Mental Lexicon Modelling in Bilinguals

Irina G. Ovchinnikova
Professor, Department of Foreign Language, Sechenov University, Russia; Haifa University, Israel

Ira.ovchi@gmail.com

Lecture 1. Current trends in the ML studies

Mental lexicon (ML) is considered to be the core component of the language mental representation. Interpreting the ML as a verbal semantic memory, researchers debate about a unit of the storage (a word? a morpheme? an idiom? a single type of units or different types to store and to operate?) and relation of the ML to the mental grammar (MG). Depending on the key statements about stored units and systems of the language mental representation, the ML modelling includes: (a) two systems (ML + MG); (b) one system: ML and rules for generating combinations of words / morphemes that are deduced from the communication experience; (c) two systems with a specific status of the ML and set of rules for regular grammar forms derivation; (d) a network of units connected in clusters based on the different criteria as in connectionism (as Multiplex model of mental lexicon - 2018).

The diversity of the approaches to the ML modelling reveals the complexity of the phenomena as well as the dependence of results upon experimental design. However, the experimental data from different languages show the variability of the ML structure in native speakers. The differences in the ML structure are related to the procedures and operations needed to access the verbal semantic storage, while the storage itself works the same way for native speakers of different languages. A unit of the storage probably differs in inflectional and strongly agglutinative languages. Therefore, the ML study and modelling requires fresh data and relevant resources.

The connectionist models of language processing in humans doubt even the fact of the ML existence (Baayen's models). Connectionists presuppose the declarative semantic memory to be the only storage for verbal and nonverbal abstract units. A speaker grasps derivation models and rules for generating syntax constructions due to his / her language input and communication experience. Thus, in bilinguals, the time limits of languages input, forcing the involvement of different zones of the brain in the process of speech perception and production, evoke development of the metalinguistic skills and intuition to deduce the rules.

Lecture 2. L1 and L2 representation in bilinguals' ML

In bilinguals, ML contains access to words / morphemes of L1 and L2, however, the activation of the units takes more time than in monolinguals. The activation of a language in bilinguals depends on contextual and cultural cues besides a speaker's intention (Timmer & Bialystok's model). The activation of L1 and L2 clusters in the bilinguals' ML in a communication act depends on objects in environments and nonverbal signs connected with one of the familiar languages. The objects and signs provoke involuntary activation of a language that is not in use in the communicative situation. Meanwhile the links among L1, L2, L3 clusters in the bilinguals' ML are influenced by the similarity of the languages (in typology and language families) that impacts the speech processing in unbalanced bilinguals. The L2 network / cluster differs in structure and has incoherent organization compared to the L1 network / cluster.

The resources for the semantic network and ML modelling in bilinguals (besides National Corpuses)

Tools to process semantics and select a semantic component:

- http://wordnet.princeton.edu/
- http://globalwordnet.org/
- http://multiwordnet.Vk.eu/online/ multiwordnet.php

• http://www.psych.rl.ac.uk/
• http://babelnet.org/

BabelNet 4

https://www.babelnet.org/news#n12 covers 284 languages and is obtained from the automatic integration of more than 10 databases and wordnets.

Examples of research projects based on the resources:

Stella, M., Beckage, N. M., Brede, M., & De Domenico, M. (2018). Multiplex model of mental lexicon reveals explosive learning in humans. *Scientific reports*, *8*(1), 2259.
https://www.nature.com/articles/s41598-018-20730-5

Zemla, J. C., & Austerweil, J. L. (2018). Estimating semantic networks of groups and individuals from fluency data. *Zemla, Jeffrey C, and Joseph L Austerweil."Estimating Semantic Networks of Groups and Individuals from Fluency Data". PsyArXiv*, *9*.
https://alab.psych.wisc.edu/papers/files/ZemlaAusterweil2018.pdf

Utsumi, A. (2015). Multilingual Distributional Semantic Models: Toward a Computational Model of the Bilingual Mental Lexicon. In *EAPCogSci*.
http://ceur-ws.org/Vol-1419/paper0041.pdf

Borodkin, K., Kenett, Y. N., Faust, M., & Mashal, N. (2016). When pumpkin is closer to onion than to squash: The structure of the second language lexicon. *Cognition*, *156*, 60-70.

Bovi, C. D., & Navigli, R. (2017). Multilingual semantic dictionaries for natural language processing: The case of BabelNet. *Encyclopedia with Semantic Computing and Robotic Intelligence*, *1*(01), 1630015.