the diminutive forms for both forms that have a sound feminine inflected plural (*jarraar/ jarrar-aat* 'a tractor') and words that have a non-sound feminine inflected plural (*jisim/?ajsam* 'a body') take the sound feminine plural *-aat* in all cases of the diminutive.

Participles

Participles represent a grammatical category – noun – which is entirely dissimilar to its base form – verb. As Table 3 below shows, the passive participle

Table 3. Participles which are derived from underlying verbs (Levi, 1971)

Verb root	Deverbal noun (singular)	Plural	Gloss
?awjad	mawjuud	mawjuud-aat	'beings'
xalaq	maxluuq	maxluuq-aat	'creatures'
sannaf	musannaf	musannaf-aat	'literary works'
jallad	mujallad	mujallad-aat	'bound books'
harram	muharram	muharram-aat	'disallowed things'

is derived using the prefix *ma-* and the insertion of the long vowel *uu* after the second consonant if the root is trilateral. If the root is quadrilateral then the root is maintained while the prefix *ma-* is inserted. Since there is no mapping between these two forms in terms of their grammatical category features, we assume that the sound feminine plural *-aat* will be the default inflection in the plural formation for participles. It is crucial to point out that this inflection is called for because it has an open schema that is capable of inflecting new forms into the grammar of JA as displayed in Table 3 below (Levi, 1971; and Wright, 1967):

In Table 3 the participle form *mawjuud* 'being' is derived from the verb *?awjad* 'cause to exist'. The two forms belong to two different grammatical categories. All derived participles have the sound feminine marker suffix *-aat* when pluralized. I assume that these derived forms do not have a canonical root in the grammar of JA because there is no access between the derived form and the base form due to the dissimilarity in the grammatical category to which each form belongs.

Names

In this part, we show how JA assigns the sound feminine default to names. According to the symbolic account (Berent et al., 1999; Pinker & Prince, 1998), the assignment of the default inflection (sound feminine in JA) does not only require the activation of a bundle of orthographic, phonological and semantic features that correspond to the target word. These stored features must be labeled by a mental variable: they must have a canonical root (Berent et al., 1999; Pinker & Prince, 1998).

Accordingly, it is possible to show that in JA family names that lack a canonical root will be sound feminine inflected as they are represented as stretches of sound, not canonical root, as displayed in data set (4) below (Ababneh, 1997; and Suleiman, 1985).

These observations suggest that the lack of canonical root motivates the establishment of the open inflection that is the sound feminine inflection assigned to these words. Because these names lack a canonical root, they are not expected to activate the associative mechanism, i.e. they are not inflected based upon their

Table 4. Names taking the default inflection with *-aat* (Ababneh, 1997; Suleiman, 1985)

Singular (Proper) Name	Plural with family name	Plural with the native meaning	Gloss
3awad	?al- 3awad-aat	?al 3awad	'compensation'
faraj	?al faraj-aat	?al faraj	'relief'
shhaab	?ashshhaab-aat	shuhub	'falling star'
jaraad	jaraad-aat	jaraad	'hopper'
3beid	3beid-aat	3abeed	'slave'

similarity with already existing forms in the language, hence taking the sound feminine inflection by default.

The data shown above in Table 4 also presents clear evidence on the insensitivity of these sound feminine nouns to similarity factors when they bear the meaning of family names and show similarity effects when they have their lexical native meaning. For example, the word *3awad* is sound feminine plural inflected *3awad-aat* when it indicates a family name while it has the non-sound feminine collective inflection *?al-3awad* when it has the meaning of 'compensation'. This supports the symbolic account properties of insensitivity of the default inflection to similarity effects.

Loan words

JA has had extensive contact with English as well as other languages since the late 19th century. The number of loaned words increased after the 1920s with the British influence in the area of Jordan. This influence was also boosted by Jordanian students who studied at British and American universities (Butros, 1963). In this section, we discuss how Jordanian Arabic displays the sound feminine inflection for these borrowings from other languages (e.g. *faaks/faads-aat* 'a fax/faxes'), for example from English.

According to the word/rule symbolic hypothesis, the assignment of 'default' inflection does not just require the activation of a bundle of orthographic, phonological and semantic features that correspond to a 'regular' word. Namely, these features given to such borrowings must be labeled by a mental variable, i.e. they must be a canonical root. Words are categorized in the lexicon in a 'canonical root' format. Loan words usually lack canonical roots (Marcus, 1995; and Berent et al., 1999), so words lacking canonical roots take a default inflection because the default inflection comes into play if a word does not have a canonical root in the lexicon, regardless of the high similarity of the root to an existing 'regular' form in the lexicon, even if this form has the same phonological or orthographic features or templates in the lexical system.

Table 5. Partially assimilated loan words coming from English that take *-aat* for the plural (Butros, 1963)

Singular	Plural -aat	Gloss
?afarhoul	?afarhoul-aat	‘an overhaul’
?aks	aks-aat	‘an axle’
?amblifayar	?amblifayar-aat	‘an amplifier’
?iksersaiz	?iksersaiz-aat	‘an exercise’
?igzost	?igzost-aat	‘an exhaust’
?ilbuum	ilbuum-aat	‘an album’
?imbalans	imbalans-aat	‘an ambulance’
?insh	?insh-aat	‘an inch’
?istaad	?ustad-aat	‘a stadium’
balanti	balanty-aat	‘a penalty’
baar	baar-aat	‘a bar’
baas	baas-aat	‘a bus’
busukleit	busukleit-aat	‘ a bicycle’
boylar	boylar-aat	‘a boiler’
baldouzar	Baldouzar-aat	‘a bulldozer’
breik	breik-aat	‘a break’
brojektar	brojektar-aat	‘a projector’
budy	budy-aat	‘a body’
drum	drumm-aat	‘a drum’
Disk	disk-aat	‘a disk’
dulaar	dular-aat	‘a dollar’
faaks	faaks-aat	‘a facsimile’
faayl	fayl-aat	‘a file’
fyuuz	fyuuz-aat	‘a fuse’
freizar	freizar-aat	‘a freezer’
faawil	faawl-aat	‘a foul’
geezar	geezar-aat	‘a geyser’
ghoreilla	ghoreill-aat	‘a gorilla’
ghraam	ghraam-aat	‘a gram’
gril	gril-aat	‘a grill’
handbreik	handbreik-aat	‘a handbrake’
houmweirk	houmweirk-aat	‘homework’
kafteerya	kafteery-aat	‘a cafeteria’
kanteen	kanteen-aat	‘a canteen’
karaaj	karaaj-aat	‘ a garage’
karboreitar	Karboreitar-aat	‘a carburetor’

katalouj	katalouj-aat	‘a catalog’
keilo	keilow-aat	‘a kilo’
keiloghraam	keiloghraam-aat	‘a kilogram’
kountar	kountar-aat	‘ a counter’
kouboun	koubon-aat	‘ a coupon’
kours	kours-aat	‘a course’
kolidour	kolidour-aat	‘a corridor’
kournar	kournar-aat	‘a corner’
kreim	kreim-aat	‘a cream’
krunk	krunk-aat	‘a crank’
kwiz	kwizz-aat	‘a quiz’
maarshaal	maarshaal-aat	‘a marshal’
maikrofoun	maikrofoun-aat	‘a mike’
maikroskoub	maikroskoub-aat	‘a microscope’
monoloug	Monoloug-aat	‘a monologue’
moudeil	moudeil-aat	‘a model’
nyoutroun aat	nyoutroun-	‘a neutron’
radaar	radaar-aat	‘a radar’
Rikit	rikt-aat	‘a racket’
radyou	radyouh-aat	‘a radio’
rudeitar	rudeitar-aat	‘a radiator’
rul	rull-aat	‘a roll’
sbeir	sbeir-aat	‘a spare’
shak	shak-aat	‘a check’
silindar	silindar-aat	‘a cylinder’
slaid	slaid-aat	‘a slide’
srinj	srinj-aat	‘a syringe’
studyo	Studyoh-aat	‘a studio’
soufa	souf-aat	‘a sofa’
short	short-aat	‘a short’
talagraaf aat	talagraaf-	‘a telegraph’
talafoun	talafoun-aat	‘a telephone’
taraktar	taraktar- aat	‘a truck ‘
telfizyoun	telfizyoun- aat	‘a television’
tiliskoub	tiliskoub- aat	‘a telescope’
tranziztor	tranziztor- aat	‘a transistor’
tyoub	tyoub-aat	‘a tube’
voult	voult-aat	‘a volt’
winish	winish-aat	‘a winch’

Table 6. Partially assimilated loan words coming from English that take *-aat* for the plural Farghal and Al-Khatib (1999)

Singular	Plural -aat	Gloss
?anteen	?anten-aat	'an antenna'
?anzeem	?anzeem-aat	'an enzyme'
?emeil	?emeil-aat	'an email'
?iliktroun	?iliktroun-aat	'an electron'
harmoun	harmoun-aat	'a hormone'
kombyouter	kombuter-aat	'a computer'
kondishin	Kondishin	'an air conditioner'
seedee	seedeeh-aat	'a compact disk'

Table 7. Partially assimilated loan words coming from French that take *-aat* for the plural Farghal and Al-Khatib (1999)

Singular	Plural -aat	Gloss
?ishaar	?ishar-aat	'a shawl'
baloun	baloun-aat	'a balloon'
barlamaan	barlaman-aat	'a parliament'
gaatuu	gatuh-aat	'cake'
karadour	karadour-aat	'a corridor'
noyun (or noon)	noyun-aat	'a fluorescent light'
rabour	rabour-aat	'a rapport'
shmbu	shambuh-aat	'shampoo'
shusi	shusy-aat	'a chassese' [chassis?]
Saaloun	saaloun	'saloon'

Table 8. Partially assimilated loan words coming from Italian (2) that take *-aat* for the plural Farghal and Al-Khatib (1999)

Singular	Plural -aat	Gloss
sabbaat	sabbaat-aat	'shoes'
kazino	kazinoh-aat	'a casino'

The fact that the sound feminine inflection is the target for recently loaned forms provides strong evidence for the assumption that this inflection is open, i.e. it represents an open schema that is capable of inflecting new forms into the

Table 9. Completely assimilated loan words in JA (Butros, 1963)

Word	Iambic plural	Sound feminine plural	Gloss
baddaal-e		baddal-aat	'a pedal'
battaariy-e		battaariy-aat	'a battery'
blouz-a(e)	balaayiz	blouz-aat	'a blouse'
dazzeen-a(e)	dazazeen	dazeen-aat	'a dozen'
faneill-a		fanell-aat	'a flannel shirt'
geethaar-a		geethaar-aat	'a guitar'
kambouy		kambouy-aat	'a convoy'
kamar-a		kamar-aat	'a camera'
kartoun-a(e)	karaateen	kartoun-aat	'a carton'
kumbreis-a		kumbreis-aat	'a compressor'
leir-a (It.)		leir--aat	'lira'
naars-e		naars-aat	'a nurse'
ounsa		ounS-aat	'an ounce'
simfouniyi-e		simfouniyi-aat	'a symphony'
shout-e		shout-aat	'a shoot'
sukerteir-a		sukerteir-aat	'a secretary'
trailla		traill-aat	'a trolley'
veilla		veill-aat	'a villa'
yard-e		yard-aat	'a yard'

grammar of JA. Based upon this openness of the sound feminine inflection, it is predicted to have default status regardless of whether these words are feminine in form or meaning (semantics). In addition, we can also assume that the openness of this inflection will be a key element in making it a default for the corpus of loan words that are expected to come into JA in the future.

As shown in Table 9, loan words are completely assimilated into the gender distinction system in JA by having the feminine suffix *-a(-e)* in the singular form.

Based upon Berent et al. (1999), the canonical root was displayed in terms of the inflection of the words that were introduced as either native words (with a canonical root) or loan words (without a canonical root) in Hebrew. Berent et al. (1999) found that when introduced as loan words, these words take the regular inflection (i.e. sound feminine in the JA case) while when they are introduced as native words they are inflected either regularly or irregularly depending on the degree of similarity to their base word. For JA, these borrowed words would take

the default inflection – sound feminine plural – because they lack the canonical root despite their similarity to existing native words.

To summarize, because these loan words lack a canonical root in the grammar of JA, they are unable to activate the associative mechanism and thus they take the default sound feminine form; in some cases they take the iambic broken plural, as in Table 9. The symbolic default inflection hypothesis only predicts the default inflection of these words, i.e. the sound feminine plural. The hypothesis needs to be further modified to offer better treatment of a system with two defaults. The canonical root plays a major role in determining the inflection of the target word, as its absence blocks the non-default inflection even if the root is highly similar to an irregular token bearing the same features (Berent et al., 1999). Accordingly, the pattern associator model cannot provide evidence for the inflection of such words, as they exist outside the phonological space; they do not have similar templates in the grammar of JA. This assumption can be supported by the fact that these non-canonical forms have no access to the memory due to their dissimilarity to already stored forms in the grammar of JA.

To recapitulate, the data in this section supports the insensitivity property of loan words to similar words in JA. The data also shows that 'openness' is necessary for the emergence of the default plural, i.e. the sound feminine, because this plural can be easily extended to new non-assimilated forms in JA. According to the data above, the sound feminine default marks the hallmark for recent loan words in JA.

The iambic broken plural: Default II

Introduction

Similarly to the sound feminine plural, we expect that the *iambic broken plural* in JA represents the second default due to its 'openness'. For example, loan words in JA that have iambic plurals include *ban(i)k/bunuuk* 'a bank/banks'; *filter/falaatir* 'a filter/filters'; *xaashuuga /xawaasheeg* 'a spoon/spoons'; *fatuura / fawaateer* 'a receipt/receipts'.

In this part, we will discuss the status of the iambic broken plural as a default by discussing data from different sources on names and loan words (Suleiman, 1985; Ababneh, 1997; and Farghal & Al-Khatib, 1999). It is also important to state that these references have taken these data from Butros (1962).

Names

In this section, we discuss how 'names' in JA are iambic broken plural inflected. We have noticed in section (Table 5) how the sound feminine plural shows 'openness' to inflect new forms into JA. Accordingly, it is possible to show that family names in JA that lack a canonical root will also be iambic broken plural inflected as they are represented as stretches of sound, not canonical roots, as displayed in Table 10 below (Suleiman, 1985):

Table 10. Names taking the iambic broken plural (Suleiman, 1985)

Singular (Proper) name	Plural with family name	Regular form	Gloss
raashid	rwaashdih	raashid-uun	'a wise person'
zayid	zawaaydih	zayid-uun	'a generous person'
zaahir	zawaahrih	zaahir-uun	'an energetic person'
mitlaq	mataalqah	----------	'a free person'
taalib	tawaalbih	talab-a	'a student'
raddaad	radaaydih	raddaad-uun	'a rescuer'
xaalid	xhawaaldih	xaalid-uun	'immortal'
xaleel	xha laaylih	xaleel-uun	'a close friend'

It is obvious that in JA family names or surnames are opaque, as they are stretches of sound and they can be derived from other names. According to Marcus' (1992) account of the default, we can assume that these surnames are represented as stretches of sound, not as canonical roots. Accordingly, these names take the open default iambic plural as the default system.

The singular names in the data above can have the open default inflection when they represent non-canonical forms, i.e. they do not match similar templates having the same meaning and function. On the other hand, these forms have the regular plural when they have a native or template format in JA. For example, there is the noun *xaalid* which takes both the default plural *xhawaaldih* and the sound masculine plural *xaalid*-uun.

Loan words

JA has accumulated a sizable number of loan words taken from different languages, including English, Turkish, French etc. (Butros, 1963; Farghal & Al-Khatib, 1999; and Suleiman, 1985). According to Farghal and Al-Khatib (1999), Jordan was considered as part of the Turkish Empire till the advent of the British in Palestine and Jordan. Turkish was also the official language used in political and commercial affairs. Accordingly, we can conclude that Turkish words came into JA before most English words because the influence of the European languages – specifically English – began to take place in the late 1920s (Suleiman, 1985).

According to Butros (1963) and Suleiman (1985), no documented evidence is available to deal with the existence of loan words before the Turkish period. This borrowing had an influence on the plural template that loan words are expected to take, i.e. most of the loans that came earlier, regardless of what language they came from, have iambic broken plurals, while more recent loans tend to be sound feminine inflected.

Table 11. Partially assimilated Turkish loan words only taking the iambic plural form (Farghal & Al-Khatib, 1999; Ababneh, 1997)

Word	Plural form	Gloss
?umbashi	?umbaashiyeh	'a sergeant'
baxsheesh	baxaasheesh	'a bribe'
diwaan	dawaaween	'a divan'
duulaab	dawaaleeb	'a drawer'
kazuuze	kazuuz	'a soft drink'
Kubri	kabaari	'a bridge '
marhab	maraahib	'hello'
nishaan	nayaasheen	'a medal'
qubtaan	qabaatineh	'a captain'
qshaat	qshataat	'a belt'
sultan	salaaTeen	'a leader'
suug	?aswaaq	'a market'
taawuug	tawuug	'a fried chicken'
tarbush	taraabeesh	'a fez'
xazuuq	xawaazeeq	'a torture tool'

In this part we offer evidence that JA contains both the iambic broken plural and sound feminine plural as two default inflections applied to loan words which do not have canonical roots or structures in the grammar of JA. The data also shows that these loans, which are taken from different languages (mainly Turkish and English), can have either the iambic broken plural or the sound feminine plural as evidence for the existence of two default plural forms in the grammar of JA.

We have classified the plurals according to their inflection and their language origin. For example, the loans have two default plural forms. The first default presented in the data is the *iambic broken plural* which is evident in Table 11 (partially assimilated Turkish loans), 12 (completely assimilated Turkish loans), and 14 (English loans). The second default presented is the *sound feminine plural* which is evident in Table 13 (Turkish loans). Finally, in Table 15 and 16 we have loans coming from English as well as other languages, and these loans take two defaults: the iambic broken plural and the sound feminine broken plural.

In the following, we will discuss data taken from Turkish and these forms take the iambic broken default, as shown below in Table 11 (Farghal & Al-Khatib, 1999; Ababneh, 1997).

The data in Table 11 presents the distribution of the Turkish loan words in JA in terms of topic. As we can see, the data instantiates the following categories or semantic domains: First, we encounter food- and drink-related loans such

Table 12. Completely assimilated Turkish loan words only taking the iambic plural form (Farghal & Al-Khatib, 1999; Ababneh, 1997)

Word	Plural form	Gloss
?argeel -a(e)	?araageel	'a hookah'
kaubb-a	kabaab	' a meat ball'
qateef-a(e)	qataayif	'a kind of patisserie'
xashuug-a	xawaasheeq	'a spoon'

Table 13. Turkish loan words only taking the sound feminine plural (Farghal & Al-Khatib, 1999; Ababneh, 1997)

Word	Plural form	Gloss
xaan	xaan-aat	'a storage place'
hammam	hammaam-aat	'restrooms'
hafle	hafl-aat	'celebration'
baasha	baashaw-aat	'a respected man'

as *kazuuze/ kazuuz* 'a soft drink', *ṯaawuug /ṯawuug* 'fried chicken'. Second, we can also notice that there are politics-related loans such as *ṣulṯan / ṣalaaṯeen* 'a leader', *diwann/ dawaaween* 'a divan' and *xazuuq / xawaazeeq* 'a torture tool'. Third, there are clothing and fashion loans such as *ṯarbuush / ṯaraabeesh* 'a fez', *nishaan / nayaasheen* 'a medal' and finally *suug /?aswaaq* 'a market'. The data in Table 11 also shows that all the loans have the iambic broken plural. I make the assumption that these forms would take the default iambic inflection, as this form is open to inflect words that fall outside the grammar of JA.

Table 12 offers evidence for the iambic default as a target inflection for completely assimilated loans – Turkish. It is important to mention that these forms have the feminine ending *-a* in the singular form, whereas they take the iambic plural, i.e. they have the tendency to fall into the iambic default. Such a tendency should not be a challenge for the suffixation inflection, i.e. the addition of *-aat*, because these forms still have the default inflection. Thus, the notion of defaultness helps in finding out why some forms do not follow the grammatical rules in having the predictable plural inflection – the sound feminine in our case.

Quantitatively speaking, according to the data in Table 11, 12 and 13, about 88% (20) of the nouns are iambic plural inflected and 12% (5) of the nouns are sound feminine inflected.

This indicates that in the lexicon of JA, the iambic plural is predominant, being the default for the inflection of about 88% of the Turkish borrowings. The data also indicates that the forms that are not iambic plural inflected do not fall outside

Table 14. English loan words taking only the iambic plural (Butros, 1963; Farghal & Al-Khatib, 1999)

Word	Plural form	Gloss
?atlas	?ataalis	'an atlas'
baas	basaat	'a bus'
banik	bunuuk	'a bank'
barmeel	baraameel	'a barrel'
bunid	?ibnuud	'a bond'
buut	?ibwaat	'a boot'
daktour	dakaatreh	'a doctor'
fatboul	fataabeel	'a football'
filim	?aflaam	'a film'?
filtar	flaatir	'a filter'
goul	?igwaal	'a goal'
gunsul	ganaasil	'a consul'
joukar	jawaakir	'a card joker'
kabtin	kabaatin	'a captain'
kart	?ikruut (eh)	' a card'
kartuuneh	karaateen	'a carton'
maksi	makaasi	'a dress'
malyoun	malaayeen	'a million'
munhul	manaahil	'a manhole'
roub	?irwaab	'a nightgown'
sandal	sanaadil	'a sandal'
shuuz	?ishwaaz	'shoes'
sigaarah	sagaayir	'a cigarette'
sarfees	saraafees	'a service'
toun	?atnaan	'a ton'

the 'defaultness' domain, i.e. these words are default (sound feminine) inflected (e.g. *xaan/ xaan-aat* 'a storage place/ storage places', *ḥammaam/ḥammam-aat* 'a restroom/restrooms'), which implies that loan words can take either default. Since these forms fall in the openness category, it would be unnecessary to predict which plural a singular form should take because these forms fall outside the template format, so they take the open default inflection. This is supported by the observation that some forms take both inflections.

Other examples can be drawn from other languages, like English which contains many instances of words that are iambic plural inflected, as in Table 14, while in 15 both default inflections are possible.

Table 15. English loan words taking the iambic plural and the sound feminine plural (Fergal, 1999; Butros, 1963)

Word	Iambic plural	Sound feminine plural	Gloss
blouzeh	balaayiz	blouz-aat	'a blouse'
buks	?ibkuus	buks-aat	'a box'
dazzeeneh	dazaazeen	dazeen-aat	'a dozen'
jakeet	jawaakeet	jaket-aat	'a jacket'
kabeeneh	kabaayin	kaben-aat	'a cabin'
kartouneh	karaateen	kartoun-aat	'a carton'
makeenah	makaayin	makeen-aat	'a machine'
mitir	?amtaar	mitr-aat	'a meter'
roub	?irwaab	roub-aat	'a robe'
shilin	shluun	shiln-aat	'a shilling'
shurt	?ishruuteh	shurt-aat	'a short'
taksi	takaasi	taksiy-aat	'a taxi'
tank	?itnuukah	tank-aat	'a tank'
yaxt	yuxuut	yaxt-aat	'a yacht'

We notice that the majority of the words in the list above belong to categories other than science and technology. For example, there are loans belonging to fashion, such as *maksi / makaasi* 'a dress/dresses', or to jobs like *daktour/ dakaatreh* 'a doctor/doctors'. The fact that the non-science and technology words are iambic inflected and the science and technology forms are sound feminine inflected might indicate that the science and technology loans came into JA in a more recent period than the non-science ones due to the fact that JA faces the problem of a need for vocabulary expansion in the domain of technological development. In addition, it is possible to suggest that this variation in the inflection between these two plurals reflects the tendency for the semantic domain to change for the pluralization template. Furthermore, we can assume that the non-technology words have templates that are modified to become native-like words, while the technology words preserve their patterns, hence the suffixation process is more accessible. Therefore, these relatively old loans have become phonologically more similar to the template format in JA and thus more probable to be similar to the iambic broken template. Thus, a primary hallmark of the assimilation of such loans is their tendency to take the broken plural which is associated with native nouns of the same template (Fergal, 1999).

Table 16. Loan words from other languages taking either the iambic or the sound feminine plural (Ababneh, 1997; Farghal & Al-Khatib, 1999)

Word (plural)	Origin	Iambic	Sound feminine	Gloss
?igraafa	Italian	garaayif	?igraafaat	'a necktie'
?injeel	Greek	?anaajeel		'the bible'
bantaloun	French	banaateel	bantaloun-aat	'pants'
daftar	Italian	dafaatir		'a notebook'
dinaar	Roman	danaaneer		'a currency name'
fatuura	Italian	fawaateer		'a receipt'
faylasouf	English	falaasifah		'a philosopher'
kabbout	Italian	kabaabeet		'an overcoat'
kaahin	Syriac	kuhhaan		'a deacon'
qamees	Spanish	qumsaan		'a shirt'
ruuh	Syriac	?arwaah		'a soul'
taabuut	Hebrew	tawaabeet		'a coffin'
qissees	Syriac	qisseeseen		'a priest'
hab(u)r	Syriac	?ahbaar		'a Jewish scholar'

The English loan word lists in Table 14 and 15 contain 39 words that are iambic plural inflected, 27% (11) words (14) take both inflections for the plural: the iambic plural and the sound feminine (e.g. *makeenah* 'a machine', *makaayin* and *makeen*-aan 'machines'). This result lends support to the notion of having two defaults for loan words in JA which take either the iambic or the sound feminine plural. This data suggests that in JA the notion of defaultness can be realized through two forms. It is important to state that no loan word has sound masculine or trochaic broken plurals despite the high frequency of the latter.

More evidence can be taken from languages other than Turkish or English. In Table 16 we find loan words taken from French , Italian , Syriac or Hebrew.

In this data set we have words taken from different languages (Italian: *kabbout/ kabaabeet* 'an overcoat/ overcoats'; French*: banṯaloun/ banṯalounaat* or *banaaṯeel* 'a pant /pants'; Hebrew: *tabuut/ tawaabeet* 'coffin'; and Syrian *ḥab(u)r / ?aḥbaar* 'a Jewish scholar/Jewish scholars').

In this set there are 14 words taking the default iambic plural. Only 14% (2 words) in this table have sound feminine and iambic plural inflection. Quantitatively speaking, 14% of the words presented in the data above can take both the iambic plural and the sound feminine plural, while more than 86% are iambic plural inflected. Accordingly, we can conclude that the data in Table 15 and 16

would offer evidence of the validity of the assumption that both plurals fall in the 'defaultness domain' when inflected in the 'elsewhere' condition.

Summary

This investigation provides compelling evidence for the existence of a continuum of defaults in JA: the iambic broken plural and the sound feminine plural. The data also supports the necessity for the 'openness' mechanism as a major determinant for the establishment of defaultness in the sense that the iambic broken plural is capable of inflecting non-canonical forms that already have the sound feminine default. The same can hold regarding the 'openness' of the sound feminine default. Based upon the data above, we can also conclude that the non-canonical structures coming into JA – names and the loans – are default inflected. The discussion of the data above reveals the importance of historical factors in determining the status of 'defaultness'. This is accounted for in terms of having the iambic broken plural to inflect old loan words and the sound feminine for inflecting modern loan words.

Conclusion and discussion

As far as we can tell, ever since D.E. Rumelhart and J.L. McClelland (1986), the representation of defaultness and the mechanism by which it comes into play have been under scrutiny. The questions that this study raised are how defaultness can be represented and in what domains this defaultness can be analyzed cross-linguistically. To manipulate these inquiries, a number of issues have been emphasized. These include regularity, type frequency, productivity, openness and, of course, defaultness. In the sections that follow, I will summarize the main conclusions of this study. Then I will show how the present work fits within future research by exploring some problematic areas.

Regularity and type frequency

The notion of 'regularity' has been defined as a rule-governed process. This mechanism can be accounted for in terms of the existence of rules that guarantee the emergence of regular patterns in the grammar of JA. In addition, these rules do not totally conform to the main guidelines proposed by the dual-mechanism account in terms of suffixation as the only hallmark of regularity. Instead, regular forms in JA were shown to be formed through the suffix concatenation rule (e.g. sound feminine plural and sound masculine plural) and through internal vowel change (e.g. the iambic and trochaic formation rules). Thus, the predominant characteristic of inflectional forms (nouns and verbs) in JA is the tendency towards rule-governed patterns that are explained via a linear and hierarchical format in the derived form.

In this study, unlike what the schema models propose, we showed that there is no role of type frequency in determining regular as well as default forms ob-

served for the inflectional module of morphology such as the sound feminine and the iambic plurals, as these forms have a relatively low type frequency but they are regular. This observation gives support to the dual-mechanism accounts regarding the minor role of type frequency in determining defaultness, while no support is available for the single route or schema accounts in the plural inflection paradigm. Thus, it is necessary to stress an account that can hold cross-linguistically to maintain the status of regularity without recourse to some internal theory criteria, like high type frequency, as determining factors for the emergence of 'regularity'.

Openness / Productivity

Openness was defined as the ability of the inflectional system to be extendible to accept new forms in the grammar of a language system. Based upon this definition, we came up with the clear distinction between 'productivity' and 'openness'. While 'productivity' was shown to have a tight relation with type frequency, i.e. productive forms usually have high frequency across the language, 'openness', on the other hand, refers to the extendibility of a process to accept forms from outside the phonological space of the grammar system. In JA, the definition of 'openness' was able to predict how the sound feminine plural and the iambic broken plural are able to accept new forms in the grammar while other forms like the trochaic broken plural and the sound masculine plural are not.

Thus, the notion of 'openness' was shown to explain why minority default languages, like German, would take that 'minor default' despite the fact that this form does not have high type frequency – productivity. So, it would be reasonable for us to view the influence of 'openness' in any language as a component in the morphological module in the grammar, without being confined to the specific features of any language, like productivity which is not expected to explain the occurrence of the default inflection. Therefore, 'openness' is shown to have a more comprehensive role than the 'elsewhere' criterion in manipulating 'defaultness' cross-linguistically.

Brokenness / Irregularity asymmetry

In this study, the 'broken plural' was shown to contain two dominant regular forms: the iambic broken plural and the trochaic broken plural, since these forms are the result of a regular rule-governed change occurring in the internal vowel system. The dominance of 'regularity', as a paradigmatic feature on the broken plural templates, sheds light on the status of 'brokenness' versus 'irregularity' within the morphological framework of JA. The motivation for this distinction comes into play because in previous studies on JA, 'brokenness' is used as an equivalent term with the term 'irregularity'. In this study the notion of 'brokenness' is conceptualized as a licensing term for forms that can be word internally inflected in a hierarchical format. Accordingly, the term 'brokenness' would not

be expected to refer to 'irregularity'; rather, it is a description of an internal vowel change. As a result of this new formulation of 'brokenness', 'regularity' should be of a wider scope to cover both categories of the 'concatenated forms' and the 'broken plurals' which are marked by an internal rule-governed pattern of change.

Defaultness

The architecture of defaultness in JA was shown to have a cross-linguistic characteristic. This conclusion was based upon the defaultness definition which refers to the application of the 'elsewhere rule pattern' on non-canonical forms in an 'openness' mechanism.

Openness was proved to be indispensable for the establishment of defaultness and it was shown that 'openness' is dissimilar to 'productivity' which is predicted to play a peripheral role in the establishment of 'defaultness' in the inflectional morphology in particular. Based upon this formulation of defaultness, we can confirm that there is a continuum containing a multiple-default representation shown on the inflectional level in JA. First, we provided evidence that a morphological system can have the capability to consist of two defaults in its module in terms of its number system. This is shown in the default forms evident in the sound feminine and the iambic broken plural. This multi-layered representation of defaultness gives insights into the architecture of the lexicon as well as the morphological modules to be lexically represented cross-linguistically, especially in the grammars of Semitic languages.

Accordingly, the data given for JA challenges all the previous accounts by providing evidence for the existence of multiple defaults at the number level: the sound feminine and the iambic plural. This model has also shown a limitation, namely having a tight connection between regularity and defaultness, because in JA the trochaic broken plural survived as regular but not as a default. Thus, in our new architecture of the lexicon for the grammar of JA, regularity would not be expected to determine the default status as claimed in the previous models proposed by Pinker (1990), Rumelhart & McClelland (1986), Bybee (1985), Laaha (2006), Zwicky (1989), Bauer (2001) and Ratcliff (1998).

The notion of 'similarity effects' was shown to have limitations in determining 'defaultness'. According to the single-mechanism account (Rumelhart & McClelland, 1986), the similarity of new items to already existing words can account for why these forms are default inflected. Taking the diachronic factor into account will enable our approach to explain how multiple defaults (in particular the sound feminine and the iambic broken plural) might exist in one language depending upon the period of time the lexical item came into the language. This idea is supported by the following conclusion. Taking these two defaults into account, we can identify that loan words, as evidence for these defaults, include loan words that came very early and are iambic broken plural inflected, while recent loans are sound feminine inflected. Accordingly, we can conclude that in

the grammar of a language, a default might undergo a shift from one form into another. In the case of JA, a new default (the sound feminine plural) was added to the iambic broken plural. This observation needs to be further investigated to see the capability of future loan words of being inflected as either iambic broken plural or sound feminine plural.

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