Although much is known about factors that facilitate or inhibit code-switching in both comprehension and production, the underlying mechanisms are still not very well understood. Using computational cognitive modeling one can simulate code-switching behavior in multilinguals with the goal to explain the code-switching process. For this reason, we have extended Dual-path (Chang, 2002), a connectionist model of monolingual sentence production, to handle two or more languages (Tsoukala et al., 2017). The Dual-path model is trained on message-sentence pairs and it learns to produce a sentence, word by word, given its semantic representation. For instance, the simple message “AGENT=DEF, WAITER; ACTION=EAT;” is expressed in English as “The waiter is eating”. Using the bilingual Dual-path model we have simulated sentence production in early (simultaneous) Spanish-English bilinguals and late speakers of English who have Spanish as a native language (“late bilinguals”). We then manipulated language control to allow the model to produce sentences in either language or to code-switch. It is important to note that the model was not taught to code-switch through, e.g., code-switched input, it solely learned to code-switch through the language control manipulation. The model shows how code-switching patterns differ between early and late bilinguals. The early bilingual model code-switches much more frequently: 17% of produced sentences contained a code-switch as opposed to 1% in the case of the late bilingual model. Furthermore, most code-switches in the early bilingual models were intra-sentential (7.5% as opposed to 0.34% in the late bilingual case), whereas the late bilingual models mostly borrowed nouns from their L1 Spanish when producing L2 English. Both model behaviors are in line with previous empirical findings (Poplack, 1980). Therefore, using this cognitive model we can proceed in further examining the code-switching process.
References:

