



Peer Commentary

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Introduction

In their recent keynote, Titone and Tiv (2022) make a call for scientists to consider bilingualism in the social contexts where languages are used. Situated in multilingual Montréal and bringing unique positionalities, Titone and Tiv have provided converging perspectives that cognitive and linguistic behavior is symbiotic. The biological reference is intentional, referring to both the individual and her environment to be living and interactional. Beyond the methodological and analytical recommendations addressed in the keynote, we intend to reinforce this position with two points: (1) bilingual experience is interactional; and (2) outcomes when comparing monolinguals to bilinguals will vary across contexts. This latter argument has implications for replicability.

Bilingual experience is interactional

Among studies that compare monolinguals to bilinguals, Surrain and Luk (2019) reported that descriptors and labels were diverse. Importantly, the authors reported that sociolinguistic contexts or participants' language ecology were described in fewer than 30% of the studies. Titone and Tiv's (2022) Systems Framework of Bilingualism (SFB) is a response to the lack of social information reported in the literature (for recommendations on studies involving developmental samples, see Byers-Heinlein, Esposito, Winsler, Marian, Castro & Luk, 2019). As reviewed in the keynote and other commentaries, we want to underscore that there was evidence supporting that variations in the social contexts does manifest to observable and measurable behavioral differences. Importantly, as Gullifer and Anderson (2022) point out, investigating the INTERACTION between an individual and her environment is a proactive way to integrate social context information when examining behavior.

We suggest that focusing on the interaction, beyond just documenting the environment, is a necessary next step to enrich our understanding of the relationship between cognitive plasticity and an individual's environment, particularly the language environment. To illustrate the importance of this relationship, we turn to research on children and the language environment in their families. Ample developmental research has demonstrated that the language environment – particularly, parental language input – shapes children's language development (see recent meta-analysis on the relative importance of quantity and quality of parental language input and child language outcomes, Anderson, Graham, Prime, Jenkins & Madigan, 2021). This relationship is not only associative, but also directional and causal: as parental coaching was reported to be associated with observable changes in children's language outcomes (Ramírez, Lytle & Kuhl, 2020). Indeed, research on multilingual child language development has long focused on the interaction between the child and their family members' language use (e.g., FAMILY LANGUAGE POLICY, FLP, King, Fogle & Logan-Terry, 2008).

FLP examines language planning involving parents' beliefs and practices, and management strategies in the home. The parallel between research on the FLP and the Systems Framework of Bilingualism is the assumption that variations in ecological levels are expected to affect behavior. In FLP, the focus of investigation includes not only children's language outcomes, but also parental beliefs in multilingual development. This perspective is essential in child language development, but also applicable to adult bilingualism. Titone and Tiv (2022) included this layer in their SFB (as the societal level), but also noted the lack of research in this area. We recognize the challenge of studying social perception of language use and language status, yet we see this as a missed opportunity to fully understand the cascading effect of distal factors (e.g., the overarching social attitude toward a language or towards bilingualism) relate to language usage factors (e.g., exposure, change in dominant language, actively using multiple languages) and ultimately cognitive or language outcomes. Researchers interested in first language attrition have also reported the importance of attitude as a motivational factor in maintenance of using the first language (e.g., Schmid & Karayayla, 2020) – although this line of inquiry has a historical presence in the sociolinguistic discipline (e.g., Lewis, 1975).

Replicability in studies comparing bilinguals and monolinguals

Another practical research implication relevant to adopting the SFB is how we should interpret group comparisons involving monolinguals and bilinguals from diverse social contexts. Studies have demonstrated that bilingualism influences domain-general cognitive processes (review in Bialystok, 2017) and reorganizes brain structure and function (reviews in Grundy, Anderson, & Bialystok, 2017; Pliatsikas, 2020). However, others have argued that these effects are not reliable or replicable by reporting null effects between bilinguals and monolinguals (e.g., Paap & Greenberg, 2013; Dick, Garcia, Pruden, Thompson, Hawes, Sutherland, Riedel, Laird & Gonzalez, 2019). Many of these null findings are likely tied to variations in the bilingual experience (Grundy, 2020). Titone and Tiv's model provides a path to examine the complexity of bilingualism. The model extends the idea that bilingualism is not a categorical variable (Luk & Bialystok, 2013), by suggesting that sociocultural and temporal contexts are critical to observed outcomes. When language ecology is accounted for, as it should be, and language contexts differ, as expected, should we continue to expect replicability in cross-cultural studies comparing bilinguals and monolinguals? Bak (2016) raised this question, but the implications have not been fully examined in the context of the replicability of research concerning bilingualism. We propose that the Systems Framework of Bilingualism model can help to explain mixed findings reported in group comparisons.

Variability in person-to-person interactions at the INTERPERSONAL (microsystem) level may modify brain structure and function. The authors give the example of a person speaking one language to their parents and another language to their siblings. If these individuals all live in the same household, then the scenario would simulate Green and Abutaleb's (2013) dual language context, in which individuals must continually control for and monitor the appropriate language depending on the interlocutor (e.g., parents or siblings). Research suggests that these environments require more attentional control than environments where only one language is spoken and lead to more functional connectivity and global network efficiency during language production (Wu, Zhang, Chen, Yuan, Zhang, Yang, Lu & Guo, 2020), as well as facilitating behavioral performance on executive function tasks (Yang, Ye, Wang, Zhou & Wu, 2018). Thus, without considering contexts at the interpersonal level as proposed in SFB, researchers are likely collapsing across important variance contributing to brain and behavior when comparing monolinguals and bilinguals, and this can help to explain failed replications and null findings in the literature.

The ECOLOGICAL (mesosystem) level is an understudied social ecological sphere that may contribute to variation in bilingual interactions, with a cascading association in cognitive outcomes between monolinguals and bilinguals. Neural activation levels of known languages are influenced by the linguistic context of the social environment – largely homogeneous environments where only the second language is heard in train stations, parks, and grocery stores, for instance, will involve heightened activation of the second language with lessened or suppressed activation of the first (Guo, Liu, Misra & Kroll, 2011, Bice & Kroll, 2019). Several researchers have shown that simply priming a single language or a dual language context can change brain and behavioral outcomes on executive function tasks, reinforcing our first point that bilingualism is an interactional experience (e.g., Chung-Fat-Yim,

Poarch, Comishen & Bialystok, 2021; Jiao, Grundy, Liu & Chen, 2020; Jiao, Liu, Liang, Plummer, Perfetti & Chen, 2019; Timmer, Wodniecka & Costa, 2021). Thus, ecological level contextual moderators of brain and behavior must be considered when examining executive function outcomes between monolinguals and bilinguals.

At the macrosystem level, SOCIETAL norms, political beliefs, and larger scale contextual environments can influence group outcomes. Imagine someone firmly believes that being bilingual is undesirable and leads to a “language handicap” (Manuel, 1935, p. 202). This person may refrain from using multiple languages, thereby reducing the interactional experiences of using multiple languages and diluting bilingual experiences. Though understudied, the distal association between language attitude, bilingual usage, and any behavioral outcomes cannot be ignored or assumed irrelevant. Given that attitudes and beliefs influence behavior (e.g., gender differences in response to COVID-19 and the resulting behaviors and mortality, Galasso, Pons, Profeta, Becher, Brouard & Foucault, 2020), there is reason to examine how attitudes and beliefs change bilingual usage, and ultimately lead to behavioral differences.

Titone and Tiv also highlight the importance of considering TEMPORAL changes such as development and historical context. In research involving bilinguals, onset age of second language acquisition (L2AoA) has been examined extensively. Yet, L2AoA marks the starting point of acquiring a new language and provides little information about the quality and quantity of bilingual usage. Multiple models have suggested potential mechanisms to account for the mode of bilingual usage and its consequences on brain functions and structures (DeLuca, Segart, Mazaheri & Krott, 2020; Grundy et al., 2017; Pliatsikas, 2020), yet empirical evidence is largely cross-sectional. Longitudinal documentation of multilingual acquisition and maintenance could shed light on establishing a theory of change in bilingual development across the lifespan.

Combinations of influence from the INTERPERSONAL, ECOLOGICAL, SOCIETAL, and TEMPORAL levels lead to a myriad of possible outcomes in brain and behavior resulting from bilingualism. Thus, it is problematic to treat groups of “bilinguals” the same across studies without consideration of contextual factors, especially when the claims involve failed “replications”.

Conclusion

Bilingualism comprises an extremely complex set of experiences. Attempts to simplify the construct are often problematic and lead researchers to view the behavioral and neural outcomes as “hazy” (e.g., García-Pentón, Fernandez Garcia, Costello, Duñabeitia & Carreiras, 2016). Titone and Tiv highlight the complexity of the bilingual experience in a model that builds off Brofenbrenner's highly influential model in developmental psychology. It is time for the cognitive, linguistic, and neuroscience fields of bilingualism to follow suit.

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