

EDITORIAL

Bimodal bilingualism: Language and cognition

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Bimodal bilingualism refers to a type of bilingualism that employs two different input-output channels, one involving spoken language and the other involving sign language. Until the second half of the twentieth century, sign language was not recognized as a fully-fledged language and there was very little research devoted to bilingual sign language speakers (Grosjean, 1992). In the last two decades, however, interest in the study of bimodal bilingualism, including the cognitive effects of bimodal bilingualism and the neural organization of spoken and sign languages, has increased considerably. Furthermore, the particular significance of studies of bimodal bilingualism for understanding bilingual language representation and processing more generally has been properly recognized. *Bilingualism: Language and Cognition* has not been silent or inactive on this front. Two years ago we specifically added the study of bimodal bilingualism to the journal's core areas of interest, and we are glad to see an increased number of research articles on bimodal bilingualism (e.g., Giezen & Emmorey, 2016; Rinaldi & Caselli, 2014; Williams & Newman, 2015; Morford et al., in press; Kaufmann & Philipp, in press).

It is, therefore, a pleasure to announce in this issue the Keynote article by Emmorey, Giezen & Gollan (2016a) entitled “Psycholinguistic, cognitive, and neural implications of bimodal bilingualism”. In their Keynote article, the authors present an elegant overview of similarities and differences between unimodal (i.e., two spoken languages) and bimodal bilingualism and its implications for how the brain controls, processes, and represents two languages. The authors focus on cases of language mixing in bimodal bilinguals, so-called code-blends (simultaneous production of a word and a sign), by hearing children of deaf parents, and explore how co-activation and control of two input-output systems (spoken and sign language) differs from bilingual language processing in a single modality. According to Emmorey et al. (2016a), code blends in bimodal bilinguals are cost-free, due to the fact that a produced word can easily be accompanied by a corresponding sign. In this sense, language mixing in bimodal bilingualism allows for an additional option that is not available in unimodal bilingualism in that two languages can be used in parallel (through the two channels), rather than requiring a sequential switch to a different (spoken) language as in unimodal bilingualism.

The authors also describe the brain networks that control bimodal bilingualism compared to unimodal bilingualism, pointing out a number of interesting differences. In speech production, for example, bimodal bilinguals engage different brain networks for spoken and sign output, whereas unimodal bilinguals recruit the same motor areas for articulating both languages.

We have invited seven commentaries to further discuss the keynote article. To begin with, Woll and MacSweeney (2016) note that research with hearing bimodal bilinguals as presented in the Keynote article should be supplemented by more research on bilingualism in deaf people. They specifically suggest that the study of mouthings in comparison to code blends can be insightful when it comes to deaf bilinguals. On a different front, Tang (2016) emphasizes that there are many other factors yet to be explored such as language proficiency, language dominance and age of acquisition in bimodal bilinguals. Green (2016) considers topics specifically related to language control and points to two interrelated questions, i.e., multimodal synchrony and control of serial order. Along similar lines, in his commentary, Ding (2016) expresses the necessity to further discuss and characterize language control in bimodal bilinguals. As he points out, there is no doubt that bimodal bilinguals do not apply the same mechanisms as unimodal bilinguals in language control, but it is still not clear what the differences are. Bimodal bilinguals may actually have to deal with much more complex situations in controlling their languages. This topic is central also in the commentary by Poarch (2016), who argues that a simple on/off switch may not do sufficient justice to the cognitive and languages control mechanism required in bimodal bilinguals. Likewise, Kroll & Bice (2016) argue that differences in language control between bimodal and unimodal bilinguals have not been examined systematically, and that further studies are needed to fully characterize the various components of language control. Finally, in their commentary, Anible & Morford (2016) raise the question to which extent the visual nature of signed languages shapes the pattern of effects found for hearing bimodal bilinguals. Anible & Morford (2016) do not dispute that the bimodality of bimodal bilinguals impacts their language processing, but the authors suggest that some phenomena might be explained better in terms of the modality, and specifically the visuality, of signed languages.

Emmorey, Giezen & Gollan (2016b) reply to all of these intriguing questions and the other points made by the commentators. In addition to the Keynote article, the commentaries and the authors' response, this issue presents another research article on the topic, by Giezen and Emmorey (2016). The package presented in this issue thus provides BLC readers with up-to-date research on the nature of bilingual language control when the two languages engage distinct sensory-motor systems. At a more general level, bimodal bilingualism tells us that the coactivation of two languages in a bilingual's mind/brain is not dependent upon low-level (e.g. perceptual) overlap, but may be mediated by more abstract linguistic properties as demonstrated by Emmorey and her collaborators, such as shared lexical-semantic properties in the spoken and the sign language. We very much hope that our readers will enjoy the Keynote article and the related debate as much as we did.

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