Phonological, Semantic, and Root Activation in Spoken Word Recognition in Arabic

Abdulrahmn Alamri and Tania Zamuner

University of Ottawa

Studies on phonological and semantic activation have provided evidence that words are recognized faster when primed by phonologically or semantically related words (Allopenna, Magnuson, and Tanenhaus, 1998; Huettig & Altmann, 2005; Mani and Plunkett, 2011;Yee and Sedivy, 2006; Zwitserlood 1989). However, this evidence has been developed based on studies of Indo-European languages, which only constitute a subset of the languages of the world. Moreover, studies based purely on Indo-European languages do not investigate lexical properties found in other languages. To date, few studies have investigated phonological and semantic activation in Arabic (Boudelaa and Marslen-Wilson, 2000, 2001, 2004; Boudelaa, Hauk, Shtyrov and Marslen-Wilson, 2009, Perea, Abu Mallouh and Carreiras, 2014), and even fewer have investigated the role of the Arabic consonantal root in spoken word recognition (SWR) (Boudelaa and Marslen-Wilson, 2005). Of the studies that do exist, all have used masked priming or cross-modal tasks, with no studies looking at SWR using eye-tracking methodology. This research explores phonological, semantic and root activation in Arabic using the visual world paradigm (VWP) with eyetracking. The goal was to investigate whether similar effects of phonological and semantic activation are found in Arabic as found in previous research in Indo-European languages using the VWP. Furthermore, the goal was to determine whether effects of root activation are also found using the VWP. The last goal was examine the time course of phonological, semantic and root activation, as the VWP provides a fine-grained measures of ongoing cognitive processing during SWR (Huettig and McQueen, 2007).

The present study examined the time course of phonological, semantic and root activation SWR in Arabic using the visual world eye-tracking paradigm. Participants were 31 adult speakers of Arabic, who saw four images and were instructed to click on a named object. The objects in each trial included a target, a related distractor (phonological, semantic, or root distractor) and two unrelated distractors. Each target (e.g., ʃubbak 'window') appeared once in each the three conditions: phonological cohort distractor (beginning with the same onset and vowel as the target, e.g., ʃurbah 'soup'; semantic distractor (e.g., ba:b 'door'); and root distractor (sharing phonology, semantics and with the same consonantal root with the target, e.g., ʃabakah 'net').

A quasi-logistic Growth Curve Analysis method (Mirman, 2014) was used to analyze the time course of fixations to the target image across the different conditions to explore whether the presence of a distractor (phonological, semantic or root) affected the fixation proportions to targets. Time course measures revealed significantly different fixations to the target across the three conditions. The earliest peak was for the targets in the phonological condition, followed by the semantic condition, and the latest peak in fixation to the target was in the root condition. This demonstrates that target fixation proportions were affected by the presence of root distractors more than by the presence of phonological or semantic distractors.

This study is the first eye-tracking investigation into the time course of phonological, semantic and root activation in Arabic. Its results confirm previous findings that have found graded competition for related distractors based on the amount of phonological and semantic overlap with targets (Huettig and Altman, 2005; Huettig and McQueen, 2007; Huettig et al, 2006; Mirman and Magnuson, 2009; Yee and Sedivy, 2005). The significant effect of root

distractors on fixation proportions of targets providing converging evidence for the assumption that the Arabic consonantal root is an important unit in lexical access. These results correspond with and provide support for the previous findings that have found an effect for the consonantal root in both spoken and visual word recognition in Arabic (Boudella and Marslen-Wilson,2000, 2001, 2005, 2011).

References

Boudelaa, S., & Marslen-Wilson, W. D. (2000). Non-concatenative morphemes in language processing: evidence from Modern Standard Arabic. Proceedings of the Workshop on Spoken Word Access Processes (pp. 23-26). Nijmegen: Max Planck Institute for Psycholinguistics.

Boudelaa, S., & Marslen-Wilson, W. D. (2001). Morphological units in the Arabic mental lexicon. Cognition, 81, 65-92.

Boudelaa, S., & Marslen-Wilson, W. D. (2004). Abstract morphemes and lexical representation: the CV-Skeleton in Arabic. Cognition, 92, 271-303.

Boudelaa, S., & Marslen-Wilson, W. D. (2005). Discontinuous morphology in time: Incremental masked priming in Arabic. Language and Cognitive Processes, 20, 207-260.

Huettig, F., & Altmann, G. T. M. (2005). Word meaning and the control of eye fixation: Semantic competitor effects and the visual world paradigm. Cognition , 96, B23-B32.

Huettig, F., Quinlan, P. T., McDonald, S. A., & Altmann, G. T. M. (2006). Models of high-dimensional semantic space predict language-mediated eye movements in the visual world. Acta Psychologica, 121, 65-80.

Huettig, F., & McQueen, J. M. (2007). The tug of war between phonological, semantic and shape information in language-mediated visual search. Journal of Memory and Language, 57(4), 460-482.

Mani, N. & Plunkett. K. (2011). Phonological priming and cohort effects in toddlers. Cognition, 121,196-206.

Mirman, D. (2014). Growth Curve Analysis and Visualization Using R. Florida, USA: Chapman & Hall/CRC.

Mirman, D., & Magnuson, J. S. (2009). Dynamics of activation of semantically similar concepts during spoken word recognition. *Memory & Cognition, 37(7),* 1026-1039.

Yee, E., & Sedivy, J. C. (2006). Eye movements to pictures reveal tran-sient semantic activation during spoken word recognition. Journal of Experimental Psychology: Learning, Memory, & Cognition, 32 , 1-14.

Zwitserlood, P .(1989). The locus of the effects of sentential-semantic context in spoken-word processing. Cognition, 32, 25–64.