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Cognitive Development



The relationship between phonological awareness and executive attention in Chinese-English bilingual children



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ABSTRACT

We examined the relationship between phonological awareness (PA) and executive attention among Chinese-English bilingual children in the process of learning to read. Seventy-four bilingual children (mean age 67.5 months) completed phonological tasks assessing onset and rime awareness and the Attention Network Test (ANT), a nonverbal measure of executive attention (Rueda et al., 2004). Hierarchical analyses revealed bidirectional relations between PA and executive attention, with PA predicting executive attention and vice versa. The predictive relation of PA to executive attention was more pronounced for English onset and Chinese rime awareness. Evidence of cross-linguistic transfer of PA skills suggests concurrent contributions of bilinguals' multiple PA skills to cognitive advantages in executive attention. Further analysis revealed that orienting attention was strongly related to both English and Chinese PA skills, whereas executive control attention was associated with English PA only. These results offer new insight into the phonological skills relevant to aspects of attentional control in bilingual children.

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1. Introduction

One of the primary features differentiating the linguistic development of bilinguals from that of monolinguals is constant practice distinguishing between two languages in the speech stream (Gottardo, 2002; Walley, 1993). Hearing and speaking two languages may facilitate understanding of the arbitrariness of language and encourage grasp of the phonological features of these languages, especially before formal literacy instruction has begun. Compared to monolingual children, bilingual children have greater phonological awareness¹ (PA), or sensitivity to the phonological structure of words in their language (Anthony & Francis, 2005; Torgesen, Wagner, & Rashotte, 1994). French-English bilingual infants as young as 10–12 months hear phonemic contrasts in both languages, which suggests that bilingual infants acquire separate phonological systems (Burns, Yoshida, Hill, & Werker, 2007). Compared to their monolingual peers, bilingual kindergarteners have also shown greater facility for phonological tasks, including onset and rime discrimination in French-English (Bruck & Genesee, 1995), rhyme-oddity detection in Urdu-English (Mumtaz & Humphreys, 2001), initial-syllable deletion in Italian-English (Campbell & Sais, 1995), phonemic segmentation in French-English (Rubin & Turner, 1989), word awareness in Italian-English (Yelland, Pollard, & Mercuri, 1993), and phoneme segmentation in Spanish-English (Bialystok, Majumder, & Martin, 2003).

These findings provide evidence for bilingual advantages in PA and suggest that bilingual children approach problems assessing phonological awareness differently from their monolingual peers. However, bilingual advantages in PA are constrained by several conditions. Bilingual superiority in PA seems apparent in early childhood but disappears when formal literacy instruction begins in the first grade (Bruck & Genesee, 1995; Yelland et al., 1993). Bilingual advantages are also limited to either relatively primitive levels of PA, which do not include high-level cognitive computations, or to bilingual children whose spoken language pairs are in some manner related (Bialystok, 2001). Nevertheless, it is at least clear that bilingual children possess a greater repertoire of phoneme distinctions than do monolingual peers.

It is difficult for children to spontaneously extract or attend to phonological segments of speech because they often automatically attend to the meaning of a spoken message rather than to individual phonemes perceived as elusive or abstract (Lundberg, Larsman, & Strid, 2012). This may explain why most achieve minimal levels of phonological awareness prior to literacy instruction (Anthony & Francis, 2005). Given that PA skills are based on the ability to analyze an individual phoneme (i.e., a sound) in the context of the surrounding sounds in the word, superior PA skills may enhance attention abilities. The reverse is also possible. Greater attention-control abilities—which can be employed to focus attention flexibly and strategically on the phonological structure of words—may promote PA skills. A bidirectional relation likely exists between bilingual children's superior PA skills and their attention-control abilities, but little is known about this link. We therefore sought to investigate the relation between bilinguals' PA skills and executive attention, defined as the ability to regulate attention in the face of distraction during information processing (Posner & Rothbart, 2007; Yang, Yang, & Lust, 2011).

1.1. Phonological awareness and executive attention

Previous research suggests a potential link between bilingual PA and executive attention. First, bilingual advantages in PA skills are pronounced, especially in early childhood; bilingual executive attention is also superior at this stage (Yang et al., 2011). Given that bilingual experiences are associated

¹ Although often used interchangeably, phonemic awareness refers to the more sophisticated skill of manipulating phonemes within a word, either by segmenting, blending, or changing individual phonemes (Chard & Dickson, 1999). Phonemic awareness requires a more explicit and higher level of ability to manipulate sounds within words when reading and spelling, whereas phonological awareness relates to the primitive ability to reflect on and understand the sound structure of a spoken word. In general, preschoolers are believed to be capable of phonological awareness but not phonemic awareness, whereas older preschoolers and elementary-school children possess both finer-grained phonological knowledge and phonemic awareness (Chard & Dickson, 1999). We focused on phonological awareness rather than phonemic awareness, because the former was deemed more developmentally appropriate for our subjects.

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