

Bilingualism, biliteracy and cognitive effects: A review paper

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ABSTRACT

The phenomenon of whether cognitive advantages are associated with bilingualism has been widely debated. This paper reviews both research on the cognitive effects of bilingualism and research on the cognitive effects of biliteracy. Definitions of bilingualism, biliteracy, and the explicit definitive characteristics of a bilingual and a biliterate are provided. Findings from bilingualism research, although mixed, have generally pointed towards advantages being associated with speaking two languages, such as cognitive flexibility (Cummins, 1976), and the ability to reflect on aspects of language known as metalinguistic awareness (Adesope, Lavin, Thompson & Ungerleider, 2010). However, some research did report negative effects of bilingualism such as poorer lexical access and receptive vocabulary (Bialystok, Craik & Luk, 2008; Ivanova & Costa, 2008). Fewer studies have examined the effects of biliteracy, particularly the effects of biliteracy in terms of writing.

BILINGUALISM AND BILITERACY

Firstly, this review aims to provide a thorough overview of the existing findings from bilingualism research, because there has been disagreement in the literature about the effects of bilingualism. Some studies have found specific advantages associated with speaking two

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languages (e.g., Cummins, 1976; Adesope *et al.*, 2010), some have found monolingual advantages in specific areas such as vocabulary (e.g., Ivanova & Costa, 2008), while others have found no effects of bilingualism at all (e.g., Kempert, Saalbach & Hardy, 2011). The review will synthesize these findings and provide readers with a better picture of the different effects associated with speaking two languages, and the different effects associated with speaking only one language. Secondly, this review aims to differentiate more clearly the effects of bilingualism from those of biliteracy, and to specifically pay attention to the effects of biliteracy, that is, the effects of reading and writing in two languages.

In the simplest of terms, bilinguals can literally be described as people who speak two languages, and monolinguals as people who speak only one language. However, bilingualism is a complex phenomenon and is not as simple as it appears. In the literature, bilingualism has been perceived and defined from different perspectives, such as linguistic, cognitive and socio-cultural perspectives. In the early days, when bilingualism was widely understood as the native-like control of two languages, bilinguals were referred to as people who spoke two languages with the proficiency and fluency of a native speaker, and being a bilingual meant being able to speak two languages 'perfectly' (Bloomfield, 1935). Past research in bilingualism and cognition referred to monolinguals and native speakers as people with full cognitive capacity for acquiring and mastering the native language. Bilinguals were viewed as those with only half of the cognitive capacity to learn a second language, as the other half was taken up with acquiring and maintaining the first language. Such an understanding suggested that the ability in a second language increased at the expense of the first language (Baker, 2006, 2011). These views were later criticized, as they defined bilingualism too narrowly and included only people with two languages with perfect proficiency, which was barely possible.

In sharp contrast to Bloomfield, Macnamara (1967) defined a bilingual as anyone who possesses a minimal competence in speaking or listening or reading or writing in a language other than the mother

tongue. Since then, other definitions have emerged that can be placed between the two extremes of absolute native-like proficiency and minimal proficiency in two languages. As people's understanding of bilingualism deepened, less simplistic definitions of bilingualism have been suggested. An example is Titone (1972) who defines bilingualism as an individual's capacity and ability to follow the concepts and structures of a second language other than paraphrasing from the mother tongue. Paraphrasing from the mother tongue refers to directly transferring the structures of the mother tongue to the second language. Another example is Mohanty (1994) who defines bilingualism from a socio-cultural perspective, as one's ability to meet communicative demands in society and interact with other speakers in two or more languages.

There is a need to clearly differentiate and make a distinction between bilingualism and biliteracy. Past definitions of bilingualism lacked precision in clearly differentiating between bilinguals and others, for example, second language speakers and biliterates. These definitions, including those mentioned at the beginning of this section, raised a number of theoretical and methodological difficulties (Hamers & Blanc, 2000). They did not specify what was meant by native-like competence (e.g., Bloomfield, 1935), nor by minimal proficiency in a second language (e.g., Macnamara, 1967). People who possess a very high competence in a second language might be excluded on account of speaking with a foreign accent (Hamers & Blanc, 2000). Extreme cases in the other direction such as those who gained minimal proficiency in a second language by attending a foreign language course for a short period of time might be recognized as bilinguals.

This review defines bilingualism as speaking well in two languages, and biliteracy as reading and writing well in two languages. A bilingual may be understood as someone proficient at communicating in two languages in terms of oracy skills, that is, speaking and listening, as these skills involve communicating in spoken language. Those with lower oral proficiency in a second language are regarded as second language speakers rather than bilinguals. A biliterate may be

understood as someone proficient at communicating in two languages in terms of literacy skills, that is, reading and writing, as these skills involve communicating in written language. The definition of a biliterate as being proficient at both reading and writing in two languages echoes definitions suggested by other researchers (e.g., Cummins, 1981; Hickey, 2001; Hornberger, 1990, 2003; Niyekawa, 1983).

This review takes the position that biliteracy is an advanced state of bilingualism, in which a biliterate is not only able to speak two languages well but is also able to read and write well in them (Niyekawa, 1983). Consequently, a bilingual proficient at speaking two languages but proficient only at reading and writing one language will be referred to as a mono-literate bilingual. A bilingual proficient at speaking, listening, reading and writing two languages will be referred to as a biliterate-bilingual.

COGNITIVE EFFECTS

The cognitive effects of bilingualism and biliteracy have been studied extensively and are well documented in the literature (Adesope *et al.*, 2010; Ehrich & Meuter, 2009). Prior to the 1960s, many researchers and educationalists strongly opposed the idea of bilingualism (Petitto, Katerelos, Levy, Gauna, Tetreault & Ferraro, 2001). People held the perception that speaking two languages would not only lead to intellectual failure and linguistic confusion, but would also delay language development in young children and damage the psychological wellbeing of immigrants (Portes & Schauffler, 1994; Petitto *et al.*, 2001). Consequently, some immigrant parents purposely delayed young children's acquisition of their home language, worrying that their children would be incompetent or partially competent in both languages when compared to monolingual children (Petitto *et al.*, 2001). Starting from the 1960s, perceptions of bilingualism gradually became more positive. In the past, having two languages was perceived as the cause of cognitive confusion because tests were administered mainly in English, which was often the weaker language of the participants (Valdes & Figueroa, 1994).

Bilinguals were found to have under-performed, as these tests tended to favour English monolinguals. Some researchers began to suggest testing bilinguals either in both languages or in their stronger language. Others demonstrated the importance of social class when examining the effects of having two languages (Cummins, 1981; Lambert & Tucker, 1972; Peal & Lambert, 1962). This was because social statuses and living environments appeared to have played a role in people's language development and learning.

To date, existing studies on the cognitive effects of bilingualism have reported mixed findings. No evidence has been reported so far that bilinguals are in any measurable sense more intelligent than monolinguals (Bialystok, 2007). Instead, bilingualism has been found to be associated with a wide range of metacognitive rather than cognitive advantages, for example metalinguistic awareness, which is the ability to focus on and direct attention to particular aspects of language, to reflect upon language and to evaluate it (as opposed to direct language use) (Dillon, 2009). Other studies have reported negative effects of bilingualism or aspects where monolinguals were advantaged over bilinguals, for example verbal and semantic fluency (Gollan, Montoya & Werner, 2002; Sandoval, Gollan, Ferreira & Salmon, 2010). Some studies have reported no effects of bilingualism (Bialystok, McBride-Chang & Luk, 2005; Kempert, Saalbach & Hardy, 2011). This divergence in the findings, which could indicate that bilinguals (and / or biliterates) are advantaged only in specific aspects of language use, will be discussed in the following sections.

Research on bilingualism

Cognitive benefits of bilingualism

Cummins' (1976) threshold hypothesis suggests that people need to have reached age-appropriate proficiency in their two languages before bilingualism (or biliteracy) can promote cognitive development or advantage. Otherwise, neither cognitive advantages nor disadvantages occur, such as in the case of some L2 speakers with a fully developed L1 but not L2, or even cognitive deficits for those with two underdeveloped languages (Ricciardelli, 1992). To date, a wide

range of positive effects of bilingualism has been found by research that investigated this hypothesis. These effects are associated with bilinguals of two proficient languages. Common areas in which positive effects have been reported include metalinguistic awareness (Bialystok, Majumder & Martin, 2003; Campbell & Sais, 1995; Galambos & Hakuta, 1988), control of attention in language processing (Bialystok, 1987, 1988, 1997, 1999, 2001a, 2001b, 2007; Bialystok, Craik, Klein & Viswanathan, 2004; Bialystok, Craik & Ryan, 2006; Cummins & Mulcahy, 1978; Cummins, 1978; Daniels, Toth & Jacoby, 2006), problem-solving that requires attentional control (Baddeley, 1996; Bialystok, 1999, 2006a, 2006b, 2007, 2009), inhibitory control in languages and working memory capacity (Engle, 2002; Kane, Bleckley, Conway & Engle, 2001; Ransdell, Barbier & Niit, 2006; Ransdell, Arecco & Levy, 2001) and cognitive flexibility between two languages and perspectives (Cummins, 1976; Peal & Lambert, 1962; Ricciardelli, 1992).

Amongst the many positive effects of bilingualism reported, metalinguistic awareness has received much attention in the research. However, different researchers appear to have had different understandings as to what metalinguistic awareness involves. Some studies define metalinguistic awareness as analysis of representation, which is the ability to think, analyse and inwardly reflect on formal aspects of language, for example grammar, with conscious knowledge and reported positive findings (Baker & Jones, 1998; Dillon, 2009; Lasagabaster, 2001; Renou, 2001). Other studies define metalinguistic awareness in terms of two dimensions, namely analysis of representation, which is the ability to reflect on language as previously mentioned, and control of attention, which is the ability to selectively attend to specific aspects of language and to reject any distractions or misleading information. This group of studies that define metalinguistic awareness in terms of the two dimensions reported a bilingual-specific advantage only for the second dimension, control of attention (Bialystok, 1987, 1988, 1999, 2001a, 2007, 2009; Bialystok & Ryan, 1985; Bialystok & Viswanathan, 2009).

Studies that focus solely on the first dimension, analysis of representation, found greater linguistic sensitivity in proficient bilinguals because they possess knowledge of two languages and are more exposed to the structural aspects of different language systems than monolinguals (Bassetti, 2007a, 2007b; Bild & Swain, 1989; Bournot-Trites & Seror, 2003; Dillon, 2009; Francis, 1999, 2002, 2004a, 2004b; Jessner, 1999; Klein, 1995; Lasagabaster, 2001; Thomas, 1988). Dillon (2009) reported high levels of metalinguistic awareness and general language proficiency in bilinguals. Similarly, Lasagabaster (2001) reported significant relationships between metalinguistic awareness and in different aspects of language including grammar, reading, speaking and listening in bilinguals.

In contrast, studies on both analysis of representation and control of attention found different results (Bialystok, 1987, 1988, 1999, 2001a, 2007, 2009; Bialystok & Ryan, 1985; Bialystok & Viswanathan, 2009). These studies reported no effects of bilingualism in terms of analysis of representation. They suggested that analysis of representation cannot be regarded as a bilingual-specific effect because people's ability to analyse language tends to improve when their language proficiency and acquisition of literacy improve. Such improvement may happen to bilinguals or monolinguals (Bialystok, 1988, 1999). Instead, control of attention has been consistently reported as a positive effect for proficient bilinguals. An example of a task involving control of attention is grammatical judgment (Bialystok, 1986, 1987, 1988, 2001a; Bialystok & Majumder, 1998). In Bialystok (1987, 2001a), young bilinguals and monolinguals were given a series of sentences to decide on their grammatical acceptability. They were asked to notice and explain any grammatical violations in grammatical sentences with distractive words that may cause confusion in understanding, such as 'why is the cat barking so loudly' and 'apple grows on noses'. Bilinguals were able to identify semantic acceptability in these sentences better than monolinguals.

Control of attention has been reported as a bilingual-specific advantage not only in linguistic related tasks but also in non-linguistic tasks (Bialystok, 2006a, 2007; Bialystok, Craik, Grady, Chau, Ishii,

Gunji & Pantev, 2005; Bialystok, Craik, Klein & Viswanathan, 2004; Bialystok, Craik & Ryan, 2006; Bialystok, Craik & Luk, 2008; Clarkson, 2006). These studies reported an advantage for bilinguals over monolinguals on a specific type of control called executive control and processing (Bialystok, 2007, 2010; Bialystok, Craik & Ryan, 2006; Bialystok, Craik, Klein & Viswanathan, 2004; Bialystok & Viswanathan, 2009). Executive control involves the ability to suppress certain information in the mind when one is performing a task (i.e., response suppression). Executive control involves also inhibition of attention to only relevant aspects of a problem (i.e., inhibitory control) and task-switching (Bialystok, Craik, Green & Gollan, 2009; Bialystok, Craik, Klein & Viswanathan, 2004). The ability to actively control two language systems from a young age to adulthood, such as to inhibit one language when the other is being used or switch between languages appropriately has enhanced better executive functioning in bilinguals than monolinguals (Bialystok, 2010; Bialystok, Craik & Luk, 2008; Bialystok & Martin-Rhee, 2008).

In Bialystok, Craik and Ryan (2006), young bilinguals were able to suppress a response triggered by an habitual cue better than monolinguals, for example, naming a picture of the sun as “night” and a picture of the moon as “day”. The bilinguals were able to suppress themselves from naming the picture of the sun directly as “day” and from naming the picture of the moon directly as “night” better than the monolinguals. In Bialystok, Craik, Klein and Viswanathan (2004), adult bilinguals were able to selectively and accurately attend to relevant aspects of a problem and ignore competing and distracting cues quicker than monolinguals on a series of tasks that measured stimulus-response compatibility (i.e., inhibitory control). Similarly, Bialystok and Martin-Rhee (2008) reported more rapid response from bilingual children on tasks in which demands for inhibitory control were high. In Clarkson (2006), high ability Australian-Vietnamese bilingual students who succeeded in mathematics demonstrated metacognitive ability as a result of having two languages. They were able to switch between languages or focus on using only one

language, and appeared more confident in their approach to solving challenging mathematical problems.

As a result of bilingualism research pointing to the advantages of speaking two languages, bilingual education has been widely offered at schools in countries with high populations of immigrants such as Australia (August & Hakuta, 1997; De Courcy, 2005; Dutcher, 1995; Elder, 2000, 2005; Elder & Davies, 1998). In the Australian school context, heritage language education and immersion are two main forms of bilingual education that promote full bilingualism, because in these contexts learning an additional language does not threaten or replace the first or home languages. Heritage language education, also known as community language classes, cater for students from language backgrounds other than English (Hornberger, 2005). These classes aim to cultivate students' home languages alongside their development in English, which is the school language. Immersion classes are bilingual classes in which some or all school subjects are taught not in the students' first language but a language that the local community values, so that students may become bilingual and bicultural. Overall, research in the area of bilingual education has mainly explored policy development and the effectiveness of heritage language programmes (e.g., Elder, 2005), LOTE (Languages Other Than English) programmes (e.g., Elder, 2000), and immersion programmes (e.g., De Courcy, 2005), rather than actual effects of bilingualism. Elder (2000) reported and suggested the need to offer different curriculum content to background speakers who are already competent in the target language and to second language speakers who are learning the target language as beginners. De Courcy (2005) reported and suggested a reduced teaching load in immersion teachers' first year of teaching, due to long hours in preparation of materials for their classes.

Cognitive costs of bilingualism

In contrast, other studies have reported negative effects or cognitive costs of bilingualism in various areas including verbal fluency, speech production and picture naming (Gollan, Montoya, Fennema-Notestine & Morris, 2005; Ivanova & Costa, 2008; Sandoval, Gollan, Ferreira &

Salmon, 2010), solving word problems in mathematics (Kempert *et al.*, 2011), lexical access and receptive vocabulary (Bialystok, Craik & Luk, 2008; Bialystok & Feng, 2009; Hoff, Core, Place, Rumiche, Senor & Parra, 2012; Ivanova & Costa, 2008; Ransdell & Fischler, 1987; Oller & Eilers, 2002). Overall, results from these studies reported that bilinguals lagged behind monolinguals in specific areas of language use, particularly in situations where skills are assessed in only one language. Sandoval *et al.*'s (2010) study on verbal fluency reported fluency disadvantage in bilinguals. Bilinguals produced fewer correct responses, slower response times and proportionally delayed retrieval relative to monolinguals. Similarly, both Gollan *et al.* (2005) and Ivanova and Costa (2008) reported slower speech production rates in picture naming in bilinguals' dominant language than monolinguals.

In a study on mathematical word-problems, Kempert *et al.* (2011) reported cognitive costs in bilingual students' problem-solving even in their native language (i.e., Turkish), because word-problems were mainly taught in a different language of instruction (i.e., German). It is worth noting that social contexts could have played a part that led to this outcome. It appeared that there was more going on in relation to these students' background with family members who may have been "Gastarbeiter" (i.e., guest workers), hired from rural areas of Turkey to work in Germany from the early 60s, than simply the effects or costs of bilingualism. Some students from this family background were born in Germany, they grew up in Germany and attended German schools, but were found to have a poor command of both their native language and school language.

Other areas of consistent bilingual disadvantage reported are receptive vocabulary (Bialystok, 2007, 2009; Bialystok & Feng, 2009; Hoff *et al.*, 2012; Ivanova & Costa, 2008; Oller & Eilers, 2002; Ransdell & Fischler, 1987) and lexical access (Bialystok, 2009; Bialystok *et al.*, 2008; Gollan, Montoya & Werner, 2002; Michael & Gollan, 2005). Receptive vocabulary is understood as the body of words that a person understands and recognizes well enough to comprehend when listening or reading. Overall, studies reported that bilinguals tend to lag behind monolinguals when receptive vocabulary

was assessed in only one language. In Hoff *et al.* (2012), the monolinguals were significantly more advanced than the bilinguals on measures of receptive vocabulary in single language comparisons, though the groups were comparable on a measure of total vocabulary. Similarly, the bilinguals in Bialystok and Feng (2009) attained lower scores on a vocabulary test than monolinguals.

Lexical access has been consistently reported as a monolingual advantage (Bialystok *et al.*, 2008; Gollan, Fennema-Notestine, Montoya & Jernigan, 2007; Gollan *et al.*, 2005; Michael & Gollan, 2005; Ransdell & Fischler, 1987). Results from studies suggest that monolinguals are better than bilinguals in lexical retrieval and on tasks that required rapid generation of words. Bialystok *et al.* (2008) reported better performance in monolinguals than bilinguals on all lexical retrieval tasks. Ransdell and Fischler (1987) reported no difference in accuracy between monolinguals and bilinguals in lexical decisions, but the bilinguals lagged behind monolinguals in retrieval rates. These studies also provided a possible explanation for the bilingual disadvantage on lexical retrieval. Firstly, it is possible that monolinguals have had more time and experience than bilinguals on retrieving words in one language, which may then lead to differences in frequency of usage in that one language (Gollan *et al.*, 2007; Gollan *et al.*, 2005). Secondly, bilinguals may suffer in lexical processing from the need to suppress possible interference from the other unwanted but active language, particularly when they are time pressured.

Research on biliteracy

Studies on the effects of biliteracy have largely examined cross-linguistic transfer (and orthographic transfer) in terms of reading (e.g., Bassetti, 2007a; Bialystok, 1997, 2001a, 2002; Bialystok & Luk, 2008; Bialystok, Luk & Kwan, 2005; Bialystok, McBride-Chang & Luk, 2005; Branum-Martin, Tao, Garnaat, Bunta & Francis, 2012; Chen, Anderson, Li, Hao, Wu & Shu, 2004; D'Angiulli, Siegel & Serra, 2001; Durgunoglu, 1998; Ehrich & Meuter, 2009; Geva & Siegel, 2000; Jared, Cormier, Levy & Wade-Woolley, 2011; Ovando, Collier &

Combs, 2003; Proctor, August, Carlo & Snow, 2006; Schwartz, Leikin & Share, 2005, 2010; Schwartz, Leikin, Share & Kozminsky, 2008; Wang, Cheng & Chen, 2006; Wang, Park & Lee, 2006; Wang, Perfetti & Liu, 2003, 2005; Wang, Yang & Cheng, 2009). Studies on the effects of biliteracy have also examined cross-linguistic transfer in terms of writing but to a much lesser degree than reading (e.g., Bournot-Trites & Seror, 2003; Gort, 2006). Cross-linguistic transfer in biliteracy is understood as transfer of literacy skills, such as reading or writing strategies, between the languages of a biliterate reader or writer. Overall, these studies have mainly adopted a skill-transferability framework rather than a cognitive advantage framework like studies on the effects of bilingualism did. Different types and conditions of skill-transfers in reading and writing have been reported in these skill-transfer studies, with some reported also on actual advantages for biliterates and bilinguals over monolinguals on some aspects of reading (e.g., Bialystok, Luk & Kwan, 2005; Bialystok, Majumder & Martin, 2003; Ehrich & Meuter, 2009; Schwartz, Leikin & Share, 2005, 2010; Schwartz, Leikin, Share & Kozminsky, 2008).

According to Cummins' (1991) linguistic interdependence principle, literacy transfer occurs in two conditions. Firstly, a person needs to have gained a high level of literacy in the dominant language or L1. Literacy gained in this stronger language then serves as a foundation for skill transfer between languages, which also facilitates the mastering of literacy in the weaker language (Cummins, 1991, 1996). Transfer does not occur when both languages are underdeveloped. Secondly, transfer also largely depends on language distance, which is known as the similarity between the orthography (i.e., writing systems) and language structure (i.e., grammar) of two languages. Two languages written in an alphabetic system (e.g., English and Spanish) are generally considered more amenable to skill transfer than would an alphabetic and ideographic language (e.g., English and Chinese) (Bialystok, McBride-Chang & Luk, 2005).

Effects of reading in two languages

Numerous studies have examined different types of reading transfer and the conditions in which these transfers occurred. These studies reported specific skills that transferred between languages of close linguistic distance, including phonological awareness and processing between alphabetic languages (e.g., English and French or Spanish) (Bialystok, 1997, 2001b, 2002; Bialystok, Luk & Kwan, 2005; Bialystok, McBride-Chang & Luk, 2005; Branum-Martin *et al.*, 2012; Chen *et al.*, 2004; Jared *et al.*, 2011; Schwartz, Leikin & Share, 2005; Wang, Park & Lee, 2006; Wang, Perfetti & Liu, 2003), and visual ability and processing in non-alphabetic languages (e.g., Chinese) (Ehrich & Meuter, 2009; Mumtaz & Humphreys, 2001). Studies have also reported positive transfer of phonological or morphological processing in non-alphabetic languages such as Chinese (Bialystok, McBride-Chang & Luk, 2005; Chan & Siegel, 2001; Chen *et al.*, 2004; Gottardo, Yan, Siegel & Wade-Woolley, 2001; Wang, Cheng & Chen, 2006; Wang, Yang & Cheng, 2009), and positive transfer of visual processing in alphabetic languages such as English (Mumtaz & Humphreys, 2001). Others have reported writing system transfer and orthographical processing in reading between alphabetic languages or languages with different writing systems (e.g., English and Chinese) (Branum-Martin *et al.*, 2012; Ehrich & Meuter, 2009; Mumtaz & Humphreys, 2001; Wang, Park & Lee, 2006; Wang, Perfetti & Liu, 2005). As much as language distance has played a role in the range of positive transfers reported, these studies have commonly agreed that skill-transfer often also depends on specific aspects of the languages, such as the phonetic systems or morphology of the languages. Examples may be seen in Gottardo *et al.* (2001) where correlation and transfers were found between Chinese and English rhyme detection, in Wang, Cheng and Chen (2006) where transfers were found between English morphological awareness and Chinese character reading and comprehension, and in Wang, Perfetti and Liu (2005) where Pinyin, an alphabetic phonetic system in Chinese was highly correlated with English pseudo word reading.

Amongst the many studies on potential transferrable skills, those with a focus on cross-language phonological and orthographic relationships have reported greater advantage in phonological awareness and processing for biliterate and bilingual readers over monolingual readers (Bialystok, Luk & Kwan, 2005; Bialystok, Majumder & Martin, 2003; Schwartz, Leikin & Share, 2005, 2010; Schwartz, Leikin, Share & Kozminsky, 2008). Both Bialystok, Luk and Kwan (2005) and Bialystok, Majumder and Martin (2003) suggest that reading in two alphabetic languages often enhances higher ability in manipulating different sounds and higher ability in recognizing letter and sound relationships than reading in one alphabetic language or reading in two languages with different writing systems. In Bialystok, Luk and Kwan (2005), English monolinguals, Cantonese-English bilinguals, Hebrew-English bilinguals and Spanish-English bilinguals were given phonological awareness and decoding tasks. The bilinguals completed those tasks in both languages. The Spanish-English and Hebrew-English bilinguals demonstrated more advanced phonological processing than both the English monolinguals and Cantonese-English bilinguals, while the Cantonese-English bilinguals demonstrated better decoding ability than the English monolinguals. It was interesting to see that the Hebrew-English bilinguals performed better than the English monolinguals and the Cantonese-English bilinguals when Hebrew is a phonetic language (with non-roman script), unlike English, which is an alphabetic language. Similarly, Bialystok, Majumder and Martin (2003) reported an advantage on phonological awareness in phoneme segmentation in Spanish-English bilinguals over English monolinguals and Chinese-English bilinguals.

Three studies, Schwartz, Leikin and Share (2005), Schwartz, Leikin and Share (2010) and Schwartz, Leikin, Share and Kozminsky (2008) examined the cognitive benefits of biliteracy on reading of Russian-Hebrew biliterate-bilinguals, Russian-Hebrew mono-literate bilinguals and Hebrew monolinguals. Note that both Russian and Hebrew are phonetic languages with non-roman script. These studies reported a consistent advantage in terms of phonological awareness

in the biliterate-bilinguals. In the three studies, the biliterate-bilinguals are those who read, write, speak and listen to both Russian and Hebrew. The mono-literate bilinguals are those who read and write in Hebrew, and speak and listen to both Russian and Hebrew. In Schwartz, Leikin and Share (2005), the biliterate-bilinguals showed a clear advantage over both the mono-literate bilinguals and monolinguals on all phonological awareness tasks. The study also reported better reading fluency measures in both bilingual groups. Schwartz, Leikin, Share and Kozminsky (2008) reported similar results. The biliterate-bilinguals showed superior levels of phonological awareness on phoneme isolation in Hebrew compared to other groups, the mono-literate bilinguals and monolinguals. The biliterate-bilinguals were also superior to the monolinguals on measures of word and pseudo word accuracy, which depended heavily on phonological processing efficiency. Schwartz, Leikin and Share (2010) reported an advantage of the biliterate-bilinguals over both the mono-literate bilinguals and monolinguals on phonemic awareness, word identification and pseudo word accuracy. The study also reported general benefits of cross-linguistic transfer of phonemic awareness from Russian to Hebrew.

Effects of writing in two languages

Existing studies on writing in two languages have examined skill transfer of biliterates between their languages and of second language writers (i.e., L1 to L2 transfer) (Bournot-Trites & Seror, 2003; Das, 1985; De Courcy & Smilevska, 2012; Edelsky, 1989; Francis, 1999; Friedlander, 1990; Gort, 2006; Halsall, 1986; Hansen, 2000; Homza, 1995; Howard & Christian, 1997; Hudelson, 1989; James, 2006, 2008; Kubota, 1998; Leki, 1995; Leki & Carson, 1994; Manyak, 2000; Mohan & Au-Yeung Lo, 1985; Moll & Dworin, 1996; Perez, 2004; Reyes, 2001; Snow & Brinton, 1988; Verhoeven, 1994). The biliterates in these studies on writing transfer mentioned were able to employ the majority of their writing-related behaviours, general writing strategies and knowledge about language cross-linguistically when they were writing in both languages (Bournot-Trites & Seror, 2003; Edelsky, 1989; Francis, 1999; Friedlander, 1990;

Gort, 2006; Halsall, 1986; Homza, 1995; Howard & Christian, 1997; Hudelson, 1989; Manyak, 2000; Moll & Dworin, 1996; Perez, 2004; Reyes, 2001; Verhoeven, 1994). Their dual language knowledge in writing may be an advantage for such positive transfer, but this has not been directly examined in the studies. De Courcy and Smilevska (2012) reported positive transfer of writing strategies from Macedonian to English in a group of Macedonian-English biliterate children in Australia. Bournot-Trites and Seror's (2003) study on French immersion students' perceptions on writing strategies found positive literacy transfers between English and French writing in sentence structure and organization. The study also reported a high level of language awareness and understanding from students on English grammar, reading and vocabulary that contributed to their French writing abilities. Gort (2006) investigated writing of a small group of Spanish-dominant and English-dominant young biliterates, and reported positive literacy transfers between the two languages. These transfers included making good use of linking words and linking phrases, and strategic lexical code-switching at all stages of writing – planning, writing, revising and editing. Similarly, in Homza's (1995) study, both English-dominant and Spanish-dominant biliterates who received writing instruction in their dominant languages were able to transfer and apply what they learned about writing in their dominant languages to their writing in the less dominant languages. As a result, they developed spontaneous biliteracy in two written language systems.

Studies on writing transfer with second language writers have reported both positive and negative skill transfer from the L1 (Das, 1985; Hansen, 2000; James, 2006, 2008; Kubota, 1998; Leki, 1995; Leki & Carson, 1994; Mohan & Au-Yeung Lo, 1985; Snow & Brinton, 1988). Negative transfer in L2 writing mainly included organization problems that were attributed to interference from the structure of L1 writing (Das, 1985; Mohan & Au-Yeung, 1985). Das (1985) reported negative transfer of rhetorical strategies from Indian, the first language, to English, the second language, in students' writing. The study suggests that general level of development in composition

seems more important in L2 writing than skill transfer from the L1. Kubota's (1998) study on L1 to L2 transfer of Japanese writers, on the other hand, reported positive transfer. The study found similar patterns between the writers' Japanese and English writing. Similarly, James (2006) reported positive transfer of multiple skills in a group of university ESL writers, including the use of appropriate syntactic patterns and vocabulary, idea organization and coherence.

Other studies have reported high levels of metalinguistic awareness for people who write in two languages and suggested that language awareness may contribute to writing ability (Bournot-Trites & Seror, 2003; Francis, 1999, 2004a, 2004b; Lasagabaster, 2001). However, these studies have examined metalinguistic awareness and writing of only bilinguals or second language writers and no comparisons have been made with monolinguals. Both Francis (1999) and Francis (2004a) reported positive relationships between different aspects of metalinguistic awareness (e.g., self-corrections of reading miscues and conscious written language processing) and writing performance of Spanish and Nahuatl bilinguals (Nahuatl is a language spoken in Central Mexico). Lasagabaster (2001) reported high levels of metalinguistic awareness as well as positive relationships between metalinguistic awareness and writing performance in second language writers.

A study by Ng (2013) examined the effects of biliteracy on writing holistically by looking at both what writers know about writing (i.e., writing knowledge) and what they actually do as they write (i.e., writing processes). Biliterate-bilinguals, who could read, write, speak and listen in both Chinese and English, were compared to monoliterate bilinguals, who could read and write in English only, but speak and listen to both Chinese and English and to monolinguals who had English as their first and only language.

The study found no differences between the three groups' writing performance, and that all the groups were able to read and write with a reasonable level of proficiency in their language(s). However, the study reported distinctive features of the three groups in terms of both what they know about writing and their actual writing processes.

In terms of writing knowledge, the monolinguals appeared to be advantaged in terms of their knowledge about writing strategies, and the biliterate-bilinguals appeared to be advantaged in terms of metalinguistic awareness associated with error classification and explanation of language rules. In terms of writing processes, the monolinguals demonstrated that they had knowledge of a range of semantically related words when searching for or changing words as they wrote.

Interestingly, the mono-literate bilinguals appeared to be in an intermediate position between the other two groups. In terms of what they knew about writing, the mono-literate bilinguals did not seem to perform as well as the monolinguals in terms of knowledge of writing strategies, nor did they seem to perform as well as the biliterate-bilinguals in terms of metalinguistic awareness. In terms of what they do when writing, they appeared, like the monolinguals, to have a broader vocabulary at their fingertips but at the same time, like the biliterate-bilinguals, were also more reflective about their writing processes than the monolinguals. It appeared that social factors such as prior schooling experience may have played a part in determining the three groups' patterns of knowledge and writing processes. However, the association between social contexts and writing was not specially examined in the study.

CONCLUSION

This review has reviewed empirical research on the effects of bilingualism and the effects of biliteracy. Existing studies have reported both positive and negative cognitive effects of bilingualism. In terms of positive effects, findings have suggested a range of specific areas where bilinguals are advantaged over monolinguals for constantly managing two active languages. Metalinguistic awareness and cognitive control in two languages and in non-language related tasks have been reported as bilingual-specific advantages. In terms of negative effects, bilinguals were found to lag behind monolinguals in some areas of language use. The main ones included verbal fluency, receptive vocabulary and lexical access.

Studies on the effects of biliteracy based on a skill-transferability framework have identified a wide range of reading transfer between a biliterate's languages. Writing has also been examined in previous research but was examined to a much lesser degree than reading. Positive reading transfer mainly occurred when a biliterate's languages share the same orthography, for example English and Spanish. Some studies have examined the cognitive effects of biliteracy on reading and reported a clear advantage for biliterates and bilinguals in phonological awareness and processing over monolinguals. Positive writing transfer was also found in the writing of biliterates and some second language writers.

Overall, findings from research on the effects of bilingualism and research on the effects of biliteracy have clearly indicated that people proficient in two languages (i.e., mono-literate bilinguals or biliterate-bilinguals) and monolinguals, who have mastered and are proficient in only one language, appear to be advantaged very differently. These differences seem to indicate that it is impossible and perhaps unfair also to categorically state that one group is advantaged over the other groups in the languages they speak or read or write. Rather, people proficient in two languages and those who have mastered only one language demonstrate different abilities in specific areas of language use.

The majority of past studies on the effects of bilingualism have found those who are proficient in two languages demonstrate greater metalinguistic awareness, that is, the ability to think about and reflect on language, than their monolingual counterparts (Bialystok, Majumder & Martin, 2003; Campbell & Sais, 1995; Galambos & Hakuta, 1988). Likewise, people who acquired two languages and were constantly maintaining them were also found to have greater metacognitive awareness in general than those who mastered only one language (Adesope *et al.*, 2010; Ransdell, Barbier & Niit, 2006; Vorstman, De Swart, Ceginkas & Van Den Bergh, 2009). The process of learning the vocabulary, syntax and phonology of two languages, as well as learning how to use this body of knowledge in two languages in contextually appropriate fashion is said to provide

people with two languages special insight into their own cognitive and learning processes (Adesope *et al.*, 2010; Kemp, 2007).

In contrast, some specific aspects of vocabulary use, such as receptive vocabulary and rapid generation of words, have been regarded as a consistent monolingual advantage. The finding that receptive vocabulary size is a monolingual-specific advantage has been replicated in almost every study that has compared monolinguals and bilinguals, even from early school age (Bialystok, 2007; Oller & Eilers, 2002). Bilinguals were found to lag behind monolinguals in their receptive vocabulary, that is, the body of words that they understand and recognize well enough to comprehend when listening or reading (e.g., Bialystok & Feng, 2009; Hoff *et al.*, 2012), and in lexical access and tasks that required rapid generation of different words (e.g., Bialystok *et al.*, 2008; Gollan *et al.*, 2007). Overall, it may be said that monolinguals appear to be advantaged in these specific aspects of vocabulary use because they have had more time, experience and perhaps exposure as well than bilinguals and biliterates on using words and retrieving them in one language (Gollan *et al.*, 2007; Gollan *et al.*, 2005). In terms of better ability in generating words rapidly, it may be possible to say that monolinguals who mastered only one language need not suppress any possible interference from another active language like people with two languages sometimes would do.

With regard to studies on biliteracy, one consistent finding in terms of the effects of reading in two languages has been the higher phonological awareness and processing ability found in biliterate-bilinguals with two alphabetic languages such as English and Spanish (e.g., Bialystok, Majumder & Martin, 2003; Bialystok, Luk & Kwan, 2005), and in some studies, biliterate-bilinguals with two phonetic languages with non-roman script such as Russian and Hebrew (e.g., Schwartz, Leikin & Share, 2010). Overall, it may be said that biliterate-bilinguals who read in two alphabetic languages (e.g., English and Spanish) or two phonetic languages (e.g., Hebrew and Russian) often demonstrate better ability in manipulating different sounds and better ability in recognizing the relationships between

sounds and the written script than those who read in two languages with different orthographies (i.e., writing systems). One example of languages with different writing systems is English, an alphabetic language, and Chinese, an ideographic or logographic language.

At this point, it may be worth noting that both studies on the effects of bilingualism and studies on the effects of biliteracy have reported a wide range of findings in terms of monolingual, bilingual, and biliterate advantages in specific but different aspects of language use, be it better language awareness for the bilinguals, or broader receptive vocabulary for the monolinguals, which were identified also as a cognitive cost of bilingualism, or better phonological processing in reading for the biliterate-bilinguals. There was a need to synthesize these very mixed findings, which has been the purpose of this review.

FUTURE DIRECTIONS

Future research should consider adopting a holistic approach to further investigate the effects of bilingualism and the effects of biliteracy. The majority of studies discussed in this review have reported monolingual, bilingual, and biliterate advantages in different but specific sub-skills. There is a need for future research to provide readers with better understanding of the cognitive benefits and cognitive costs of bilingualism or biliteracy in terms of holistic skills such as speaking or listening or reading. The study by Ng (2013) presented a holistic view of writing, and it could be valuable for other studies to follow suit.

Moreover, it would be worthwhile for studies on the effects of bilingualism or biliteracy, which have been conducted mainly from a cognitive perspective, to include a focus on the social and cultural aspects of different people's speaking, listening, reading and writing. Some researchers have already called for future studies on people's writing processes to be examined from a socio-cognitive perspective (e.g., Roco de Larios & Murphy, 2001). Social contexts, such as prior schooling experience and family background are likely to have played some roles in determining what the monolinguals, the mono-literate bilinguals, and the biliterate-bilinguals are good at. Social contexts

may also be a relevant factor that further determines how and why monolinguals, mono-literate bilinguals and biliterate-bilinguals are different from each other in terms of the advantages they have and the possible challenges they face.

Future research may also consider including the analysis of social and contextual factors that mediate, say, the reading or writing process of the three groups. One way to do this may be to develop accounts of how people, as individuals shaped by and operating within a social and cultural environment, interpret and construct a writing (or reading) task (Flower, 1994; Roca de Larios & Murphy, 2001). Based on the specific monolingual, bilingual and biliterate advantages discussed in this review, it is almost certain that people with different language abilities and backgrounds shaped by and operating within different social environments would interpret and construct a writing, reading, speaking, listening, or language task differently.

Finally, studies on biliteracy may continue to adopt a cognitive advantage framework and further explore if there are any other effects in writing for biliterate-bilinguals, mono-literate bilinguals and monolinguals. It may be worthwhile also for future studies to include some analysis of social, contextual and cultural factors mediating biliterate-bilinguals, mono-literate bilinguals or second language writers' writing across different languages. For biliterate-bilinguals, mono-literate bilinguals, and second language writers, writing in a language other than one's own mother tongue is a complex and socially-bound process affected by one's quantity and quality of previous literacy experiences (Bosher, 1998; Cumming, 1989; Carson, Carrel, Silverstein, Kroll & Kuehn, 1990) and sometimes, cultural assumptions (Bell, 1995). Thus, some future areas of inquiry may be to analyse in what ways the transfer of strategies across languages in biliterate-bilinguals', mono-literate bilinguals' or second language writers' writing is socially mediated (Roca de Larios & Murphy, 2001). Do biliterates, bilinguals or second language writers have cultural assumptions or pragmatic attitudes that may affect their writing in the two languages? Future research may also consider examining and comparing culturally preferred patterns of writing in different

languages, the processes in which writers of these languages engage in, and the texts that writers of these languages produce.

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