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RUNNING HEAD: School outcomes of children with communication impairment

A nationally representative study of the association between communication impairment at 4-  
5 years and children's life activities at 7-9 years

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## **Abstract**

**Purpose:** To examine the longitudinal association between communication impairment (primary or secondary diagnosis) and children's Activities and Participation (*International Classification of Functioning, Disability and Health – Children and Youth*, ICF-CY; WHO, 2007).

**Method:** Participants were 4,329 children in the *Longitudinal Study of Australian Children* (LSAC): 1,041 (24.0%) were identified with communication impairment at 4-5 years and 3,288 (76.0%) were not identified. At age 7-9 years, Activities and Participation outcomes across five ICF-CY domains were provided by teachers (*Academic Rating Scales*, *Approaches to Learning*, *Strengths and Difficulties Questionnaire* (SDQ), *Student-Teacher Relationship Scale*), parents (*School-Age Inventory of Temperament*, SDQ), children (*Marsh Self-Description Questionnaire*, *School Liking*, *Bullying*), and child assessment (*Peabody Picture Vocabulary Test–III*).

**Results:** Children identified with communication impairment at 4-5 years performed significantly less well at 7-9 years on all outcomes. Parents and teachers reported slower progression in reading, writing, and overall school achievement than peers. Children reported more bullying, poorer peer relationships, and less enjoyment of school than peers. ANCOVA tests confirmed the significant associations between communication impairment and outcomes, over and above the effects of sex, age, Indigenous status, and socioeconomic status.

**Conclusion:** Considering the breadth and longevity of Activities and Participation outcomes reveals the potential extent and severity of communication impairment, and directs future research and practice.

Key words: outcomes, ICF-CY, childhood, speech, language, communication impairment

## **Introduction**

Communication impairment (including speech sound disorders and/or language impairment) is prevalent in preschool children (e.g., Beitchman, Nair, Clegg & Patel, 1986; McLeod & Harrison, 2009; Tomblin, Records, Buckwalter, Zhang, Smith, & O'Brien, 1997) and continues to be prevalent throughout the school years (Harrison, McLeod, Berthelsen, & Walker, 2009; Law, Boyle, Harris, Harkness, & Nye, 2000). Indeed, data from the National Centre for Education Statistics (NCES, 2009) revealed for US children enrolled in schools “speech or language impairments” were the second most common disability, after specific learning disability. Similar findings were reported by McLeod and McKinnon (2007) for Australian primary and secondary school students: “communication disorder” was the second most prevalent identified area of learning need, after specific learning needs, and was more prevalent than behavioral/emotional difficulties, physical/medical disabilities, intellectual disabilities, hearing or vision impairments. Clearly these reports underline the need for speech and language intervention in school. However, to provide appropriate and holistic intervention programs requires an understanding of the breadth and extent to which communication impairment may limit children’s life activities, including an understanding of the activities that may be most limited.

### **The ICF-CY**

In the current paper, the *International Classification of Functioning, Disability and Health – Children and Youth version* (ICF-CY; World Health Organization, WHO, 2007) has been used as a framework to enable the association between communication impairment and the life activities of school-aged children to be examined in a holistic manner (McCormack, McLeod, McAllister, & Harrison, 2009).

According to the ICF-CY (WHO, 2007), health and wellbeing result from the

interaction between biology (Body Structures and Functions<sup>1</sup>) and everyday life activities (Activities and Participation), that are influenced by Personal and Environmental Factors. Impairment may be diagnosed when there is a problem with a Body Structure or Function.

Communication (specifically, speech and/or language) impairment results from problems with communication functions (e.g., articulation, producing/receiving messages). For some children, communication impairment presents co-morbidly with another diagnosis such as Down syndrome, or autism spectrum disorder. For other children, communication impairment is a secondary symptom of a structural or functional impairment such as profound hearing loss or neurological damage. However, for many children with communication impairment, their difficulties occur independently of another diagnosis, and present clinically as diagnoses such as specific language impairment, or speech sound disorders of unknown origin (Shriberg, 2004; Shriberg & Kwiatkowski, 1988). For all children with communication impairment, regardless of whether the cause or contributing factors are known, examining the way in which the impairment limits everyday life activities enables the extent and severity of the impairment to be determined, and goals for intervention to be identified.

The ICF-CY provides a comprehensive list of the tasks and actions of everyday life, that is divided into nine domains: Learning and applying knowledge, General tasks and demands, Communication, Mobility, Self care, Domestic life, Interpersonal interactions and relationships, Major life areas, and Community, social and civic life. The nine domains are described by a total of 132<sup>2</sup> specific items (see for example, Table 1, columns 1 and 2) that form the Activities and Participation component of the ICF-CY. A problem performing any of the activities listed in these domains is termed an “Activity limitation” or “Participation

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<sup>1</sup> Capitalization has been used to be consistent with usage in the ICF-CY and to differentiate between everyday usage of these terms.

<sup>2</sup> There are 132 items at two-level classification in the ICF-CY, which is the level used in the present study.

restriction.” According to the ICF-CY (2007), such limitations are recognised when there is discordance between the performance of an individual with an impairment (such as communication impairment) compared to an individual without the impairment (expected performance). Previous research with small and/or clinical samples has demonstrated the association between communication impairment and Activity limitations across multiple domains (McCormack et al., 2009, 2010; Thomas-Stonell et al., 2009; Teverovsky et al., 2008).

In the following sections, research is reviewed for five of the nine ICF-CY Activities and Participation domains (Learning and applying knowledge, General tasks and demands, Communication, Interpersonal interactions and relationships, Major life areas). The association between communication impairment and Activities and Participation within the other four domains (Mobility, Domestic life, Self care, Community, social and civic life) was not included due to the content of those domains being less appropriate to the school-age group and communication focus of the current study.

### **Learning and applying knowledge.**

Learning and applying knowledge covers the actions necessary for acquiring new information and skills or the actions of putting those skills into practice, including attention, early literacy, and calculation skills. Children with communication impairment have been found to have greater difficulty with literacy than their typically developing peers, including difficulties with phonological awareness skills (e.g., Gernand & Moran, 2007), reading (e.g., Harrison et al., 2009; Nathan, Stackhouse, Goulandris & Snowling, 2004a; Tomblin et al., 2000), and spelling (e.g., Nathan et al., 2004a), particularly if the communication impairment is still present when formal literacy instruction commences (Nathan et al., 2004b; Young et al., 2002). School-aged children with communication impairment have also been found to have difficulty with mathematical skills (Fazio, 1996, 1999; Harrison et al., 2009; Nathan,

Stackhouse, Goulandris & Snowling, 2004b), attention (Hauner, Shriberg, Kwiatkowski, & Allen, 2005; McGrath et al., 2008) and approaches to learning (Harrison et al., 2009).

### **General tasks and demands.**

General tasks and demands cover the actions necessary for completing everyday tasks and for dealing with problems when task performance breaks down. Children with communication impairment often experience communication breakdowns in their interactions with others (Yont, Hewitt, & Miccio, 2002), and may have difficulty negotiating and resolving issues due to their impairment. For instance, families have reported young children with communication impairment become frustrated when communication breakdowns occur and may withdraw from communication interactions, or become angry/upset when their attempts to communicate are not understood (McCormack et al., 2010; Thomas-Stonell, Oddson, Robertson, & Rosenbaum, 2009). Additionally, researchers have reported that children with identified communication impairment commonly have difficulty with managing behavior (Teverovsky, Bickel & Feldman, 2009: childhood apraxia of speech), and show more problem behaviors (Lindsay & Dockrell, 2000: specific speech and language difficulties). However, other research suggests that associations between communication impairment and behavior in the school classroom may not be direct (Tomblin et al., 2000: language impairment) or straightforward (Redmond & Rice, 1998: specific language impairment). In particular, these studies draw attention to the possible influence of context (i.e., classroom requirements and/or teacher expectations for academic performance) on behavior problems.

### **Communication.**

Communication covers the skills necessary for producing and comprehending verbal and non-verbal messages, and for using communication strategies or devices. Communication impairment may persist into the school years and may be associated with a range of

problems producing and understanding language, including difficulties with speech sound production (Roulstone, Miller, Wren, & Peters, 2009), syntactic development (Nippold, Mansfield, Billow & Tomblin, 2009), and speech processing (Nathan, Stackhouse, & Goulandris, 1998). Communication impairment may affect conversation and discussion (Teverovsky et al., 2009), sometimes due to lack of coherence and context (Nathan, 2002).

### **Interpersonal interactions and relationships.**

The area of interpersonal interactions and relationships includes the actions of engaging with peers, teachers, family members, strangers, or others. There is a vast body of literature investigating the way in which speech and/or language difficulties influence children's behavior and socialization. This research has shown that individuals identified with communication impairment in early childhood may experience difficulty with social interactions with peers at school (Fujiki, Brinton, Isaacson & Summers, 2001; Glogowska, Roulstone, Peters, & Enderby, 2006; Lindsay & Dockrell, 2000), and report poorer friendship quality than children without communication impairment (Durkin & Conti-Ramsden, 2007; Fujiki, Brinton, & Todd, 1996). In addition, they may be perceived more negatively than typically developing children by peers at school (e.g., Crowe-Hall, 1991; Silverman & Paulus, 1989) and may experience more bullying (Conti-Ramsden & Botting, 2004; Knox & Conti-Ramsden, 2003; Savage, 2005); however, some researchers have suggested the degree of bullying is no greater than for typically developing children (Lindsay, Dockrell, & Mackie, 2008). Communication impairment in early childhood has also been reported to be associated with changes in the type and/or quality of relationships between children and parents (Perry-Carson, Carson, Klee, & Jackman-Brown, 2007), children and siblings (Barr, McLeod, & Daniel, 2008) and children and teachers (Marshall, Ralph & Palmer, 2002; Overby, Carrell & Bernthal, 2007).

### **Major life areas.**

Major life areas covers the activities required for education and/or employment. For school-aged children, education forms a major part of their everyday life, and communication forms a major part of their education. Speaking and listening, reading and writing, are the main modes through which information at school is imparted and skills are taught. Not surprisingly, therefore, individuals with a history of childhood communication impairment require more remedial assistance at school and may complete fewer years of formal education than their peers (Felsenfeld et al., 1994). Robertson, Harding and Morrison (1998) found that students with communication impairment were at risk for school drop-out as they reported feeling less connected to school. Other researchers have suggested students might choose vocational/employment training instead of remaining in the mainstream school system (Snowling, Adams, Bishop & Stothard, 2001) and may undertake less skilled employment than typically developing peers (Clegg, Hollis, Mawhood, & Rutter, 2005; Felsenfeld et al., 1994).

### **Methods of Studying Communication Impairment**

Two types of research studies have been used to examine the association between communication impairment and life activities: 1) those incorporating clinical samples (e.g., Hauner, Shriberg, Kwiatkowski & Allen, 2005; Nathan, 2002; Silverman & Paulus, 1989; Yont, Hewitt & Miccio, 2002); and 2) those incorporating large, population-based samples. In the appendix, a summary is provided of studies that have utilized population samples of children and considered speech and language development as part of the research design. Studies were excluded when the population had a pre-existing condition related to communication impairment (e.g., hearing impairment, or dyslexia).

Studies drawing on clinical samples typically include children with communication impairment as a primary diagnosis, and exclude children whose communication impairment is related to other structural or functional impairments. Thus, they provide evidence of the

links between communication impairment and limitations to life activities that controls for other potentially confounding variables. However, generalization from clinical samples to a wider population of school-age children is limited by factors including the small sample size.

In contrast, studies drawing on non-clinical, nationally representative samples (community and population studies) identify communication impairment in very large samples (as shown in column 4 of the appendix), that enable generalization of results to the larger population. Furthermore, many of these studies incorporate longitudinal data collection which provides a means of examining the factors associated with developing communication impairment (e.g., Harrison & McLeod, 2009; Reilly et al., 2009), the natural history of communication impairment (e.g., Johnson et al., 2010; Law, Tomblin, & Zhang, 2008), and the direct and indirect associations between communication impairment and difficulties with life activities over time (e.g., Tomblin, Zhang, Buckwalter, & Catts, 2000). However, when the outcomes measured in these studies are considered in terms of ICF-CY Activities and Participation domains, a focus on literacy or ongoing communication concerns is indicated (column 6). To date, no population studies have examined the associations between communication impairment and a comprehensive, broad set of life activities in school-aged children.

### **Context and Aims of the Current Study**

This study is the fourth in a series of studies that have examined speech and language development of children within the Longitudinal Study of Australian Children (LSAC; Australian Institute of Family Studies, AIFS, 2009) Kindergarten cohort, recruited at age 4-5 years (Harrison & McLeod, 2010; Harrison et al., 2009; McLeod & Harrison, 2009). The LSAC data set documents the development of a large, nationally representative sample of Australian children and the contexts in which they are raised. Communication development is one of the many areas for which data are available for analysis, and these data have been

accessed by McLeod, Harrison and colleagues to investigate the following objectives: First, McLeod and Harrison (2009) reported the prevalence of: (1) expressive speech and language impairment, based on parental concern (25.2%) and teacher concern (22.3%), and (2) receptive language impairment based on parental concern (9.5%), teacher concern (16.9%), and direct assessment (14.7%). Next, Harrison and McLeod (2010) identified risk factors (being male, having ongoing hearing problems, and a more reactive temperament), protective factors (having a more persistent and sociable temperament, and higher levels of maternal wellbeing), and risk/protective factors (having an older sibling, parents speaking a language other than English (LOTE), and parental support for children's learning at home) for speech and language impairment. Third, Harrison et al. (2009) used longitudinal data to examine the academic progress (literacy and numeracy tasks, and approach to learning) of children identified with speech and language impairment at age 4-5 years when they were 6-7 years of age.

The present study extends this work in three ways, by: (1) examining a further wave of longitudinal data, gathered four years after recruitment, at age 7-9 years; (2) examining the associations between communication impairment and a broad range of life activities (hereafter referred to as Activity and Participation outcomes) including, but also extending beyond, a focus on language and learning outcomes; and (3) drawing on multiple perspectives – reports from children, parents, and teachers, as well as direct assessment – to provide a more holistic examination of Activities and Participation outcomes. The specific aim of this paper was to enable a better understanding of the dimensions of childhood communication impairment by investigating the longitudinal associations between communication (speech and language) impairment at age 4-5 years and five domains of Activities and Participation as defined by the ICF-CY (WHO, 2007), at age 7-9 years. A further aim was to examine the relative strength of these associations after accounting for the

contribution of important child and family demographic characteristics to the outcomes.

## **Method**

### **Participants**

Participants were a nationally representative sample of 4,329 children (51.1% boys, 48.9% girls) recruited into the Kindergarten cohort in the Longitudinal Study of Australian Children (LSAC; AIFS, 2009) at age 4-5 years (Wave 1). At the time of data collection for the present study (Wave 3), children had a mean age of 8.26 years ( $SD = 0.44$ ). Most were aged 8 years or under (73.8%); the rest were 9 years or over (26.2%).

At recruitment (Wave 1), the LSAC Kindergarten cohort ( $n = 4,983$ ) comprised children aged between 4 years; 3 months to 5 years; 7 months (mean = 4.90 years). The children were recruited from every state and territory in Australia, and sample characteristics (e.g., sex, cultural background, and socio-economic status) were broadly representative of the population (Gray & Smart, 2008) as ascertained by the Australian Bureau of Statistics Census data from 2001. Family cultural background was assessed by parental home language, and identification as Aboriginal and/or Torres Strait Islander. Consistent with the Australian national heritage, there were more than 37 languages spoken by parents; however, the majority (86.4%) were English-only speakers. There were 124 (2.8%) children identified as Aboriginal and/or Torres Strait Islander (Indigenous status). In the present study children were included when they had parent-reported information regarding their communication skills in Wave 1, as well as parent, teacher and/or child data at Wave 3. The maximum sample size was 4,329, as 654 of the original Kindergarten cohort did not participate in Wave 3.

### **Procedure**

Wave 3 of LSAC was conducted between April and December, 2008. Parent and child data were collected during home interviews lasting 1-2 hours and via computer-assisted

self-administered questionnaires designed for use in LSAC. Structured interviews were conducted by trained interviewers to obtain information from the primary parent about their child (e.g., health, social/cognitive/behavioral development) and family (e.g., socio-demographic information). Parent questionnaires covered additional aspects of the child's personality and behavior as well as the family's functioning and support. The interviewers then administered the Adapted PPVT-III (Rothman, 2003) and assisted the child to complete the self-report questionnaire. With the consent of parents, a questionnaire was mailed to the child's teacher data for completion and return. Full information about the interviews and content is available elsewhere (AIFS, 2009).

## **Measures**

### **Indicator of communication impairment.**

At age 4-5 years, the identification of children with communication impairment was based on parent responses (no, yes, a little) at Wave 1 to the following interview question: "Do you have concerns about how [child] talks and makes speech sounds?" The interview question was taken from the *Parents' Evaluation of Developmental Status* (PEDS; Glascoe, 2000), a screener for identifying developmental delays in young children. Those children whose parents responded "yes" or "a little" to the question were identified as having communication impairment (McLeod & Harrison, 2009). That is, the participants in the current study were 1,041(24.0%) children identified as having expressive speech or language impairment at 4-5 years, and 3,288 (76.0%) children not identified.

At the time of recruitment (4-5 years), a small proportion of children in the group identified by parents with communication impairment were also identified by parents with comorbid conditions such as hearing problems (4.8%), learning difficulties (5.7%), and/or vision problems (1.6%). In order to be consistent with Harrison et al. (2009), the sample group was not further distinguished into groups with co-morbid diagnoses.

At Wave 3, teachers reported that 604 children (16.9%) had learning difficulties (including problems with reading/mathematics, communication impairment, Autism spectrum disorder, emotional/behavioral problems, intellectual disability, limited English, and hearing impairment) and were receiving additional services at school; however, further information about the type of services received was not gathered. Of the 604 children, 268 were in the group identified with communication impairment at 4-5 years (that is, 30.9% of children in that group), and 336 were in the group with no communication concerns identified (12.4%). It is important to note that in Australia, the provision of services for school-aged children with communication impairment is variable. SLP services are not mandated, and access and provision of services is inconsistent across states and localities (McLeod, Press, & Phelan, 2010). Therefore, receipt of services (or lack of) does not reflect current communication impairment status.

#### **Outcome measures (Activities and Participation items).**

Table 1 provides an overview of the five ICF-CY domains, and the measures of child Activities and Participation in those domains selected from the LSAC database because they aligned with the previously reviewed literature. Where an LSAC scale or item was relevant to more than one ICF-CY domain, it was only included under the domain considered the best match.

Insert table 1 here

#### ***Learning and applying knowledge.***

Three measures were selected to describe the domain of Learning and applying knowledge. All three were based on teacher report: The *Academic Rating Scale* (ARS); Language and Literacy Scale and Mathematical Thinking Scale (National Centre for Educational Statistics (NCES), 2002), and the *Approach to Learning Scale* (ALS; Gresham & Elliott, 1990). The ARS Language and Literacy Scale had 9 items (e.g., conveys ideas when

speaking, reads fluently), that rate a child's performance in oral and written language according to a 5-point scale (not yet=1, beginning=2, in progress=3, intermediate=4, and proficient=5). The ARS Mathematical Thinking Scale used the same scale to rate a child's performance on 9 items (e.g., creates and extends patterns, recognizes shape properties and relationships). The ALS had 6 items (e.g., works independently, persists in completing tasks,) that were taken from the Social Skills Rating Scale (Gresham & Elliott, 1990). Teachers rate a child's performance on a 4-point scale (never=1 to very often=4). The internal reliability (Cronbach's alpha) of each of the Scales was high: for the ARS Language and Literacy Scale,  $\alpha = 0.96$ ; for the ARS Mathematical Thinking Scale,  $\alpha = 0.94$ ; and for the ALS,  $\alpha = 0.91$ . The correlation between the scores on the two Academic Rating Scales was high ( $r = 0.81$ ).

#### ***General tasks and demands.***

Two measures were selected for General tasks and demands: the emotional symptoms sub-scale from the *Strengths and Difficulties Questionnaire* (SDQ; Goodman, 1997), and the persistence sub-scale from the *School-Age Temperament Inventory* (SATI; McClowry, 1995). Parents and teachers completed the SDQ in its entirety; however, only their ratings for the emotional symptoms subscale were selected to examine this ICF-CY domain. The emotional symptoms scale had 5 items (e.g., often complains of headaches/stomach-aches or sickness, often seems worried), that were rated by both teachers and parents on a 3-point scale (not true=1, sometimes true=2, certainly true=3). The internal reliability (Cronbach's alpha) of the emotional symptoms sub-scale was moderate for teachers ( $\alpha = 0.75$ ), but moderate-low for parents ( $\alpha = 0.66$ ). The SATI persistence sub-scale had four items (e.g., goes back to task after interruption) that were rated by parents on a 5-point scale (never=1 to always=5). The internal reliability (Cronbach's alpha) of the persistence scale was high ( $\alpha = 0.84$ ).

#### ***Communication.***

An adapted, shortened version of the *Peabody Picture Vocabulary Test – Third Edition*

(PPVT-III; Dunn & Dunn, 1997) was used to assess later Communication (specifically, later receptive language skills). The Adapted PPVT-III was developed especially for the LSAC study (Rothman, 2003), following Rasch modeling of the results of testing the full PPVT-III with a group of children (n=215, aged 3;7 to 5;6). The best 40 items were determined for use in a shortened version, that consisted of a core set of 20 items, with basal and ceiling sets (each with an additional 10 items). For the LSAC sample, Rasch estimates were determined for each item. Estimates were transformed to generate a scale with a mean of 64 and an SD of 8 (Rothman, 2003). Scaled scores for the Adapted PPVT-III were used in all analyses. Further details on scaling of the Adapted PPVT-III are available on the LSAC Web site (AIFS, 2009).

#### ***Interpersonal interactions and relationships.***

A range of measures described Interpersonal interactions and relationships, including data collected solely from children, solely from teachers, and from teachers and parents. The child self-report measures were: the *Marsh Self-Description Questionnaire* (MSDQ; Marsh, 1992) and a Bullying Scale adapted from the *Perceptions of Peer Support Scale* (Kochenderfer & Ladd, 1997; Ladd, Kochenderfer, & Coleman, 1996). The MSDQ was comprised of 8 items (e.g., I make friends easily), which children rated according to a 5-point scale (false=1, mostly false=2, sometimes false/sometimes true=3, mostly true=4, true=5). Internal reliability (Cronbach's alpha) of the MSDQ was high:  $\alpha = 0.84$ . The Bullying Scale was comprised of four questions about the frequency of bullying incidents (peer victimization) that they had experienced (e.g., how often do kids pick on you? how often do kids say mean things to you?). Children rated these items on a 5-point scale (never=1 to always=5). Internal reliability (Cronbach's alpha) was moderate-high:  $\alpha = 0.79$ .

The teacher-reported measures were two subscales of the *Student-Teacher Relationship Scale* (STRS; Pianta, 2001). The conflict sub-scale comprised 7 items (e.g.,

struggle to get along). The closeness sub-scale comprised 8 items (e.g., shares affectionate relationship, easy to be in tune with feelings). Teachers rated these items on a 5-point scale (definitely does not apply=1 to definitely applies=5). Internal reliability (Cronbach's alpha) of each of the scales was high: conflict  $\alpha = 0.90$ ; closeness  $\alpha = 0.83$ .

Two sub-scales (prosocial and peer relationship problems) from the parent- and teacher-completed SDQ measures were selected for this ICF-CY domain. The prosocial sub-scale had 5 items (e.g., considerate of other people's feelings, shares readily with other children), as did the peer relationship problems sub-scale (e.g., rather solitary, tends to play alone). Teachers and parents rated these items on a 3-point scale (not true=1, somewhat true=2, certainly true=3). The internal reliability (Cronbach's alpha) of the prosocial sub-scale was moderate-high for parents ( $\alpha = 0.72$ ) and teachers ( $\alpha = 0.83$ ). The internal reliability of the peer relationship problems sub-scale was low-moderate for both parents ( $\alpha = 0.61$ ) and teachers ( $\alpha = 0.69$ ). Although weaker than the other scales, the peer relationship problems sub-scale was included as it provided a useful balance to the measures of relationships and interactions.

### ***Major life areas.***

Measures of Major life areas (i.e. education) were provided by teachers, parents, and the children themselves. Teachers rated the child's school progress in reading, mathematics, and overall school achievement in comparison to other children in the class, on a 5-point scale (far below average=1 to far above average=5). Parents were also requested to rate their child's progress in these areas relative to their peers (much worse=1 to much better=5). Teachers' and parents' ratings for all three items were highly intercorrelated and were combined to form a single measure of children's achievement and progress at school. The same process was undertaken for parents' ratings. Internal reliability (Cronbach's alpha) of the two new measures was very high for teachers ( $\alpha = 0.93$ ) and moderately high for parents

( $\alpha = 0.81$ ).

Children were asked five questions from the *School Sentiment Inventory* (Ladd & Price, 1987) relating to their enjoyment of school (e.g., is school fun? are you happy about going to school?), using a 3-point scale (yes=1, sometimes=2, no=3). The scale had moderate-high internal reliability:  $\alpha = 0.84$ . Note that lower scores show greater enjoyment of school.

### **Covariates**

Child characteristics (sex, age, Indigenous status) and family socio-economic status were selected as controls in tests of the association between communication impairment status and Activities and Participation outcomes. Following the process adopted by LSAC, a measure of family socio-economic position (SEP; Blakemore, Gibbings, Strazdins, 2006) was derived from three aspects of socio-economic information (parental education, parent income and occupational prestige) and coded as quartiles (low: 0-25%, low-medium: 26-50%, medium-high: 51-75%, high: 76-100%).

### **Data Analysis**

The selected data were analysed in two ways. First, for each of the 18 outcome variables, the numbers of children who were performing within the normal range (WNL: i.e., within 1.0 SD of the mean) or outside the normal range (1.0 SD, 1.5 SD, and 2.0 SD below/above the mean) were identified and compared using chi-square tests. Second, the strength of the association between communication impairment at 4-5 years and each of the Activities and Participation outcomes was tested using analysis of co-variance (ANCOVA), with child sex, age, Indigenous status, and family Socio-Economic Position (SEP) included in the analyses. These tests determined the relative effects of communication impairment and the four covariates on each outcome variable.

## **Results**

Results for 18 Activities and Participation outcomes (corresponding to five ICF-CY Activities and Participation domains) for children identified by parents as having communication impairment at 4-5 years (CI group) and children not identified (Non-CI group) are presented in Table 2. It shows the number and percentage of children in each group who performed within the normal range and outside the normal range. A significant chi-square statistic indicates that group membership (CI vs. non-CI) has a significant effect on the distribution. Results of ANOVA and ANCOVA tests are presented in Table 3 that gives the mean scores, 95% confidence intervals, and adjusted means for the CI and Non-CI groups for each outcome variable. For all but two of the rating scales, the range of scores provided by both the CI and non-CI groups covered the full range of possible scores. The two exceptions were: the Adapted *PPVT-III*, and the *STRS* (Closeness) scale. However, significant *F*-values and the non-overlap of the 95% Confidence Intervals indicate differences between group means. The *eta*<sup>2</sup> statistics report the unique effects of CI status and each of the co-variables on the outcome variable. The following sections summarise the results for each Activities and Participation domain.

Insert Table 2 and Table 3 here

### **Learning and applying knowledge.**

Three teacher-completed measures described children's performance in this domain. Results presented in Table 2 show that for all three outcomes, a greater proportion of children in the CI group scored outside the normal range (represented by the total for Columns 3-5): 30.6% compared to 12.6% for the Non-CI group in ratings of Language and Literacy ability, 28.4% compared to 14.6% for Mathematical Thinking, and 30.7% compared to 18.6% for Approaches to Learning that is a rating of attentiveness and eagerness to learn in class. The largest difference between the groups was the proportion of children who scored 2.0 SD or more below the mean (Column 5). This was particularly evident on the ARS scales: 11.0%

compared to 2.9% for the ARS Language and Literacy scale, and 9.2% compared to 3.0% for the ARS Mathematical Thinking Scale.

Results in Table 3 (Columns 2 and 3) showed that children in the CI group were rated lower (by 0.3-0.4 of a point for unadjusted means and 0.2 - 0.3 for adjusted means) than their non-identified peers. Effect sizes for communication impairment status (Column 7) were significant:  $\eta^2 = .035$ ,  $.023$  and  $.015$ , for Language and Literacy, Mathematical Thinking, and Approaches to Learning, respectively. The results indicate a small effect (Cohen, 1988); however, the figures are larger than or comparable to the effects of the co-variates – child sex, age, Indigenous status, and family SEP, that ranged from  $\eta^2 = .000$  (*ns*) to  $.061$  ( $p < .001$ ).

#### **General tasks and demands.**

Parent and teacher rated emotional symptoms on the SDQ, and parent rated persistence on the SATI were the measures selected to describe this domain. Values presented in Table 2 showed that for all three outcomes, a significantly higher proportion of children in the CI group scored outside the normal range than children in the Non-CI group: 16.7% compared to 12.5% on the parent-rated SDQ, 15.5% compared to 10.6% on the teacher-rated SDQ, and 25.8% compared to 18.0% on the SATI persistence scale. The pattern of results was similar for parent and teacher ratings suggesting that the association between early childhood communication impairment and difficulty handling stress and emotional concerns was similarly evident both at home and at school. Table 3 results showed that mean scores were significantly higher for emotional symptoms and lower for persistence in the CI group, indicating that these children had more difficulty with managing demands or stress than their peers in the Non-CI group. Effect sizes for communication impairment status were very small:  $\eta^2 = .004$ ,  $.007$ , and  $.011$ , but tended to be larger than or comparable to the effects of child sex, age, Indigenous status, and family SEP.

### **Communication.**

Children's receptive vocabulary scores on the adapted PPVT-III provided a measure of communication at age 7-9 years. Figures in Table 2 showed that almost twice the proportion of children in the CI group (19.1%) obtained scores outside the normal range on the PPVT-III as children in the Non-CI group (10.6%). Comparison of the distributions of children who scored outside the mean showed a higher proportion of children in the CI group across all cut-off points (Columns 3-5), with the greatest difference being in the group who scored 2.0 SD or more below the mean (2.6% of the CI group vs. 0.8% of the Non-CI group). Results in Table 3 showed a clear separation in mean scores between the CI and Non-CI groups. Communication impairment status had an effect size of 0.017, that was greater than the effects of child sex, age and Indigenous status, but smaller than the effect of family SEP ( $\eta^2 = 0.056$ ).

### **Interpersonal interactions and relationships.**

Eight measures, representing child, teacher, and parent perspectives, were available to describe this domain. For seven of the eight outcomes, a significantly higher proportion of children in the CI group scored outside the normal range than children in the Non-CI group; however, figures suggested that the differences between groups were less marked than in the Learning and applying knowledge domain.

A greater proportion of children in the CI group (20.1%) than their peers (13.9%) reported a degree of bullying at 7-9 years that was outside normal limits (see Table 2). Differences were also noted for children's ratings of self-esteem (MSDQ): 19.2% of the CI group scored below the normal range compared to 16.2% of the Non-CI group. For each of the outcomes, mean scores and the non-overlap of the 95% Confidence Intervals confirmed a significant difference between children in the CI and Non-CI groups (Table 3). The effect sizes for communication impairment status for child-reported bullying and self-esteem were

very small ( $\eta^2 = .003$  and  $.001$ ), but were similar in magnitude to the effects of child and family variables ( $\eta^2$  ranged from  $.000$  to  $.009$ ).

Teacher-student relationships were poorer for children in the CI group, but only for teacher-rated conflict (16.4% of the CI group scored below the normal range compared to 11.4% of the Non-CI group). Effect sizes for early communication impairment were very small ( $\eta^2 = .001$ ) for teacher-reported conflict and closeness, relative to the effects of child sex ( $\eta^2 = .033$ ) and family SEP ( $\eta^2 = .014$ ).

For prosocial behavior, more children in the CI group (parent rated: 23.9%; teacher-rated: 25.5%) scored outside the normal range at 7-9 years than children in the Non-CI group (parent rated: 15.3%; teacher-rated: 19.6%). Similar findings were reported for peer relationship problems. A higher proportion of the CI group (parent rated: 18.7%; teacher-rated: 16.0%) received scores outside the normal range than the Non-CI group (parent rated: 10.2%; teacher-rated: 11.2%). The pattern of results did not suggest that teachers gave children with communication impairment poorer ratings for social problems than did their parents, as has been reported by Redmond and Rice (1998). In contrast, on the four parent and teacher reported subscales of the SDQ, effect sizes for parents' ratings of prosocial and peer problems ( $\eta^2 = .007$  and  $.012$ , respectively) were somewhat larger than effect sizes for teacher ratings ( $\eta^2 = .003$  and  $.007$ ), suggesting that parents may be harsher, or perhaps more accurate, judges of their children's difficulties with peers.

### **Major life areas.**

Education as a Major life area for 7-9 year olds was described by parent- and teacher-rated school progress and child attitudes to school. As noted for ratings of achievement in the Learning and applying knowledge domain, a significantly higher proportion of children in the CI group fell below the mean on reports of school progress and achievement in comparison to their peers in the Non-CI group: parent-rated: 21.2% vs. 10.4%; teacher-rated: 28.5% vs.

13.0% (Table 2). Comparison of the distributions of children who scored outside the normal range revealed a substantially higher proportion of children in the CI group whose scores were 2 SD or more outside the mean: parent-rated: 9.3% vs. 2.4; teacher-rated: 7.7% vs. 1.7%. Parents' and teachers' ratings of children's progress in school education were noticeably poorer for the CI group compared to the Non-CI group, as shown in Table 3 by a difference in mean scores: 0.32 and 0.35 (on a 5-point scale) respectively. Effect sizes for communication impairment status were similar for parents and teachers, ( $\eta^2 = .023$  and  $.029$ , respectively), and relatively large when compared with the effects of child and family co-variables, particularly for parents' reports. These results suggest that early communication impairment has a lasting impact on children's experience of school education.

Children in the CI group reported poorer attitudes to school than their Non-CI peers. A total of 23.0% of children in the CI group scored outside the normal range on child self-reports of school liking at 7-9 years, of whom 7.4% scored 2 SD or more below the mean. In comparison, 17.4% of children in the Non-CI group scored outside the normal range and only 3.9% scored 2.0 SD or more below the mean. That children in the CI group had poorer attitudes to school was also shown by significantly different mean scores for school liking (0.08 on a 3-point scale) compared to the Non-CI group. The effect size for communication impairment was very small ( $\eta^2 = .001$ ), that was similar in magnitude to the effects of child age and Indigenous status, and family SEP, but considerably smaller than the effect of child sex.

## **Discussion**

This research utilised a nationally representative study of Australian children to comprehensively investigate the association between childhood communication impairment and Activities and Participation during the primary school years, using reports from children, parents and teachers, as well as direct assessment. Studies with nationally representative

samples have not typically examined a broad range of outcomes for school-aged children with communication impairment, nor have they considered children's perspectives regarding the association between communication impairment and life activities. The United Nations Convention on the Rights of the Child (UNICEF, 1989) and numerous researchers (Dockett & Perry, 2007; McCormack et al., 2010; Owen, Hayett, & Roulstone, 2004; Rannard & Glenn, 2009; Vanryckeghem, Brutten, & Hernandez, 2005) have recognized the rights of children to express their views about issues that concern them, and acknowledged the valuable insights gained from children with communication impairment. Understanding the association between communication impairment and a broad range of Activities and Participation outcomes, and including the perspective of children who experience this impairment as well as the parents and teachers who support them is necessary to ensure adequate intervention is provided to address their needs.

In the present study, two methods were used to examine the association between communication impairment in early childhood (4-5 years) and 18 outcome measures at school age (7-9 years). The first approach, that used cut-off points of 1.0, 1.5, and 2.0 SD outside the sample mean, demonstrated that the majority of children identified by parents with communication impairment at 4-5 years (the CI group) performed within normal limits on all outcomes. However, for all of the 18 Activities and Participation outcomes (across all five Activities and Participation domains), there were children with a history of communication impairment who performed outside the normal range, and this proportion was consistently higher than the proportion of children in the group with no such history. The second approach showed a significant association between communication impairment at 4-5 years and poorer scores on all 18 Activities and Participation outcomes at 7-9 years, even when accounting for the effects of other important child and family socio-demographic factors. Although effect sizes for communication impairment status were small ( $\eta^2 < 0.04$ ),

they were comparable to the effect sizes for child and family demographic factors.

The results provide compelling evidence that communication impairment in early childhood is associated with limitations to children's Activities and Participation into their primary years of school, and that these limitations are recognised by parents and teachers, and child self-report. This research explored a broad range of associations between communication impairment and Activities and Participation outcomes and these are discussed in more detail below. Future research would be useful to examine the complexity of the interactions between multiple outcomes, and between factors contributing to the outcomes. Furthermore, given the valuable information that children can provide, future research could examine children's perceptions of their performance of activities across ICF-CY domains other than Interpersonal interactions, that was the only domain in the current study for which child-reports were available.

In the present study, the greatest areas of difficulty for children identified with communication impairment at 4-5 years were with Activities and Participation outcomes related to Learning and applying knowledge. Nearly a third of these children were reported by their teachers to have limitations with reading and writing, calculating, and attention and thinking. This is consistent with previous research that has identified difficulties with reading and writing in children with communication impairment (e.g., Harrison et al., 2009; Nathan, Stackhouse, Goulandris & Snowling, 2004b). However, limitations in other Activities and Participation domains were also identified for a quarter of children with a history of communication impairment including: completing tasks and handling demands, informal social relationships with friends/peers, and school education/school life. Furthermore, approximately one-fifth of children in the CI group were reported to have difficulty with receptive vocabulary, interactions with peers, and interactions with teachers. Such results indicate the need to consider more than academic skills when investigating outcomes for

children with a history of communication impairment.

Previous research has shown that children identified with communication impairment are more likely to have difficulty with social interactions than other children (e.g., Fujiki, Brinton, & Todd, 1996; Lindsay & Dockrell, 2000). In the present study, the association between communication impairment and Interactions and relationships, particularly peer relationships, was demonstrated by reports from parents, teachers and the children themselves. Children in the present study with a history of communication impairment experienced a significantly higher incidence of bullying and less ease in making friends compared to children with no such history. These findings contrast with those of Lindsay, Dockrell and Mackie (2008), who identified similar rates of victimization among children with a history of communication impairment, children with special education needs, and typically developing children, but are consistent with those of Conti-Ramsden and Botting (2004) and Savage (2005), who reported that students with communication impairment were more likely to be bullied than their peers. Conti-Ramsden and Botting (2004) and Savage (2005) reported higher proportions of children with communication impairment experienced bullying than was found in the present study (36% and 50% respectively, compared to 20.2%); however, factors such as the age and number of participants, as well as the type and severity of communication impairment, and the tools used to measure experiences of bullying or victimization may have contributed to the different findings. In the present study, the proportion of children with no history of communication impairment who reported bullying (13.9%) was consistent with prevalence rates for peer victimization provided by other studies of typically developing children, such as Nansel et al. (2001; 10.6%) and Perry, Kusel, and Perry (1988; 10.0%).

The present study demonstrates the need for interventions that target the children's environment as well as the impairment. It also shows the need for SLPs and teachers to focus

on children's social development and self-esteem, as well as the provision of academic support, when providing services to children with communication impairment at school (Durkin & Conti-Ramsden, 2007). Such a change in focus might address parental concern that SLPs do not always prepare students for the *social* world at/beyond school (Paradice & Adewusi, 2002), since SLPs often give literacy and academic skills higher priority.

Good communication skills are important for academic progress. In the present study, children identified at 4-5 years with communication concerns achieved significantly lower ratings than did other children on both parent and teacher reported measures of school progress and achievement at 7-9 years. The effect of communication impairment in early childhood was particularly strong for parent reported progress. Results from the current study extend the findings reported by Harrison et al. (2009) to show that difficulties associated with school achievement continue beyond the early school years for children with a history of communication impairment. Previous longitudinal studies of individuals with communication impairment have indicated that communication impairment may be associated with lower grades and the need for remedial assistance as individuals progress through high school (Felsenfeld, Broen & McGue, 1994), and with higher likelihood of vocational and employment training than completion of higher years of schooling (Snowling et al., 2001). In the present study, children identified with communication concerns in early childhood reported less enjoyment of school than their peers. Although inter-relationships among the ICF-CY domains were not examined in this study, it is possible that less enjoyment of school was related to their poorer academic performance and/or less effective relationships with peers and teachers (Ladd, 1990). The findings suggest the need to improve school experiences for children with communication impairment.

### **Limitations**

It may be considered a limitation of this study that the indicator of communication

impairment in the preschool years (4-5 years) was a parent-report measure and no objective data were collected regarding the expressive communication skills of children. Thus, it is unclear whether the children identified by parents with concerns about their “ability to talk and make speech sounds” would be diagnosed with communication impairment by professionals. While parent perspectives and concerns about their children should be considered valid means of identification in their own right (cf. Bishop & McDonald, 2009), the validity of the parent-report measure used in LSAC (PEDS; Glascoe, 2000) as a means of identifying communication impairment has been supported by other studies. McLeod, Harrison, McAllister and McCormack (2011) utilized the same PEDS question to identify children with communication concerns in a study of speech impairment in a community sample of preschool children (aged 4-5 years). They then examined the correspondence between parent identification of communication impairment with direct speech-language pathology assessment for 143 children, and found that 83.3% of children identified by parents with concerns would receive a clinical diagnosis of speech (communication) impairment. Therefore, it may be anticipated that the parent identification of children with communication impairment in the present study is likely to be consistent with a clinical diagnosis of communication impairment in the majority of cases. Unfortunately, the LSAC dataset did not include the PEDS measure as an indicator of communication impairment at age 7-9, so it was not possible to assess the extent of long-term parental concern about their children's speech and language. However, the focus of the current study was the association between communication impairment identified in early childhood and outcomes at school, rather than the persistence of communication concerns.

It may also be considered a limitation of the present study that all children identified with communication concerns in early childhood were included, even those with other primary diagnoses. There were two main reasons for this decision. The first reason for

including all children identified with communication concerns in early childhood was to ensure consistency of the participant group in the present study and previous studies utilising the same database that the present study builds upon (e.g., Harrison et al., 2009; Harrison & McLeod, 2010). However, the second and most important reason was that the focus of the present study was on the link between communication impairment and other skills *regardless* of the cause of the communication impairment. Thus, difficulty with “talking and making speech sounds” in the early childhood years was the variable common to all participants. It is acknowledged that for some children additional impairments may have contributed to the difficulties identified. However, attempting to isolate children with a specific speech or language impairment presents a difficult and somewhat ineffectual task. “Children with communication difficulties are a heterogeneous population” (Broomfield & Dodd, 2004, p. 305), who present at clinics with a range of symptoms and potential causes (although often the origin is unknown). Furthermore, McLeod and McKinnon (2010) have indicated that the presence of communication impairment (and not other areas of learning need) was the most important predictive factor of teachers’ recommendation that students required a high level of support at school. Finally, as suggested by the ICF-CY framework, there are a range of Personal and Environmental factors that uniquely influence the presentation and experience of communication impairment for each child. SLPs and teachers work with all these children regardless of the underlying cause of their communication impairment. Therefore, all children were included to ensure the full range of capabilities was investigated.

### **Future Research**

In this study, the focus was on exploring the range of negative outcomes (Activity limitations) that may be associated with early childhood communication impairment, the degree of limitation, and the consistency across data sources (child/parent/teacher perspectives). Communication impairment in early childhood was found to be associated with

Activity Limitations and Participation Restrictions for a number, but not all, children at school age. Future research could use longitudinal trajectories to explore successful (positive) outcomes. Furthermore, research could examine the value of early measures of communication impairment at predicting specific outcomes, or developmental pathways associated with specific outcomes.

The Activities and Participation outcomes found to be associated with communication impairment in this study may be mediated by other biological, individual and societal factors (as discussed in the Personal and Environmental Factors component of the ICF-CY). The current research investigated the contribution of four child and family factors (age, sex, Indigenous status, and socio-economic status). Future research could investigate other factors that may contribute to outcomes, both positive and negative, for children with communication impairment, given the small amount of variance explained by the covariates in this study.

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Table 1.

*ICF-CY Activities and Participation Domains and Outcome Measures*

<b>ICF-CY chapter</b>	<b>ICF-CY domain</b>	<b>Measures</b>
Learning and applying knowledge (d1)	Activities and participation related to learning and application of language and literacy skills (e.g., d133 Acquiring language, d140 Learning to read, d145 Learning to write, d163 Thinking, d166 Reading, d170 Writing)	Academic Rating Scale – Language and Literacy (NCES, 2002) (T)
	Activities and participation related to learning and application of calculation skills (e.g., d137 Acquiring concepts, d150 Learning to calculate, d172 Calculating)	Academic Rating Scale – Mathematical thinking (NCES, 2002) (T)
	Activities and participation related to attention skills (e.g., d160 Focusing attention, d161 Directing attention)	Approach to Learning Scale (Gresham & Elliott, 1990) (T)
General tasks and demands (d2)	Activities and participation related to completing tasks and handling demands (e.g., d210 Undertaking a single task, d220 Undertaking multiple tasks, d230 Carrying out daily routine, d235 Managing behaviour, d240 Handling stress and other psychosocial demands)	School-Aged Inventory of Temperament (persistence scale) (McClowry, 1995) (P) Strengths and Difficulties Questionnaire (emotional symptoms) (Goodman, 1997) (T, P)
Communication (d3)	Activities and participation related to expressive and receptive communication (e.g., d310 Communicating with - receiving - spoken messages, d325 Communicating with - receiving - written messages, d330 Speaking, d345 Writing messages, d360 Using communication devices and techniques)	Peabody Picture Vocabulary Test –III (Dunn & Dunn, 1997) (D)
Interpersonal interactions and relationships (d7)	Activities and participation related to interactions with friends/peers (e.g., d750 Informal social relationships)	Marsh Self-Description Questionnaire (Marsh, 1992) (C) Bullying Scale (AIFS, 2009)(C) Strengths and Difficulties Questionnaire (peer problems scales) (Goodman, 1997) (T, P)
	Activities and participation related to interactions with others (e.g., d710 Basic interpersonal interactions, d730 Relating with strangers)	Strengths and Difficulties Questionnaire (prosocial) (Goodman, 1997) (T, P)
	Activities and participation related to interactions with teachers (e.g., d740 Formal relationships)	Student-Teacher Relationship Scale (Pianta, 2001) (T)
Major life areas (d8)	Activities and participation related to school progress (e.g., d820 School education, d835 School life and related activities)	School Liking Scale (AIFS, 2009) (C) Progress questions (AIFS, 2009) (T, P)

Note: C = Child-report measure, P = Parent-report measure, T = Teacher-report measure, D = Direct assessment.

Table 2. *Distribution of Children Within (WNL) and Outside Normal Limits on Life Activities*

*Outcomes at 7-9 Years According to Communication Status at 4-5 years.*

Outcome measures according to ICF-CY Activities and Participation chapters	Proportion of children within and outside normal range				Chi-square ( $\chi^2$ ) <i>p</i>
	WNL	1.0 SD below / above <sup>1</sup>	1.5 SD below / above <sup>1</sup>	2.0 SD below / above <sup>1</sup>	
<b>Learning and applying knowledge</b>					
ARS – Language and Literacy (T) (n=3584)					
CI group	603 (69.4%)	93 (10.7%)	77 (8.9%)	96 (11.0%)	168.62
Non-CI group	2372 (87.4%)	151 (5.6%)	114 (4.2%)	78 (2.9%)	<i>p</i> ≤ .001
ARS – Mathematical Thinking (T) (n=3579)					
CI group	620 (71.6%)	106 (12.2%)	60 (6.9%)	80 (9.2%)	100.11
Non-CI group	2316 (85.4%)	214 (7.9%)	101 (3.7%)	82 (3.0%)	<i>p</i> ≤ .001
Approaches to Learning (T) (n=3593)					
CI group	606 (69.3%)	105 (12.0%)	127 (14.5%)	36 (4.1%)	61.81
Non-CI group	2214 (81.4%)	217 (8.0%)	242 (8.9%)	46 (1.7%)	<i>p</i> ≤ .001
<b>General tasks and demands</b>					
SDQ – Emotional Symptoms <sup>1</sup> (P) (n=3802)					
CI group	756 (83.3%)	70 (7.7%)	39 (4.3%)	43 (4.7%)	12.00
Non-CI group	2532 (87.5%)	167 (5.8%)	107 (3.7%)	88 (3.0%)	<i>p</i> ≤ .01
SDQ – Emotional Symptoms <sup>1</sup> (T) (n=3588)					
CI group	738 (84.4%)	53 (6.1%)	30 (3.4%)	53 (6.1%)	17.99
Non-CI group	2425 (89.4%)	117 (4.3%)	79 (2.9%)	93 (3.4%)	<i>p</i> ≤ .001
SATI – Persistence (P) (n=3801)					
CI group	673 (74.2%)	128 (14.1%)	64 (7.1%)	42 (4.6%)	26.29
Non-CI group	2374 (82.0%)	303 (10.5%)	147 (5.1%)	70 (2.4%)	<i>p</i> ≤ .001
<b>Communication</b>					
Adapted PPVT-III (D) (n=4271)					
CI group	824 (80.9%)	116 (11.4%)	53 (5.2%)	26 (2.6%)	56.88
Non-CI group	2906 (89.4%)	223 (6.9%)	97 (3.0%)	26 (0.8%)	<i>p</i> ≤ .001
<b>Interpersonal interactions and relationships</b>					
Bullying <sup>1</sup> (C) (n=4250)					
CI group	803 (79.9%)	98 (9.8%)	38 (3.8%)	66 (6.6%)	24.06
Non-CI group	2795 (86.1%)	229 (7.1%)	71 (2.2%)	150 (4.6%)	<i>p</i> ≤ .001
MSDQ (C) (n=4255)					
CI group	814 (80.8%)	88 (8.7%)	40 (4.0%)	65 (4.5%)	7.73
Non-CI group	2722 (83.8%)	268 (8.3%)	113 (3.5%)	145 (4.5%)	<i>p</i> ≤ .05
STRS – Carer conflict <sup>1</sup> (T) (n=3584)					
CI group	731 (83.6%)	50 (5.7%)	29 (3.3%)	64 (7.3%)	18.30
Non-CI group	2402 (88.6%)	84 (3.1%)	67 (2.5%)	157 (5.8%)	<i>p</i> ≤ .001
STRS – Closeness (T) (n=3585)					

CI group	704 (80.5%)	90 (10.3%)	37 (4.2%)	43 (4.9%)	5.53
Non-CI group	2276 (84.0%)	235 (8.7%)	93 (3.4%)	107 (3.9%)	$p=N/S$
SDQ – prosocial (P) (n=3801)					
CI group	692 (76.1%)	98 (10.8%)	86 (9.5%)	33 (3.6%)	36.98
Non-CI group	2449 (84.7%)	221 (7.6%)	164 (5.7%)	58 (2.0%)	$p \leq .001$
SDQ – prosocial (T) (n=3587)					
CI group	651 (74.5%)	101 (11.6%)	60 (6.9%)	62 (7.1%)	24.94
Non-CI group	2181 (80.4%)	301 (11.1%)	130 (4.8%)	101 (3.7%)	$p \leq .001$
SDQ – peer problems <sup>1</sup> (P) (n=3802)					
CI group	738 (81.3%)	80 (8.8%)	50 (5.5%)	40 (4.4%)	53.98
Non-CI group	2599 (89.8%)	172 (5.9%)	71 (2.5%)	52 (1.8%)	$p \leq .001$
SDQ – peer problems <sup>1</sup> (T) (n=3589)					
CI group	734 (84.0%)	57 (6.5%)	35 (4.0%)	48 (5.5%)	15.31
Non-CI group	2410 (88.8%)	133 (4.9%)	83 (3.1%)	89 (3.3%)	$p \leq .01$
<b>Major life areas</b>					
Progress and achievement (P) (n=4301)					
CI group	812 (78.8%)	76 (7.4%)	46 (4.5%)	96 (9.3%)	120.76
Non-CI group	2930 (89.6%)	192 (5.9%)	70 (2.1%)	79 (2.4%)	$p \leq .001$
Progress and achievement (T) (n=3591)					
CI group	624 (71.5%)	159 (18.2%)	23 (2.6%)	67 (7.7%)	144.25
Non-CI group	2366 (87.0%)	284 (10.4%)	22 (0.8%)	46 (1.7%)	$p \leq .001$
School liking <sup>1</sup> (C) (n=4258)					
CI group	777 (77.0%)	126 (12.5%)	31 (3.1%)	75 (7.4%)	25.51
Non-CI group	2683 (82.6%)	362 (11.1%)	76 (2.3%)	128 (3.9%)	$p \leq .001$

Note: CI= Concerns about possible communication impairment identified by parents at 4-5 years  
Measures: ARS = Academic Rating Scale; SDQ = Strengths and Difficulties Questionnaire; SATI = School-age Temperament Inventory; PPVT III = Adapted Peabody Picture Vocabulary Test – III; MSDQ = Marsh Self-Description Questionnaire; STRS = Student-Teacher Relationship Scale.

Adjusted marginal means = means after accounting for the effects of child sex, age, Indigenous status and family SEP.

<sup>1</sup>Scores above the mean indicated performance outside normal limits

<sup>2</sup>df = 3 for all measures. Number of valid cases is given in brackets next to outcome measure

Table 3.

*The Unique and Combined Effects of Communication Impairment and Other Child and Family Characteristics on Child Outcomes at 7-9 Years.*

Outcome measures according to ICF-CY Activities and Participation chapters	Parent reported concerns about “how [child] talks and makes speech sounds” at 4-5 years			Child and Family Characteristics						
	Yes/A little (n=1,041)	No (n=3,288)	Total (n=4,329)	F value	Model Effect (R <sup>2</sup> )	CI status (Eta <sup>2</sup> )	Sex (Eta <sup>2</sup> )	Age (Eta <sup>2</sup> )	ATSI Status (Eta <sup>2</sup> )	SEP (Eta <sup>2</sup> )
<b>Learning and applying knowledge</b>										
ARS – Language and Literacy (T)										
Mean (SD)	3.24 (.87)	3.65 (.74)	3.55 (.79)	174.88***						
95% CI	3.19 – 3.30	3.62 – 3.68	3.52 – 3.58							
n	852	2680	3532							
<i>Adjusted marginal means</i>	3.30	3.63	3.46	90.74***	.114	.035***	.013***	.000	.003**	.054***
ARS – Mathematical Thinking (T)										
Mean (SD)	3.26 (.91)	3.58 (.80)	3.50 (.84)	96.80***						
95% CI	3.20 – 3.32	3.55 – 3.61	3.47 – 3.53							
n	848	2657	3505							
<i>Adjusted marginal means</i>	3.28	3.57	3.43	65.12***	.085	.023***	.002**	.002**	.003**	.051***
Approaches to Learning (T)										
Mean (SD)	3.04 (.75)	3.32 (.69)	3.25 (.71)	100.71***						
95% CI	2.99 – 3.09	3.29 – 3.34	3.23 – 3.27							
n	874	2719	3593							
<i>Adjusted marginal means</i>	3.10	3.30	3.20	91.90***	.114	.015***	.061***	.000	.001	.031***
<b>General tasks and demands</b>										
SDQ – Emotional Symptoms (P)										
Mean (SD)	1.36 (.37)	1.30 (.34)	1.31 (.35)	17.34***						
95% CI	1.33 – 1.38	1.29 – 1.31	1.30 – 1.32							
N	908	2894	3802							
<i>Adjusted marginal means</i>	1.35	1.30	1.33	15.23***	.020	.004***	.000	.000	.001	.013***
SDQ – Emotional Symptoms (T)										
Mean (SD)	1.31 (.39)	1.23 (.35)	1.25 (.36)	30.16***						
95% CI	1.28 – 1.33	1.22 – 1.24	1.24 – 1.26							
n	874	2714	3588							

<i>Adjusted marginal means</i>	1.30	1.23	1.27	14.27 <sup>***</sup>	.019	.007 <sup>***</sup>	.000	.000	.000	.010 <sup>***</sup>
SATI – Persistence (P)										
Mean (SD)	3.17 (.86)	3.44 (.85)	3.38 (.86)	70.22 <sup>***</sup>						
95% CI	3.12 – 3.23	3.41 – 3.47	3.35 – 3.41							
n	907	2894	3801							
<i>Adjusted marginal means</i>	3.22	3.43	3.33	48.79 <sup>***</sup>	.060	.011 <sup>***</sup>	.041 <sup>***</sup>	.000	.000	.002 <sup>**</sup>
<b>Communication</b>										
Adapted PPVT-III (D)										
Mean (SD)	77.11 (5.12)	78.71 (4.77)	78.33 (4.90)	84.41 <sup>***</sup>						
95% CI	76.79 – 77.42	78.55 – 78.87	78.18 – 78.48							
n	1019	3252	4271							
<i>Adjusted marginal means</i>	77.21	78.69	77.95	79.12 <sup>***</sup>	.085	.017 <sup>***</sup>	.003 <sup>***</sup>	.006 <sup>***</sup>	.001 <sup>*</sup>	.056 <sup>***</sup>
<b>Interpersonal interactions and relationships</b>										
Bullying (C)										
Mean (SD)	2.06 (0.92)	1.92 (0.86)	1.96 (0.87)	19.66 <sup>***</sup>						
95% CI	2.01 – 2.92	1.89 – 1.95	1.93 – 1.98							
n	1005	3245	4250							
<i>Adjusted marginal means</i>	2.04	1.93	1.98	19.00 <sup>***</sup>	.022	.003 <sup>***</sup>	.005 <sup>***</sup>	.000	.003 <sup>***</sup>	.009 <sup>***</sup>
MSDQ (C)										
Mean (SD)	3.85 (.80)	3.95 (.76)	3.93 (.77)	12.45 <sup>***</sup>						
95% CI	3.81 – 3.90	3.93 – 3.98	3.91 – 3.95							
n	1007	3248	4255							
<i>Adjusted marginal means</i>	3.88	3.95	3.91	10.01 <sup>***</sup>	.012	.001 <sup>**</sup>	.004 <sup>***</sup>	.000	.000	.004 <sup>***</sup>
STRS – Carer conflict (T)										
Mean (SD)	1.47 (.70)	1.36 (.64)	1.39 (.65)	16.62 <sup>***</sup>						
95% CI	1.42 – 1.51	1.34 – 1.39	1.37 – 1.41							
n	874	2710	3584							
<i>Adjusted marginal means</i>	1.43	1.38	1.40	38.00 <sup>***</sup>	.050	.001 <sup>*</sup>	.033 <sup>***</sup>	.001	.000	.014 <sup>***</sup>
STRS – Closeness (T)										
Mean (SD)	3.97 (.64)	4.07 (.63)	4.05 (.64)	18.05 <sup>***</sup>						
95% CI	3.92 – 4.01	4.05 – 4.09	4.02 – 4.07							
n	874	2711	3585							
<i>Adjusted marginal means</i>	4.00	4.06	4.03	40.92 <sup>***</sup>	.054	.001 <sup>*</sup>	.043 <sup>***</sup>	.003 <sup>**</sup>	.000	.005 <sup>***</sup>
SDQ – Prosocial (P)										
Mean (SD)	2.58 (.38)	2.67 (.33)	2.65 (.35)	52.64 <sup>***</sup>						
95% CI	2.55 – 2.60	2.66 – 2.68	2.64 – 2.66							
n	909	2892	3801							

<i>Adjusted marginal means</i>	2.60	2.66	2.63	50.50 <sup>***</sup>	.062	.007 <sup>***</sup>	.045 <sup>***</sup>	.000	.000	.005 <sup>***</sup>
SDQ – Prosocial (T)										
Mean (SD)	2.44 (.48)	2.55 (.44)	2.52 (.45)	37.71 <sup>***</sup>						
95% CI	2.41 – 2.47	2.53 – 2.57	2.51 – 2.54							
n	874	2713	3587							
<i>Adjusted marginal means</i>	2.48	2.54	2.51	85.71 <sup>***</sup>	.107	.003 <sup>**</sup>	.086 <sup>***</sup>	.000	.000	.015 <sup>***</sup>
SDQ – Peer relationship problems (P)										
Mean (SD)	1.37 (.37)	1.27 (.31)	1.30 (.33)	65.12 <sup>***</sup>						
95% CI	1.35 – 1.40	1.26 – 1.28	1.28 – 1.31							
n	908	2894	3802							
<i>Adjusted marginal means</i>	1.36	1.28	1.32	40.80 <sup>***</sup>	.051	.012 <sup>***</sup>	.003 <sup>***</sup>	.000	.000	.031 <sup>***</sup>
SDQ – Peer relationship problems (T)										
Mean (SD)	1.33 (.38)	1.25 (.34)	1.27 (.35)	34.59 <sup>***</sup>						
95% CI	1.30 – 1.35	1.24 – 1.26	1.26 – 1.28							
n	874	2715	3589							
<i>Adjusted marginal means</i>	1.32	1.25	1.29	17.18 <sup>***</sup>	.023	.007 <sup>***</sup>	.002 <sup>**</sup>	.001 <sup>*</sup>	.000	.010 <sup>***</sup>
<b>Major life areas</b>										
Progress and achievement (P)										
Mean (SD)	3.51 (.94)	3.83 (.82)	3.76 (.86)	112.71 <sup>***</sup>						
95% CI	3.45 – 3.57	3.81 – 3.86	3.73 – 3.78							
n	1030	3271	4301							
<i>Adjusted marginal means</i>	3.52	3.83	3.68	29.86 <sup>***</sup>	.034	.023 <sup>***</sup>	.000	.000	.000	.008 <sup>***</sup>
Progress and achievement (T)										
Mean (SD)	2.92 (.90)	3.27 (.75)	3.19 (.81)	133.42 <sup>***</sup>						
95% CI	2.86 – 2.98	3.24 – 3.30	3.16 – 3.21							
n	873	2718	3591							
<i>Adjusted marginal means</i>	2.95	3.26	3.11	74.86 <sup>***</sup>	.095	.029 <sup>***</sup>	.000	.000	.003 <sup>**</sup>	.056 <sup>***</sup>
School liking (C)										
Mean (SD)	1.54 (.53)	1.46 (.46)	1.48 (.48)	21.88 <sup>***</sup>						
95% CI	1.51 – 1.58	1.45 – 1.48	1.47 – 1.49							
n	1009	3249	4258							
<i>Adjusted marginal means</i>	1.51	1.47	1.49	45.79 <sup>***</sup>	.051	.001 <sup>**</sup>	.045 <sup>***</sup>	.000	.000	.002 <sup>**</sup>

Note: C = Child-report measure, P = Parent-report measure, T = Teacher-report measure, D = Direct assessment, CI status = Communication impairment status, ATSI = Aboriginal and Torres Strait Island (Indigenous) status, SEP = Socioeconomic position.

Measures: ARS = Academic Rating Scale; SDQ = Strengths and Difficulties Questionnaire; SATI = School-age Temperament Inventory; PPVT III = Adapted Peabody Picture Vocabulary Test – III; MSDQ = Marsh Self-Description Questionnaire; STRS = Student-Teacher Relationship Scale.

Adjusted marginal means = means after accounting for the effects of child sex, age, Indigenous status and family SEP.

Significance of F value: <sup>\*\*\*</sup> p ≤ 0.001, <sup>\*\*</sup> p ≤ 0.01, <sup>\*</sup> p ≤ 0.05

## Appendix

### *Population and Community Studies That Consider Childhood Speech and Language*

Study	Country	Age range at recruitment	Number of participants <sup>a</sup>	Communication skills investigated	Outcomes reported (Corresponding ICF-CY domains)	Data source	Indicative references
Avon Longitudinal Study of Parents and Children	UK	During pregnancy	14,000 (n=1,127 with communication impairment)	Speech, Expressive language	Speech and oral language (Communication)	Assessment, parent & child report	Roulstone et al. (2002; 2009)
British Cohort Study	UK	Birth	17,196	Receptive language	Literacy (Learning and applying knowledge)	Assessment & adult report	Schoon et al. (2010)
Early Language in Victoria Study	Australia	7-10 months	1,911	Speech, language, stuttering	Gesture and early oral language (Learning and applying knowledge, Communication)	Assessment & parent report	Reilly et al. (2006; 2009)
Epidemiology of Specific Language Impairment	USA	5-6 years	7,218	Expressive language, speech	Speech and oral language (Communication)	Assessment	Tomblin et al. (1997); Shriberg et al. (1999); Nippold et al. (2009)
Family & Child Experiences Survey	USA	3-4 years	3,200 (n=1,015 with communication impairment)	Language, literacy	Oral language and literacy (Learning and applying knowledge, Communication)	Assessment & parent report	Scheffner Hammer et al. (2010)
Longitudinal Study of Australian Children	Australia	4-5 years (Kinder cohort)	4,983	Speech, language	Oral language, literacy and numeracy (Learning and applying knowledge, Communication)	Assessment, parent, teacher & child report	McLeod & Harrison (2009); Harrison et al. (2009)
National Longitudinal Survey of Youth	USA	Birth	7,862	Language, literacy	Oral language, literacy and numeracy (Learning and applying knowledge, Communication)	-	Hart et al. (2010)
Ottawa Language Study	Canada	5 years	1,655	Language, speech	Language, cognition, literacy, education, occupation and social networks	Assessment & adult report	Beitchman et al. (1986); Johnson et al. (2010)

Pittsburgh Otitis Media study	USA	0-2 months	2,253	Hearing, language, speech	(Learning and applying knowledge, Communication, Major life areas, Interpersonal interactions and relationships) Oral language (Communication)	Assessment	Dollaghan & Campbell (2009); Feldman (1999); Paradise et al. (1997; 2000);
RASCALS	Australia	Birth	4,007 (n=1,766 with communication impairment)	Language, speech	Oral language (Communication)	Assessment & parent report	Rice et al. (2008); Zubrick et al. (2007)
Sound Effects Study	Australia	4-5 years	1,097	Speech, language	Speech and oral language (Communication)	Assessment, parent, teacher & child report	McLeod et al. (2010)
Understanding the Early Years	Canada	5-6 years	2,743	Language	Oral language, early literacy and attention (Learning and applying knowledge, Communication)	Assessment, parent & teacher report	Kohen et al. (2009)

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Key: <sup>a</sup> = At the beginning of the study.

RASCALS=Randomly Ascertained Sample of Children born in Australia's Largest State