

EDITORIAL

Translational Approaches to Bilingualism and Multilingualism Research

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Bilingualism and multilingualism provide a unique lens for exploring how human experiences influence language and cognition. This editorial presents a collection of studies on the relationship between bilingualism/multilingualism and cognition in typically developing and neurodiverse populations. The articles assembled in this issue synthesize findings from diverse linguistic populations (e.g., second-language learners, heritage speakers, different-script bilinguals, etc.) and techniques (e.g., behavioral, magnetic resonance imaging, electroencephalography, eye-tracking, etc.) to provide compelling evidence that knowing more than one language can benefit learning, health, and social outcomes. Translational research on bilingualism and multilingualism is necessary for informing policy and can serve as a guide to researchers, practitioners, and educators who work with linguistically diverse populations, as well as individuals and parents who speak multiple languages. We conclude that multilingualism shapes cells, selves, and societies.

Keywords: bilingualism, multilingualism, L2 learning, language development, cognitive control

This special issue of *Translational Issues in Psychological Science* features cutting-edge research on how speaking more than one language can shape linguistic, cognitive, and broader social outcomes, including in applied settings such as

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education, policy, and clinical practice. A unique feature of this journal is the emphasis on providing opportunities to graduate students and postdoctoral fellows in the peer-review and editorial process, from writing and reviewing manuscripts to guest editing special issues. Having early career scholars serve as associate editors, reviewers, and authors allowed for varied perspectives, thought processes, and insights, with the additional benefit of training the next generation of scientists in conducting and disseminating linguistically and culturally sensitive research that reflects diverse perspectives. Because most of the world's population speaks more than one language (Marian, 2023), research on multilingualism can build our understanding of how humans process and learn information and has a wide range of real-world implications for practitioners, educators, and policymakers. Multilingualism was once thought to be detrimental to cognitive development (e.g., Saer, 1923), but has since been found to be beneficial for psychological adjustment (Chen et al., 2008), creativity (Chung-Fat-Yim et al., in press), cognitive reserve (see Berkes & Bialystok, 2022 for a review), and academic achievement (Marian et al., 2013).

As the world is becoming more globalized and families are becoming more diverse, translational research on the effects of knowing multiple languages can help dispel common myths about multilingualism.

The editorial is divided into three parts. The first part highlights the articles that focus on the effects of multilingualism on language development in children, adolescents, and adults. The second part highlights the articles that examine how learning two or more languages can shape social and cognitive development, including empathy and executive functions. The third part highlights the articles that investigate the consequences of multilingualism for neural architecture. These studies provide insight into the important role language plays in shaping the mind and brain. Throughout the editorial, the terms “multilingualism” and “multilinguals” are used to refer to speakers of more than one language. The terms “bilingualism” and “bilinguals” are used in instances where the articles in this special issue specifically referred to their participants as bilinguals.

Multilingualism and Language Development

Multilinguals either grow up with multiple languages in the home, acquire new languages at school, learn new languages later in life, or undergo combinations of these experiences. The link between multilingualism and language development was explored in four studies that investigate literacy and language learning across the lifespan.

Caregivers of children raised with two languages in the home often wonder how to best support their bilingual child’s language development. In bilingual households, language switching is a typical occurrence. Tsui et al. (2023) examined whether the type of language switching (hearing a translation immediately or hearing a translation separated in time) influences bilingual children’s novel word learning. Do bilingual children acquire new words in both languages more effectively if they immediately hear a translation of the word, or is it better to use one language at a time? French–English and Spanish–English bilingual children between the ages of 3 and 5 performed similarly in a word-learning task across both types of language-switching conditions, suggesting that the timing of the language switch does not affect novel word learning. These findings illustrate that word learning can successfully occur under different linguistic environments and that the variability in bilingual language exposure

is not detrimental to language development. The authors’ take-home message is that caregivers are free to use whichever language-switching pattern they are most comfortable with, provided that the interactions with the child in each language promote learning and development. These findings can help caregivers learn how to best support early bilingual language development.

Language learning does not occur only during childhood but can happen at any age. Mastering a second language in adulthood can be challenging, and several factors influence how well adults learn a new language. In a group of Spanish learners, Bobb et al. (2023) investigated whether individual differences in cognitive control abilities influence foreign language learning. They found that beginner learners of Spanish who rely more on proactive control (i.e., ability to actively maintain goal-related information in a sustained manner) than reactive control (i.e., ability to respond and adapt to unexpected situations as they arise) experienced greater interference from their native language during a word recognition task in their second language, demonstrating that the strategies used by second-language learners to translate words in recognition tasks are influenced by individual differences in cognitive control.

Similarly, Oh et al. (2023) examined how variations in domain-general cognitive skills, such as attention and working memory, predict reading comprehension in children and adolescents from diverse linguistic backgrounds. Given the multidimensionality of language experience, the authors examined multilingualism along a continuum using regression models. Decoding skills (i.e., the ability to read pseudowords and real words) and language comprehension (i.e., the ability to associate meaning to speech) were stronger predictors of reading comprehension (i.e., the ability to extract meaning from text) in multilingual children than in multilingual adolescents. Furthermore, working memory uniquely predicted reading comprehension in children, whereas home language usage and exposure moderated the relationship between decoding skills and reading comprehension in adolescents. The authors note the importance of taking into consideration home language use and exposure when educators and researchers assess children’s and adolescents’ literacy skills.

In a different study, De Luis Sanabria et al. (2023) explored the effects of presentation modality (reading only vs. reading while listening),

biology enjoyment, and biology knowledge on text comprehension in university students with varied language experience. Interestingly, the results showed an advantage in text comprehension for bilingual students, particularly in the reading-only condition. Moreover, students' enjoyment of the topic influenced performance, especially among bilinguals. Educators and researchers may find these insights helpful in considering the effects of presentation modality and individual preferences on text comprehension.

The studies in this section revealed that vocabulary development in children, foreign language learning in adult learners, and reading comprehension in children, adolescents, and adults are shaped by multilingualism. Because the multidimensionality of language experience makes operationalizing and measuring multilingualism a challenge, a few studies in this section used innovative approaches to characterize language experience. Linguistic outcomes in multilinguals were found to be related to individual differences in language abilities and cognitive control.

Social and Cognitive Development in Typical and Neurodiverse Multilingual Populations

Research in recent decades has demonstrated that knowing more than one language can lead to better performance on nonverbal tests of executive function (see [Bialystok & Craik, 2022](#), for a review). Executive function refers to a set of cognitive processes involved in regulating attentional resources, selecting between competing responses, planning future behaviors, and ignoring irrelevant information ([Diamond, 2013](#)). One criticism of this research is that executive functioning skills tested in laboratory settings do not always transfer to real-life situations. Additionally, most of the research on the effects of multilingualism and cognition has been conducted in typically developing children and adults. The studies in this section investigate how knowing more than one language affects cognitive development in applied contexts, including in children who are neurodivergent.

[Brannick et al. \(2023\)](#) explored whether empathy and social cognition contributed to the executive control advantages observed in bilinguals. In a modified version of the flanker task that incorporated social stimuli, participants were asked to indicate the direction a target face's eyes were looking toward, while ignoring the faces flanked on each side of the target face. Among participants who

scored high on a measure of empathy, those with greater second-language proficiency were slightly faster on the socially-modified flanker task than those with lower second-language proficiency. Second-language proficiency and empathy interacted to predict blink counts and fixations, such that higher levels of bilingualism were associated with more blinks and fewer fixations. The authors concluded that empathetic bilinguals may have a better capacity to process socially informative cues.

The consequence of bilingualism on cognition was also explored in neurodiverse populations, such as children with and without attention deficit hyperactivity disorder (ADHD). [Williams et al. \(2023\)](#) sought to determine whether the advantages in executive functions observed in typically developing bilingual children extend to children with ADHD. The authors focused on applied executive function skills in children (e.g., keeping track of homework assignments or completing multistep tasks). In an intervention designed for children with ADHD, known as the Collaborative Life Skills program, both monolingual and bilingual children with ADHD showed improved executive function skills at the end of the intervention. However, there was evidence that bilinguals benefited most from the intervention. These findings have clinical implications, as socioemotional skills training may be especially beneficial for bilingual children with attentional and behavioral concerns.

A common misconception about multilingualism that caregivers often share is that exposing their child to multiple languages will delay language acquisition. Although there is no evidence to support this claim ([Byers-Heinlein & Lew-Williams, 2013](#)), healthcare professionals often recommend caregivers to raise their children monolingually. In a narrative review, [Reimann and Ratto \(2023\)](#) explored the sociocultural consequences of advising against heritage language use in bilingual families of children with autism spectrum disorder. The review emphasized the need for professionals to encourage bilingual families to maintain their heritage language use at home. Based on the findings of the review, the authors outlined short- and long-term recommendations for professionals on how to better support culturally diverse families of children with autism spectrum disorder.

The misconceptions about multilingualism are in part driven by society's beliefs about the perceived value of multilingualism. [Surrain and Luk \(2023\)](#) used surveys and U.S. census data

to examine whether parental attitudes about multilingualism would affect their home language practices. Parents living in areas of the United States where more languages are spoken had more positive attitudes toward multilingualism than parents living in areas where only English is spoken. For English-speaking parents with no knowledge of a second-language, living in a multilingual area led to positive views of multilingualism. For parents with young children exposed to a non-English language, those who valued multilingualism for their child were more likely to engage in activities using their home language. Linguistic diversity in the community can influence how parents view multilingualism and the language practices implemented in the home.

The studies assembled in this section reveal that variability in language experience has important consequences for socioemotional skills and empathy. Furthermore, Reimann and Ratto's (2023) review article and Williams et al.'s (2023) intervention study emphasize the need to consider neurodiverse developmental trajectories when conducting research in multilingual populations.

Multilingualism and the Brain

As a result of knowing two or more languages, multilinguals activate brain regions associated with domain-general executive control to select the target language and prevent interference from the nontarget language (Abutalebi & Green, 2016). The repeated engagement of these brain regions has been proposed to modulate brain outcomes. The three papers in this section provide compelling evidence that multilingualism contributes to neural and structural plasticity.

Combining MRI data from eight studies, Nguyen et al. (2023) investigated the association between cortical thickness and English proficiency in English monolinguals and Spanish-English heritage bilinguals while controlling for socioeconomic status, age of acquisition, and chronological age. Increased English proficiency was negatively associated with cortical thickness in both groups, indicating renormalization of the cortex following language learning. On the contrary, higher proficiency in heritage bilinguals' less dominant native language (Spanish) was positively associated with cortical thickness, suggesting greater variability within the heritage bilinguals. These findings

highlight the dynamic nature of the bilingual language system and experience-based neuroplasticity in the bilingual brain.

Chung-Fat-Yim et al. (2023) examined whether bilingualism alters the neural correlates of attention. Korean-English bilinguals and English monolinguals heard a series of two different tones, one of which occurred less frequently (deviant tone) than the other (standard tone). While mentally counting the number of infrequent tones, the bilingual group had overall larger ERP amplitudes than the monolingual group at earlier stages of processing, but a smaller difference in ERP amplitude between standard and deviant trials at later stages of processing. These findings suggest that bilingual language experience can shape the mechanisms underlying nonspeech sound processing.

To understand the neural basis of arithmetic processing in Spanish-English bilinguals, Cerda et al. (2023) investigated the problem size effect (i.e., the ability to solve smaller problems such as 2×4 better than larger problems such as 8×9) in bilinguals' first and second (less familiar) languages. Bilinguals are typically faster and more accurate at solving multiplication problems in the language used for learning arithmetic compared to the language not used for learning arithmetic. The authors found that problems presented in the language not used for learning arithmetic were solved slower than problems presented in the language used for learning arithmetic when participants were required to produce a verbal response. These differences across languages have implications for the efficiency and accuracy of performing arithmetic in daily life.

The three studies in this section demonstrate that knowing multiple languages can lead to structural and neural adaptations in the brain. The brain regions associated with low-level (perceptual encoding of sound) and high-level processes (arithmetic and language expertise) change as a result of learning a second language. Furthermore, the dynamic effects of multilingualism on neurocognition differed depending on the language used (e.g., first- vs. second-language acquired). These findings enrich our understanding of how language is represented in the brain and how experience-based factors modify the neural structures that support learning and cognition in everyday life.

Conclusions

Over the past few decades, multilingualism research has expanded to focus on the broader influence that language learning has on social, health, and educational outcomes. Some of the common themes shared by the articles assembled in this special issue include evidence-based tips and recommendations for (a) caregivers on how to best support language development in children, (b) practitioners on how to promote heritage language use in the home for multilingual children, (c) educators on how to create educational curriculums catered to multilinguals with potentially different learning strategies, and (d) clinicians on how to design therapeutic interventions for individuals from diverse linguistic backgrounds. These tips and recommendations can inform educational and health policies. The findings from the articles will be of interest to researchers from multiple disciplines, including psychology, linguistics, and neuroscience, as well as to educators, practitioners, policymakers, and other stakeholders wishing to learn more about the effects of multilingualism on social, emotional, language, and cognitive development. In this special issue, we bridged research from different parts of the world on diverse groups of multilingual speakers and synthesized the findings for a better understanding of the dynamic interactions between language, mind, and brain. We conclude that multilingualism shapes cells, selves, and societies (Marian, 2023).

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