



Multilingualism and speech-language competence in early childhood: Impact on academic and social-emotional outcomes at school



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ABSTRACT

This large-scale longitudinal population study provided a rare opportunity to consider the interface between multilingualism and speech-language competence on children's academic and social-emotional outcomes and to determine whether differences between groups at 4–5 years persist, deepen, or disappear with time and schooling. Four distinct groups were identified from the Kindergarten cohort of the Longitudinal Study of Australian Children (LSAC) (1) English-only + typical speech and language ($n=1012$); (2) multilingual + typical speech and language ($n=476$); (3) English-only + speech and language concern ($n=643$); and (4) multilingual + speech and language concern ($n=109$). Two analytic approaches were used to compare these groups. First, a matched case-control design was used to randomly match multilingual children with speech and language concern (group 4, $n=109$) to children in groups 1–3 on gender, age, and family socio-economic position in a cross-sectional comparison of vocabulary, school readiness, and behavioral adjustment. Next, analyses were applied to the whole sample to determine longitudinal effects of group membership on teachers' ratings of literacy, numeracy, and behavioral adjustment at ages 6–7 and 8–9 years. At 4–5 years, multilingual children with speech and language concern did equally well or better than English-only children (with or without speech and language concern) on school readiness tests but performed more poorly on measures of English vocabulary and behavior. At ages 6–7 and 8–9, the early gap between English-only and multilingual children had closed. Multilingualism was not found to contribute to differences in literacy and numeracy outcomes at school; instead, outcomes were more related to concerns about children's speech and language in early childhood. There were no group differences for socio-emotional outcomes. Early evidence for the combined risks of multilingualism plus speech and language concern was not upheld into the school years.

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The majority of the world's people speak more than one language (Grosjean, 1982; Tucker, 1998). Even in predominantly English-speaking countries such as the US, the UK, Canada, Australia, and New Zealand, there are a noteworthy portion of the population who speak languages other than English. For example, in the US, 20.8% of the population speak a language other than English at home (Ryan, 2013) of which the predominant non-English language is Spanish (12.9% of the entire US population). In Canada, 20.6% of people speak a language other than English or French at home, 17.5% of the population speak at least two languages at home, and more than 200 different languages are spoken

(Statistics Canada, 2012). Similarly, in Australia, 23.2% of the population speaks a language other than English at home (Australian Bureau of Statistics, ABS, 2012). However, in Australia, there is no clearly predominant language other than English (ABS, 2012). The most common languages other than English in Australia are Mandarin (1.6% of the Australian population), followed by Italian (1.4%), Arabic (1.3%), Cantonese (1.2%), and Greek (1.2%) (ABS, 2012). Thus, multilingualism is commonplace even within primarily English-speaking countries.

People who acquire more than one language are described (often interchangeably) as *bilingual* and *multilingual* (Romaine, 2013), and children are often called dual language learners (Paradis, Genesee, & Crago, 2011). We prefer the term multilingual as it corresponds with the term multicultural and recognizes the multiplicity of linguistic influences within the lives of children and adults. Within this paper, multilingual people are defined as those who “are able

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to comprehend and/or produce two or more languages in oral, manual, or written form with at least a basic level of functional proficiency or use, regardless of the age at which the languages were learned" (International Expert Panel on Multilingual Children's Speech, 2012, p. 1; adapted from Grech & McLeod, 2012, p. 121). People who are multilingual can be classified as either simultaneous or sequential language learners (De Houwer, 1995; Paradis et al., 2011). Simultaneous language learners receive exposure to their languages from birth or soon after, whereas sequential language learners learn their second language after a first language has been established, and this typically occurs after three years of age (Paradis et al., 2011).

Most young children accomplish the ability to communicate in one or more languages by participating within their family, communities, and educational settings, but some children require additional support. Within many educational settings, children receive support if they speak more than one language in order to enhance their competence in speaking the dominant (educational) language of the community in which they live (e.g., support for English language learners, Abedi, 2004). Alternatively (or additionally) they may receive support if they have a speech and language impairment and have difficulty learning to communicate in their first language (e.g., speech-language pathology, Winter, 2001). Until recently, most of the research on children's communicative competence and outcomes considered (1) typical speech and language acquisition versus speech and language impairment, or (2) monolingualism versus multilingualism. This paper examines the interface between speech and language competence and multilingualism.

Speech and language competence

Children's ability to communicate effectively is important for participation in day-to-day life and lays the foundation for future academic, social, and occupational success. Speech and language competence during early childhood is linked to literacy, numeracy, and social-emotional outcomes at school, providing a basis for participation in society as adults (Felsenfeld, Broen, & McGue, 1994; Harrison, McLeod, Berthelsen, & Walker, 2009; Johnson, Beitchman, Brownlie, 2010; Marchman & Fernald, 2008; McCormack, Harrison, McLeod, & McAllister, 2011).

Regardless of whether children are monolingual or multilingual, not all children develop typical speech and language skills. Indeed Law, Boyle, Harkness, Harris, and Nye (2000) summarized their systematic review by stating primary speech and language impairment "is a high prevalence condition" (p. 179). In a comparative study of the prevalence of different areas of learning need for 14,500 children from kindergarten to year 12 within a school district, McLeod & McKinnon (2007) found that speech and language impairment (communication disorder) was the second most prevalent learning need after learning disability, and exceeded five other areas of learning need: behavioral/emotional disorder, intellectual impairment, physical/medical disability, vision impairment, and hearing loss. Speech and language impairment may be of known origin (e.g., hearing loss, cleft lip and palate); however, most children with speech and language impairment have no known cause or origin for their difficulties (Campbell et al., 2003). There is a large body of evidence to suggest that children with speech and language impairment benefit from early identification and intervention (Baker & McLeod, 2011) so long as they receive a sufficient amount (dosage) of intervention sessions (Baker, 2012; Glogowska, Roulstone, Enderby, & Peters, 2000; Law & Conti-Ramsden, 2000).

Presence of speech and language impairment has been identified as a risk factor for children's subsequent academic and social-emotional outcomes at school or throughout life. For exam-

ple, McCormack et al., 2009, conducted a systematic review of 57 papers and documented an association between childhood speech impairment and difficulties with "learning to read/reading, learning to write/writing, focusing attention and thinking, calculating, communication, mobility, self-care, relating to persons in authority, informal relationships with friends/peers, parent-child relationships, sibling relationships, school education, and acquiring, keeping and terminating a job" (p. 155). Since this review, additional evidence has been published to document the short- and long-term effects of speech and language impairment. A series of studies by Beitchman and colleagues, following a cohort of children identified with and without speech and language impairment, reported that when the cohort was 25 years old, there was a significant difference between each group's communication skills, academic and cognitive skills, their level of educational attainment, and occupational status, but no difference in quality of life (Johnson, Beitchman, Brownlie, 2010). Similar findings have been reported at younger ages. Following a cohort of 4- to 5-year-old children with and without speech and language concern to age 8–9 years, McCormack, Harrison, McLeod, & McAllister (2011) identified slower progression in reading, writing, and overall school achievement (as reported by parents and teachers), and a higher likelihood of self-reported bullying, less enjoyment of school, and poorer peer relationships in the group with speech and language concern. Additionally, recent qualitative studies that have examined the perspectives of preschoolers, school-aged children, and young adults on having speech and language impairment have outlined social-emotional outcomes (frustration, embarrassment, withdrawal) as well as academic outcomes (difficulties with literacy and numeracy) associated with their communication difficulties (Fujiki, Brinton, Isaacson, & Summers, 2001; McCormack, McAllister, McLeod, & Harrison, 2012; McLeod, Daniel, & Barr, 2013a,b). Snow and Powell (2011) have found that almost half of young offenders presented with delayed language skills.

Most studies of children with speech and language impairment published in English consider monolingual children, typically those who speak English as their only, or primary, language; and many studies purposefully exclude children who speak languages other than English. In recent years, some studies have included multilingual children with speech and language impairment (Fabiano-Smith & Goldstein, 2010), but few have analyzed longitudinal outcomes for multilingual children with and without speech and language impairment.

Multilingual status

Although in the past, many people believed that learning more than one language was "detrimental to children's linguistic and intellectual development" (Paradis, 2007, p. 551), much of the research on which this claim was based did not control for degree of bilingualism or socio-economic status, or use appropriate comparative research methods (Hakuta, 1986). More recent research has demonstrated that multilingualism can result in increased metacognitive skills (e.g., abstract and symbolic representation, attention, working memory, executive functioning) and metalinguistic awareness skills (Adesope, Lavin, Thompson, & Ungerleider, 2010; Barac, Bialystok, Castro, & Sanchez, 2014; Bialystok, 2001; Gathercole et al., 2010; Nguyen & Astington, 2014; Paradis, 2007; Paradis et al., 2011).

Studies that consider the impact of multilingualism on typically developing children's speech and language acquisition have shown that when skills in both languages are considered, children who speak more than one language are not at greater risk for speech and language impairment than monolingual children (De Houwer, 2009; Goldstein & Bunta, 2012; Goldstein & McLeod, 2012; Hambly,

Wren, McLeod, & Roulstone, 2013; Umbel, Pearson, Fernández, & Oller, 1992). Umbel, Pearson, Fernández, & Oller, 1992 showed that, for 105 first-grade children who spoke Spanish and English, “learning two languages at once does not harm receptive language development in the language of origin” (p. 1012). They indicated that children’s receptive vocabulary consisted of a significant number of words that did not overlap in both languages. Children’s speech and language has been found to progress well over time if they receive sufficient exposure and opportunities to develop in each of the languages they speak (Hammer, Lawrence, Rodriguez, Davison, & Miccio, 2011). A longitudinal large-scale Australian study indicated the following exposure and opportunities that support home language maintenance: parental language use, presence of a grandparent in the home, use of family (informal) child care, and migration from the home country to an English-dominant country in recent generations (Verdon, McLeod, & Winsler, 2014).

For children who learn English as a sequential language, it may take two to three years to develop conversational skills and five to seven years to develop cognitive-academic language skills that are commensurate with monolingual (English) speakers (Cummins, 1984; Roseberry-McKibbin, 1994). Predictive factors of English competence have been studied in the US and Australia. Winsler, Kim, and Richard (2014) found that 2059 Spanish-speaking children’s acquisition of English was predicted by their competence in Spanish, initiative, self control, attachment, and behavior problems at age four. Children with fewer behavior problems at age four were more proficient in English by the end of kindergarten. Similarly, a recent Australian population study indicated that multilingual children who were proficient in English received higher ratings on social competence and emotional maturity in the first year of school than their monolingual English-speaking peers (Goldfeld, O’Connor, Mithen, Sayers, & Brinkman, 2014). This evidence provides support for the positive impact of multilingualism on school outcomes, particularly when children are also proficient in the majority language used in the educational system.

Interface between multilingual status and speech and language competence

A more nuanced understanding of the interface between multilingual status and speech and language competence is required to understand children’s literacy, numeracy, and social-emotional outcomes at school and subsequent academic, social, and occupational success in adulthood (De Feyter & Winsler, 2009). Paradis (2010) considered “the interface between bilingual development and specific language impairment” (SLI) (p. 227) in her review of research comparing four groups of children: (1) monolingual children with typical language development, (2) multilingual children with typical language development, (3) monolingual children with SLI, and (4) multilingual children with SLI. She suggested that group 4 may have a “double delay” (p. 237) in the acquisition of grammatical morphemes compared to the delay experienced by their monolingual peers with SLI (group 3).

Double delay

A body of research examining the interface between multilingualism and speech and language competence sheds some light on the possibility of “double delay” (Paradis, 2010, p. 237) in multilingual children. Much of this research has considered the acquisition of grammatical morphology in children with and without SLI (Gutiérrez-Clellen, Simon-Cerejido, & Wagner, 2008; Håkansson & Nettelbladt, 1993; Orgassa & Weerman, 2008; Paradis & Crago, 2000; Paradis, Crago, Genesee, & Rice, 2003; Paradis, Rice, Crago, & Marquis, 2008), but some have extended it to other areas of

speech and language (Windsor et al., 2010). Within these studies, researchers found that typically developing, monolingual children had higher accuracy in the production of grammatical morphemes than multilingual children and children with SLI (particularly in the acquisition of finiteness and tense morphemes in English, French, and Swedish). Gutiérrez-Clellen et al. (2008) considered the acquisition of English verbs for 71 children distributed across five groups: (1) monolingual English-speaking children with typical language development, (2) monolingual English-speaking children with SLI, (3) multilingual Spanish-English-speaking children with typical language development, (4) multilingual Spanish-English-speaking children with SLI and (5) multilingual English as second language learners with typical language development. They found that regardless of their multilingual status, children with typical development (groups 1, 2, and 5) achieved higher results than children with SLI (groups 3 and 4). A different result was found in a study of Dutch speakers. Orgassa and Weerman (2008) examined Dutch gender morpheme agreement for 96 children divided into four groups (1) monolingual Dutch-speaking children with typical language development, (2) multilingual Dutch-Turkish-speaking children with typical language development, (3) monolingual Dutch-children with SLI, (4) multilingual Dutch-Turkish-speaking children with SLI, and (5) another group of nine Turkish-Dutch-speaking adults. In contrast to the findings of Gutiérrez-Clellen et al. (2008), Orgassa and Weerman (2008) suggested that there was evidence of double delay for group 4, the multilingual children with SLI. In another study, Windsor et al. (2010) considered non-word repetition (NWR) tasks in English and Spanish for 187 children divided into four groups: (1) monolingual English-speaking children with typical language development, (2) multilingual Spanish-English-speaking children with typical language development, (3) monolingual English-children with language impairment (LI), and (4) multilingual Spanish-English-speaking children with LI. They concluded that “NWR performance relies on the dual influences of LI and native language experience” (p. 298). To summarize, some of these studies provide evidence for “double delay” whereas others do not. Consequently, further research is needed to disambiguate the findings of the studies to date.

Cumulative effects over time

In addition to the possible “double delay” of multilingual children with SLI, Paradis (2010) also considered whether the cumulative impact on language acquisition for multilingual children with SLI persisted, deepened, or disappeared over time. Paradis (2010) reanalyzed cross-sectional data from Steenge’s (2006, cited in Paradis, 2010) study of Dutch children’s acquisition of grammatical morphemes that were collected at three ages (6–8 years). These analyses demonstrated “bilinguals with SLI had lower scores than the monolinguals with SLI at all ages, but the differentials between their scores and those of the bilinguals with TDL [typically developing language] changed with time/exposure to equal that of the differential between monolingual groups” (Paradis, 2010 p. 242). She concluded that this re-analysis showed no evidence for cumulative (i.e., worsening) effects over time. Cornips and Hulk (2008) reviewed studies regarding the acquisition of gender morphology in Dutch to describe factors that affected multilingual children’s acquisition over time and reported that four factors were likely to promote acquisition: “(1) early age of onset [of Dutch], (2) lengthy and intensive input, (3) the quality of the input, (4) the role of the other language.” (p. 267).

Scope for future research

While there is much merit in previous research examining the interface between multilingualism and language competence, [Paradis \(2010\)](#) outlined parameters that have not yet been explored. To date, there has not been a large-scale, longitudinal study that has considered all four combinations to determine the impact of multilingual status and speech and language competence on children's development over time. Studies to date have focused on a subset of languages (e.g., English, French, Swedish, Spanish, and Dutch), but a wide range of languages has not yet been explored. Some of the previous studies have considered children in additive contexts (e.g., children who speak both English and French in Canada) where there is "high status and institutional support for both languages" ([Paradis, 2010](#), p. 243). Other studies have considered children from "nonintegrated, socioeconomically disadvantaged minority groups" ([Paradis, 2010](#), p. 243). There is a need for a study where context and socio-economic status are controlled. In addition, most studies to date have only considered children with SLI or children's language skills (especially grammatical morphology). Few have considered speech and language competence, nor have they examined a broad range of academic and social outcomes.

Context of the present investigation

The linguistic context of Australia enables an extensive analysis of children's speech and language competence in combination with multilingualism since it is an English-dominant country that is highly culturally and linguistically diverse. There are over 400 languages spoken in Australia ([Australian Bureau of Statistics, 2010](#)) with 57 different countries of birth being represented by 10,000 or more residents ([Hugo, 2004](#)). The availability of longitudinal data from the Longitudinal Study of Australian Children (LSAC) ([Soloff, Lawrence, & Johnstone, 2005](#)) provides a unique opportunity to examine the impact of multiple language learning contexts in early childhood and the long-term impact these have upon children. LSAC is a population-based study of two cohorts of approximately 5000 children in each: the B(irth) cohort (who were 0- to 1-years-old in the first wave of data collection) and the K(indergarten) cohort (who were 4- to 5-years-old in the first wave of data collection). Recruitment employed a two-stage clustered sampling design, stratified by state and clustered by post code within each stratum. The children within LSAC comprise a nationally representative sample of Australian children (as compared with the 2001 Census data) on key characteristics including ethnicity, country of birth, whether a language other than English was spoken at home, postcode, month of birth, education, and income ([Gray & Sanson, 2005](#)).

The present study has drawn on data from the first three biennial waves of data collection on the K cohort. Wave 1 was collected when the children were 4–5 years of age, wave 2 when the children were 6–7 years of age, and wave 3 when the children were 8–9 years of age. The cultural and linguistic diversity of the 4- to 5-year-old children within the K cohort of LSAC has been described previously ([Harrison & McLeod, 2010](#); [McLeod, 2011](#)). [McLeod \(2011\)](#) indicated that while the majority (86.0%) of the children in the K cohort spoke English as their first language, 12.2% of the children spoke one of 35 other languages at home, including: Arabic (spoken by 1.6% of the children), Cantonese (1.3%), Vietnamese (1.0%), Greek (0.8%), and Mandarin (0.8%). Most of the children's parents spoke English at home (parent 1: 82.5%; parent 2: 69.8%); however, 42 other languages were also spoken and over one fifth (21.9%) of the children were regularly spoken to in a language other than English. The diverse language and cultural background of the LSAC population sample makes it highly relevant to international English-dominant

contexts that also have many school contexts that include learners from different language and cultural backgrounds.

Previous analyses of LSAC also indicated a high occurrence of concern regarding the speech and language of children within the K cohort. Parents of 25.2% of children in the K cohort had concerns about how their child talked and made speech sounds, and 9.5% had concerns about how their child understood language ([McLeod & Harrison, 2009](#)). According to parent and teacher report, 14.5% of children had accessed speech-language pathology services, with an additional 2.2% who needed but could not access these services. A companion study by [Harrison and McLeod \(2010\)](#) identified a connection between multilingual status and speech and language competence at age 4–5 years: having a parent who spoke a language other than English was a protective factor for parent-reported expressive speech and language ability, but a risk factor for English receptive vocabulary. A follow-up study examining speech and language competence at age 4–5 years as a predictor of literacy, numeracy, and approaches to learning at school-age, while controlling for multilingual status ([Harrison et al., 2009](#)) showed that both speech and language competence, and having a language background other than English, were independent predictors of child outcomes. The effects, however, were not equivalent. Children identified as having speech and language concern at age 4–5 were doing significantly less well at school at 6–7 years than their peers, on all three outcome measures. Children with a language background other than English had better outcomes in numeracy and approaches to learning than their English-only peers, but did not differ on literacy outcomes ([Harrison et al., 2009](#)).

Aims of the current study

This large-scale longitudinal population study provided a rare opportunity to consider two key questions regarding the interface between multilingual status and speech and language competence: (1) What is the impact of different combinations of multilingualism and speech and language competence on academic and social-emotional outcomes?; and (2) Do gaps between groups at age 4–5 years persist, deepen, or disappear with time and schooling? Four distinct groups were identified from the K cohort of LSAC: (1) English-only + typical speech and language; (2) multilingual + typical speech and language; (3) English-only + speech and language concern; and (4) multilingual + speech and language concern. The current study extends previous research by examining the combined effects of multilingual status (English-only versus multilingual) and speech and language competence (typically developing versus children who are identified with speech and language concern) on academic and social outcomes at three age points: vocabulary, school readiness, and behavior problems at age 4–5 years; academic abilities in literacy and numeracy, and classroom behavior problems at aged 6–7 and 8–9 years. The effects of confounding demographic variables were controlled.

Method

Participants

Participants in this study were children in the K cohort of LSAC. At recruitment, wave 1, there were 4983 children (50.9% boys) who ranged in age from 4 years 3 months to 5 years 7 months (mean age = 4 years 9 months, or 56.91 months, $SD = 2.64$). The families were a close match to the Australian population of families with a 4- to 5-year-old child on ethnicity, including Aboriginal or Torres Strait Islander background, country of birth, education, and income ([Gray & Sanson, 2005](#)). The sample for the present study ($N = 3240$) comprised the group of children for whom complete data were

available, including parent and teacher questionnaires, at waves 1–3. Missingness was due to sample attrition (10.5% at wave 2; 14.2% by wave 3), non-completion of the Adapted Peabody Picture Vocabulary Test-III (PPVT-III) (Rothman, 2003) or the Who Am I? (WAI) (De Lemos & Doig, 1999) tests (12%), and non-return of teacher questionnaires (18.3% at wave 2; 14.6% at wave 3).

Preliminary analyses were conducted to compare the study sample with children in the LSAC recruitment sample who were missing. Results showed no differences in the proportion of boys (50.5%), but significant differences on other demographic characteristics. The study sample had a lower proportion of Aboriginal or Torres Strait Islander (Indigenous) children (3.0% versus 5.2% in the missing sample) and children who spoke or were regularly spoken to in a language other than English (18.1% versus 25.5% in the missing sample). The study sample families were more socio-economically advantaged (z -score $M = 0.08$ versus $M = -0.15$ for the missing sample).

Family socio-economic status

Family socio-economic status was measured using the LSAC-generated composite variable, socio-economic position (SEP), which was derived from maternal and paternal education, household income, and occupational prestige (adjusting for single-parent families) to create a standardized score (Blakemore, Strazdins, & Gibbons, 2009).

Identification of participants' multilingual status

To dichotomize the children as monolingual (English only) versus multilingual, responses to two parent-interview questions were considered. The first question was: "Does the child speak a language other than English at home? If more than one, record main language." Response options were "English only," a list of 15 languages, plus "other." Those who answered "English only" were coded as English-only and those who identified another language were coded as multilingual. A second question, "Is the child regularly spoken to in a language other than English", was used to confirm monolingual versus multilingual status. Children who were not spoken to in another language were identified as English-only; children who only spoke English, but were regularly spoken to in another language were included in the multilingual group. The LSAC data collection protocol did not include information regarding whether the children learned the language(s) other than English simultaneously, or sequentially.

Identification of participants' speech and language competence

To dichotomize the participants as having typical speech and language versus speech and language concern, data from wave-1 interviews were used to identify parent-reported concern about children's expressive and receptive speech and language competence using two questions from the Parents' Evaluation of Developmental Status (PEDS) (Glascoe, 2000):

PEDS expressive speech and language: "Do you have any concerns about how your child talks and makes speech sounds?" (yes, a little, no)

PEDS receptive language: "Do you have any concerns about how your child understands what you say to him?" (yes, a little, no)

These questions had also been used as identifiers in previous papers addressing speech and language of children within the K cohort of LSAC (Harrison & McLeod, 2010; Harrison et al., 2009; McCormack et al., 2011; McLeod & Harrison, 2009; McLeod et al., 2012). Children whose parents gave a rating of no to both of these questions were included in the typical group, and children whose parents gave a rating of yes and/or a little to either of these two ques-

tions were identified with speech and language concern. A small number of these children were also identified by parents (at 4–5 years) with co-occurring conditions such as learning difficulties, hearing problems, and/or vision problems. To be consistent with the previous studies, these children were not excluded (Harrison & McLeod, 2010; McLeod & Harrison, 2009).

Identification of multilingual and speech and language status

A 2×2 cross-tabulation table identified four groups of children: Group 1: Children who only spoke and were spoken to in English and had typical speech and language competence (English + Typical) ($n = 2012$); Group 2: Children who were multilingual and had typical speech and language competence (Multi + Typical) ($n = 476$); Group 3: Children who only spoke and were spoken to in English and whose parents indicated concern regarding their expressive and/or receptive speech and language competence (English + Concern) ($n = 643$); and Group 4: Children who were multilingual and whose parents indicated concern regarding their expressive and/or receptive speech and language competence (Multi + Concern) ($n = 109$).

Procedure

During the LSAC data collection, a variety of methods were employed to gather information from multiple respondents on a broad range of measures (Soloff, Millward, Sanson, & LSAC Consortium Advisory Group, and Sampling Design Team, 2003). Data collection methods in LSAC included: face-to-face interviews with parent 1 during a home visit, self-completed parent questionnaires (parent 1, parent 2, parent living elsewhere), interviewer observations and direct assessments (child), mailed out questionnaires (teacher) and linked data (medical records, national testing). Parent 1 was typically the mother of the study child. Only the measures of relevance to the present investigation are reported here.

Outcome measures at 4–5 years

Two direct assessments and one teacher-reported outcome measure were used to determine academic and social-emotional outcomes at 4–5 years. The Adapted Peabody Picture Vocabulary Test-III (PPVT-III) (Rothman, 2003), which is a shortened version of the Peabody Picture Vocabulary Test-III (Dunn & Dunn, 1997), was administered in English to the children during home visits. The PPVT-III was designed to test children's receptive vocabulary of English and may be related to English-speaking children's verbal intelligence (Williams & Wang, 1997). The PPVT-III measure was adapted especially for the LSAC study, following processes used in the United States for the Head Start Impact Study for children of a similar age (U.S. Department of Health and Human Services, 2010). By applying item response theory (Rasch modeling) to the results of the full PPVT-III undertaken by 215 non-study children aged from 3 years 7 months to 5 years 6 months (mean 54.7 months), the 'best' set of 40 items, an Adapted PPVT-III test (basal = 10 items, core = 20 items, ceiling = 10 items), was developed to assess all LSAC children. Scores were scaled to a mean of 64 and SD of 6. For the present sample, the mean score was 64.7 (SD = 5.99).

The Who Am I? (WAI) (De Lemos & Doig, 1999) test was also administered in the home. The WAI measures school readiness (academic) competencies including early literacy concepts, numeracy concepts, and fine motor skills. The WAI requires children to copy and draw geometric shapes, and write letters and words in a booklet. Each item is scored on a 4-point scale relating to the skill required for the task; 0 is allocated to a 'no attempt'. WAI scores are scaled to a mean of 64 and an SD of 8. For the present sample, the mean score was 64.66 (SD = 7.92).

The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) is a screening tool for social-emotional skills. The SDQ can be completed by parents, teachers, or the children themselves. At age 4–5 years for the present study, teacher-reported data from the SDQ was used as a dependent variable. The SDQ total problems score was calculated by averaging the hyperactivity scale, emotional symptoms scale, peer problems scale, and conduct problems scale. A higher score equates to a poorer result. For the LSAC study sample, Cronbach's $\alpha = 0.73$; $M = 8.32$ ($SD = 6.15$).

Outcome measures at 6–7 and 8–9 years

Three teacher-reported outcome measures were identified to determine academic and social-emotional outcomes at 6–7 and 8–9 years in an English-dominant educational context. Social-emotional outcomes were measured using the teacher-rated version of the SDQ (Goodman, 1997) to generate a total problems score, as described previously. Academic outcomes were measured using two subscales of the Academic Rating Scale (ARS): Language and Literacy Scale and Mathematical Thinking Scale (National Center for Educational Statistics, NCES, n.d., 2015). The ARS Language and Literacy Scale rates performance in oral and written language over 9 items (e.g., conveys ideas when speaking, reads fluently). The ARS Mathematical Thinking Scale rates performance on 10 items relating to numeracy (e.g., creates and extends patterns, recognizes shape properties and relationships). Both scales use a 5-point scale (not yet = 1, beginning = 2, in progress = 3, intermediate = 4, and proficient = 5). There was high internal reliability for the ARS Language and Literacy Scale ($\alpha = 0.96$) and the ARS Mathematical Thinking Scale ($\alpha = 0.94$). The correlation between scores on the two Academic Rating Scales was high (age 6–7: $r = 0.82$; age 8–9: $r = 0.84$). A higher score equates to a better result on these two scales.

Analysis plan

Two different analytic approaches were used to compare the four groups. (1) Cross-sectional analyses applied a matched case-control design to assess the impact of multilingualism and speech and language competence on academic and social-emotional skills at age 4–5 years. Matched case-control studies are commonly used in population studies of rarely occurring conditions to increase statistical efficiency by reducing variation in both the matched (confounding) variables and the parameters of interest (Rothman, Greenland, & Lash, 2008), which in the present study were pre-existing differences in the skills needed to succeed at school. (2) Longitudinal analyses testing the predictive impact of multilingual status and speech and language competence on literacy, numeracy, and behavioral adjustment at ages 6–7 and 8–9 years used GLM univariate analysis of variance with the whole sample ($N = 3240$). To maintain consistency with the matched case-control study, these analyses controlled for 4- to 5-year-old pre-existing skills along with socio-demographic factors.

Matched case-control comparison (4–5 years)

A matched case-control design was used to investigate differences in learning and social abilities at 4–5 years for the four identified groups: Group 1 (English+Typical), Group 2 (Multi+Typical), Group 3 (English+Concern), and Group 4 (Multi+Concern). The smallest group, Group 4 ($n = 109$) was used as the 'case' and members of this group were randomly matched to members of the other three groups, controlling for gender, age, and family socio-economic position (SEP). For the purpose of matching, SEP was categorized into three levels: low (lowest quartile), medium (middle quartiles), and high (highest quartile). The

selected variables in a matched case-control study should ensure that cases are as similar as possible (Grimes & Schulz, 2005), but avoid overmatching on unnecessary or highly correlated variables (Bruce, Pope, & Stanistreet, 2008) so that the differences between groups can be attributed to the characteristic of interest. In the present study, this characteristic was children's multilingual status and speech and language competence. Demographic descriptors of the four groups are presented in Table 1. Univariate ANOVAs were run, using GLM analyses, to test for differences in mean scores on the PPVT-III, WAI, and SDQ at age 4–5 years by group membership applying Tukey's post hoc tests for groups of equal size. Significant differences between groups were confirmed at $p < .05$ using a Bonferroni adjustment for multiple comparisons. Effect sizes for the univariate ANOVA tests were computed using η^2 which is the proportion of the variance explained, with cut-offs of .01, .05, and .14 for small, medium and large effects, respectively. Cohen's d was calculated for the post-hoc comparisons and interpreted according to Cohen's (1988) recommendations for small ($\geq .2$), medium ($\geq .5$), and large ($\geq .8$) effect sizes.

Longitudinal prediction of school-age outcomes (6–7 and 8–9 years)

Longitudinal analyses were undertaken using the sample of 3240 children. First, inter-correlations between each of the outcome variables at ages 4–5, 6–7, and 8–9 years were examined using Pearson's correlation tests. Next, separate univariate ANOVA tests, using GLM analysis, were undertaken to test group differences for ARS Language and Literacy, ARS Mathematical Thinking, and SDQ total problems at ages 6–7 years and 8–9 years. Covariates included in these analyses were child gender, Aboriginal and Torres Strait Islander status, family SEP, and child learning and social competencies at age 4–5 years (PPVT-III, WAI, and SDQ). GLM analysis generates an R -squared figure for the model, an F statistic, and an η^2 effect size for each covariate. Group membership effects were assessed as a univariate F based on the pairwise comparisons among the estimated marginal means for the four groups of children: Group 1 (English+Typical), Group 2 (Multi+Typical), Group 3 (English+Concern), and Group 4 (Multi+Concern), using a Bonferroni adjustment for multiple comparisons. When the η^2 for the categorical (group membership) predictor was significant, effects were further explored by examining group differences in the estimated marginal means. Cohen's d was computed for each significant pairwise comparison, following the method advised by Taylor (2014).

Results

Vocabulary, school readiness, and social-emotional skills at 4–5 years

Means and standard deviations for vocabulary (PPVT-III), school readiness (WAI), and SDQ total problems for the four matched case-control groups ($ns = 109$) are presented in Table 2.

Vocabulary at 4–5 years

There were significant differences between the four groups on the PPVT-III, $F(3, 364) = 23.34$, $p < .001$, $\eta^2 = .161$. Post hoc tests indicated that the greatest difference in PPVT-III scores was between English+Typical ($M = 65.52$) and Multi+Concern ($M = 58.83$), accounting for the largest proportion of the explained variance ($\eta^2 = .148$) and the largest effect size, $d = 1.16$. Large effects were also noted in the comparisons between English+Typical ($M = 65.52$) and Multi+Typical ($M = 61.26$), $d = .91$, and between English+Concern ($M = 63.51$)

Table 1
Demographic characteristics of the four groups of participants in the matched case control study.

Group	Group 1: English + typical (n = 109)	Group 2: Multilingual + Typical (n = 109)	Group 3: English + Concern (n = 109)	Group 4: Multilingual + Concern (n = 109)
Description	English-only + typical speech and language	Multilingual + typical speech and language	English-only + speech and language concern	Multilingual + speech and language concern
Age in months mean (SD)	57.5 (2.65)	57.5 (2.5)	57.4 (2.78)	57.5 (2.79)
Sex (% male)	66.1	66.1	66.1	66.1
Socio-economic position	Low 28.4% Mid 47.7% High 23.9%	Low 28.4% Mid 47.7% High 23.9%	Low 28.4% Mid 47.7% High 23.9%	Low 28.4% Mid 47.7% High 23.9%
Main language spoken (n in brackets)	English (109)	African languages (3) Arabic (15) Assyrian (1) Cantonese (12) Croatian (1) French (6) German (2) Greek (9) Hakka (2) Hindi (4) Indonesian (2) Italian (3) Japanese (2) Mandarin (9) Polish (1) Portuguese (1) Russian (1) Samoan (4) Serbian (2) Sinhalese (4) Somali (1) Spanish (5) Tagalog (3) Tamil (3) Thai (1) Turkish (2) Urdu (1) Vietnamese (7) Other (2)	English (109)	African languages (1) Arabic (9) Bengali (3) Cantonese (10) Croatian (3) French (3) German (2) Greek (8) Hakka (2) Hindi (2) Indonesian (1) Italian (6) Japanese (2) Macedonian (1) Mandarin (8) Maori (New Zealand) (1) Polish (1) Portuguese (2) Punjabi (4) Russian (1) Samoan (6) Sinhalese (2) Spanish (7) Tagalog (1) Tamil (3) Thai (1) Tongan (2) Turkish (3) Urdu (1) Vietnamese (12) Other (1) Aboriginal (1)
Indigenous cultural background	Aboriginal (9) Torres Strait Islander (1)	Aboriginal (1)	Aboriginal (4)	Aboriginal (1)
Country of birth	Australia (107) United Kingdom (1) Philippines (1)	Australia (85) China (1) India (1) Japan (1) Kenya (2) New Zealand (3) Philippines (1) Confidentialised (15)	Australia (106) India (1) Confidentialised (2)	Australia (94) China (1) India (3) Japan (2) New Zealand (3) South Africa (1) Confidentialised (5)
Year of children's arrival to Australia	1999 (1) 2000 (1)	1999 (1) 2000 (7) 2001 (5) 2002 (6) 2003 (4) 2004 (1)	2000 (1) 2002 (1) 2003 (1)	1999 (2) 2000 (7) 2001 (2) 2003 (3) 2004 (1)

Table 2
Comparative scores in the matched case control study.

Group	PPVT-III M (SD)	WAI M (SD)	SDQ M (SD)
Group 1: English-only + typical (n = 109)	65.52 (5.30) ^{a*}	63.73 (8.29)	8.12 (6.21) ^{a*}
Group 2: multilingual + typical (n = 109)	61.26 (5.99) ^{a*}	66.43(8.87) ^{a*}	10.09 (7.18)
Group 3: English-only + concern(n = 109)	63.51 (5.60) ^{d*}	61.77(7.43) ^{a*}	9.95 (6.40)
Group 4: multilingual + concern(n = 109)	58.83(6.20) ^{b*}	64.08 (8.86)	11.94(6.33) ^{a*}

Key. PEDS, Parents' Evaluation of Developmental Status; PPVT-III, Adapted Peabody Picture Vocabulary Test-III (Dunn & Dunn, 1997; Rothman, 2003); WAI, Who Am I? (ACER, 1999); SDQ, Strengths and Difficulties Questionnaire (teacher rated) (Goodman, 1997)

* $p \leq .05$ (Bonferroni adjustment for multiple comparisons). Superscript pairs indicate significant differences between groups in post-hoc comparisons.

and Multi + Concern ($M = 58.83$), $d = .81$. Comparisons between Multi + Typical ($M = 61.26$) and Multi + Concern ($M = 58.83$) achieved significance but a small effect size, $d = .43$. Examination of the means and significant differences between the groups indicated the following relationships:

English + Typical > Multi + Typical > Multi + Concern

English + Concern > Multi + Concern

English-only children without speech and language concern (English + Typical) achieved the highest scores on the PPVT-III (which was administered in English) but were not significantly different from English-only children with speech and language concerns (English + Concern). This finding can be explained by the fact that the PPVT-III only addresses receptive vocabulary in English, and children with speech and language concern may only have expressive speech and language difficulties. Multilingual children without concern (Multi + Typical) had similar scores to English-only children with speech and language concern (English + Concern), and both these groups had significantly higher scores than multilingual children with speech and language concern (Multi + Concern).

School readiness at 4–5 years

There was a significant difference between groups on the WAI, $F(3, 417) = 5.43$, $p = .001$, $\eta^2 = .038$. Tukey post hoc tests revealed a significant difference between Multi + Typical ($M = 66.43$) and English + Concern ($M = 61.77$) and a medium effect size, $d = .56$. There were no significant differences between Multi + Typical or English + Concern and the other groups (English + Typical: $M = 63.73$; Multi + Concern: $M = 64.08$). Examination of the means differences between the groups indicates the following relationship:

Multilingual + Typical > English + Concern

Children who were from a multilingual background without speech and language concern (Multi + Typical) had higher scores on the WAI than English-only children with poor speech and language skills, but did not differ from English-only children without speech and language concern or multilingual children with speech and language concern.

Social-emotional skills at 4–5 years

A higher score on the SDQ indicated higher ratings of teacher-reported behavior problems (i.e., poorer social-emotional skills). There was a significant difference between groups on the SDQ scores, $F(3, 432) = 6.19$, $p < .001$, $\eta^2 = .041$. Tukey post hoc comparisons revealed that this was due to the difference between scores for English + Typical ($M = 8.12$) and the Multi + Concern ($M = 11.94$) groups, which achieved a medium effect size, $d = .58$. There were no other significant differences between groups, indicating the following relationship:

English + Typical < Multi + Concern

English-only children with and without speech and language concern had similar scores on the SDQ problem scale to multilingual children without speech and language concern. Multilingual children with parental concern about their speech and language competence had the poorest (highest) scores on the SDQ problem scale.

Academic and social-emotional skills at 6–7 years and at 8–9 years

Results for the longitudinal analyses were based on the larger LSAC sample of 3240 children. Correlation tests showed significant but modest associations between outcomes at school-age and measures of children's school entry skills at age 4–5 years (PPVT-III, WAI, SDQ) (see Table 3). The strongest associations were between

school readiness scores on the WAI (age 4–5) and teachers' ratings on the ARS: Language and Literacy (age 6–7: $r = .45$; age 8–9: $r = .42$); Mathematical Thinking (age 6–7: $r = .43$; age 8–9: $r = .39$). Weaker correlations were noted between the PPVT ($r = .27$ to $.32$) and the ARS, and between the SDQ at age 4–5 and ratings of problem behaviors in later years ($r = .30$ and $.26$).

Results from the GLM analyses for the three teacher-rated outcome variables are presented in Table 4. Columns 2 and 3 present Language and Literacy results at ages 6–7 years and 8–9 years respectively. Columns 4 and 5 present Mathematical Thinking outcomes at ages 6–7 years and 8–9 years, and columns 6 and 7 present SDQ problem scales at ages 6–7 years and 8–9 years. Results at each age group showed significant effects of the control variables. Socio-demographic factors: child gender was associated with scores for Mathematical Thinking and problem behaviors; Indigenous status was associated with Language and Literacy and Mathematical Thinking scores; and family socioeconomic position was associated with all three outcomes. After accounting for other variables in the model, there were no differences between males and females on Language and Literacy, and no differences between Indigenous and non-Indigenous children on problem behaviors, at either age group. Children's English language ability (PPVT) and level of school readiness (WAI) at age 4–5 years were important predictors of ARS outcomes at ages 6–7 years and 8–9 years (effect sizes for these abilities ranged from small, $\eta^2 = 0.02$, to medium, $\eta^2 = 0.11$). Problem behavior at age 4–5 was a consistent predictor of classroom problem behavior at school ($\eta^2 = 0.06$ and 0.04).

Language and literacy

At age 6–7 years, the results for the full model explained 27.1% of the variance, with an overall $F = 133.09$. The unique contribution of multilingual status by speech and language competence was significant but very small: $F = 9.75$, $\eta^2 = .009$. Significant differences in the estimated marginal means were identified between English + Typical ($M = 3.71$) or Multi + Typical ($M = 3.77$) and English + Concern ($M = 3.52$), but the effect sizes were small ($d = .22$ and $d = .28$, respectively). There was no difference between mean scores for English + Typical and Multi + Typical. Pairwise comparisons also showed no differences between the multilingual children with speech and language concern (Multi + Concern $M = 3.61$) and the other three groups. The relationship between groups for language and literacy outcomes is illustrated in the following:

English + Typical = Multi + Typical > English + Concern

Similar results were found for multilingual status by speech and language competence at age 8–9 years: $F = 14.21$; $\eta^2 = .013$. Post hoc comparisons revealed significant differences and small effect sizes for children in the English + Typical ($M = 3.78$) or Multi + Typical ($M = 3.79$) groups compared to children in the English + Concern ($M = 3.56$) group, $ds = .28$ and $.38$, respectively, and the Multi + Concern ($M = 3.56$) groups ($ds = .28$). The relationship between groups is illustrated in the following equation:

English + Typical = Multi + Typical > English + Concern = Multi + Concern

Mathematical Thinking

At age 6–7 years, the results for the full model explained 24.9% of the variance, with an overall $F = 119.11$. The unique contribution of multilingual status by speech and language competence was significant but only achieving a very small effect: $F = 5.11$, $\eta^2 = .005$. Significant differences were identified between English + Typical ($M = 3.60$) and English + Concern ($M = 3.48$), and between Multi + Typical ($M = 3.67$) and English + Concern, but effect sizes were very small ($ds = .14$ and $.22$, respectively). There was no difference between mean scores for English + Typical and Multi + Typical. Pairwise com-

Table 3

Correlations between competence measures at age 4–5 years, 6–7 years and 8–9 years.

	4/5 WAI	4/5 SDQ	6/7 SDQ	6/7 ARS lang and lit	6/7 ARS math	8/9 SDQ	8/9 ARS lang and lit	8/9 ARS math
4/5 PPVT-III	.29**	-.18**	-.15**	.32**	.29**	-.14**	.31**	.27**
4/5 WAI		-.19**	-.25**	.44**	.42**	-.28**	.41**	.38**
4/5 SDQ			.30**	-.22**	-.22**	.26**	-.21**	-.19**
6/7 SDQ				-.43**	-.36**	.56**	-.36**	-.31**
6/7 ARS lang and lit					.81**	-.33**	.65**	.56**
6/7 ARS math						-.27**	.55**	.55**
8/9 SDQ							-.46**	-.41**
8/9 ARS lang and lit								.83**

** $p < .01$. 4/5, 4–5 years; 6/7, 6–7 years; 8/9, 8–9 years; PPVT-III, Adapted Peabody Picture Vocabulary Test-III (Rothman, 2003); WAI, Who Am I? (ACER, 1999); SDQ, Strengths and Difficulties Questionnaire problem scale (Goodman, 1997); ARS lang and lit, Academic Rating Scale: Language and Literacy scale (NCES, n.d.); ARS math, Academic Rating Scale: Mathematical Thinking scale (NCES, n.d.).

Table 4

Academic and social-emotional outcomes at 6–7 years and 8–9 years.

	ARS Language and Literacy				ARS Mathematical Thinking				SDQ behavior problems			
	6–7 Years		8–9 Years		6–7 Years		8–9 Years		6–7 Years		8–9 Years	
	$R^2 = 0.271^{**}$		$R^2 = 0.259^{**}$		$R^2 = 0.249^{**}$		$R^2 = 0.233^{**}$		$R^2 = 0.155^{**}$		$R^2 = 0.143^{**}$	
Covariates	<i>F</i>	<i>eta</i> ²	<i>F</i>	<i>eta</i> ²	<i>F</i>	<i>eta</i> ²	<i>F</i>	<i>eta</i> ²	<i>F</i>	<i>eta</i> ²	<i>F</i>	<i>eta</i> ²
Sex (Male)	0.1	.000	0.0	.000	41.8	.013**	89.2	.027**	67.1	.020**	60.4	.019**
Indigenous status	21.8	.006**	11.6	.004**	11.8	.004**	9.1	.003**	0.0	.000	0.0	.000
Socioeconomic position	64.1	.019**	81.2	.025**	45.2	.014**	77.0	.024**	14.1	.004**	36.3	.011**
PPVT-III (4–5 years)	99.2	.029**	103.9	.032**	73.7	.022**	64.2	.020**	6.1	.002*	0.7	.000
WAI (4–5 years)	350.2	.098**	277.0	.080**	402.0	.111**	338.9	.096**	52.2	.016**	64.2	.020**
SDQ (4–5 years)	38.5	.012**	32.6	.010**	52.0	.016**	32.9	.010**	205.3	.060**	124.6	.038**
Predictor												
Categorical: multilingual status by speech/language competence	9.7	.009**	14.2	.013**	5.1	.005**	5.2	.005**	1.2	.001	1.7	.002
Estimated marginal means (standard error)												
Group 1 ($n = 2012$): English + Typical	3.71 (.019) ^{a*}		3.78 (.018) ^{a* c*}		3.60 (.019) ^{a*}		3.70 (.019) ^{a*}		6.12 (.115)		5.95 (.123)	
Group 2 ($n = 476$): multilingual + typical	3.77 (.040) ^{b*}		3.79 (.037) ^{b* d*}		3.67 (.039) ^{b*}		3.77 (.038) ^{b*}		5.87 (.240)		5.77 (.248)	
Group 3 ($n = 643$): English + Concern	3.52 (.034) ^{a* b*}		3.56 (.032) ^{a* b*}		3.48 (.034) ^{a* b*}		3.58 (.034) ^{a* b*}		6.44 (.204)		6.39 (.218)	
Group 4 ($n = 109$): multilingual + concern	3.61 (.082)		3.56(.078) ^{c* d*}		3.63 (.081)		3.63 (.081)		6.38 (.494)		6.48 (.521)	

Note: PPVT-III, Adapted Peabody Picture Vocabulary Test-III (Rothman, 2003); WAI, Who am I? (De Lemos & Doig, 1999); SDQ, Strengths and Difficulties Questionnaire problem scale (Goodman, 1997); ARS Language and Literacy, Academic Rating Scale: Language and Literacy scale (NCES, n.d.); ARS Mathematical Thinking, Academic Rating Scale: Mathematical Thinking scale (NCES, n.d.).

* $p < .05$ (Bonferroni adjustment for multiple comparisons). Superscript pairs indicate significant differences between groups.

parisons also showed no differences between Multi+Concern ($M = 3.63$) and the other three groups. The sequence is illustrated in the following equation:

English + Typical = Multi + typical > English + Concern

Similar results were found for multilingual status by speech and language competence at age 8–9 years ($F = 5.17$; $eta^2 = .005$), with significant differences identified between English + Typical ($M = 3.70$) or Multi+Typical ($M = 3.77$) and English+Concern ($M = 3.58$), $ds = 14$ and $.22$, respectively. There was no difference between Multi+Concern ($M = 3.63$) and the other three groups:

English + Typical = Multi + Typical > English + Concern

Social-emotional skills

There was no overall effect of the group comparison for multilingual status by speech and language competence, and no difference in the mean scores for problem behaviors on the SDQ for the four groups at either age 6–7 years or 8–9 years (see Table 4). These results are illustrated by the following equation:

English + Typical = Multi + Typical = English + Concern = Multi + Concern

Discussion

This large-scale longitudinal population study aimed to answer two key questions regarding the interface between multilingualism and speech and language competence: (1) What is the impact of different combinations of multilingualism and speech and language competence on academic and social-emotional outcomes?; and (2) Do gaps between groups at 4–5 years persist, deepen, or disappear with time and schooling? Academic and socio-emotional skills and outcomes were compared for four groups of children (English+Typical, Multi+Typical, English+ Concern, Multi+Concern) at three different time points (ages 4–5, 6–7, and 8–9). A summary of the findings is presented in Table 5.

At age 4–5 years, results for the matched-case control study indicated that multilingual children with speech and language concern had the poorest results for two of the three measures: English receptive vocabulary and behavior problems. The difference between this group and English-only children with typical speech and language development was largest for English vocabulary, and moderate for behavior problems. For the WAI test of school readiness, on the other hand, children who were multilin-

Table 5
Summary of the relationships between multilingual status and speech and language competence on child outcomes.

Age	Aspect	Measure	Results ^a
4–5 Years	English vocabulary	PPVT-III (direct assessment)	English + Typical > Multi + Typical > Multi + Concern English + Concern > Multi + Concern English + Typical = English + Concern English + Concern = Multi + Typical
	School readiness	WAI (direct assessment)	Multi + Typical > English + Concern English + Typical = English + Concern, Multi + Typical, Multi + Concern Multi + Concern = English + Typical, English + Concern, Multi + Typical
	Behavior problems	SDQ (teacher report)	English + Typical < Multi + Concern English + Typical = English + Concern, Multi + Typical Multi + Concern = English + Concern, Multi + Typical
6–7 Years	Language and Literacy	ARS Language and Literacy (teacher report)	English + Typical = Multi + Typical > English + Concern Multi + Concern = English + Typical, English + Concern, Multi + Typical
	Numeracy	ARS Mathematical Thinking (teacher report)	English + Typical = Multi + Typical > English + Concern Multi + Concern = English + Typical, English + Concern, Multi + Typical
	Behavior problems	SDQ (teacher report)	English + Typical = Multi + Typical = English + Concern = Multi + Concern
8–9 Years	Language and Literacy	ARS Language and Literacy (teacher report)	English + Typical = Multi + Typical > English + Concern = Multi + Concern Multi + Concern = English + Typical, English + Concern, Multi + Typical
	Numeracy	ARS Mathematical Thinking (teacher report)	English + Typical = Multi + Typical > English + Concern Multi + Concern = English + Typical, English + Concern, Multi + Typical
	Behavior problems	SDQ (teacher report)	English + Typical = Multi + Typical = English + Concern = Multi + Concern

=Means that the difference was not statistically significant. PPVT-III, Adapted Peabody Picture Vocabulary Test-III (Rothman, 2003); WAI, Who Am I? (De Lemos & Doig, 1999); SDQ, Strengths and Difficulties Questionnaire problem scale (Goodman, 1997); ARS Language and Literacy, Academic Rating Scale: Language and Literacy scale (NCES, n.d.); ARS Mathematical Thinking, Academic Rating Scale: Mathematical Thinking scale (NCES, n.d.).
Note: ^aBest results are on the left hand side of the equation. Significant relationships are in **bold** text.

gual performed equally well or better than their English-only peers, and multilingual children with speech and language concern had similar scores to all other children. While the pattern of results is mixed, it appears that the combination of being multilingual with identified speech and language concern was associated with poorer outcomes, suggesting that these children might be at most risk in the period of transition from preschool to school.

The longitudinal results, however, presented a somewhat different picture. Analyses on the full sample of 3240 children at ages 6–7 and 8–9 years, when all children were attending school, showed that children who were multilingual with typical speech and language development were equivalent to their English-only peers on academic outcomes (ARS Language and Literacy and ARS Mathematical Thinking), whereas children whose parents expressed concern about their speech and language skills (regardless of their multilingual status) had the poorest academic outcomes. In relation to social and emotional wellbeing, there were no differences in teacher ratings of problem behavior at ages 6–7 or 8–9 by speech and language competence, or multilingual status. The suggestion from the 4- to 5-year-old results that multilingual children with speech and language concern were at the greatest risk of poor school outcomes was not upheld. Whilst their performance in Literacy and Language was lower than English-only children with typical speech and language development at age 8–9, they received similar ratings to English-only children with speech and language concern. On Language and Literacy at age 6–7, Mathematical Ability at ages 6–7 and 8–9, and behavior problems at ages 6–7 and 8–9, multilingual children with speech and language concern received equivalent ratings to all other children.

The longitudinal findings align with previous studies that have demonstrated that children’s academic outcomes at school age (literacy and numeracy) are related to their speech and language competence in early childhood; for English-only children (Leitão & Fletcher, 2004; McCormack et al., 2011; Raitano, Pennington, Tunick, Boada, & Shriberg, 2004), and for multilingual children (Brinkman, Sayers, Goldfeld, & Kline, 2009). The critical age hypothesis (Bishop & Adams, 1990; Nathan, Stackhouse, Goulandris, & Snowling, 2004a) suggests that children who still have speech and language impairment at the beginning of literacy instruction (around 5 years of age) are most at risk of having ongoing literacy difficulties and there is evidence that between 30 and 77% of

children with speech sound disorder (a subgroup of speech and language impairment) are likely to have literacy difficulties (Anthony et al., 2011). Australian population data have shown that English-only and multilingual children who are not proficient in English have the poorest outcomes for language and cognitive development in the first year of school (Goldfeld et al., 2014).

The findings also add to the evidence that numeracy outcomes are related to speech and language competence in early childhood (Arvedson, 2002; Dockrell & Lindsay, 1998; Fazio, 1999; Harrison et al., 2009; Nathan, Stackhouse, Goulandris, & Snowling, 2004b), since numeracy requires symbolic representation and phonological memory skills. The current research provides further evidence that children with speech and language difficulties have ongoing difficulties with literacy and numeracy at school.

In relation to social and emotional wellbeing, the present study showed that the poorer outcomes for multilingual children with speech and language difficulties at age 4–5 were no longer a concern once children had progressed into the early years of school. Studies of English-only children with speech and language impairment have indicated that social interactions are difficult, particularly outside of the home (Markham, van Laar, Gibbard, & Dean, 2009; McCormack et al., 2011; McLeod et al., 2013a,b). On the other hand, studies of typically developing multilingual children show that they often have better behavior and social skills than their typically developing monolingual counterparts (Goldfeld et al., 2014; Winsler, Kim, and Richard, 2014). For example, the 2009 Australian Early Development Index (AEDI) data collected on all school entrants (N = 260,147) showed that English-proficient bilingual children receive higher ratings on social competence and emotional maturity than their monolingual peers. Similarly, in a large-scale US study of 2059 4-year-old children, Winsler, Kim, and Richard (2014) found that positive behavior and social skills of low-income, ethnically diverse Hispanic Spanish-English-speaking children was a predictor of competence in English. Whilst the current study did not fully support these findings (since there was no significant difference between the four groups of children at ages 6–7 or 8–9), the results are limited to problem behavior in the classroom and may not reflect the wider range of children’s social interactions. It is noteworthy, however, that the higher levels of problem behavior reported for multilingual children with speech

and language concern at age 4–5 had reduced once children were attending school.

Implications

Whilst multilingual children with speech and language concern were performing least well on English vocabulary and behavioral adjustment at age 4–5 years, by 6–7 and 8–9 years of age, they had achieved a similar level to English-only children with speech and language concern in language and literacy, and to all other typically developing children on social-emotional outcomes. The reasons for these improvements may be that multilingual children in Australian schools had time to continue their English language acquisition, and may have received targeted services to support their acquisition of English. On the other hand, children with speech and language concern may have received less targeted support since Australia places less national emphasis on speech-language pathology services in schools (compared with countries such as the UK or US) (Commonwealth of Australia, 2014; McLeod et al., 2010). However, there are likely to be other, as yet unexplored, reasons. For example, it is also possible that multilingual children have compensatory skills that reduce the impact of their language impairment on processing academic learning over time.

Despite the growing body of literature documenting the benefits of multilingualism for children's academic and social outcomes (Bialystok, 2001; Goldfeld et al., 2014; Nguyen & Astington, 2014; Paradis, 2007; Paradis, Genesee, & Crago, 2011), there is less discussion of the impact of children's speech and language competence for multilingual children. When children are experiencing speech and language difficulties, parents and teachers may believe that input in multiple languages is the cause of such difficulties or that multilingualism may exacerbate speech and language difficulties (Genesee, 2007; Saunders, 1982). The findings of the current research do not support this assumption. Multilingualism was not found to contribute to poorer educational and social-emotional outcomes at school. Instead, it was the children's speech and language competence (regardless of whether they spoke English-only or were multilingual) at age 4–5 that made a difference to their educational outcomes at school.

Limitations

The aim of this study was to compare four groups of children (English+Typical, Multi+Typical, English+Concern, Multi+Concern) within LSAC, a large population-based sample. While the overall sample size was large ($N = 3,240$), the comparative samples were restricted by the size of the smallest group ($n = 109$); that is, children who were multilingual with parental concern about their speech and language competence (Multi+Concern). Whilst the use of a matched case-control analysis at age 4–5 years confirmed significant differences between this group and the other three groups, the relatively small sample size for the Multi+Concern group, when compared to the other three groups ($n_s = 2012, 476, \text{ and } 673$) in the longitudinal analyses, may have contributed to an inability to detect significant differences at ages 6–7 and 8–9. We also note that for many of the longitudinal results, effects sizes for the group membership categorical variable did not achieve Cohen's (1988) standard for a "small" effect ($\eta^2 = .01$), and mean differences between groups only achieved small effect sizes ($d = .2$).

A further limitation was the use of parent report, rather than direct assessment to identify children's multilingualism and speech and language competence. Within the present study, identification of the children as multilingual was by parent report when the children were aged 4–5 years. In order to provide a conservative classification of monolingual, English-only participants, parents'

responses had to be "no" to the following questions: "Does the child speak a language other than English at home?" and is the child "regularly spoken to in a language other than English". Therefore, for the multilingual participants, the mode of multilingualism (receptive versus expressive), extent of use of the different languages, and whether or not the children were simultaneous or sequential language learners was unknown. Additionally, there was no opportunity for parents to indicate whether children had more than one main language. The present study was unable to provide direct evidence that the children were multilingual and was unable to update the children's multilingualism classification when aged 8–9 years. It is known that bilingual households are not guaranteed to produce bilingual children (De Houwer, 2009), and language loss is a factor impacting children's multilingualism through early childhood (Verdon, McLeod, & Winsler, 2014). Therefore acknowledgment is made regarding the limitations of parent reported multilingual status.

Additionally, parent-reported concern was used as a proxy for the children's speech and language competence, as LSAC did not include formal direct assessment of speech and language. The children's status was determined via two questions "Do you have any concerns about how your child talks and makes speech sounds?" and "Do you have any concerns about how your child understands what you say to him?" These questions have been used in previous longitudinal studies documenting children's speech and language competence and outcomes (Harrison et al., 2009; McCormack et al., 2011; McLeod & Harrison, 2009; McLeod, Harrison, & McCormack, 2012). Some studies have considered the sensitivity and specificity of parent report on children's language competence indicating some differences between parent report and direct assessment in the identification of specific language impairment (Tomblin et al., 1997). One study has specifically compared the question used in the present investigation ("Do you have any concerns about how your child talks and makes speech sounds?") with direct speech-language pathology assessment of children's speech sound production (McLeod et al., 2013a,b). They found an association between parent reported speech-language concern and assessed competence in producing speech sounds, with 86.7% of parent-identified children achieving a standard score at least 1 SD below the mean and 65.0% achieving a score at least 2 SDs below the mean on direct assessment. Whilst this suggests a close match, there may be some under- or over-reporting of speech and language concern by parents.

Finally, we note that children's language and literacy, mathematical thinking, and socio-emotional outcomes were assessed using validated teacher-reported measures as outlined in the method. In particular, it is important to note that the assessment of children's socio-emotional development was based on teacher-rated problem behavior in the classroom. Subsequent studies will need to examine other aspects of children's socialization and behavior.

Summary

At age 4–5 years, children who were multilingual, particularly those children whose parents expressed concern about their speech and language skills, had poorer English receptive vocabulary (PPVT-III) and more behavior problems than their English-only peers. Multilingual children performed equally well or better than their English-only peers on the test of school readiness (WAI). By age 6–7 and 8–9 years, children with speech and language concern at 4–5 years (regardless of their multilingual status) received poorer scores on academic ratings for language and literacy and mathematical thinking, whereas children with typical speech and language development, both multilingual and English-

only, achieved similar and higher ratings. Speaking a language other than English at 4–5 years did not, in itself, affect children's academic outcomes at school, and there was no evidence that multilingualism in combination with speech and language concern resulted in a "double delay" in academic or behavioral outcomes.

This paper presented a rare opportunity to use extensive data from a national population sample for both cross-sectional and longitudinal views of relationships between multilingual status and speech and language competence. The major findings substantiate claims that longer-term monolingual-multilingual comparisons may give a different, more positive picture than do short-term comparisons at school entry (Collier & Thomas, 2004; Oller & Eilers, 2002). In the matched case-control study (when 4–5 years) multilingual children were not disadvantaged with respect to the school readiness measure, but they achieved lower scores on measures of behavior and English receptive vocabulary. That is, there was evidence of "double delay" prior to school entry on two of three measures. The longitudinal data at ages 6–7 and 8–9 showed that early gaps between English-only and multilingual children had closed. That is, if multilingualism was a risk factor at 4–5 years it did not persist. Academic outcomes at school were more related to whether or not their parents were concerned about their children's speech and language skills at 4–5 years of age, than children's multilingual status.

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References

- Abedi, J. (2004). The No Child Left Behind Act and English language learners: assessment and accountability issues. *Educational Researcher*, 33, 4–14. <http://dx.doi.org/10.3102/0013189X03001004>
- Adesope, O. O., Lavin, T., Thompson, T., & Ungerleider, C. (2010). A systematic review and meta-analysis of the cognitive correlates of bilingualism. *Review of Educational Research*, 80, 207–245. <http://dx.doi.org/10.3102/0034654310368803>
- Anthony, J. L., Aghara, R. G., Dunkelberger, M. J., Anthony, T. I., Williams, J. M., & Zhang, Z. (2011). What factors place children with speech sound disorder at risk for reading problems? *American Journal of Speech-Language Pathology*, 20, 146–160. [http://dx.doi.org/10.1044/1058-0360\(2011\)10-0053](http://dx.doi.org/10.1044/1058-0360(2011)10-0053)
- Arvedson, P. J. (2002). Young children with specific language impairment and their numerical cognition. *Journal of Speech, Language, and Hearing Research*, 45, 970–982. [http://dx.doi.org/10.1044/1092-4388\(2002\)079](http://dx.doi.org/10.1044/1092-4388(2002)079)
- Australian Bureau of Statistics. (2010). *Yearbook Australia, 2009–10*. Retrieved from <http://www.abs.gov.au/AUSSTATS/Lookup/1301.0Feature+Article7012009%E2%80%9310>
- Australian Bureau of Statistics. (2012). *2011 Census QuickStats*. Retrieved from http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/0
- Baker, E. (2012). Optimal intervention intensity. *International Journal of Speech-Language Pathology*, 14(5), 401–409. <http://dx.doi.org/10.3109/17549507.2012.700323>
- Baker, E., & McLeod, S. (2011). Evidence-based practice for children with speech sound disorders: part 1 narrative review. *Language, Speech, and Hearing Service in Schools*, 42, 102–139. [http://dx.doi.org/10.1044/0161-1461\(2010\)09-0075](http://dx.doi.org/10.1044/0161-1461(2010)09-0075)
- Barac, R., Bialystok, E., Castro, D. C., & Sanchez, M. (2014). The cognitive development of young dual language learners: a critical review. *Early Childhood Research Quarterly*, 29(4), 699–714. <http://dx.doi.org/10.1016/j.ecresq.2014.02.003>
- Bialystok, E. (2001). *Bilingualism in development: language, literacy and cognition*. Cambridge, UK: Cambridge University Press.
- Bishop, D. V. M., & Adams, C. (1990). A prospective study of the relationship between specific language impairment, phonological disorders and reading retardation. *Journal of Child Psychology and Psychiatry*, 31, 1027–1050. <http://dx.doi.org/10.1111/j.1469-7610.1990.tb00844.x>
- Blakemore, T., Strazdins, L., & Gibbins, J. (2009). Measuring family socio-economic position. *Australian Social Policy Journal*, 8, 121–168.
- Brinkman, S., Sayers, M., Goldfeld, S., & Kline, J. (2009). Population monitoring of language and cognitive development in Australia: the Australian Early Development Index. *International Journal of Speech-Language Pathology*, 11, 419–430. <http://dx.doi.org/10.1080/17549500903147552>
- Bruce, N., Pope, D., & Stanistreet, D. (2008). *Quantitative methods for health research: a practical interactive guide to epidemiology and statistics*. West Sussex, England: John Wiley & Sons.
- Campbell, T. F., Dollaghan, C. A., Rockette, H. E., Paradise, J. L., Feldman, H. M., Shriberg, L. D., & Kurs-Lasky, M. (2003). Risk factors for speech delay of unknown origin in 3-year-old children. *Child Development*, 74, 346–357. <http://dx.doi.org/10.1111/1467-8624.7402002>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Collier, V. P., & Thomas, W. (2004). The astounding success of dual language immersion for all. *NABE Journal of Research and Practice*, 2(1), 1–20.
- Commonwealth of Australia (2014). *Senate Community Affairs References Committee: Prevalence of different types of speech, language and communication disorders and speech pathology services in Australia*. Canberra, Australia: Author.
- Cornips, L., & Hulk, A. (2008). Factors of success and failure in the acquisition of grammatical gender in Dutch. *Second Language Research*, 24, 267–296.
- Cummins, J. (1984). *Bilingualism and special education: issues in assessment and pedagogy*. San Diego, CA: College-Hill Press.
- De Feyter, J. J., & Winsler, A. (2009). The early developmental competencies and school readiness of low-income, immigrant children: influences of generation, race/ethnicity, and national origins. *Early Childhood Research Quarterly*, 24, 411–431. <http://dx.doi.org/10.1016/j.ecresq.2009.07.004>
- De Houwer, A. (1995). Bilingual language acquisition. In P. Fletcher, & B. MacWhinney (Eds.), *The handbook of child language* (pp. 219–250). Oxford, UK: Blackwell.
- De Houwer, A. (2009). *Bilingual first language acquisition*. Clevedon, UK: Multilingual Matters.
- De Lemos, M., & Doig, B. (1999). *Who Am I? Melbourne, Australia: The Australian Council for Educational Research*.
- Dockrell, J., & Lindsay, G. (1998). The ways in which speech and language difficulties impact on children's access to the curriculum. *Child Language Teaching and Therapy*, 14, 117–133. <http://dx.doi.org/10.1191/02656598672704149>
- Dunn, L., & Dunn, L. (1997). *Peabody Picture Vocabulary Test* (3rd ed.). Circle Pines, MN: American Guidance Service.
- Fabiano-Smith, L., & Goldstein, B. A. (2010). Phonological acquisition in bilingual Spanish-English speaking children. *Journal of Speech, Language, and Hearing Research*, 53, 160–178. [http://dx.doi.org/10.1044/1092-4388\(2009\)07-0064](http://dx.doi.org/10.1044/1092-4388(2009)07-0064)
- Fazio, B. B. (1999). Arithmetic calculation, short-term memory, and language performance in children with specific language impairment: a 5-year follow-up. *Journal of Speech, Language, and Hearing Research*, 42, 420–431.
- Felsenfeld, S., Broen, P. A., & McGue, M. (1994). A 28-year follow up of adults with a history of moderate phonological disorder: educational and occupational results. *Journal of Speech and Hearing Research*, 37, 1341–1353.
- Fujiki, M., Brinton, B., Isaacson, T., & Summers, C. (2001). Social behaviors of children with language impairment on the playground: a pilot study. *Language, Speech, and Hearing Services in Schools*, 32, 101–113. [http://dx.doi.org/10.1044/0161-1461\(2001\)008](http://dx.doi.org/10.1044/0161-1461(2001)008)
- Gathercole, V. C. M., Thomas, E. M., Jones, L., Guasch, N. V., Young, N., & Hughes, E. K. (2010). Cognitive effects of bilingualism: digging deeper for the contributions of language dominance, linguistic knowledge, socio-economic status and cognitive abilities. *International Journal of Bilingual Education and Bilingualism*, 13, 617–664.
- Genesee, F. (2007). A short guide to raising children bilingually. *Multilingual Living Magazine*, (Jan/Feb), 1–9.
- Glascow, F. P. (2000). *Parents' Evaluation of Developmental Status: authorized Australian version*. Parkville, Australia: Centre for Community Child Health.
- Glogowska, M., Roulstone, S., Enderby, P., & Peters, T. J. (2000). Randomised controlled trial of community based speech and language therapy in preschool children. *British Medical Journal*, 321, 1–5. <http://dx.doi.org/10.1136/bmj.321.7266.923>
- Goldfeld, S., O'Connor, M., Mithen, J., Sayers, M., & Brinkman, S. (2014). Early development of emerging and English-proficient bilingual children at school entry in an Australian population cohort. *International Journal of Behavioral Development*, 38, 42–51. <http://dx.doi.org/10.1177/0165025413505945>
- Goldstein, B. A., & Bunta, F. (2012). Positive and negative transfer in the phonological systems of bilingual speakers. *International Journal of Bilingualism*, 16, 388–401. <http://dx.doi.org/10.1177/1367006911425817>

- Goldstein, B. A., & McLeod, S. (2012). Typical and atypical multilingual speech acquisition. In S. McLeod, & B. A. Goldstein (Eds.), *Multilingual aspects of speech sound disorders in children* (pp. 84–100). Bristol, UK: Multilingual Matters.
- Goodman, R. (1997). The Strengths and Difficulties Questionnaire: a research note. *Journal of Child Psychology Psychiatry and Allied Disciplines*, 38, 581–586. <http://dx.doi.org/10.1111/j.1469-7610.1997.tb01545.x>
- Gray, M., & Sanson, A. (2005). Growing up in Australia: the Longitudinal Study of Australian Children. *Family Matters*, 72, 4–9.
- Grech, H., & McLeod, S. (2012). Multilingual speech and language development and disorders. In D. Battle (Ed.), *Communication disorders in multicultural and international populations* (4th ed., pp. 120–147). St Louis, MO: Elsevier.
- Grimes, D., & Schulz, K. (2005). Compared to what? Finding controls for case-control studies. *The Lancet*, 365, 1429–1433.
- Grosjean, F. (1982). *Life with two languages: an introduction to bilingualism*. Cambridge, MA: Harvard University Press.
- Gutiérrez-Clellen, V. F., Simon-Cerejido, G., & Wagner, C. (2008). Bilingual children with language impairment: a comparison with monolinguals and second language learners. *Applied Psycholinguistics*, 29(01), 3–19. <http://dx.doi.org/10.1017/S0142716408080016>
- Håkansson, G., & Nettelbladt, U. (1993). Developmental sequences in L1 (normal and impaired) and L2 acquisition of Swedish syntax. *International Journal of Applied Linguistics*, 3(2), 131–155. <http://dx.doi.org/10.1111/j.1473-4192.1993.tb00047.x>
- Hakuta, K. (1986). *Mirror of language: The debate on bilingualism*. New York, NY: Basic Books.
- Hambly, H., Wren, Y., McLeod, S., & Roulstone, S. (2013). The influence of bilingualism on speech production: a systematic review. *International Journal of Language and Communication Disorders*, 48(1), 1–24. <http://dx.doi.org/10.1111/j.1460-6984.2012.00178.x>
- Hammer, C. S., Lawrence, F., Rodriguez, B., Davison, M. D., & Miccio, A. W. (2011). Changes in language usage of Puerto Rican mothers and their children: do gender and timing of exposure to English matter? *Applied Psycholinguistics*, 32, 275–297. <http://dx.doi.org/10.1017/S014271641000041X>
- Harrison, L. J., & McLeod, S. (2010). Risk and protective factors associated with speech and language impairment in a nationally representative sample of 4- to 5-year-old children. *Journal of Speech, Language, and Hearing Research*, 53, 508–529. [http://dx.doi.org/10.1044/1092-4388\(2009\)08-0086](http://dx.doi.org/10.1044/1092-4388(2009)08-0086)
- Harrison, L. J., McLeod, S., Berthelsen, D., & Walker, S. (2009). Literacy, numeracy and learning in school-aged children identified as having speech and language impairment in early childhood. *International Journal of Speech-Language Pathology*, 11, 392–403. <http://dx.doi.org/10.1080/17549500903093749>
- Hugo, G. (2004). *Australia's most recent immigrants*. Canberra, Australia: Australian Bureau of Statistics.
- International Expert Panel on Multilingual Children's Speech. (2012). *Multilingual children with speech sound disorders: position paper*. Bathurst, Australia: Research Institute for Professional Practice, Learning and Education, Charles Sturt University. <http://www.csu.edu.au/research/multilingual-speech/position-paper>
- Johnson, C. J., Beitchman, J. H., & Brownlie, E. B. (2010). Twenty-year follow-up of children with and without speech-language impairments: family, educational, occupational, and quality of life outcomes. *American Journal of Speech-Language Pathology*, 19, 51–65. [http://dx.doi.org/10.1044/1058-0360\(2009\)08-0083](http://dx.doi.org/10.1044/1058-0360(2009)08-0083)
- Law, J., Boyle, J., Harris, F., Harkness, A., & Nye, C. (2000). Prevalence and natural history of primary speech and language delay: findings from a systematic review of the literature. *International Journal of Language and Communication Disorders*, 35, 165–188.
- Law, J., & Conti-Ramsden, G. (2000). Treating children with speech and language impairments: six hours of therapy is not enough. *British Medical Journal*, 321(14 October), 908–909.
- Leitão, S., & Fletcher, J. (2004). Literacy outcomes for students with speech impairment: long-term follow-up. *International Journal of Language and Communication Disorders*, 39, 245–256. <http://dx.doi.org/10.1080/13682820310001619478>
- Marchman, V. A., & Fernald, A. (2008). Speed of word recognition and vocabulary knowledge in infancy predict cognitive and language outcomes in later childhood. *Developmental Science*, 11(3), F9–16. <http://dx.doi.org/10.1111/j.1467-7687.2008.00671.x>
- Markham, C., van Laar, D., Gibbard, D., & Dean, T. (2009). Children with speech, language and communication needs: their perceptions of their quality of life. *International Journal of Language and Communication Disorders*, 44, 748–768. <http://dx.doi.org/10.1080/13682820802359892>
- McCormack, J., Harrison, L. J., McLeod, S., & McAllister, L. (2011). A nationally representative study of the association between communication impairment at 4–5 years and children's life activities at 7–9 years. *Journal of Speech, Language, and Hearing Research*, 54, 1328–1348. [http://dx.doi.org/10.1044/1092-4388\(2011\)10-0155](http://dx.doi.org/10.1044/1092-4388(2011)10-0155)
- McCormack, J., McAllister, L., McLeod, S., & Harrison, L. J. (2012). Knowing, having, battles of childhood speech impairment. *Child Language Teaching and Therapy*, 28, 141–157. <http://dx.doi.org/10.1177/0265659011417313>
- McCormack, J., McLeod, S., McAllister, L., & Harrison, L. J. (2009). A systematic review of the association between childhood speech impairment and participation across the lifespan. *International Journal of Speech-Language Pathology*, 11, 155–170. <http://dx.doi.org/10.1080/17549500802676859>
- McLeod, S. (2011). Cultural and linguistic diversity in Australian 4-to 5-year-old children and their parents. *Journal of Clinical Practice in Speech-Language Pathology*, 13, 112–119.
- McLeod, S., Daniel, G., & Barr, J. (2013). When he's around his brothers he's not so quiet: the private and public worlds of school-aged children with speech sound disorder. *Journal of Communication Disorders*, 46, 70–83. <http://dx.doi.org/10.1016/j.jcomdis.2012.08.006>
- McLeod, S., & Harrison, L. J. (2009). Epidemiology of speech and language impairment in a nationally representative sample of 4- to 5-year-old children. *Journal of Speech, Language, and Hearing Research*, 52, 1213–1229. [http://dx.doi.org/10.1044/1092-4388\(2009\)08-0085](http://dx.doi.org/10.1044/1092-4388(2009)08-0085)
- McLeod, S., Harrison, L. J., & McCormack, J. (2012). Intelligibility in Context Scale: validity and reliability of a subjective rating measure. *Journal of Speech, Language, and Hearing Research*, 55, 648–656. [http://dx.doi.org/10.1044/1092-4388\(2011\)10-0130](http://dx.doi.org/10.1044/1092-4388(2011)10-0130)
- McLeod, S., Harrison, L. J., McAllister, L., & McCormack, J. (2013). Speech sound disorders in a community study of preschool children. *American Journal of Speech-Language Pathology*, 22(3), 503–522. [http://dx.doi.org/10.1044/1058-0360\(2012\)11-0123](http://dx.doi.org/10.1044/1058-0360(2012)11-0123)
- McLeod, S., & McKinnon, D. H. (2007). The prevalence of communication disorders compared with other learning needs in 14,500 primary and secondary school students. *International Journal of Language and Communication Disorders*, 42(S1), 37–59. <http://dx.doi.org/10.1080/13682820601173262>
- McLeod, S., Press, F., & Phelan, C. (2010). The (in)visibility of children with communication impairment in Australian health, education, and disability legislation and policies. *Asia Pacific Journal of Speech, Language, and Hearing*, 13, 67–75. <http://dx.doi.org/10.1179/136132810805335173>
- Nathan, L., Stackhouse, J., Goulandris, N., & Snowling, M. J. (2004a). The development of early literacy skills among children with speech difficulties: a test of the critical age hypothesis. *Journal of Speech, Language, and Hearing Research*, 47, 377–391.
- Nathan, L., Stackhouse, J., Goulandris, N., & Snowling, M. J. (2004b). Educational consequences of developmental speech disorder: key stage 1 national curriculum assessment results in English and mathematics. *British Journal of Educational Psychology*, 74, 173–186.
- National Center for Education Statistics (NCES, n.d.). *Early Childhood Longitudinal Study-Kindergarten (ECLS-K)*. Washington, DC: Department of Education. nces.ed.gov/ecls
- Nguyen, T.-K., & Astington, J. W. (2014). Reassessing the bilingual advantage in theory of mind and its cognitive underpinnings. *Bilingualism: Language and Cognition*, 17, 396–409. <http://dx.doi.org/10.1017/S1366728913000394>
- Oller, D. K., & Eilers, R. (2002). *Language and literacy in bilingual children*. Clevedon, UK: Multilingual Matters.
- Orgassa, A., & Weerman, F. (2008). Dutch gender in specific language impairment and second language acquisition. *Second Language Research*, 24(3), 333–364. <http://dx.doi.org/10.1177/0267658308090184>
- Paradis, J. (2007). Bilingual children with specific language impairment: theoretical and applied issues. *Applied Psycholinguistics*, 28, 551–564. <http://dx.doi.org/10.1017/S0142716407070300>
- Paradis, J. (2010). The interface between bilingual development and specific language impairment. *Applied Psycholinguistics*, 31, 227–252. <http://dx.doi.org/10.1017/S0142716409990373>
- Paradis, J., & Crago, M. (2000). Tense and temporality: a comparison between children learning a second language and children With SLI. *Journal of Speech, Language, and Hearing Research*, 43(4), 834–847. <http://dx.doi.org/10.1044/jshr.4304.834>
- Paradis, J., Crago, M., Genesee, F., & Rice, M. (2003). French-English bilingual children with SLI: how do they compare with their monolingual peers? *Journal of Speech, Language, and Hearing Research*, 46, 113–127. [http://dx.doi.org/10.1044/1092-4388\(2003\)009](http://dx.doi.org/10.1044/1092-4388(2003)009)
- Paradis, J., Genesee, F., & Crago, M. (Eds.). (2011). *Dual language development and disorders: a handbook on bilingualism and second language learning*. Baltimore, MD: Paul H. Brookes.
- Paradis, J., Rice, M. L., Crago, M., & Marquis, J. (2008). The acquisition of tense in English: distinguishing child second language from first language and specific language impairment. *Applied Psycholinguistics*, 29(04), 689–722. <http://dx.doi.org/10.1017/S0142716408080296>
- Raitano, N. A., Pennington, B. F., Tunick, R. A., Boada, R., & Shriberg, L. D. (2004). Pre-literacy skills of subgroups of children with speech sound disorders. *Journal of Child Psychology and Psychiatry*, 45, 821–835. <http://dx.doi.org/10.1111/j.1469-7610.2004.00275.x>
- Romaine, S. (2013). The bilingual and multilingual community. In T. K. Bhatia, & W. C. Ritchie (Eds.), *The handbook of bilingualism and multilingualism* (2nd ed., pp. 445–465). Malden, MA: Blackwell.
- Roseberry-McKibbin, C. (1994). Assessment and intervention for children with limited English proficiency and language disorders. *American Journal of Speech-Language Pathology*, 3, 77–88.
- Rothman, S. (2003). *An Australian version of the Adapted PPVT-III for use in research*. Melbourne, Australia: Australian Council for Educational Research. Unpublished paper.
- Rothman, K. J., Greenland, S., & Lash, T. L. (2008). *Case-control studies*. Chichester, UK: John Wiley & Sons.
- Ryan, C. (2013). *Language use in the United States: 2011*. Washington, DC: U.S. Census Bureau.
- Saunders, G. (1982). Infant bilingualism: a look at some doubts and objections. *Journal of Multilingual and Multicultural Development*, 3, 277–292.
- Snow, P. C., & Powell, M. B. (2011). Oral language competence in incarcerated young offenders: links with offending severity. *International Journal of*

- Speech-Language Pathology, 13(6), 480–489. <http://dx.doi.org/10.3109/17549507.2011.578661>
- Soloff, C., Lawrence, D., & Johnstone, R. (2005). *Sample design (LSAC Technical Paper No. 1)*. Melbourne, Australia: Australian Institute of Family Studies.
- Soloff, C., Millward, C., Sanson, A., & LSAC consortium advisory group, and sampling design team. (2003). *Growing up in Australia: the Longitudinal Study of Australian Children - discussion paper no. 2. proposed study design and wave 1 data collection*. Canberra, Australia: Australian Institute of Family Studies. <http://www.growingupinaustralia.gov.au/pubs/discussion/dp2/index.html>
- Statistics Canada. (2012). *Linguistic characteristics of Canadians: language, 2011 census of population. (Report 98-314-X2011001)*. Ottawa, Canada: Minister of Industry, Statistics Canada. <http://www12statcan.gc.ca/census-recensement/2011/as-sa/98-314-x/98-314-x2011001-eng.cfm>
- Taylor, A. (2014, March). *Standardised effect size in a mixed/multilevel model*. http://www.psy.mq.edu.au/psystat/documents/standardised_effect_size_in_mixed_ML_models.
- Tomblin, J. B., Records, N. L., Buckwalter, P., Zhang, X., Smith, E., & O'Brien, M. (1997). Prevalence of specific language impairment in kindergarten children. *Journal of Speech, Language, and Hearing Research*, 40, 1245–1260. <http://dx.doi.org/10.1044/jslhr.4006.1245>
- Tucker, G. R. (1998). A global perspective on multilingualism and multilingual education. In J. Cenoz, & F. Genesee (Eds.), *Beyond bilinguals: Multilingualism and multilingual education* (pp. 3–15). Clevedon, UK: Multilingual Matters.
- Umbel, V. M., Pearson, B. Z., Fernández, M. C., & Oller, D. K. (1992). Measuring bilingual children's receptive vocabularies. *Child Development*, 63(4), 1012–1020. <http://dx.doi.org/10.1111/j.1467-8624.1992.tb01678.x>
- U.S. Department of Health and Human Services, Administration for Children and Families (January, 2010). Head Start Impact Study. Technical Report, Washington, DC. http://www.acf.hhs.gov/sites/default/files/opre/hs_impact_study_tech_rpt.pdf.
- Verdon, S., McLeod, S., & Winsler, A. (2014). Language maintenance and loss in a population study of young Australian children. *Early Childhood Research Quarterly*, 29, 168–181. <http://dx.doi.org/10.1016/j.ecresq.2013.12.003>
- Williams, K., & Wang, J. (1997). *Technical references to the Peabody Picture Vocabulary Test (PPVT-III)* (3rd ed.). Circle Pines, MN: American Guidance Service.
- Windsor, J., Kohnert, K., Lobitz, K. F., & Pham, G. T. (2010). Cross-language nonword repetition by bilingual and monolingual children. *American Journal of Speech-Language Pathology*, 19(4), 298–310. [http://dx.doi.org/10.1044/1058-0360\(2010/09-0064\)](http://dx.doi.org/10.1044/1058-0360(2010/09-0064))
- Winsler, A., Kim, Y. K., & Richard, E. R. (2014). Socio-emotional skills, behavior problems, and Spanish competence predict the acquisition of English among English language learners in poverty. *Developmental Psychology*, 50(9), 2242–2254. <http://dx.doi.org/10.1037/a0037161>
- Winter, K. (2001). Numbers of bilingual children in speech and language therapy: theory and practice of measuring their representation. *International Journal of Bilingualism*, 5, 465–495. <http://dx.doi.org/10.1177/13670069010050040401>