



RESEARCH BRIEF # 11

The Cognitive Development of Young Dual Language Learners: A Critical Review of the Research

Introduction

The purpose of this critical review was to synthesize the existing research on cognitive development in dual language learners and to identify the gaps and methodological concerns present in the existing research. Studies conducted over the last 30 years have demonstrated that the experience of speaking two languages has positive consequences for the development of several cognitive processes. However, what remains unclear is which cognitive abilities are affected by bilingualism and which are not, if these effects are further influenced by the languages involved, and the extent to which factors such as language proficiency, language of instruction and age of acquisition, moderate the effects of bilingualism. Given that dual language exposure and bilingualism are relatively common experiences for children, identifying the abilities that are affected by bilingualism has important implications for the theoretical understanding of cognitive development and for the design of educational programs for dual language learners.

The study includes peer-reviewed articles from 2000-2013 with a focus on typically-developing dual language learners from birth through age six. The search resulted on 187 articles from which 102 met all review criteria.

Results

1. Typically developing bilingual children show more advanced skills than their monolingual peers in non-verbal executive control skills and theory of mind abilities. The three main executive control skills which have been more commonly examined are: a) inhibitory control (ability

- to resist a habitual response or information not relevant), b) working memory or updating (ability to hold information in mind and mentally manipulate it), and c) cognitive flexibility (ability to adjust to changes in demands or priorities and switch between goals). Although bilingual children outperformed monolinguals on a variety of executive control tasks, the advantage is relatively stronger for inhibitory control and cognitive flexibility, and less so, for working memory, which has been examined to a lesser degree. Similarly, dual language learners show a more advanced understanding of theory of mind (children's ability to ascribe mental states to other people) than monolinguals. This advantage has been linked to both enhanced inhibitory processing as well as better sociolinguistic awareness.
- 2. The bilingual advantage was not found for all executive control skills (e.g., delay of gratification).** The reviewed studies suggest that the bilingual advantage in executive control skills is only evident in those tasks that are characterized by levels of high executive demands. For example, on tasks that required children to postpone opening a gift, no differences were found between monolingual and bilingual children.
- 3. Differences between monolinguals and bilinguals in executive control were found very early on, in the first year of life.** Studies conducted with bilingual infants revealed an advantage over monolinguals in tasks that required the use of inhibitory control, indicating that even only being exposed to two languages and not necessarily speaking two languages has consequences for cognitive processing.

4. **Advantages were reported in bilinguals as compared to monolinguals in theory of the mind and executive control regardless of the language combinations children were exposed to or spoke.** This suggests that it is the cognitive task of managing two different linguistic systems, regardless of the specific relationship or typological distance between the two languages that leads to cognitive advantages of bilingualism.
5. **Bilingual children show different patterns in brain responses to processing linguistic stimuli.** The experience with two languages, no matter how short, changes the way language is organized in the brain and therefore drives functional plasticity in bilingual children.
6. **An area that has been extensively studied in the cognitive development of bilinguals is metalinguistic awareness. Findings from these studies show inconsistent results with regard to the performance of bilinguals as compared to monolinguals.** Generally, bilingual children showed an advantage on syntactic and morphological awareness tasks, whereas research investigating phonological awareness skills in DLLs has shown mixed results, with bilingual children performing better, the same or even worse than monolingual peers. Differences in these findings can be attributed to variables associated to bilingualism such as language proficiency, typological distance between languages, features of the linguistic system, order in which languages were learned by the child and task demands, among others.

Conclusions

This review examined existing research on the cognitive development of DLLs. Despite the variability in the questions asked, measures used, and definitions of bilingualism, a relatively consistent pattern of results emerged in certain areas of cognitive development that included executive control, theory of mind and brain function.

A methodological concern of the studies reviewed was the lack of consistency in the definition and categorization of the bilingual experience. There is wide variability in how researchers measure bilingualism which, in part, explains the mixed results in the area of cognitive development. Another concern is the choice of tasks for measuring executive control abilities as it seems that tasks need to require high executive demands in order to detect differences between dual language learners and monolingual children.

The current review also points to several possible future research directions.

- More research is needed on the brain development of children who grow up with two languages. Questions remain on the influence of bilingualism on the brain structure in bilingual children ages 0 to 6.
- Most research has focused on executive control, theory of the mind, and metalinguistic awareness. Additional research is needed that investigates memory and working memory processes, intelligence, processing speed, problem solving, divergent and convergent thinking.

Method

The search parameters for this review included the following: published peer-reviewed journal articles from 2000–2013; a focus on typically-developing DLLs from birth through age six; analyses that focused on DLLs either exclusively or as a subgroup, and research designs that included cross-sectional and longitudinal approaches. Search terms were defined in accordance with CECER-DLL guidelines and included terms related to dual language learners (dual language learners, bilingual, second language learners) as well as terms related to cognitive development (executive function, theory of mind, metalinguistic awareness, brain development).

- A research gap exists in the literature on the links between verbal and nonverbal skills in bilingual and monolingual children. Findings from this kind of research can lead to a better understanding of how a mainly linguistic experience can lead to non-verbal cognitive changes.
- Finally, there is relatively a lack of research that focuses on infants and toddlers. Examining the bilingual experience early in life can help understand what changes as a function of the bilingual experience, when and how it changes.

Selected References of Studies Included in the Review

DLL's Executive Function Development

- Bialystok, E., Barac, R., Blaye, A., & Poulin-Dubois, D. (2010). Word mapping and executive functioning in young monolingual and bilingual children. *Journal of Cognition and Development, 11*, 485-508. doi: 10.1080/15248372.2010.516420
- Carlson, S. M., & Meltzoff, A. N. (2008). Bilingual experience and executive functioning in young children. *Developmental Science, 11*(2), 282-298. doi: 10.1111/j.1467-7687.2008.00675.x
- Martin-Rhee, M., & Bialystok, E. (2008). The development of two types of inhibitory control in monolingual and bilingual children. *Bilingualism: Language and Cognition, 11*(1), 81-93.

DLLs' Metalinguistic Awareness

- Bialystok, E., Majumder, S., & Martin, M. M. (2003). Developing phonological awareness: Is there a bilingual advantage? *Applied Psycholinguistics, 24*, 27-44. doi: 10.1017/S014271640300002X
- Davidson, D., Raschke, V. R., & Pervez, J. (2010). Syntactic awareness in young monolingual and bilingual (Urdu-English) children. *Cognitive Development, 25*, 166-182. doi: 10.1016/j.cogdev.2009.07.003
- Loizou, M., & Stuart, M. (2003). Phonological awareness in monolingual and bilingual English and Greek five-year-olds. *Journal of Research in Reading, 26*(1), 3-18. doi: 10.1111/1467-9817.261002

DLLs' Brain Development

- Conboy, B. T., & Kuhl, P. K. (2011). Impact of second-language experience in infancy: Brain measures of first- and second-language speech perception. *Developmental Science, 14*(2), 242-248. doi: 10.1111/j.1467-7687.2010.00973.x

DLLs' Theory of Mind

- Cheung, H., Chung, K. K. H., Wong, S. W. L., McBride-Chang, C., Penney, T. B., & Ho, C. S.-H. H. (2010). Speech perception, metalinguistic awareness, reading, and vocabulary in Chinese-English bilingual children. *Journal of Educational Psychology, 102*(2), 367-380. doi: 10.1037/a0017850
- Kovacs, Á. M. (2009). Early bilingualism enhances mechanisms of false-belief reasoning. *Developmental Science, 12*(1), 48-54. doi: 10.1111/j.1467-7687.2008.00742.x

DLL's Memory Development

- Brito, N., & Barr, R. (2012). Influence of bilingualism on memory generalization during infancy. *Developmental Science, 15*(6), 812-816. doi: 10.1111/j.1467-7687.2012.1184.x

DLLs' Performance on Neuropsychological Assessments

- Rosselli, M., Ardila, A., Navarrete, M.G., & Matute, E. (2010). Performance of Spanish/English bilingual children on a Spanish-Language neuropsychological battery: Preliminary normative data. *Archives of Clinical Neuropsychology, 25*, 719-726. doi: 10.1093/arclin/acq012

DLLs' Intelligence, Processing Speed, and Academic Performance

- Bialystok, E. (2010). Global-local and trail-making tasks by monolingual and bilingual children: Beyond inhibition. *Developmental Psychology, 46*(1), 93-105. doi: 10.1037/a0015466
- Rasmussen, C., Ho, E., Nicoladis, E., Leung, J., & Bisanz, J. (2006). Is the Chinese number-naming system transparent? Evidence from Chinese-English bilingual children. *Canadian Journal of Experimental Psychology, 60*(1), 60-67.
- Morales, J., Calvo, A., & Bialystok, E. (2013). Working memory development in monolingual and bilingual children. *Journal of Experimental Child Psychology, 114*(2), 187-202. doi: 10.1016/j.jecp.2012.09.002

About CECER-DLL

CECER-DLL is a national center that is building capacity for research with dual language learners (DLLs) ages birth through five years. CECER-DLL aims to improve the state of knowledge and measurement in early childhood research on DLLs, identify and advance research on best practices for early care and education programming, and develop and disseminate products to improve research on DLLs. CECER-DLL is a cooperative agreement between the Frank Porter Graham (FPG) Child Development Institute at The University of North Carolina at Chapel Hill and the Office of Planning, Research, & Evaluation (OPRE) in the Administration for Children & Families (ACF), in collaboration with the Office of Head Start and the Office of Child Care.

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Additional Resources: For additional information regarding this research brief, see <http://cecerdll.fpg.unc.edu>



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