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## Effects of early bilingualism on learning phonological regularities in a new language

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### ABSTRACT

Drawing on structural sensitivity theory, the current study investigated monolingual and bilingual children's ability to learn how phonemes combine to form acceptable syllables in a new language. A total of 186 monolingual and bilingual kindergarteners, first graders, and second graders in Taiwan participated in the study. Bilingual children, regardless of whether they actively used a second language at home or simply had exposure to it, showed an advantage over their monolingual peers in learning the phonological patterns in the new language. The study provides empirical support for structural sensitivity theory and calls for the need to reconceptualize the effects of early bilingualism.

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### Introduction

A growing body of research has demonstrated that bilingualism may have an impact on aspects of children's cognitive development. Bilingual children have been found to outperform their monolingual peers on cognitive tasks that contain conflicting or misleading cues such as the Simon task (Martin-Rhee & Bialystok, 2008), the ambiguous figure reversal task (Bialystok & Shapero, 2005), false belief reasoning (Kovacs, 2009), and the dimensional change card sort task (Bialystok, 1999; Bialystok & Martin, 2004). These tasks all require children to control their attention and inhibit interfering options—a process that parallels bilinguals' unique experience of choosing between two competing language systems, selecting the structures of the target language, and inhibiting interference from the nontarget language (Bialystok, 2009). It has been argued that this unique cognitive demand facilitates bilingual children's development of executive control, which includes the following primary

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processes: inhibition, cognitive flexibility, and updating information in working memory (Bialystok, 2009; Miyake et al., 2000).

Interestingly, although bilingualism is a verbal experience, much of the bilingual advantage that has been observed has involved nonverbal processing. Only a handful of studies have reported a bilingual advantage in the verbal domain with a focus on cognitive flexibility, information updating in working memory, and the inhibition aspect of executive control (e.g., Ben-Zeev, 1977; Bialystok, 1986a; 1988; Cromdal, 1999; Cummins, 1978; Davidson, Raschke, & Pervez, 2010; Gathercole, 2007; Gathercole, Sabastian, & Soto, 2002; Yelland, Pollard, & Mercuri, 1993). Most of the verbal tasks designed to study bilingual effects are metalinguistic tasks that evaluate children's ability to process structural features of a language. For example, using a grammaticality judgment task, it has been found that balanced bilingual children perform better than their monolingual peers in accepting sentences, such as "A cat barks", that are grammatically correct but semantically incongruous (Bialystok, 1986b; 1988; Cromdal, 1999; Davidson et al., 2010; Gathercole, 2007; Gathercole et al., 2002). The task requires children to inhibit distraction from meaning and redirect their attention to form.

Although a bilingual effect on grammatical judgment has been documented consistently with children speaking various pairs of languages, research on the effect of bilingualism on the development of phonological awareness—the ability to segment and blend small sound units such as onset, rimes, and phonemes—has produced mixed findings. When an advantage for bilingual children is observed, it is usually interpreted as *transfer* of phonological skills developed through experience with the specific features of one of the two languages. Most of the observed advantage has been limited to bilinguals who speak a language with one of the following features: (a) simpler and more regular phonological structures (e.g., Italian, which has only five vowels and no diphthongs and thus is simpler and has more regular phonological structures than English [Campbell & Sais, 1995]), (b) more salient segmental units (e.g., French, which has more salient syllables than English [Bruck & Genesee, 1995]), or (c) a more transparent orthography (e.g., Spanish and Hebrew as compared with Mandarin and English [Bialystok, Majumder, & Martin, 2003; Bialystok, McBride-Chang, & Luk, 2005]).

Several methodological challenges must be faced in designing verbal tasks to study the effects of bilingualism on language development. The first challenge lies in the choice of the language to be employed in the task. Bilingual children are usually less proficient, as measured in vocabulary size, in either of their two languages when compared with their monolingual peers (e.g., Bialystok, Luk, Peets, & Yang, 2010; Oller & Eilers, 2002). Because metalinguistic tasks are highly correlated with language proficiency (e.g., Kuo & Anderson, 2008), superior performance on metalinguistic tasks by bilingual children, as compared with their monolingual peers, may be attributed to their unique bilingual experience. However, poorer performance by the bilinguals can be due to a number of possible factors, including lower proficiency in the test language and interference from the additional language.

The second challenge is the choice of verbal tasks. Even if bilingual children are found to outperform their monolingual peers on metalinguistic tasks in a weaker language, it remains problematic whether the result can be attributed to a general advantage from bilingualism. Children may become more attentive to structural features of a second language because attention to form or grammar is generally more emphasized in second language instruction than in first language instruction (Kuo & Anderson, 2008). While receiving more explicit instruction in the grammar of a second language may be a typical part of the bilingual experience, it is not an intrinsic property of bilingualism.

One way to address these challenges is to investigate bilinguals' *ability to learn a new language* instead of comparing them with monolinguals on a language that both groups speak but may have divergent learning experiences with and different proficiencies in. To our knowledge, the only study employing this approach was conducted by Nation and McLaughlin (1986). They investigated the process of learning an artificial syntax by monolingual, bilingual, and multilingual adults. The experiment involved a learning phase, during which stimuli following an artificial syntax were presented without any explicit instruction, and a test phase, during which participants were asked to judge the grammaticality of new stimuli based on what they had learned from the study phase. The results showed that the multilingual group performed significantly better than both the bilingual group and the monolingual group.

Despite the innovative approach employed by Nation and McLaughlin (1986), two potential confounds in their study make the conclusion uncertain. First, the language background of the

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