

The Perception of Word Juncture in English and Arabic

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Abstract:

In this study the perception of word juncture in English and Arabic is investigated. Word juncture is taken as the allophonic, or phonetic, variation at word boundary that is contrastive. It is hypothesized that minimal pairs differentiated by means of juncture (or boundary features) cannot be identified when heard in isolation and that the sentential context helps identifying the phrases of the pair. Corpuses of English and Arabic minimal pairs of juncture phrases were collected and native speakers of English and Arabic were asked to pronounce these phrases in isolation and then to use them in sentences. Three groups of subjects (a group of 13 Undergraduate students of English, a group of 11 MA students of English and a group of 9 Lecturers, all being native speakers of Arabic) were chosen to carry out the experimental part of the study. Four perception tests were carried out: two on English and two on Arabic. These tests were designated to examine the subjects' precision in the identification of the juncture phrases when used in isolation and in sentences. The subjects' reliance on the phonetic cues to identify the juncture phrases when used in isolation was low and rather fluctuant between the groups and the two languages. The sentential context, on the other hand, has shown a significant influence on the identification responses of the subjects in the three groups and in both English and Arabic.

إدراك مفصل الكلمة في اللغتين الإنكليزية والعربية

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ملخص البحث:

تبحث هذه الدراسة في إدراك مفصل الكلمة في اللغتين الإنكليزية والعربية. يعرف مفصل الكلمة بأنه الإختلاف الصوتي عند حدود الكلمة والذي يحقق إختلاف المعنى بين الثنائيات الصغرى. تحاول هذه الدراسة اختبار فرضية أن الثنائيات التي يميزها المفصل (أو خواص حدود الكلمة) لا يمكن التمييز بينها عند سماعها بمعزل عن السياق ، وأن سياق الجملة يساهم في التمييز بين كلمات هذه الثنائيات. ولغرض إجراء التحليل تم استخدام عينات من الثنائيات الصغرى التي تميزها من بعضها صفات المفصل من كلتا اللغتين الإنكليزية والعربية (25 زوج من اللغة الإنكليزية و 16 زوج من اللغة العربية) وتمت الإستعانة بثلاثة مجاميع من متحدثي اللغة العربية المحليين والمتعلمين للغة الإنكليزية في الوقت ذاته (13 طالب من الدراسة الأولية و 11 طالب من طلبة الدراسات العليا و9مدرسين من قسم اللغة الإنكليزية في كلية الآداب)

لغرض إجراء اختبار الإدراك عليهم . تم إجراء أربعة إختبارات على كل مجموعة من المجاميع الثلاثة ؛ إثنان لكل لغة: الأول لإختبار إدراك الثنائيات الصغرى - عينة البحث- خارج السياق ، والثاني لإختبار تأثير سياق الجملة على إدراك المفصل والتمييز بين الثنائيات الصغرى. أظهرت النتائج أن اعتماد مجاميع الأشخاص على الصفات الصوتية لإدراك المفصل عند استخدام الكلمات خارج سياق الجمل ضعيف في كلتا اللغتين وأن سياق الجملة له تأثير معنوي كبير على عملية الإدراك .

1.Introduction:

The concept of juncture has received renewed interest cross-linguistically in the last six decades. A considerable work has been done to investigate the nature and the status of juncture, sometimes with remarkable debates though. A handful of definitions for juncture have been provided, with some enclosing its broader aspects and others restricting the reference of the term, i.e. juncture to one of its types (see Moulton, 1947; Roberts, 1956; Hockett, 1958; Bloomfield and Newmark, 1965; Robins, 1967; Hughes, 1969; Gimson,1994; among others). In what follows a closer look will be given to some of these definitions.

Juncture is, generally, viewed as a type of supra-segmental area which has most to do with segmental phonemes(Gramley and Patzold, 1992:109)⁽¹⁾. This term is used in phonology to refer to the phonetic boundary features that may demarcate grammatical units such as morpheme, word, or clause (Crystal, 2003:248)⁽²⁾. In other words, it is a phonologically manifested boundary between linguistic units(Lehiste, 1964: 172). The most obvious realization of a junctural feature is pause or silence(West, 1975:104; Al-Hamash, 1979:124; Crystal, 2003:248); which is, though, functional (Bičan, 2006:2)⁽³⁾. However, for some linguists " it is primarily a lengthening of a sound after which it , i.e. a boundary, occurs "(Hill, 1955: 534). There is a dependency on other correlates to identify word- boundaries, viz. boundary signals. These are of segmental and supra-segmental nature (Lehiste, 1964:196-200; Hughes, 1969: 254). They include the occurrence of certain phonemes adjacent to word-boundaries, which abide by the phonotactics of the language, and modifications of phonotary patterns(such as the insertion of glottal stops, modifications of supra-segmental patterns of fundamental frequency, duration, intensity, lengthening of phonemes in onsets and coda and other modifications(see Keating et al., 1999:171f; Weber, 1999).

There are several types of juncture as proposed in the literature. The most convenient distinction is one made between three types: close juncture, internal open juncture, and external open juncture (Ukashah, 2005: 53 and Roach, 2000: 144). For example, in the phrase ' my train', the relationship that holds between /m / and /aɪ / in 'my', /t / and / r /, /r / and /eɪ /, and finally /eɪ / and /n / in 'train' is described as a close juncture. The relationship that holds between /aɪ / of 'my' and / t / of 'train' is described as internal open juncture, whereas the relationship between / m / of 'my' and / n / of 'train' is described as external open juncture. Since the chief interest of this study is in the perception of the allophonic variation across word boundary, we

(1) This term was first used by the American school (see Hughes,1969:69).

(2) For other definitions of the term see Robins, 1967:146f;Davis,1973; Anderson and Stageberg, 1975:196; and Roach,2000: 144.

(3) However, as Bičan(2006:2) proceeds, not every interruption of speech can be functional. Speakers can make a pause in the middle of a word, if they used to take breath (Zellner, 1994: 44; Crystal, 2003: 341).

specify ourselves with the first two types, viz. close juncture and internal open juncture. Accordingly, no theoretical account will be provided for the third type.

Close juncture refers to the normal transition between sounds within a word (Crystal, 2003: 249, and Ukashah, 2005:53). The internal open juncture (or the plus juncture / + / as frequently termed in the literature) is treated as a "special kind of break between phonemes, thus it breaks up the phonemic flow and makes words" (Roberts, 1956:231). This term is used to refer to the phonetic features that differentiate dozens of minimal pairs" which contain the same sequence of phonemes but differ in their prosody, meaning and orthography" (Karn and Yeni-Komshian, 2005:1). To consider the previously given example in the light of this account of internal open juncture, we gather the minimal pair 'my train' /maɪ + treɪn /and ' might rain' / maɪt + reɪn /. This notation suggests that in the first example the plus juncture falls between /aɪ / and / t /, whereas in 'might rain' it falls between /t / and / r /.

2. Statement of the Problem :

There are two distinct views with respect to juncture or word boundary identification. Some scholars hold the view that the phonetic and prosodic features at word boundaries do not provide enough acoustic cues to identify the word boundaries and that misperception is expected, especially in rapid speech (see, for example, Hockett, 1958:59; Bloomfield and Newmark, 1965:78f; West, 1975:104; Ohlander, 1976; Austin and Carter, 1988; Gimson, 1994:256; Vroomen and van Zon, 1996; Weber, 1999:1; Prieto, 2006:18f; Davis et al, 2007). Other scholars, however, hold the view that the presence of phonetic cues at word boundaries is an important issue for word recognition and for phonotactic learning (e.g., Lehiste, 1960; 1964; Hoard, 1966; Shimizu and Dantsuji, 1980; Gow, et al, 1996; Keating et al, 2001; Shafran et al., 2001; Katsika, 2007). This is stated, rather plainly, by Shimizu and Dantsuji (1980 : 2) : " We usually hear the difference between two phrases ..., even out of context, and, there must be some perceptual cues to distinguish them." (See Discussion).

Adhering to the first view, viz. that the phonetic variation at word boundaries does not provide reliable acoustic cues for juncture phrases discrimination, we intend to test the validity of the second view. Thus, this study seeks to verify the subsequent hypothesis: Listeners can identify minimal pairs of juncture phrases when used in sentential contexts better than when they are used in isolation. By sentential context we intend the semantic and pragmatic properties of the sentence.

3. Cues to Word Juncture Identification :

Development in laboratory techniques and computer soft-wares has noticeably facilitated speech analysis and acoustic studies. Vigorous experimental work has been implemented cross-linguistically to study the acoustic cues that characterize word boundaries (see among others, Scherer, 1946 (for Polish); Lehiste, 1960, 1964 (for English and three European languages); Dilley and McAuley, 2008 (for English) ; Katsika, 2007 (for Greek); Prieto, 2006 (for Catalan in Spain); Shimizu and Dantsuji, 1980 (for Japanese); Vroomen and van Zon, 1996 (for Dutch))⁽¹⁾. Languages have been found to differ in the ways they manifest word boundaries, viz. juncture, by using either segmental or suprasegmental features, or both. Lehiste (1964: 196) states:

⁽¹⁾ Experimental work on speech segmentation and word recognition has suggested that a complex of sources are available to listeners during speech processing and perception. These include acoustic/phonetic cues, metrical stress (rhythm), phonotactic regularities in addition to lexical knowledge and the linguistic context (see, for example, Duanmu, S., 1995; Vroomen and van Zon, 1996; Mattys et al., 2005; Dilley and McAuley, 2008).

" There appear to exist two general types: languages in which boundary signals are primarily of a segmental nature, and languages with well developed suprasegmental patterns characterizing units of the phonological hierarchy. ... Elements of both types may be present in a language." In what follows an overview is presented for juncture cues in English based on the experimental work done by different scholars.

Many reports have been presented about the acoustic and phonetic characteristics of juncture and syllable structure in English, in which several segmental and suprasegmental (prosodic) cues have been recognized to demarcate juncture and word boundaries (e.g., Lehiste, 1960; Hoard, 1966; Dilley and McAuley, 2008). Lehiste (1960), for example, provides a comprehensive study of the acoustic characteristics of internal open juncture in English and shows several segmental cues that indicate the presence of juncture. Among the acoustic/ phonetic cues she identified are aspiration of voiceless stop consonants, duration of consonants and vowels and glottalization of initial vowels. Dilley and McAuley (2008), focusing attention on the prosodic features of juncture, have shown that English, in addition to using proximal features like stress, uses distal prosodic aspects (like pitch and rhythm) to mark word boundaries (cf. Hoard, 1966). Table 1 provides a summary of the main acoustic/phonetic cues of juncture in English.

From the review given above we notice that the juncture phenomenon has attracted great attention cross-linguistically, yet little has been provided about this phenomenon in Arabic. The available literature reveals peripheral notes accompanied by scattered examples of minimal pairs differentiated by juncture features (see, for example, Omer, 1976: 196-7 and Ukasha, 2005: 52-7).

Table1: A Summary of the Phonetic Cues of Juncture in English⁽¹⁾

	Phonetic Cues	IPA Symbol	Position	Example
1.	Vowel lengthening		Pre-juncture	I scream / aI + skri:m / Ice cream / aIs+kri:m /
2.	Consonant lengthening		Pre-juncture	That sink / ðæt+sɪŋk / That's ink / ðæts+ɪŋk /
3.	Aspiration	[h]	Of voiceless stops post-juncture	That's tough / ðæts+tʌf / That stuff / ðæt+stʌf /
4.	Vowel shortening	[˘]	Before voiceless consonants pre-juncture	House trained / haus+treɪnd / How strained / hav+streɪnd /
5.	Strengthening		In consonants post-juncture	Play track / pleɪ+træk / Plate rack / pleɪt+ræk /
6.	Devoicing	[°]	Resonants after voiceless consonants post-juncture	Grey train / greɪ+treɪn / (great rain / greɪt+reɪn /)
7.	Glottalization	[?]	Post-juncture vowels	An aim / ən+ eɪm / A name / ə+neɪm /
8.	Dark / l/	[ɫ]	Pre-juncture	Heal eyes / hi:l+ aɪz / He lies. / hi:l+laɪz /

⁽¹⁾ This table is based on the description of the allophonic cues of juncture and syllable structure in English as given in Lehiste,1960; Bloomfield and Newmark, 1965:77; Hoard, 1966; Jones, 1966:174f; Gimson, 1994:265; Mattys and Clark, 2002; Dilley and McAuley, 2008 .

	Phonetic Cues	IPA Symbol	Position	Example
9.	Contrastive stress	[']		Blackbird /'blæk b3:d/; black bird /blæk 'b3:d/
10.	Rythmic groups			The way to cut it. /ðə'weɪ-tə 'kʌt It /; The waiter cut it. /ðə'weɪtə-'kʌt It /

4. Data Collection and Procedure :

Since this study is concerned with the perception of internal open juncture in English and Arabic(Standard Arabic) a corpus of pairs of words and phrases from both languages was collected. The data (50 pairs from English and 16 pairs from Arabic) were prepared in lists⁽¹⁾. Two native speakers (a female English speaker and a male Arabic speaker) were instructed to pronounce these phrases first out of context and then to use them in sentences⁽²⁾. Their pronunciations were recorded using an MP3 (model genx). The recorded material was then manipulated using a computer software WASP (Waveform Annotations) to segment and extract the samples of phrases which were used to carry out the experimental tests. Two groups of subjects: 13-undergraduate students of English (age range: 19-21years) and 9 lecturers of English (age range: 26-49 years), all native speakers of Arabic, were chosen as subjects to carry out the preliminary tests. A third group of 11 subjects (all native speakers of Arabic and MA students of English; age range: 23-27 years) was taken to carry out the modified version of the preliminary tests. Four identification tests were carried out, two on English and two on Arabic, all in one session with short breaks between the tests . See section 5 for a full description of each experiment.

5. Data Analysis and Results:

This study has been planned in terms of four perception tests: two were designated for the identification of juncture when the juncture phrases are used out of sentential context (one for English and the other for Arabic: tests one and three respectively) and the other two for the identification of juncture when these phrases are used in sentences (one for English and the other for Arabic : tests two and four respectively). All the perception tests carried out were 12 (four on each group of subjects). The forthcoming is a description of these tests and the obtained results (See Appendix).⁽³⁾

5.1 Test One: English Juncture Phrases Out of Context:

In order to examine the listeners' reliability on the acoustic/ phonetic cues at word boundaries a perception test was carried out on 13 undergraduate students (all

⁽¹⁾ The English minimal pairs were collected from books most of which are used as references in this paper. The Arabic minimal pairs were collected from some books and some were constructed by the researchers.

⁽²⁾ A special note of thanks is due to Mrs. Natalia Tarry and Mr. Oday Talal for taking the trouble of pronouncing the data. I would also like to thank all the subjects who voluntarily participated in the perception tests.

⁽³⁾ It was formerly planned to conduct a two-fold study in which acoustic and perception analyses were intended to be provided. The acoustic analysis was put off because of the difficulties associated with the recording process and the failure to obtain the suitable wave form formats required for using the computer software (WASP) properly.

native speakers of Arabic and learners of English)⁽¹⁾. Twenty five juncture phrases/words were used in this test (see Appendix, Table 1). The subjects were enabled to listen to one member of the juncture phrases twice, with a maximum of three times and were instructed to write down the spelling of the word/phrase they heard. The subjects' responses were processed as follows: If the subject's response accurately identified a pair item to be the heard form, it was scored as "correct". If the response misidentified the played form to be the other pair member, it was scored as "incorrect". If the subject's response matched neither member or no response was given, it was scored as "misperceived"(see Table2). For example, if the played pair item was "grey train" and the subject had written "great rain", that was classified as incorrect but if the subject had written "great train", "great aim", etc. or given no response, it was classified as misperceived. The results obtained from this test revealed that the correct responses were significantly low: mean = 25.76% ($t = -9.374$, $df = 12$, $p \leq 0.000$)⁽²⁾.

To examine the influence of proficiency in English on the precision of the identification of juncture phrases, the same test was repeated on a group of 9 Lecturers of English. Twenty (out of the 25) juncture phrases were used this time, in which only one pair item was played at a time (with chances of listening ranged between two and three times per item). This group of subjects were instructed to write down the spelling of these played words/phrases with no prior knowledge of the phrases being presented. The results obtained from this test demonstrate significantly low identification responses: means of correct responses were 16.66% ($t = -14.142$, $df = 8$, $p \leq 0.000$) (see Table: 2).

Table 2
Means of Identification Responses of English Juncture Phrases Out of Context

Subjects	Correct	Incorrect	Misperceived
13 Undergraduate Students	25.76%	32.6%	41.7%
9 Lecturers	16.66%	26.2%	57.1%
Total	21.2%	29.4%	49.4%

A modified version of this test was carried out in which an answer sheet of juncture phrases was prepared with the phrases of each pair randomly ordered so as to ensure the subjects' reliance on the acoustic signals in their choice and to avoid prejudicing their choices. The sheet contained 25 pairs of juncture phrases. The subjects (11 MA students) were instructed to listen to the recording and to score the item they think heard. Each juncture phrase was played twice at a time(sometimes with a maximum of three times). The test was planned to examine the subjects' identification of juncture by offering only one item of the pair used in isolation.

The results obtained from this test show moderate identification scores; thus, the correct responses ranged between 52% - 80% (mean: 65.81%). Comparing the percentages of correct responses obtained from this test with those obtained from earlier tests, viz. on the 13 Undergraduate students and the 9 Lecturers, reveals an increase in the correct scores (see Discussion).

⁽¹⁾ Non of the subjects participated in this study has a history of problems in hearing.

⁽²⁾ The difference is significant if the value of $p \leq 0.05$.

5.2 Test Two: English Juncture Phrases in Sentential Context:

This test involved examining the influence of sentential context on the identification of juncture. In this test the subjects (of all the three groups being tested in separate sessions) were enabled to listen to sentences where one of the juncture phrases was embedded and they were supplied with answer sheets in which the pairs were typed. The order of the phrases of each pair was randomized so that it might be the first or the second. The subjects were instructed to score the word or the phrase they heard used in the sentence by ticking it in the answering sheet. Twenty five sentences were played, repeated maximally twice for each (see Appendix, Table 3).

The results of this test on the 13 Undergraduate students demonstrated that correct identification scores ranged between 36% - 92%: mean = 74.15%. The correct identification responses of the Lecturers group (tested listening to only 20 juncture phrases) were also high and ranged between 75% - 95% : mean = 87.22%. The results obtained from the test on the 11 MA students revealed that the correct identification responses ranged between 62.95% - 88.87% : mean = 82.21% . When comparing the results obtained from this test with those obtained from the earlier test (i.e. test one) for all the three groups we notice an increase in the correct identification responses (see Figure 1). In order to examine the significance of this increase a Paired-Samples T Test , from the SPSS version 11.5 computer software, was used. The percentages of the correct identification scores from Test One and Test Two were compared. The paired samples test revealed that the increase in all the three groups is significant (see Table 3). This, in consequence, means that the sentential context has significant influence on the identification process of juncture phrases.

Table 3

Results of the Paired-Samples T Tests on the Correct Identification Responses of Juncture Out of and in Sentential Context in English

Subjects	Out of Context	In Context	Std. Deviation	t	df	Value of P
13 Undergraduate Students	25.76%	74.15%	15.42338	-5.282	12	P ≤ .000
9 Lecturers	16.66%	87.22%	8.45741	-25.027	8	P ≤ .000
11 MA Students	65.8%	82.21%	13.10241	-4.150	10	P ≤ .002

5.3 Test Three: Arabic Juncture Phrases out of Context:

To test the identification of juncture in Arabic 16 pairs of juncture phrases pronounced in isolation were used (see Appendix, Table 2). This test was carried out on the three groups of subjects participated in this study. The following is a description of the test and the results obtained.

Thirteen undergraduate students were instructed to listen to the words/ phrases played and to write down the spelling of the item they think heard. Only one item of each pair was played with chances of listening ranged between two or three times maximally. The subjects had no prior knowledge about the material being tested on but they were instructed to listen attentively to the played words/phrases and identify the item being heard. The responses obtained from the subjects were processed in a way similar to that done earlier, viz. with the English data in test one. Thus, if the played item was "أخو نهى" /?axu: nuha/(Nuha's brother) and the subject's response was "أخونها" /?axu:nuha/ (I cheat her), such response was classified as

incorrect, but if the subject's response was "أخون نهى"/?axu:n nuha/ (I cheat Nuha) or no response was given, this was classified as misperceived. The correct identification responses obtained from this test were significantly low (range 25%-43.75% : mean = 34.14%), $t = 8.716$, and $p \leq 0.000$.

The same test was repeated on the 9 Lecturers group using the same procedure described above. The results, likewise, demonstrated low correct identification responses (range 12.5% -50%, mean = 30.13%), $t = -4.498$, $p \leq 0.002$ (see Table 4).

Table 4
Means of Identification Responses of Arabic Juncture Phrases Out of Context

Subjects	Correct	Incorrect	Misperceived
13 Undergraduate Students	34.14%	32.20%	32.9 %
9 Lecturers	26.13%	10.34%	63.5%
Total	30.13%	21.27%	48.2%

A modified version of this test was carried out on the 11 MA students who were instructed to listen to the recording and to score the item they heard on an answer sheet of juncture phrases formerly prepared. One phrase was given at a time with chances of listening, maximally, two times. All the phrases of the test were given in isolation (i.e. out of a sentential context) and with a randomized order. The results of this test showed moderate rates of correct identification responses which ranged between 46.66% and 93.3% : mean = 76.98%. These percentages are higher than those obtained from the former tests given above (see Discussion).

5.4 Test Four: Arabic Juncture Phrases in Sentential Context:

In this test 16 sentences with juncture phrases embedded in them were used. One phrase of each pair was used in the sentence (see Appendix, Table 4). The subjects (of all the three groups in separate sessions) were told to listen to the recording of these sentences and to identify the juncture phrase embedded in them by scoring it in an answer sheet they were formerly supplied with. This answering sheet contained both items of each pair randomly ordered. The results of this test done on the 13 Undergraduate students demonstrated moderate percentages of correct identification which ranged between 25% and 81.25%: mean = 56.73%. The correct identification responses of the 9 Lecturers were high and ranged between 65% and 95%: mean = 80.55%. The 11 MA students' correct identification responses were rather better and their percentages ranged between 86.6% and 100% : mean = 92.7%. To examine the significance of the results in this test, the percentages of correct identification of this test and those of the former test (viz. Test 3) were compared using a Paired-Samples T Test . This comparison revealed that the increase in the correct identification scores (responses) in test four is significant (see Table 5). This, accordingly, means that the sentential context significantly contributes to juncture identification in Arabic also.

Table 5
Results of the Paired-Samples T Tests on the Correct Identification Responses of
Juncture Out of and in Sentential Context in Arabic

Subjects	Out of Context	In Context	Std. Deviation	t	df	Value of P
13 Undergraduate Students	34.14%	56.73%	15.42338	-5.282	12	$P \leq 0.000$
9 Lecturers	28.47%	80.55%	18.16208	-9.521	8	$P \leq 0.000$
11 MA Students	76.98%	92.70%	13.75271	-3.791	10	$P \leq 0.004$

6. Discussion:

The data analysis provided in section 5 demonstrates that the allophonic variation at juncture (word / phrase boundaries) is not significantly sufficient to facilitate juncture phrases identification. The sentential context, on the other hand, has been shown to be significantly helpful in this respect. The series of tests carried out in this study on the three groups of subjects suggest that proficiency in English has no influence on the subjects' accuracy in the identification of the juncture phrases. Some studies on second language learning (e.g., Altenberg, 2005 and Mattys et al., 2009) posited that second language learners have difficulty segmenting speech in their second language on the basis of acoustic-phonetic cues. Although this might be true, results obtained from tests done on Arabic (our subjects' native language), viz. low identification percentages, suggest that difficulty in speech segmentation is not restricted to situations of second language learning but it may include first language also. Increase in the correct identification responses in tests 1 and 3 in the third group (11 MA students) may, in part, be due to the nature of the task in which the subjects had to make a choice from an answer sheet. Simplifying the nature of the test might have influenced the results and reflected this significant increase in correct responses.

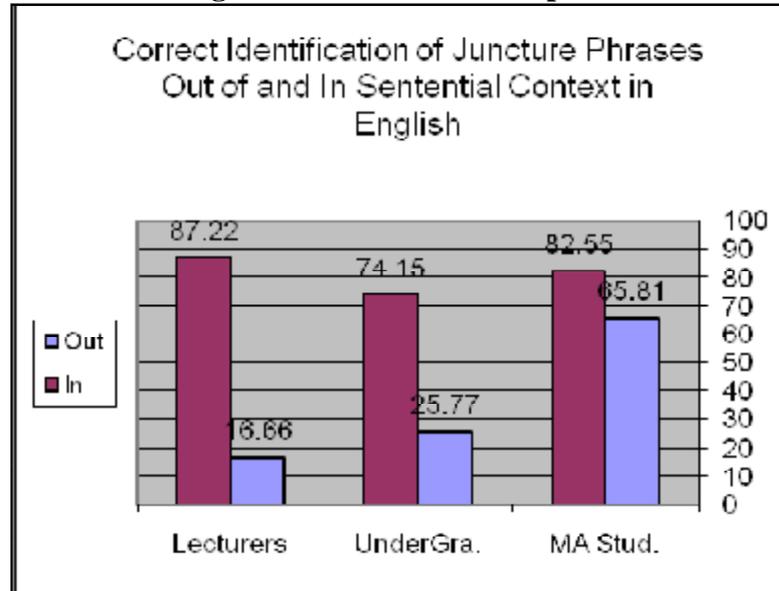
To make a more convenient reading to the results obtained from the perception tests carried out in this study, a comprehensive statistical analysis was conducted to detect significant differences within, between and among the groups and the tests. The following is a description of the results of this statistical analysis and a discussion of the results.

The correct identification responses of juncture phrases in English used out of context for the three groups (see Figure 1) were compared using a repeated One-Way ANOVA Test, by changing the Factor. This analysis has shown no significant difference between the three groups. Having the MA students' group as the Factor: the significance value of the comparison between the MA students and the Undergraduate students was: $F = 4.429$, $P = .254$ (i.e., $p > .05$) and between the MA students and the Lecturers it was: $F = 4.429$, $P = .351$ (i.e., $p > .05$). Repeating the analysis by changing the factor has shown no significant differences between these groups.

Since the same procedure was used in the preliminary identification test, in which no answer sheet of the juncture phrases was supplied, for the Undergraduate students' group and the Lecturers' group a Paired-Samples T Test was carried out to detect any significant difference between the two groups. This test has shown a significant difference in favour of the Undergraduate students' correct responses: $t = -3.000$, $df = 8$, $p = .017$ (2-tailed). The tentative reading to this result is that proficiency in English is not crucial in the identification of the phonetic variation at juncture boundaries (see Altenberg, 2005 for similar results). A future study can be

conducted to investigate this further with the circumstances of the perception test being restrictively controlled to prove the validity of the results obtained here.

Figure 1
The Correct identification of Juncture Phrases In and Out of Sentential Context in English for the Three Groups.

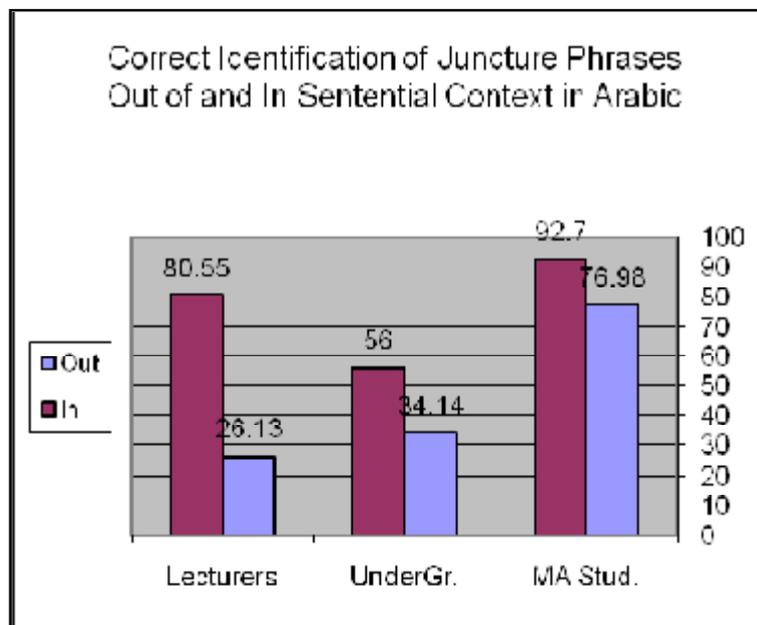


Using a repeated One-Way ANOVA Test, the comparison between the correct responses of the juncture phrases in English used in sentential context has shown a significant difference between the MA students' group (taken as the factor) and the Undergraduate students' group: $F = 14.42$, $P = .005$ (i.e., $p < .05$). No significant difference was found between the MA students' group and the Lecturers' group: $F = 7.743$, $P = .061$ (i.e., $p < .05$). The results obtained from this statistical analysis may entail that the MA students are more experienced at using higher-level information of lexical knowledge and sentence structure (see Mattys et al., 2005 and Mattys and Melhorn, 2007).

The ANOVA Test applied to the correct identification responses of juncture phrases used out of context in Arabic for the three groups (see Figure 2) has revealed a significant difference between those of the MA students' group (taken as the factor) and the Lecturers' group: $F = 87.000$, $P = .000$ (i.e., $p < .05$). No significant difference was found between the MA students' group and the Undergraduate students' group: $F = 1.545$, $P = .322$ (i.e., $p > .05$). No satisfactory explanation can be provided for these results; future research may investigate this more intensively on larger groups of subjects to examine its validity. When the percentages of the correct identification responses of the Arabic juncture phrases used in sentential context were compared using ANOVA Test no significant differences between the three groups were obtained, thus all P values obtained were above .05.

Another series of statistical tests was carried out to compare the means of the correct identification responses of the three groups in English and Arabic to see any significant influence of the native language on the subjects' precision in the identification of juncture phrases.

Figure 2
The Correct identification of Juncture Phrases In and Out of Sentential Context in Arabic for the Three Groups.



Comparing the means of the correct identification responses of juncture phrases used out of context in English and Arabic for all the groups using a T-Test has shown a significant difference in favour of the correct responses in Arabic: $t = -6.052$, $df = 2$, $p = .026$ (2-tailed) .This may indicate that the subjects are more sensitive to the allophonic variation at juncture boundaries in their native language, viz. Arabic, than in the learned language, viz. English (cf. Altenberge, 2005). However, the comparison between the means of the correct identification responses of juncture phrases in sentential context in English and Arabic for all the three groups has shown no significant difference between the two languages: $t = .558$, $df = 2$, $p = .633$ (2-tailed) . One possible reading to this result is that the sentential context contributes to the identification of juncture phrases in both the native and learned languages.

The initiative of this study, stated in section 1, is that listeners have difficulty in relying on the acoustic-phonetic cues in speech perception. This may be ascribed to the considerable variation in the acoustic signals received, in which a complex of factors are interactively present. Ladefoged (1967: 144f), for examples, summarizes these in terms of three influences of context on speech perception: context of situation, linguistic context, and the acoustic context⁽¹⁾. The first type of context is non-linguistic in nature and is made up of a large number of factors: the identity of the speaker, the listener, the time, the place, etc. We believe that this factor may positively contribute to speech perception, though misperception may take place (see, among others, Austin and Carter,1988). Listeners seem to depend on a variety of sources of information in speech perception. In an up-to-date series of studies, Mattys et al. (2005) and Mattys & Melhorn (2007), examined the contribution of a complex of factors to speech segmentation and perception. Among the factors studied were the acoustic-phonetic cues, phonotactic cues, the lexical knowledge, and the sentential context. They have found that these factors are of graded, interactive and flexible

⁽¹⁾ The second and third types of context in Ladefoged's terminology are used in rather special senses not the ones employed in this paper .

nature. The acoustic cues, as being suggested, assume a low level rank in the hierarchy, whereas the sentential context assumes the top rank (Mattys et al. 2005: 488).

7. Conclusion:

In this study the sentential context has been shown to significantly influence the perception of word juncture in contrary to the phonetic variation which was found to be a non-reliable source of information for listeners. The results obtained in this study calls for further investigation and research. As being highlighted earlier, section 3, little research has been done on word juncture in Arabic. This makes the phenomenon of juncture and word boundaries a fertile area to investigate through. Among the research that can be carried out in this respect is one focusing on the acoustic aspects of juncture phrases in Arabic so as to establish the phonetic features that differentiate these minimal pairs.

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Appendix

Table 1: Data of Juncture Phrases Used in Test One
Juncture Phrases Used in Test Three

1. find her	finder
2. I scream	ice cream
3. a grey train	a great rain
4. Kissed Ed	Kiss Ted
5. uneasy	an easy
6. mark it	market
7. an oat	a note
8. play track	plate rack
9. illegal	ill eagle
10. car track	cart rack
11. an ocean	a notion
12. gentleman	gentle man
13. Greek's pie	Greek spy
14. black bird	blackbird
15. full stop	false top
16. It swings	Its wings
17. the waiter cut it	the way to cut it
18. it stuff	It's tough
19. already	all ready
20. at ease	a tease
21. an aim	a name
22. nitrate	night rate
23. house trained	how strained
24. changed over	change Dover
25. at all	a tall

Table 2: Data of

1. أودعاني	1. أو دعاني
2. ذاهبة	2. ذاهبة
3. تهذي بها	3. تهذيبها
4. أخونهي	4. أخونها* (1)
5. مالي	5. مالي*
6. قد رشاني	6. قدر شاني
7. قف لي	7. قفلي*
8. صديقة هاني	8. صديق تهاني
9. أقسما	9. أقسى ما*
10. جاد لك	10. جادللك*
11. كللك	11. كلا لك*
12. مجالس جود	12. مجال سجود
13. بنا به	13. بنا به
14. حقرنا	14. حق رنا*
15. جام لنا	15. جاملنا
16. ما ذكر	16. ما ذكر

(1) The juncture phrases marked with * have been constructed by the researchers.

Table 3: Sentences Used in Test 2.

1. The blackbird in my garden sings sweetly.
2. It's too late to go to market; the shops shut an hour ago.
3. I wrote a note and noted what I wrote.
4. If you want to make an aim in life you've got to get on.
5. If I do something illegal but nobody knows, am I a criminal?
6. My sister disappeared yesterday; I had to go and find her.
7. From the bridge we saw a grey train coming.
8. We traveled by bus overnight, so it wasn't an easy journey.
9. The first words our baby said were, "Kiss Ted".
10. I like ice-cream; it's cold and sweet.
11. A Greek's pie always contains olives and cheese.
12. You are doing it wrong ! Let me show you the way to cut it.
13. It says play track on my computer, but what's it for.
14. On the return journey the drivers changed over
15. He was a tall man and very thin.
16. A shop can keep a gentleman, but a gentleman cannot keep a shop.
17. I like my sister's dog but certainly isn't house trained.
18. You could tell by the car track where the vehicle fell over the cliff.
19. If you take a taxi after nine o'clock the driver charges the night rate.
20. We saw a humming bird; it's wings were tiny.
21. The building looked very tall but actually it had a false top.
22. The sergeant Major told his men to stand at ease.
23. I asked if he knew where London is but he hadn't a notion.
24. It's tough being a hamster because everyone thinks they're greedy.
25. When the children were all ready I took them to school.

Table 4. Sentences Used in Test 4

1. جاء أحمد وعلي وأودعاني مبلغا من المال.
2. التاريخ مليء بأخبار ملوك ودول ذاهبة.
3. ماهذه الترهات التي ما تزال تهذي بها.
4. أخونها مسألة لاوارد لها.
5. أخذت مالي الذي أقرضته لأحمد.
6. لبيت الناس تعرف قدر شاني عند الخليفة.
7. اذا جئت الحفلة، قف لي حتى اعرف مكانك.
8. ذهبت مع صديقة هاني لأدلها على عنوانه.
9. كان ذلك أفسى مامر بنا من مصاعب.
10. انه شخص جواد طالما جاد لك.
11. لقد كللك الغار أيها الملك المنتصر.
12. كان المسجد مكتظا بالمصلين فلم احظ حتى بمجال سجود.
13. جاملنا كثيرا وبمناسبات عدة.
14. قال له والده "اعطي حق رنا.
15. لكل من أساء لنا أقول "بيت ما بنا به".
16. المهم أن نستفيد من كل ماذكر.