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Early development of emerging and English-proficient bilingual children at school entry in an Australian population cohort

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Abstract

Children who enter school with limited proficiency in the language of instruction face a range of challenges in negotiating this new context, yet limited data have been available to describe the early developmental outcomes of this subpopulation in the Australian context. The Australian Early Development Index (AEDI) is a teacher-rated checklist that measures five important domains of child development: physical health and wellbeing, social competence, emotional maturity, language and cognitive skills, and communication skills and general knowledge. In 2009, the AEDI was completed for 97.5% of Australian children in their first year of schooling ($N = 261{,}147$; $M =$ 5 years, 7 months of age), providing a unique opportunity to explore the cross-sectional associations between language background, proficiency in English, and early developmental outcomes at the population-level. Logistic regression analyses revealed that, compared to their peers from English-speaking backgrounds, bilingual children who were not yet proficient in English had substantially higher odds of being in the "vulnerable" range (bottom 10th percentile) on the AEDI domains ($OR = 2.88$, $p < .001$, to $OR = 7.49$, $p < .001$), whereas English-proficient bilingual children had equal or slightly lower odds ($OR = .84$, $p < .001$, to $OR = .97$, *ns*). Future research with longitudinal data is now needed to establish causal pathways and explore long term outcomes.

Keywords

Australian Early Development Index (AEDI), bilingual, English proficiency, early childhood outcomes, school entry

The entrance to formal schooling brings children and their families into contact with a host of new environments, demands, and relationships, and these early school experiences can have lasting implications for children's educational trajectories (Duncan et al., 2007). Of increasing concern is that some groups of children show greater vulnerability in their development at the outset of schooling, and these differences tend to increase rather than diminish over time (Feinstein, 2003).

Like many other Western industrialized countries, Australia is a culturally and linguistically diverse society. English is the official language and the language of instruction in almost all schools, but over 160 other languages are also spoken and around 15% of Australian children speak a language other than English at home (Australian Bureau of Statistics, 1999, 2006a). Emerging evidence suggests that students with limited proficiency in the language of instruction at school may experience poorer outcomes across broad health and developmental domains, well beyond the language and academic difficulties that may be most obvious in the classroom (e.g., Dawson & Williams, 2008; Dowdy, Dever, DiStefano, & Chin, 2011; Edl, Jones, & Estell, 2008; Han, 2010). In contrast, bilingual children who enter school proficient in the language of instruction may be equipped with a range of subtle developmental advantages (Brinkman, Sayers, Goldfeld, & Kline, 2009; Halle, Hair, Wandner, McNamara, & Chien, 2012; Lesaux & Siegel, 2003). Yet to date, there has been limited capacity to explore the outcomes for these children with sufficiently powerful data on multiple domains of early childhood functioning in the Australian context.

In this study, we capitalize on population-level data from the Australian Early Development Index (AEDI) completed by teachers for 97.5% of children across Australia in their first year of schooling in 2009 ($N = 261{,}147$), to investigate the associations between language background, proficiency in English, and early developmental outcomes at the outset of schooling.

Language background and proficiency in English at school entry

A range of terms have been used in the literature to describe children from language backgrounds other than English who attend school in countries where English is the primary language, such as *limited English-proficient*, *English-language learners*, and *language-minority students* (Dowdy et al., 2011). In this article, we use the term

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bilingual in the broad sense of the word to refer to all students who speak a language or languages other than English at home and are also operating within the predominantly English-speaking school setting (Grosjean & Grosjean, 2010). We further differentiate between *English-proficient bilinguals* and *emerging bilinguals* who are not yet proficient in the English language (García & Kleifgen, 2010). These terms provide a strengths-based terminology by acknowledging home language ability rather than only describing difficulties with the English language.

As emerging bilingual children enter school, they face the challenge of trying to keep pace academically with their same-age peers whilst simultaneously learning the English language (MacSwan & Pray, 2005). Although these students may learn oral or conversational English relatively quickly, proficiency in ''academic English,'' or the language skills needed to fully engage with the curriculum, can take much longer to obtain (Hakuta, Butler, & Witt, 2000). The link between entering school with limited English proficiency and reduced early academic performance (in English) has been well documented (e.g., Brinkman et al., 2009; Halle et al., 2012).

Beyond these academic difficulties, recent research suggests that emerging bilinguals may also show poorer outcomes across broad health and psychosocial domains. For example, Canadian children in their first year of school classified as having English as a Second Language (ESL; indicates that the child is not yet proficient in English) were rated lower by teachers across all domains of the Early Development Instrument (EDI), including communication skills, social competence, emotional regulation, and physical health, although individual (e.g., gender) and community (e.g., disadvantage) factors attenuated the strength of these relationships (Guhn, Gadermann, Hertzman, & Zumbo, 2010; Janus & Offord, 2007; Puchala, Vu, & Muhajarine, 2010). Other studies have similarly observed less favorable teacher-ratings of emerging bilinguals on social, emotional, and behavioral dimensions (e.g., Dawson & Williams, 2008; Dowdy et al., 2011; Edl et al., 2008; Han, 2010).

In contrast, English-proficient bilingual children may begin school with a range of developmental advantages. For example, English-proficient bilingual children tend to outperform their monolingual peers on tasks that require controlling attention to specific stimuli and inhibiting attention to distracting information, thought to be related to the demands of bilingual language processing (Bialystok & Martin, 2004; Blumenfeld & Marian, 2011). English-proficient bilinguals may also show stronger early academic skills (Halle et al., 2012; Lesaux & Siegel, 2003), social and emotional development (Halle et al., 2012; Han, 2010; Oades-Sese, Esquivel, Kaliski, & Maniatis, 2011; Yow & Markman, 2011), language development (Brinkman et al., 2009), phonological awareness (Liow & Lau, 2006), and family relationships (Boutakidis, Chao, & Rodríguez, 2011) than their monolingual peers. These factors are all likely to be assets in helping young children to meet the new demands placed on them as they start school.

A number of potentially confounding factors need to be taken into account when trying to untangle outcomes for bilingual children. Australian children of overseas-born mothers with poor English-proficiency on average live in lower-income households and more disadvantaged areas than children with Australian-born mothers from English-speaking backgrounds (Priest, Baxter, & Hayes, 2012). Guhn et al. (2010) found that some apparent differences between ESL and non-ESL Canadian children on the EDI were entirely explained by controlling for community-level disadvantage. Additionally, early learning environments prior to school entry can promote the skills children need to successfully negotiate the school context, yet bilingual children are less likely to attend early learning settings than children from English-speaking backgrounds in Australia (Harrison et al., 2009; O'Connor, O'Connor, Kvalsvig, & Goldfeld, in press). Hence, it is important to take these factors into account when examining the relationship between language background and children's developmental outcomes.

Needless to say, children from English-speaking backgrounds also enter school with a range of English language abilities, including around a fifth who experience language difficulties of some concern to their teachers and parents (McLeod & Harrison, 2009). The developmental origins of these difficulties may be different for those children who are not yet proficient in English due to lack of exposure and opportunity to learn the language (Kohnert, Windsor, & Ebert, 2009). Nevertheless, there is some overlap in the correlates and potential outcomes, with students from English language backgrounds with language difficulties in the early years of schooling also showing poorer concurrent and long-term outcomes across a broad range of domains, including academic, psychosocial and health dimensions (Beitchman & Brownlie, 2010; Johnson, Beitchman, & Brownlie, 2010).

Background to the current study

Australia consists of a federation of eight States and Territories, and the first year of formal and compulsory schooling is referred to as Kindergarten, Reception, Pre-primary or Preparatory depending on the State or Territory in which the child lives. Children generally begin school when they are 5 years of age, although starting ages do vary. Prior to school entry, 4-year-old children in Australia are entitled to a minimum of 15 hours per week of non-compulsory early childhood education and care (COAG, 2008), which has an emphasis on cognitive, social, and emotional development through play-based learning. Most Australian children attend preschool (over 80%; O'Connor et al., in press), but rates are higher in more socioeconomically prosperous areas and for children from English-speaking backgrounds (Harrison et al., 2009; O'Connor et al., in press).

This article draws on data from a population cohort representing over 97% of Australian children in their first year of formal schooling, in order to explore the relationship between children's language background and important domains of health and development at school entry in the Australian context. The AEDI is a relative population measure of young children's development in communities across Australia, adapted from the Canadian EDI (Janus & Offord, 2007). It provides information on five important aspects of early childhood development—physical health and well-being, social competence, emotional maturity, language and cognitive skills, and communication skills and general knowledge—as well as data about children's language background and demographic characteristics. The data provides a census snapshot of the development of Australian children and an unprecedented capacity to report on low-prevalence subpopulations.

The reliability and validity of the AEDI as a population measure of early child development has been well established (Andrich & Styles, 2004; Brinkman et al., 2007; Janus, Brinkman, & Duku, 2011). The AEDI domains have also been found to predict literacy and numeracy outcomes in Grades 3, 5, and 7, and the social competence and language and cognitive domains relate to

scores on the Strengths and Difficulties Questionnaire at age 8 (Brinkman, Zubrick, & Silburn, 2010). These findings suggest that the AEDI is a meaningful measure of children's early developmental outcomes.

However, the measurement equivalence of the EDI for bilingual children is an important question, particularly given the growing evidence that teacher ratings of minority students can be subtly influenced by factors such as ethnic stereotypes (Tenenbaum & Ruck, 2007). Exploring the issue of measurement equivalence, Guhn, Gadermann, and Zumbo (2007) examined responses to the checklist items in a sample of Canadian ESL and non-ESL children. They found that Differential Item Functioning was limited to the communication skills and general knowledge domain, with ESL children receiving lower scores, which was an expected outcome given that lack of proficiency in English was a criterion of ESL status. Furthermore, correlations between the EDI and directly administered language and cognitive measures have also been observed to be similar for ESL and non-ESL students (Janus, Offord, & Walsh, 2001). Hence, the AEDI appears to provide a robust measure of the skills needed for effective functioning within the mostly English-language setting of Australian schools for both bilingual children and those from English-speaking backgrounds. Nonetheless, it should be noted that the AEDI does not (nor intends to) measure skills demonstrated in languages other than English outside of the school context (Janus, Hertzman, Guhn, Brinkman, & Goldfeld, 2009).

Research aims

The aim of the current study is to report on the associations between language background and early developmental outcomes (physical health and wellbeing, social competence, emotional maturity, and language and cognitive development) for Australian children. We bring together estimates of these associations for both English-proficient and emerging bilingual students, in order to provide a more complete picture of the bilingual student population. In making these comparisons, we also distinguish between those children from English-speaking backgrounds who were or were not competent within their home language at school entry, providing a clearer baseline for comparison.

Method

Participants

The AEDI was completed on 261,147 children (97.5% of estimated 5-year-old population; 51.3% male, 48.7% female) by 15,522 teachers from 7,422 Government, Independent, and Catholic schools (95.6% school participation) across all states and territories in Australia in 2009 (Centre for Community Child Health & Telethon Institute for Child Health Research, 2009). On average, children were 5 years and 7 months of age. The proportion of Aboriginal and Torres Strait Islander children (4.8%) reflect standard population estimates (Australian Institute of Health and Welfare, 2005). The majority of children were living in urban areas (64.7%), with a further 29.9% living in regional and 3.1% in remote regions. The relative socioeconomic standing of their communities was similar to that of 3-year-olds in the 2006 Australian census (Centre for Community Child Health & Telethon Institute for Child Health Research, 2009). The proportion of children with special needs (4.4%, $n = 11{,}484$) was also similar to other Australian estimates and these children were excluded from the current sample given their significant and established developmental difficulties (Goldfeld, O'Connor, Sayers, Moore, & Oberklaid, 2012).

There was a total of 6.6% of children born outside of Australia in 187 different countries (Centre for Community Child Health & Telethon Institute for Child Health Research, 2009). Bilingual children in this cohort spoke a wide range of languages at home, with the most common being Arabic (11.8%), Chinese languages (9.9%), Vietnamese (8.4%), Greek (4.3%), and Hindi (3.2%) (Centre for Community Child Health & Telethon Institute for Child Health Research, 2009). They were also widely dispersed across Australian communities, although this population was more urban-based: 87% of bilingual children lived in major Australian cities, compared to 62% of children from English-speaking backgrounds. Communities had between 0% and 15.3% of bilingual children who were not yet proficient in English (excluding Indigenous children and communities with less than 15 eligible children).

Measures

Australian Early Development Index. Children's health and development was measured using the AEDI, an Australian adaptation of the Canadian EDI (Janus & Offord, 2007). The AEDI is a relative population measure of early childhood development (see www.aedi.org.au). Teachers complete a checklist for each child based on their knowledge of the child. The AEDI checklist has five domains and 16 subdomains (see Table 1), which is measured by 105 items. Each item's response scale is either dichotomous (yes/no) or a Likert scale (e.g., very good/good, average, and poor/very poor). Domain scores range between 0 and 10 and are calculated as a mean score of all valid answers, where the teacher has completed at least 70% of the items. Higher scores indicate stronger competency in that domain.

The AEDI domain scores are highly skewed and do not respond to transformation. Hence, children's scores on the AEDI outcomes were categorized as "developmentally vulnerable" if they fell below the 10th percentile (Centre for Community Child Health & Telethon Institute for Child Health Research, 2009). This classification is age standardized, with the 10th percentile calculated separately for 4-, 5-, and 6-year-olds. This "developmentally vulnerable" category should be interpreted as the child demonstrating much lower than average ability in the competencies measured in that domain (Janus et al., 2007).

In the current analyses, we do not examine the relationship between language status and the communication skills and general knowledge domain, because the same teacher-rating of English proficiency used to define language status (English-proficient versus not yet proficient) was used in the calculation of the communication skills and general knowledge domain score. Hence, it would not be possible to meaningfully interpret any significant relationships between language status and this domain.

Language status. Two items were used to examine children's language background, including 1) "Does this child speak a language other than English at home?," and 2) "Is the child considered ESL (English as a second language)?," both rated as "yes" or "no." Children were categorized as bilingual if their teacher answered "yes" to either question. English proficiency was assessed according to the item "How would you rate this child's ability to use

Table 1. Summary and description of AEDI domains and sub-domains.

Domain	Sub-domain	Description
Physical health and wellbeing	Physical readiness for the school day	Whether the child is dressed appropriately for school activities, comes to school on time, and is not hungry or tired
	Physical independence	Whether the child is independent regarding their own needs, has an established hand preference and is well coordinated
	Gross and fine motor skills	Child's ability to physically tackle the school day, including gross and fine motor skills
Social competence	Overall social competence	Overall social development, including the ability to get along and play with other children, cooperativeness and self-confidence
	Responsibility and respect	Whether child shows respect for others and for property, follows rules, takes care of materials, accepts responsibility for actions, and shows self-control
	Approaches to learning	Whether child works neatly and independently, can solve problems, follow instructions and class routines, and easily adjust to changes
	Readiness to explore new things	Whether child is curious about the surrounding world, and eager to explore new books, toys or unfamiliar objects and games
Emotional maturity	Pro-social and helping behavior	Whether child shows helping behaviors including helping someone hurt, sick or upset, offering to help spontaneously, and inviting others to join in
	Anxious and fretful behavior	Whether child shows anxious behaviors, is happy and able to enjoy school, and is comfortable being left at school
	Aggressive behavior	Whether child shows aggressive behaviors as a means of solving a conflict and has temper tantrums
	Hyperactivity and inattention	Hyperactive behaviors and ability to concentrate, settle to chosen activities, wait their turn, and think before acting
Language and cognitive development	Basic literacy	Basic literacy skills including how to handle a book, ability to identify some letters and attach sounds to some letters, show awareness of rhyming words, know the writing directions, and ability to write their own name
	Interest in literacy/numeracy and memory	Interest in books and reading, math and numbers, and memory functioning
	Advanced literacy	Advanced literacy skills such as reading simple words or sentences, and writing simple words or sentences
	Basic numeracy	Basic numeracy skills such as counting to 20, recognizing shapes and numbers, comparing numbers, sorting and classifying, use of one-to-one correspondence, and understanding simple time concepts
Communication skills and general knowledge	Communication skills and general knowledge	Ability to communicate easily and effectively, participate in story-telling or imaginative play, articulate clearly and show adequate standard knowledge

language effectively in English?'' rated on a 3-point scale where 1 = ''poor/very poor,'' 2 = ''average,'' and 3 = ''very good/good;'' teachers could also indicate ''don't know.'' Those children rated as ''average'' or above were categorized as English-proficient, and those rated as ''poor/very poor'' were categorized as not yet proficient in English. ''Don't know'' responses were coded as missing.

Demographic characteristics and preschool attendance. Teachers recorded the child's gender as male or female. The socioeconomic status of the community in which the child lived was attributed using the Australian Bureau of Statistics Index of relative Socio-Economic Disadvantage (SEIFA) score for the child's home neighborhood, which was then categorized into quintiles. This measure takes into account variables such as income, educational attainment, and unemployment (Australian Bureau of Statistics, 2006b). SEIFA is an area-based measure as the AEDI does not record any specific variables relating to socioeconomic status at the child or family level.

To assess preschool attendance, teachers were asked ''In the year before entering school has this child been in non-parental care on a regular basis and/or attended any other educational program?,'' a question which was answered as ''yes,'' ''no,'' or ''don't know.'' Teachers who indicated ''yes'' were further asked whether this included attendance at a ''Day Care Centre (with a pre-school or kindergarten program)'' or a ''Preschool or kindergarten.'' Children were coded as having attended preschool if either of these options were selected. ''Don't know'' responses to the question stem were coded as missing values.

Procedure

During the period from May 1 until July 31 in 2009, school teachers across Australia completed the AEDI through a secure web based data entry system. Schools were recruited by state-based government officers and permission to approach schools was obtained from the relevant authorities for all school sectors (i.e., Government, Independent, and Catholic schools). Each school was provided with funding to enable participating teachers to undertake a training module as well as complete the checklists for all the children in their class. Data on participating children were collected following a parental passive consent process utilizing a combination of parent information letters (translated into a number of languages)

Table 2. Summary of children's characteristics overall and according to language background.

	Full sample		English-language background		Bilingual	
	Number	%	Proficient in English (%)	Not yet proficient in English (%)	Proficient in English (%)	Not yet proficient in English (%)
Gender						
Male	125,934	50.44	49.85	66.67	49.16	59.33
Female	123,729	49.56	50.15	33.33	50.84	40.67
Missing	*0*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Preschool						
Did not attend	44,455	17.81	16.03	26.97	23.68	34.13
Attended	184,913	74.07	77.18	62.74	67.07	52.60
Missing	*20,295*	*8.13*	*6.78*	*10.28*	*9.25*	*13.27*
Community socioeconomic status						
Quintile 1 (most disadvantaged)	53,574	21.46	18.36	29.31	32.38	40.81
Quintile 2	45,471	18.21	18.39	22.97	16.82	16.08
Quintile 3	43,185	17.30	17.58	18.00	16.24	14.78
Quintile 4	44,441	17.80	18.78	14.84	14.40	12.12
Quintile 5 (most advantaged)	61,310	24.56	26.40	14.38	19.06	13.35
Missing	*1,682*	*0.67*	*0.49*	*0.49*	*1.10*	*2.86*
Full sample						
Number	249,663	100%	196,984	6,495	37,657	6,361
%			78.90	2.60	15.08	2.55

Note. [a]These descriptive results show original data, exclusive of multiple imputation. $N = 2{,}166$ children (0.87%) had missing data on language category.

and school newsletters with both written and verbal opt-out processes. Ethical approval to conduct the data collection was granted by the Royal Children's Hospital Human Research Ethics Committee.

Data analysis

Stata V.12 was used to conduct the analyses. The average rate of missing data across the variables was very low (an average of 3.2% for the predictor variables and 1.07% for the outcome variables; see Table 2). The preschool attendance variable had the highest rate of missing data (8.1% missing), mostly due to "don't know" responses. We used multiple imputation to address the missing data in our analyses, as this method has been shown to produce relatively unbiased estimates even with very high rates of MAR data (e.g., Graham & Schafer, 1999). Multiple imputation draws on the available data to estimate a number of realistic values for each piece of missing data, and analyses are then based on pooled or combined estimates across the imputed data sets (Croy & Novins, 2005). We implemented multiple imputation by creating 20 imputed data sets using NORM in Stata and the *mi estimate* command to produce the pooled regression results. In each of the subsequent analyses, cases with imputed data on the outcome variable were deleted; that is, the Multiple Imputation then Deletion procedure (Von Hippel, 2007). We also ran the analyses using complete case data ($N = 226{,}066$) and the results were similar across these two approaches. Given the large sample size, a threshold of $p < .001$ was used as a minimum for reporting statistical significance.

The analyses are presented in two parts. First, we describe the sample characteristics of this cohort, including their language background and English proficiency. Next, we examine the relationship between language background and vulnerability on the AEDI outcomes using a series of logistic regressions. For each AEDI outcome, two models were estimated. The first examines the unadjusted associations between language background and the AEDI outcomes. The second multivariate model presents these associations adjusted for gender, preschool attendance, and socioeconomic status. Preliminary analyses were also run including the remoteness of the child's community, but as this had no significant effect on the results it was removed from the final analysis for parsimony.

In each of the following logistic regressions, we accounted for the nested nature of the data using robust standard errors, clustering on teacher. This procedure produces unbiased standard errors that allow the assumption of the independence of observations to be relaxed (Williams, 2000), and produces similar results to more complex methods such as multilevel modeling (Arceneaux & Nickerson, 2009). Given the focus on individual-level effects and the extremely large sample size (Greenland, 2000), the choice between methods to account for clustered data is unlikely to have a significant impact on these results.

Results

Language and demographic characteristics

As shown in Table 2, around a fifth of children in this cohort were bilingual (17.8%). Of these children, most were proficient in English when they entered school (85.6%, $n = 37{,}657$), although a substantial minority were rated as not yet proficient in English (14.5%, $n = 6{,}361$). For children from English-speaking backgrounds (82.2%), the majority were proficient in English (96.8%, $n = 196{,}984$) and only a small proportion were not yet proficient in their home language (3.2%, $n = 6{,}495$).

Although a higher proportion of bilingual children were considered not yet proficient in English, the absolute number of children with poor English skills was similar for children from English and non-English-speaking backgrounds. A higher proportion of bilingual students, particularly those who were not yet proficient in English, lived in the most disadvantaged areas of Australia and had not

attended preschool compared to children from English-speaking backgrounds that were competent in this language (see Table 2).

Language status and developmental outcomes

Table 3 presents the relative odds of being below the 10th percentile (developmentally vulnerable) on each AEDI domain associated with the predictors (language status, gender, preschool attendance, and socioeconomic status). Children from English-speaking backgrounds who were proficient in English formed the comparison group to which other language groups were compared.

The results revealed that emerging bilinguals had significantly higher odds of being developmentally vulnerable on the four AEDI domains. When covariates were taken into account in the adjusted models, this risk was slightly reduced but remained substantial at two ($OR = 2.88$, $p < .001$) to seven ($OR = 7.49$, $p < .001$) times the odds of being in the developmentally vulnerable range.

In contrast, English-proficient bilingual students had slightly lower odds of being in the developmentally vulnerable range on the emotional maturity ($OR = 0.84$, $p < .001$) and physical health and wellbeing ($OR = 0.85$, $p < .001$) domains. Looking across the adjusted and unadjusted models, these protective effects were not revealed until we included the covariates. While English-proficient bilingual children appeared to be at higher risk of vulnerability on the language and cognition domain in the unadjusted model, they did not differ from the reference group once the covariates were accounted for ($OR = 0.97$, $p > .001$).

Finally, the greatest odds of developmental vulnerability were observed for children from English-speaking backgrounds who were not yet proficient in their home language. On average, their relative odds of being in the developmentally vulnerable range were around double that of emerging bilinguals. This risk was most pronounced for the language and cognition domain, where these children had over 13 times the odds of being in the vulnerable range than their peers from English-speaking backgrounds who were proficient in this language ($OR = 13.67$, $p < .001$).

Hence, the results reveal a consistent association between lack of English proficiency and developmental vulnerability across four important domains of early childhood functioning, for both bilingual children and children from English-speaking backgrounds. In contrast, speaking a language other than English at home coupled with proficient English language skills was associated with lower odds of being in the vulnerable range on the emotional maturity and physical health domains.

Discussion

Population-level data from a census of children entering their first year of schooling in Australia in 2009 revealed that around one fifth of children were bilingual, and that most bilingual children in Australia also had adequate English language skills. The findings further revealed that children who were not yet proficient in English, whether from an English or non English-speaking background, had substantially higher odds of being in the ''vulnerable'' range on the AEDI domains, including physical health and wellbeing, social competence, emotional maturity, and language and cognitive development. In contrast, English-proficient bilingual children had equal or slightly lower odds of being in the vulnerable range across the domains, compared to their English-proficient monolingual peers. Although future research is needed to establish causation, these results suggest that proficiency in the language of instruction is a salient factor as children embark on their schooling careers.

Language status and early childhood outcomes

Consistent with emerging international evidence, entering school without fluent English language skills was associated with increased vulnerability in early developmental outcomes for Australian children, and these effects were not limited to the language and cognition domain, which might be most obvious in a classroom context, but also encompassed the other AEDI domains tapping social, emotional, and physical dimensions. Han (2010) suggests that these more global effects may be related to negative social feedback from peers and teachers, and that these children may also compare themselves unfavorably to their English-fluent peers. More broadly, it has been suggested that limited proficiency in the language of instruction may increase stress (e.g., through discrimination, or difficulties accessing curriculum) which in turn may contribute to poorer psychosocial and health outcomes (Dawson & Williams, 2008; Dowdy et al., 2011). In future research, it will be imperative to examine the longitudinal course of these early difficulties, firstly to establish causation, and secondly to explore whether emerging bilingual children show evidence of ''catch up,'' as in some research focusing on academic skills (e.g., Lesaux, Rupp, & Siegel, 2007), or whether initial differences widen over time.

Community socioeconomic disadvantage reduced but did not eliminate the differences in outcomes for these children when controlled for in the analyses. This is in contrast to previous Canadian research which found a more pronounced attenuating role of disadvantage for the EDI outcomes (Guhn et al., 2010). This may be due to their examination of the impact of neighborhood socioeconomic disadvantage at the community level, whereas we attributed community-level socioeconomic status to the individual (see limitations section for further discussion). Given that the total number of children with limited English proficiency was relatively small (only 2.5% of the total population), and these children were widely dispersed across the country with only a small number of concentrated areas, the policy implications of community-level effects may be limited and a national approach focused on addressing the needs of individual children within the context of their schools is likely to be necessary.

Although children from English-speaking backgrounds with poor English skills were not the focus of the current study, their developmental outcomes provide an interesting point of comparison. Their relative odds of being in the developmentally vulnerable range were around double that of emerging bilinguals. This heightened risk is consistent with a large body of previous research, which further suggests that these poor outcomes are likely to track forward over the life course (e.g., Johnson et al., 2010). There is a clear need for the identification of these children and the development of appropriate prevention and intervention approaches.

In contrast, English-proficient bilingual children had equal (social competence and language and cognition domains) or slightly lower (emotional maturity and physical health and wellbeing domains) odds of being in the developmentally vulnerable range on the four domains, compared to children from English-speaking backgrounds with adequate English language skills. The protective association identified for the emotional maturity and physical health and wellbeing domains is consistent with previous

Table 3. Unadjusted and adjusted logistic regression models predicting developmentally vulnerable status (< 10th percentile) on the AEDI domains ($N = 249{,}663$).

	Physical health and wellbeing			Social competence			Emotional maturity			Language and cognition		
	Dev vuln (%)	Unadjusted model	Adjusted model	Dev vuln (%)	Unadjusted model	Adjusted model	Dev vuln (%)	Unadjusted model	Adjusted model	Dev vuln (%)	Unadjusted model	Adjusted model
Language background												
English												
English-proficient	7.70	Ref.	Ref.	7.77	Ref.	Ref.	7.89	Ref.	Ref.	6.64	Ref.	Ref.
Not yet proficient	50.05	12.00 (11.35–12.69)**	10.25 (9.68–10.86)**	45.50	9.91 (9.37–10.49)**	8.33 (7.85–8.84)**	34.12	6.05 (5.71–6.41)**	4.95 (4.65–5.26)**	53.50	16.17 (15.26–17.13)**	13.67 (12.87–14.53)**
Bilingual												
English-proficient	7.41	0.96 (.91–1.02)	0.85 (.80–.90)**	7.87	1.02 (.96–1.08)	0.92 (.87–.98)	7.22	0.91 (.86–.96)	0.84 (.79–.88)**	7.51	1.15 (1.08–1.22)**	0.97 (.91–1.03)
Not yet proficient	29.18	4.94 (4.60–5.31)**	3.91 (3.63–4.20)**	35.01	6.40 (5.93–6.90)**	5.20 (4.81–5.62)**	23.34	3.56 (3.31–3.82)**	2.88 (2.67–3.10)**	41.21	9.85 (9.18–10.57)**	7.49 (6.97–8.06)**
Gender												
Female	6.81		Ref.	5.91		Ref.	4.19		Ref.	6.44		Ref.
Male	11.79		1.71 (1.66–1.76)**	12.98		2.26 (2.19–2.33)**	13.47		3.44 (3.33–3.57)**	11.29		1.72 (1.67–1.78)**
Community socioeconomic status												
Quintile 5 (most advantaged)	6.13		Ref.	6.18		Ref.	6.35		Ref.	4.73		Ref.
Quintile 4	7.81		1.23 (1.16–1.32)**	8.16		1.29 (1.20–1.38)**	7.52		1.16 (1.09–1.23)**	6.92		1.41 (1.31–1.52)**
Quintile 3	8.91		1.39 (1.30–1.48)**	9.38		1.47 (1.37–1.57)**	9.02		1.41 (1.33–1.50)**	8.47		1.69 (1.58–1.82)**
Quintile 2	10.26		1.58 (1.49–1.69)**	10.46		1.62 (1.51–1.74)**	9.59		1.48 (1.39–1.57)**	10.05		2.00 (1.86–2.15)**
Quintile 1 (most disadvantaged)	13.50		2.10 (1.98–2.24)**	13.36		2.03 (1.90–2.18)**	11.90		1.87 (1.76–1.98)**	14.22		2.82 (2.63–3.02)**
Preschool												
Did not attend	13.33		Ref.	13.21		Ref.	11.10		Ref.	14.88		Ref.
Attended	8.07		0.69 (.67–.72)**	8.26		0.73 (.70–.76)**	8.13		0.83 (.79–.86)**	6.77		0.55 (.53–.58)**

Note. Percentages based on original data, exclusive of multiple imputation.

Dev vuln = Percentage within the developmentally vulnerable range (< 10th percentile) on the AEDI domain.

** = $p < .001$.

research suggesting that bilingualism may hold benefits that extend across a wide range of outcomes (e.g., Blumenfeld & Marian, 2011; Brinkman et al., 2009; Halle et al., 2012). For both of these domains, the associations were subtle and not fully apparent until the covariates were accounted for, suggesting the importance of taking these characteristics, including socioeconomic disadvantage, into account. Although further research is needed to establish causation, the current findings would seem to support the conclusion that bilingualism is a strength that may subtly promote children's success in Australian schools, providing that children are also proficient in the language of instruction.

Strengths and limitations

The AEDI data represent a whole population of Australian children in their first year of schooling, and this breadth is a major strength of the study in that it avoids sampling bias and provides a sufficient sample size for reporting on minority subpopulations such as bilingual students, which is particularly important given that it has been difficult in the past to gain sufficiently large and representative samples of this group. As a cross-sectional "snapshot" of Australian children at school entry, however, it means that while the current study provides valuable insight into the associations between language background and early developmental outcomes at the population level, further longitudinal research is now needed to explore causal pathways underlying these relationships.

The teacher report methodology reflects both another major strength and a limitation of this data. On the one hand, it makes population-level coverage feasible and provides insight into difficulties as they are manifested in the context of the classroom. Nevertheless, the use of a single informant is always a limitation, and means that we cannot rule out whether teachers' ratings may be subtly influenced by factors such as ethnic stereotypes (Tenenbaum & Ruck, 2007), although previous comparisons between teacher report on the EDI and directly administered cognitive and language assessments suggests this is unlikely (Brinkman et al., 2007; Janus et al., 2001).

The AEDI gathers broad information from a population cohort, providing unique Australian data on the development of previously underreported subpopulations of children. In devising the checklist, some sacrifice was made in the types of measures and depth of issues that could be explored. In particular, the measure of English proficiency used for our analysis was restricted to a single teacher-reported item. However, similar items have been found to correlate with directly administered standardized measures, and are based on teachers' daily comparisons of children with their peers on a wide range of behaviors (McLeod & Harrison, 2009). Similarly, home language use was measured by two simple items, neither of which could ascertain which language was dominant for the child or the language usage patterns between the child and their parents and siblings, again limiting our capacity to comment on more nuanced aspects of home language use. We further acknowledge that the findings may not generalize beyond contexts in which English is the primary language of instruction.

The AEDI collects relatively little data about children's family context, and as a result, we have been able to control for neighborhood socioeconomic status only in the analyses. Although this area-level SES measure has been found to perform satisfactorily as a proxy of family SES in multivariate analyses (Lim & Gemici, 2011), it is possible that there is residual confounding that could have been accounted for if it were possible to take account of family sociodemographic characteristics. Further research is needed to explore the impact of family disadvantage as well as other family characteristics, such as the circumstances and timing of immigration. In addition, the analyses do not estimate the effects of community-level clustering. Although it was beyond the scope of the current article, further examination of the role of Australian communities in promoting positive outcomes for bilingual children is an important area for future research.

Implications

Although any implications drawn from these results are at this stage tentative, the current findings do suggest that further research to explore the current approaches to supporting bilingual students in Australia is warranted. Given the association observed between entering school as an English-proficient bilingual and stronger outcomes in some areas, further investigation of the potential benefits of supporting bilingual language development and the ways in which this could be achieved is needed. In contrast, our findings reveal that bilingual children who enter school not yet proficient in English are geographically dispersed, relatively few in number, and on average present with a higher level of vulnerability across multiple developmental domains. Given their small number, individualized responses at the school level are likely to continue to be an important component of interventions to promote better outcomes for this population. In addition, future research could explore whether school-based interventions that broaden beyond the generally narrow focus on supporting English language and academic skill development to also consider students' physical and psychosocial wellbeing, provide additional benefit for this group. Emerging evidence also suggests the potential for early intervention prior to school entry. For example, preschool attendance (including bilingual preschool environments), may provide increased opportunities to develop English language skills prior to school entry (Halle et al., 2012; Magnuson, Lahaie, & Waldfogel, 2006; O'Connor et al., in press).

Conclusions

In a population cohort of Australian children in their first year of schooling, bilingual children represented a substantial contingent (nearly a fifth). Entering school not yet proficient in the language of instruction was associated with higher levels of vulnerability across multiple important domains of early child development, including physical health and wellbeing, social competence, emotional maturity, and language and cognitive development. In contrast, beginning school with skills in a home language in addition to English proficiency was associated with better or no worse outcomes than for children from English-speaking backgrounds. Further longitudinal research is needed to examine whether the associations found in this study persist, dissipate, or increase over time. In addition, research is needed to examine the causal pathways underlying these associations and longer term outcomes for bilingual children in Australia.

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