

Anglophone perceptions of Arabic syllable structure

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Empirically, the onset-rhyme structure of syllabic constituents has been revealed in several types of experiment: using word-games [1], or auditory priming stimuli or visual priming of auditory stimuli [2, 3]. These experiments are designed supposing that perception of the auditory prime and the separate perception of a visual target (text or image) are mediated by the same structural model of lexical items. To escape this supposition we have sought for an empirical probe that engages only one kind of processing for probing perceived syllable structure, and settled on audiovisually incongruent stimuli which elicit the channel-fusion phenomenon known as McGurk fusion [4]. If human are presented with incongruent stimuli having different segments temporally aligned in audio and visual channels, then the perceived sound may different from that present in either channel (see Figure 1).

McGurk fusion rates have been used successfully to probe syllable structure of English words [5, 6]. The abiding pattern, in this work, indicates that fusion rates elicited by incongruent segments by native English speakers (*Anglophones*) are significantly lower in onset than in coda positions. Such differences survive in branching constituents, polysyllabic words and words embedded in natural phrase contexts. These quantitative differences would not be observed in pure CV languages, which lack syllabic codas. In the case of languages for which syllable structure is contested, one could use incongruent stimuli to seek for the segments that show too much fusion to be onsets, thereby putting linguistic conjectures and hypotheses about codas to empirical test. Such a venture has been started for Arabic [7].

The Arabic tradition of Sybawaih, on which the (phonetic) Arabic alphabet is founded, uses CV units symbolised orthographically by a consonant bearing a vowel diacritic. Word-medial consonant clusters can occur because one of the Arabic vowels is silent [8]. The Western tradition of classical scholars treats Arabic like Latin and Greek, postulating there are closed CVC, CVVC, CVCC syllables [9]. In segments classed as codas in this tradition, empirical studies of fusion indicate that native Arabic speakers (*Arabophones*) fuse (Western) codas at the same rate as onsets, or even at a lower rate if they consist of CC-geminates (as in ‘khaass’ = special, ‘saff’ = class, for example). There seem to be no codas in the mental models mediating the speech perception of *Arabophones*. Recently, Baothman [10] has developed a modern representation of Arabic speech patterns using element phonology and a coda-less constituent structure. Baothman has derived a stress-prediction algorithm that is much simpler than those based on the syllabification of the western classical tradition, and has been able to model the well-known coarticulation processes of Arabic using a CV-based element phonology [8].

The aim of this paper is to move on from the basic differences between mental models of *Anglophones* and *Arabophones*. First we confirm earlier results [7] empirically using McGurk fusion rates that *Arabophones* do not show coda-onset differences of fusion rate: their distribution of fusion rates is unimodal (Figure2), and their average fusion rates for (Western) onsets and (Western) codas are not significantly different (Table 1). Secondly we subject *Anglophones* to the same Arabic word stimuli as our *Arabophones* and investigate whether or not their fusion responses show the coda-onset fusion differences suggested by syllabification in the Western tradition. The results (Table 1 and Figure 2 overleaf) show a bimodal distribution rate and (Western) onsets that fuse significantly less readily than (Western) codas in Arabic speech.

These new results suggest that *Arabophones* use mental models of speech that differ markedly from the mental models of *Anglophones*. The suggestion raises further research questions addressable by McGurk studies and possibly priming studies: At what point on the learning curve, for an Anglophone learning Arabic does a student acquire the no-coda mental model that characterises Arabophones? What are the fusion habits of those bilingually fluent from an early age *Et Cetera...*

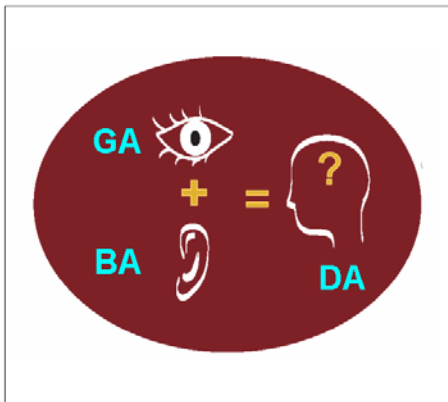


Figure 1: McGurk fusion

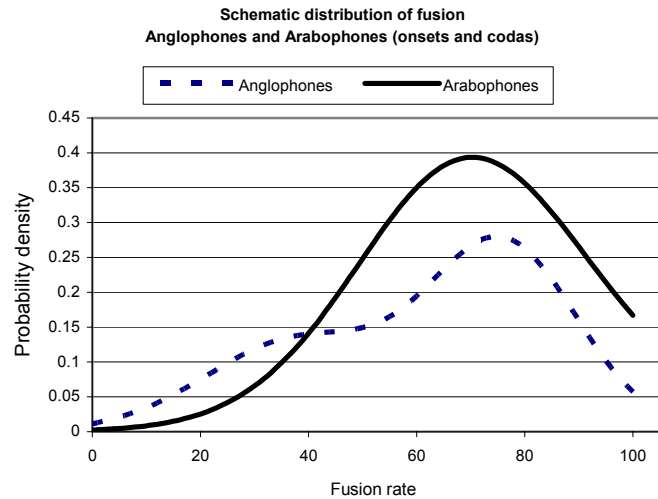


Figure 2: Fusion rates

Stimuli - Participants	Fusion Rates		
	Onsets	Codas	Significant difference between onsets vs. codas (Paired T-Test)
English Stimuli – Anglophone Participants	40%	65%	Yes
Arabic Stimuli – Arabophone Participants	67%	74%	No
Arabic Stimuli – Anglophone Participants	39%	75%	Yes

Table 1: Fusion rates for onsets and codas

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