A Review Based Reflection on the Ongoing Debate of Bilingualism and Enhanced Executive Control Functions

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Abstract
As the topic bilingualism and enhanced executive control functions (EF) still continues to be a matter of debate, the present review study has examined the existing literature in order to understand the nature of inconsistencies and contradictions in the findings relating to this area. Major areas of investigation included the relationship between bilingual language control and executive functions, the distinct components of EF getting advantage from bilingualism and its biological Underpinnings, various techniques used for assessing EF and the role of other confounding factors such as socio-economic status, age of acquisition and language experience. The outcomes revealed that there is a prevailing inconsistency in the findings, may be due to the complexity and lack of clarity in the concepts, usage of varying techniques to measure the same construct, EF, and failure to incorporate the relevant confounding factors.

Keywords: Bilingualism, Executive Control Function, Components of EF, Biological Underpinnings, Confounding Factors

Introduction

This review has been carried out in the context of a heated debate on the socio-cognitive consequences of bilingualism. The cognitive impacts of bilingualism continue to remain a matter of controversy ever since the researchers started studying it. In the beginning, it was believed that bilingualism is inimical for intelligence and other cognitive functions because of its assumed cognitive overload. This notion was gradually changed by Pearl and Lambert who found that bilingual children outperform monolinguals in concept formation and in tasks that required mental flexibility and showed more diversified mental abilities than the monolinguals after controlling for socio-demographic factors (Peal & Lambert). Hence it was proved that under certain conditions bilingualism helps language competence and cognitive functioning in general (De Groot). This finding was counter argued by the idea that the relationship between bilingualism and intelligence had worked the other way around, i.e., the more intelligent children may have been the ones to become bilingual, hence they performed better on intelligence tests. However, this argument was tackled through some longitudinal studies and the findings suggest that it works both ways but, the model claiming that the degree of bilingualism to be the causal link was more consistent. That is, the chances of a child becoming bilingual are greater when having strong cognitive skills than having poor cognitive skills but, bilingualism is the cause of enhanced cognitive ability (Hakuta & Diaz). In addition to this, a few authors proposed that metalinguistic awareness is increased in bilingual children probably due to their dual linguistic environment forcing them to focus on the structural facets of language (Ben-Zeev, 1009; Bruck & Genesee, 307). According to Bialystok, metalinguistic tasks appeal to two cognitive aspects namely analysis of representational structures and control of attentional processes and she believed bilinguals excel in the latter one otherwise called cognitive control. This was the

instance where researchers started focusing on the association between bilingualism and executive control functions, a term closely related to cognitive control. The present study reviewed the recent (since 2000) evidence of the association between bilinguals' language control and executive functions, its mechanism, and biological underpinnings. It also listed the potential confounding factors of enhanced executive control functions among bilinguals which have been discussed in the literature.

Bilinguals' Language Control and Executive Functions

It became interesting for the researchers to see if the language control of bilinguals benefits the general processes and mechanisms of cognitive control. Language control is basically defined as "the ability to keep the two languages separate to avoid interference and to select one language or the other in a given conversational context" (Calabria et al.) whereas cognitive control, collectively called executive control functions is referred to the all higher-order cognitive processing skills essential for planning, working memory, inhibition, mental flexibility, as well as the initiation and monitoring of action. It helps us to stay focused by resisting the (Diamond). Several studies have been carried out to see the link between bilingual language control and executive control functions and their findings suggest that the BLC system does not completely function under the domain-general executive control system (Calabria et al.) but certainly, the control processing required for bilingual comprehension adds to it (Jiao). Other researchers who tried to explore if bilinguals perform better on non-linguistic tasks too just as they do on metalinguistic tasks found that bilinguals have reliably smaller Simon effect, in other words, higher cognitive control on non-linguistic tasks too. By and large, evidence showed that bilingual children's executive functions develop sooner, and is more efficient and preserved better as they grow old than their monolingual counterparts (Bialystok and Viswanathan, 494).

However, some researchers failed to replicate these results in a larger population and claimed that the samples of such studies which support the bilingual benefits are small and non-representative and which failed to control many other important confounding variables as well. Because they could not find any significant difference in the performances between bilinguals and monolinguals in cognitive control after controlling certain confounding factors such as ethnicity, socio-economic status, etc (Morton and Harper; Anton et al.). But these studies had adopted the conventional style of dichotomous classification of participants merely to monolinguals and bilinguals and also did not incorporate other confounding factors such as the age of acquisition. Then a detailed study has been conducted among adults by addressing all these issues and the findings still showed no significant bilingual advantage in the distinct areas of executive functions (Von Bastian).

If so, then what could be the reason for the earlier findings to show such effects? Is this just due to methodological errors and the task-specific effects? To understand this further, we need to again look in detail into the major domains of research being carried out in this specific area such as components of EF, biological underpinnings of this mechanism, tasks utilized for assessing EF, and other language experience-based factors, etc.

Components and Mechanisms of EF Getting an Advantage from Bilingualism

It was Bilalystok and Vishwanathan, who strongly felt the need to identify the components of executive control functions that are influenced by bilingualism. As there is already no agreement among the scholars on the components of executive functions, there is no agreement on what components of executive functions get advantage from bilingualism. A popular model has been derived from the unity and diversity approaches of EF, which says that EF is comprised of three distinct subsets namely inhibition, working memory, and set-shifting/cognitive flexibility with an underlying executive control component in adults (Miyake et al.). Inhibition was found to be benefitted by bilingualism which was further divided into active and reactive, and it was found that bilingualism benefits only the later (Colzato et al.). Another finding suggests that it is cognitive flexibility that gets improved due to bilingualism (Meuter and All port; Costa et al). In this way, researchers expressed contradictions in their findings and never agreed

upon each other. Then Bialystok and Viswanathan brought in all these relevant components namely response suppression, inhibitory control, and cognitive flexibility, together in a single study in order to understand how they really work in relation to bilingualism. Their findings suggest that bilingual children outperformed monolingual children on both inhibitory control and cognitive flexibility but not on response suppression. However, they still failed to include working memory, an important component of executive control function, in their study. A recent meta-analytical study of 27 independent studies showed that bilingualism improves a speaker's working memory over time as it requires continuous switching between two languages that compete for selection (Grundy and Timmer).

Biological Underpinnings of Bilingualism and Executive Control Function

Though the association between bilingualism and enhanced executive function is well researched, its biological underpinnings were not studied well despite the fact that the differences in cognitive functioning must have resulted in some features of the bilingual brain. And now there is a growing trend in research to study the brain structures involved in bilingualism and its cognitive advantages though their findings are inconsistent and sometimes contradicting in nature.

One study shows that bilinguals make use of cognitive control networks for carrying out tasks like language switching and various brain regions have been found to be involved in this control mechanism such as the prefrontal cortex, the anterior cingulate cortex, the posterior parietal cortex, and the basal ganglia (Abutalebi and Green, 557). Whereas some other findings suggest that bilinguals might be altering the network involved in executive control functions. Rodríguez-Pujadas et al found that early bilingualism deploys some effects on the brain structures responsible for EF tasks in a way that bilinguals employ brain areas accountable for language control while performing non-linguistic switching tasks involving executive control more than monolinguals. This study explained the role of brain areas-left caudate, and left inferior and middle frontal gyri- responsible for language control in domain-general executive control tasks, hence proving the cross-link between the two. The brain-based computational model (Stocco et al.) explains the neural basis of enhanced executive functions in bilinguals differently where they argued that long term experience with bilingualism facilitates a gating mechanism in the striatum, an important part of the basal ganglia responsible for language selection in bilinguals that flexibly directs the information to the prefrontal cortex. That is, the information arising from the striatum influences activities of the prefrontal cortex, which in turn weakens the more automated actions of other cortical regions. As a result of this constant practice in language switching, the automated cortico-cortical connections can be rerouted or over-ridden, causing a cognitive enhancement in bilinguals.

Costumero et al. observed a similar pattern to what Stocco and others have found. They found that the bilinguals make use of the language control networks in the brain differently while processing the non-linguistic tasks that demand cognitive control. But this was only qualitative in nature and the monolinguals and bilinguals did not show any differences in their executive control functions which leaves room to rethink and develop better strategies to effectively tackle these issues. Here what needs to be clarified is whether the enhanced executive control functions observed in bilinguals in several studies are really a consequence of bilingualism or is it a result of any methodological errors or a failure to take other relevant factors into account.

Methods Exploited for Assessing EF

Assessing EF is a bit difficult task due to the inconsistencies prevailing with regard to the various components and structure of the same in children as well as adults. The thing is, EF develops as we grow. So whatever tasks we use to measure it, should be first of all age-appropriate. Those who find EF in children as a single factor use a single task to measure it. Here the challenge lies in accurately tapping all aspects of EF using a single task. Whereas others use different tasks to separately assess each component of EF in both children and adults.

Minnesota executive function scale (Carlson and Zelazo) is one such scale that can be used to assess the EF of children at the earliest, i.e., 2 years. It has seven different levels of difficulties based on age.

Apart from this, the Simon task, Stroop-like task, trial-making task, and day-night task are also in use for studying executive control in children. But when it comes to adults, there is a need to tap all the subsets of EF. For that reason, different tasks attending to working memory, inhibition, and cognitive flexibility are to be used. To measure inhibition, the adult version of 'Stroop color and word test', 'The Color-Word Interference Test of Delis-Kaplan Executive Function System (D-KEFS)', flanker task, and stop-signal task are in use. Working memory is mostly measured by the Corsi block test and/or backward digit span task. Tasks that tap cognitive flexibility are many like 'design fluency', 'verbal fluency', and 'category fluency', 'Wisconsin Card Sorting Task', The Sorting Test of D-KEFS, Dimensional Change Card Sort Test (DCCS)], etc (Diamond, 135). Apart from these, there are some batteries that are in use to assess a wide array of EF skills like the Cambridge Neuropsychological Test Automated Battery (Luciana and Nelson, 273). Another battery includes Simon, Stroop-like, and Go/No- 17 Go tasks for inhibitory control, the span-like tasks for working memory, and an attention shifting task (Willoughby et al. 306). Attentional Network Task (ANT), is widely in use these days that claim to tap three attentional processes namely executive control, alerting, and orienting (Costa, et al. 59).

In sum, we can assume that the divergent use of available tools and techniques to assess the executive functions could be one of the reasons for the inconsistencies and the contradictions present in the evidence of the cognitive advantage of bilingualism. This also makes the findings of different studies non-comparable. Another thing is the purity of the tools, i.e., how accurately each tool is measuring the intended component of EF, since the behavioral aspects of each component are very much overlapping. Basically, many of the above-mentioned tasks such as the Simon task, Stroop task, and ANT have some congruent and incongruent conditions in it and when administered, and several studies, not all, found that bilinguals faced less interference from incongruent part of the tasks than monolinguals.

Now we say the varying usage of tools and the impurities of the tools are not only the reasons for leading to a difference in opinion regarding bilingualism and executive function. Rather, it has more to do with the other experiential, socio-economic, and cultural factors as discussed below.

Age of Acquisition and Language Experience

There are multiple factors found to be associated with the cognitive advantage of bilingualism. Among them, the age of acquisition of the second language and the different language experiences of the participants seem to be more important in determining the degree of the cognitive consequence of bilingualism. This means, the greater the experience with language control, the better the cognitive control (Luk et al. 588). But one problem is, that there is no uniformity in explaining the concept of the age of acquisition. Some would use this as the age of immersion to the second language, some would be like the age at which people started speaking L2, and others like the age of attaining fluency in that language. Another problem is the simple classification of the participants into monolinguals and bilinguals or balanced and unbalanced bilinguals bypassing the individual variations in language proficiency and language experience. This problem of reliability of the concept acquisition of language as well as the different language experiences of the participants seems to be the reason behind the inconsistent evidence in the literature with regard to bilingualism and cognitive control (Yang, et al. 237; DeLuca, et al. 7565). The dichotomous classification of participants into monolinguals and bilinguals has failed to take the degree of proficiency into consideration. There are few studies that indicate language proficiency modulates the relationship between executive control functions and bilingualism, i.e., higher the proficiency, higher the EFs in bilinguals (Iluz-Cohen and Armon-Lotem 884). In other words, the more balanced the bilinguals are, the better their cognitive functions regardless of their socioeconomic background (Thomas-Sunesson et al. 197). In order to make it more sophisticated and reliable, Yang, Hwajin, Hartanto, and Yang further classified the perfectly balanced bilinguals based on their interactional context into single language and dual-language context bilinguals. In a dual-language context, the speakers use two languages within the

same context whereas in a single language context they keep two languages separate and speak only one language in one context. The former demands higher language control which facilitates cognitive control than the latter where they hardly switch languages. In effect, "the regular experience with extensive practice in controlling attention to their two language systems results in better performance in related EFs such as inhibiting prepotent responses and global set-shifting" (Yow and Li 164; DeLuca et al. 7565).

All the aforesaid studies on the effect of language context on executive control functions in bilinguals compared different groups of bilinguals in terms of their long-lasting effects of bilingual experience on executive functions. A very recent study approached it in a different way where they examined the effect of language context on executive control functions among bilinguals and found that language context in production modulates the executive control functions (Jiao, et al., 1984). This finding gives support to the adaptive control hypothesis by Green and Abutalelabi, which says that, depending on the current language context, bilinguals adapt their control mechanisms. Hence the long-term outcomes of bilingualism on executive control functions might not be apparent until the language context aspects are accounted for (Jiao et al).

Socio-Economic and Cultural Factors

Few scholars advocate that the differences observed in the cognitive control in bilinguals can also be attributed to the other factors apart from bilingualism alone, such as socio-economic and cultural factors, education, etc. It is not necessary that just dealing with two languages alone would result in enhanced executive control function (Mishra). But Riggs et al., ruled out the influence of biculturalism on executive control functions while examining the association between bilingualism and EF.

While some researchers claim that the evidence of cognitive benefits of bilingualism is more of a result of socio-economic and other experiential factors rather than bilingualism itself, some argue that it is not limited by such factors, rather it enriches the poor too (Engel de Abreu et al). The effect of both bilingualism and socio-economic status is independent of each other and uniquely contributes to development i.e., children of any social class equally benefit from bilingualism and higher socioeconomic status can benefit anyone equally irrespective of their language status (Calvo and Bialystok).

Some Meta-Analytical Findings

In this contradicting scenario, a meta-analytical study was thought to more reliable, but what we can see now is that even the meta-analytical studies on this topic have become a matter of dispute as in one study reported, after systematically reviewing the results of 170 individual studies, that bilingualism indeed enhance executive control functions, but such effects are modulated by both task and age of the participants. Attentional Network Task was found to yield a consistent effect and older bilinguals tended to show more advantages compared to younger bilinguals (Ware et al). Whereas, another study indicated that this bilingual advantage in executive control function is nothing but a publication bias. They reviewed 152 individual studies that compared the executive control functions of monolinguals and bilinguals and found no evidence for enhanced executive functions among bilinguals after correcting for bias, interestingly they even found a small linguistic disadvantage in their verbal fluency (Lehtonen et al., 2018).

Conclusion

The study of bilingualism and executive functions seems to be more complicated. First of all, Bilingualism,more than a categorical variable, is a spectrum accompanied by varying language experiences and cultural factors. Secondly, the mechanisms of executive control function have been observed divergent in the literature. In order to reach the conclusion that bilingualism really enhances executive control function, we need to have some level of unity among the researchers regarding the components as well as the assessment of the same. It is still a matter of question, whether the tools meant to assess the different components of executive functions are actually tapping them distinctly. Moreover, all the experiential, socioeconomic, and cultural factors should be taken into consideration while studying bilingualism and executive functions.

Suggestions, Recommendations, and Implications

Future studies in this line should be designed in such a way that the causality link between bilingualism and other cognitive skills can be explored and established. So far, the studies conducted in this area are more correlational in nature which tells us only about the relationship between bilingualism and executive functions. Since establishing the direction and the cause-and-effect relationship between these variables are not possible through such studies, there is a need of setting up more longitudinal-experiment based studies taking account of all the methodological as well as instrumental drawbacks in the present literature and controlling all the potential confounding factors in order to conclusively claim that bilingualism enhances executive control functions.

It is highly recommended that more meta-analytical studies should be carried out to further explore the literature more objectively. This review study will help to bring some light to the existing inconsistencies and uncertainties in the area of bilingual studies and also shows the necessary steps to be taken to bring more clarity into the picture and which is very important in the present scenario to put an end to the decades' old debate on the cognitive benefits of bilingualism.

References

Abutalebi, Jubin, and David W. Green."Control Mechanisms in Bilingual Language Production: Neural Evidence from Language Switching Studies." *Language and Cognitive Processes*, vol. 23, no. 4, 2008, pp. 557-82.

Antón, Eneko, et al. "Is there a Bilingual Advantage in the ANT Task? Evidence from Children." *Frontiers in Psychology*, vol. 5, 2014.

Ben-Zeev, Sandra. "The Influence of Bilingualism on Cognitive Strategy and Cognitive Development." *Child Development*, vol. 48, no. 3, 1977, pp. 1009-18.

Bialystok, Ellen, and Mythili Viswanathan. "Components of Executive Control with Advantages for Bilingual Children in Two Cultures." *Cognition*, vol. 112, no. 3, 2009, pp. 494-500.

Bruck, Maggie, and Fred Genesee. "Phonological Awareness in Young Second Language Learners." *Journal of child Language*, vol. 22, no. 2, 1995, pp. 307-24.

Calabria, Marco, et al. "Neural Basis of Bilingual Language Control." *Annals of the New York Academy of Sciences*, 2018.

Calabria, Marco, et al. "Qualitative Differences between Bilingual Language Control and Executive Control: Evidence from Task-Switching." *Frontiers in Psychology,* vol. 2, 2012.

Calvo, Alejandra, and Ellen Bialystok. "Independent Effects of Bilingualism and Socioeconomic Status on Language Ability and Executive Functioning." *Cognition*, vol. 130, no. 3, 2014, pp. 278-88.

Carlson, S.M., and P.D. Zelazo. *Minnesota Executive Function Scale: Test Manual*. Reflection Sciences, 2014.

Colzato, Lorenza S., et al. "How does Bilingualism Improve Executive Control? A Comparison of Active and Reactive Inhibition Mechanisms." *Journal of Experimental Psychology: Learning, Memory, and Cognition,* vol. 34, no. 2, 2008, pp. 302-12.

Costa, Albert, et al. "Bilingualism Aids Conflict Resolution: Evidence from the ANT Task." *Cognition*, vol. 106, no. 1, 2008, pp. 59-86.

Costumero, Víctor, et al. "How Bilingualism Shapes the Functional Architecture of the Brain: A Study on Executive Control in Early Bilinguals and Monolinguals." *Human Brain Mapping*, vol. 36, no. 12, 2015, pp. 5101-12.

De Groot, Annette M.B. *Language and Cognition in Bilinguals and Multilinguals: An Introduction*. Psychology Press, 2011.

DeLuca, Vincent, et al. "Redefining Bilingualism as a Spectrum of Experiences that Differentially Affects Brain Structure and Function." *Proceedings of the National Academy of Sciences,* vol. 116, no. 15, 2019, pp. 7565-74.

Diamond, Adele. "Executive Functions." *Annual Review of Psychology*, vol. 64, 2013, pp. 135-68.

Engel de Abreu, Pascale M.J., et al. "Bilingualism Enriches the Poor: Enhanced Cognitive Control in Low-Income Minority Children." *Psychological Science*, vol. 23, no. 11, 2012, pp. 1364-71.

Grundy, John G., and Kalinka Timmer. "Cognitive Mechanisms Underlying Performance Differences between Monolinguals and Bilinguals." *Cognitive Control and Consequences of Multilingualism*, edited by John W. Schwieter, John Benjamins Publishing Company, 2016.

Hakuta, Kenji, and Rafael M. Diaz. "The Relationship between Degree of Bilingualism and Cognitive Ability: A Critical Discussion and Some New Longitudinal Data." *Children's Language*, vol. 5, 1985, pp. 319-44.

Iluz-Cohen, Peri, and Sharon Armon-Lotem. "Language Proficiency and Executive Control in Bilingual Children." *Bilingualism: Language and Cognition,* vol. 16, no. 4, 2013, pp. 884-99.

Jiao, Lu, et al. "Language Context Modulates Executive Control in Bilinguals: Evidence from Language Production." Neuropsychologia, vol. 142, 2020.

Jiao, Lu, et al. "The Contributions of Language Control to Executive Functions: From the Perspective of Bilingual Comprehension." *Quarterly Journal of Experimental Psychology*, vol. 72, no. 8, 2019, pp. 1984-97.

Lehtonen, Minna, et al. "Is Bilingualism Associated with Enhanced Executive Functioning in Adults? A Meta-analytic review." *Psychological Bulletin*, vol. 144, no. 4, 2018, pp. 394-425.

Luciana, Monica, and Charles A. Nelson. "The Functional Emergence of Prefrontally-guided Working Memory Systems in Four-to Eight-Year-Old Children." *Neuropsychologia*, vol. 36, no. 3, 1998, pp. 273-93.

Luk, Gigi, et al. "Is there a relation between Onset Age of Bilingualism and Enhancement of Cognitive Control?." *Bilingualism: Language and Cognition,* vol. 14, no. 4, 2011, pp. 588-95.

Meuter, Renata F., and Alan Allport. "Bilingual Language Switching in Naming: Asymmetrical Costs of Language Selection." *Journal of Memory and Language*, vol. 40, no. 1, 1999, pp. 25-40.

Mishra, Ramesh Kumar. "Let's not forget about Language Proficiency and Cultural Variations while Linking Bilingualism to Executive Control." *Bilingualism: Language and Cognition,* vol. 18, no. 1, 2015, pp. 39-40.

Miyake, Akira, et al. "The Unity and Diversity of Executive Functions and their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis." Cognitive Psychology, vol. 41, no. 1, 2000, pp. 49-100.

Morton, J. Bruce, and Sarah N. Harper. "What did Simon Say? Revisiting the Bilingual Advantage." *Developmental Science,* vol. 10, no. 6, 2007, pp. 719-26.

Peal, Elizabeth, and Wallace E. Lambert. "The Relation of Bilingualism to Intelligence." *Psychological Monographs: General and Applied*, vol. 76, no. 27, 1962.

Riggs, Nathaniel R., et al. "Prospective Associations between Bilingualism and Executive Function in Latino Children: Sustained Effects while Controlling for Biculturalism." *Journal of Immigrant and Minority Health*, vol. 16, no. 5, 2014, pp. 914-21.

Rodríguez-Pujadas, Aina, et al. "Bilinguals Use Language-Control Brain Areas more than Monolinguals to Perform Non-Linguistic Switching Tasks." *PLoS One*, vol. 8, no. 9, 2013.

Stocco, Andrea, et al. "Bilingual Brain Training: A Neurobiological Framework of How Bilingual Experience Improves Executive Function." *International Journal of Bilingualism,* vol. 18, no. 1, 2014, pp. 67-92.

Thomas-Sunesson, Danielle, et al. "Degree of Bilingualism Modifies Executive Control in Hispanic Children in the USA." *International Journal of Bilingual Education and Bilingualism*, vol. 21, no. 2, 2018, pp. 197-206.

Von Bastian, Claudia C., et al. "No Evidence for Bilingual Cognitive Advantages: A Test of Four Hypotheses." *Journal of Experimental Psychology: General,* vol. 145, no. 2, 2016, pp. 246-58.

Ware, Anna T., et al. "Meta-analysis Reveals a Bilingual Advantage that is Dependent on Task and Age." *Frontiers in Psychology*, vol. 11, 2020.

Willoughby, Michael T., et al. "The Measurement of Executive Function at Age 3 years: Psychometric Properties and Criterion Validity of a New Battery of Tasks." *Psychological Assessment*, vol. 22, no. 2, 2010, pp. 306-17.

Yang, Hwajin, et al. "The Importance of Bilingual Experience in Assessing Bilingual Advantages in Executive Functions." *Cortex,* vol. 75, 2016, pp. 237-40.

Yow, W. Quin, and Xiaoqian Li. "Balanced Bilingualism and Early Age of Second Language Acquisition as the Underlying Mechanisms of a Bilingual Executive Control Advantage: Why Variations in Bilingual Experiences Matter." *Frontiers in Psychology*, vol. 6, 2015.

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