Bilingual advantages, bilingual delays: Sometimes an illusion

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Studying bilingualism is complicated. Baum and Titone's keynote article concludes with a discussion of three particularly thorny issues in bilingualism research: 1) bilinguals are not a homogeneous group, 2) bilingualism is not randomly assigned, and 3) the effects of bilingualism are often more complicated than simple "advantages" or "disadvantages/delays". On this latter point, Baum and Titone consider how binary thinking about bilingualism as "good" or "bad" can limit the kinds of research questions that we ask. Here, I expand on this issue by showing how some apparent bilingual "advantages" and "disadvantages" can be illusory. I describe two examples of reasonable, justifiable, and prudent experimental designs that initially led to misleading conclusions about the effects of bilingualism on development. While both of these examples are drawn from research with bilingual infants, they nonetheless have implications for how we interpret the results of studies of bilingualism across the lifespan.

The first example illustrates how the same task does not always measure the same thing in monolinguals and bilinguals. Bosch & Sebastián-Gallés (2003) were interested in the development of phonetic perception in bilingual infants. Decades of research with monolinguals had pointed to a consistent developmental pattern: in the first year of life, infants' sensitivity to native language phonetic contrasts is maintained and sharpened (Kuhl et al., 2007), while their sensitivity to non-native contrasts declines (Werker & Tees, 1984). Would bilinguals show a similar developmental trajectory?

Spanish-Catalan bilingual and Catalan monolingual infants were tested on their discrimination of a Catalan vowel contrast, /e/ - /ɛ/. Because this contrast was native to all infants (i.e. was meaningful in Catalan, a language all infants were learning), it was expected that both groups would discriminate it throughout development. Infants were tested using a well-established infant looking time procedure. They were familiarized to tokens from one category (e.g., /e/), and then at test were presented with more tokens from the same category (e.g., /e/) or from a new category (e.g. /ɛ/). Monolingual infants showed the expected response, looking longer (i.e., they were surprised) when the tokens from the new category were presented at test, showing discrimination of the phonetic contrast at age 4-, 8-, and 12-months. Intriguingly, bilinguals showed discrimination of the contrast at 4- and 12-months, but not at 8-months.

Initially, these data were interpreted in terms of a temporary bilingual difficulty in phonetic perception. However, subsequent work by the same group challenged this original conclusion. Albareda-Castellot, Pons, & Sebastián-Gallés (2011) tested 8-month-old Spanish-Catalan bilinguals on their discrimination of the same /e/ - /ɛ/ contrast, using a different procedure – the anticipatory eye movement paradigm. In their experiment, infants were taught that phonemes from one category (e.g., /e/) predicted a visual reward on the right side of the screen and that phonemes from the other category (e.g., /ɛ/) predicted a reward on the left side of the screen. Infants' ability to use the phonetic difference to correctly anticipate the location of the reward was used as an index of successful discrimination. This time, bilingual 8-month-old infants

succeeded, discriminating the same phonetic contrast that they had seemingly failed to discriminate in the previous study.

A key difference between the two studies was their experimental procedure. The procedure used in the first study required infants to show a "surprise" response when stimuli changed from one phoneme to the other. Albareda-Castellot and colleagues argued that bilingual infants are sensitive to the difference between /e/ and /ɛ/ throughout development, but are not always surprised by a change from one phoneme to the other. This could be because Spanish and Catalan share many cognates (e.g., Spanish *abeja* and Catalan *abella*, both meaning bee) that differ primarily in their vowels. In the context of a bilingual environment, a change in vowel does not necessarily imply a change of meaning, and might not be very surprising to bilinguals. In other words, an experimental procedure that was perfectly valid with monolinguals was not necessarily revealing for bilinguals, due to how bilinguals' everyday language environment affected their performance on the task itself (see also Byers-Heinlein & Fennell, 2013; Sebastián-Gallés, 2010, for a fuller discussion of this and other potential explanations of these results).

The second example illustrates how identical stimuli can be non-equivalent to monolinguals and bilinguals. A series of studies investigated infants' ability to learn minimal pair words (i.e. those that differ on a single phoneme), such as *cat* and *mat*. Monolinguals can learn minimal pairs by age 17 months (Stager & Werker, 1997), and we were interested in whether bilinguals would show the same developmental pattern. Using stimuli from previous studies of monolinguals, which had been recorded by a

monolingual speaker, we tested bilinguals' ability to learn the minimal pair *bih – dih* (Fennell, Byers-Heinlein, & Werker, 2007). Bilinguals in our study only succeeded by age 20 months, three months later than monolinguals had succeeded under identical testing conditions. We concluded that bilinguals have greater difficulty with minimal pair word learning than monolinguals.

Once again, subsequent research challenged this interpretation. Mattock and colleagues (2010) tested 17-month-old monolingual and bilingual infants on the minimal pair *bos – gos*. Unlike our stimuli, their stimuli were produced by a bilingual speaker, and included both English- and French-produced tokens of the word. This time, bilinguals succeeded where monolinguals failed: only bilinguals were able to learn the minimal pair. The authors posited a bilingual advantage, whereby bilinguals are more flexible in their word learning than monolinguals.

These two findings – one showing a bilingual delay, and the other showing a bilingual advantage – were initially difficult to reconcile. Recently, however, we conducted a third set of studies that united these seemingly contradictory results. We tested both monolingual and bilingual infants on two types of stimuli: we recorded two version s of the minimal pair *kem – gem*, one produced by a monolingual speaker and one produced by a bilingual speaker (Fennell & Byers-Heinlein, 2014). Our results showed that on the monolingual stimuli, monolinguals succeeded but bilinguals failed (a bilingual delay?). However, on the bilingual stimuli, bilinguals succeeded but monolinguals failed (a bilingual advantage?). Rather than evidence of "advantage" or "delay", a more parsimonious account is that infants from both language backgrounds

learned words only when the stimuli matched their language-learning environments (see also Mattock et al., 2010, for congruent evidence from monolinguals). Indeed, monolinguals primarily receive input from monolingual parents, while bilinguals often receive input from bilingual parents. The lesson from these studies is that testing monolinguals and bilinguals with identical stimuli does not necessarily test them in an equivalent way. In minimal pair word learning, bilingual infants show neither a bilingual advantage nor a bilingual delay, but simply a bilingual difference.

To summarize, these two examples demonstrate the illusory nature of some apparent bilingual "advantages" and bilingual "disadvantages/delays". Despite using identical procedures and stimuli, the same experiment does not always test the same thing in different populations. Behavior both inside and outside the lab is affected multifactorially by individuals' adaptation to their particular linguistic environments. The complexity of bilingualism engenders considerable challenges for designing studies and interpreting results. At the same time, its richness provides fertile ground for understanding behavioral and neural plasticity across the lifespan.

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