Arabic versus French Digits in Short-Term Memory Span Assessment:
a Stationarity Analysis

Raja Ghozi, Ph.D

American University of Bahrain, Bahrain

Email: raja.ghozi@aubh.edu.bh, Phone Number: +973 37109223

Sofiene Bacha

MS in TICV, ENIT-Tunisia, and Univ. Paris Descartes, France

Policy Specialist at UNDP, United Nations, New York, USA

Email: sofiene_bacha@yahoo.fr

Meriem Jaidane

Professor, ENIT, University of Tunis Manar, Tunisia

Email: Meriem.jaidane@enit.utm.tn

Abstract

Short-term Memory evaluation is very important in tracking the learning development of children, and for that, speech-therapists use several tests, where Auditory Digit Span (ADS) is one of the most common. It uses sequences with increasing number of digits, and evaluates the child's ability to recall them according to a specific protocol. Speech-therapists, in the Department of Child and Adolescent Neurology in the National Institute of Neurology, rely on the standardized (NEEL) French set of tests and its manual in administrating interpreting the ADS test. In this work, we highlight the importance of taking into consideration the phonological differences between Arabic and French digit, which has an impact on memory recall and thus can produce unexpected ADS test score performance. For that, we performed a signal time-frequency analysis by evaluating three indices of digit sound stationarity, namely: Kolmogorov, Küllback and Bhattacharyya indices. The Arabic digits were found to be on average of higher stationarity then their French equivalents, which could be translated into lower phonetic complexity. Such effect may alter the expected score in either way, depending on the short memory rehearsal process and the phonological complexity of the digit sequence. We note that this work is an extension of a previous study 1 , where we have validated and confirmed the French to Arabic adaptation of the heuristically constructed Tunisian Arabic Data base of words, used in phonological memory evaluation of the same standardized French NEEL set of tests.

Keywords: Auditory Digit Span, Phonological Complexity Entropy, Short-Term Memory,   Stationarity.

References

[1] A. Baddeley and G.J. Hitch, "Working memory," In G. Bower (Ed.), The Psychology of Learning and Motivation: Advances in Research and Theory, Vol. VIII., New York: Academic Press, Vol. 22, 1974.

[2] A. Baddeley, "Human memory: theory and practice," Allyn and Bacon, Boston, 1990.

[3] A. Baddeley, "Working memory : looking back and looking forward," Nature review,

Neuroscience, Vol. 4, New-York, October 2003.

[4] F. Ben Ali, S. Djaziri Larbi, M. Jaïdane, and K.Ridene, "Experimental mapping and validation of the dependence on the language of objective speech quality scores in actual GSM network conditions," Proc. 17th European Signal Processing Conference (EUSIPCO), Glasgow,Scotland, 2009.

[5] S. Ben Gouider, and N. Gouider-Khouja, "Propositions in adaptation of Phonology and Memory French NEEL's test," Internal Report, National Institute of Neurology, Tunis, 2010.

[6] 1 S. Bacha, R. Ghozi, M. Jaidane, and N.G. Khouja, "Arabic Adaptation of Phonology and Memory Test using Entropy-based Analysis of Word Complexity". ISSPA 2012: 672-677, DOI 10.1109/ISSPA.2012.6310638

Note: This work was part of a research project of a master degree, and was not published before