

Research Report

School-readiness profiles of children with language impairment: linkages to home and classroom experiences

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(Received October 2013; accepted February 2014)

Abstract

Background: This study represents an effort to advance our understanding of the nature of school readiness among children with language impairment (LI), a population of children acknowledged to be at risk of poor academic achievement. The academic, social–emotional, and behavioural competencies with which children arrive at kindergarten affect the nature of their future educational experiences, and their overall academic achievement.

Aims: To examine whether there are reliable profiles that characterize children with LI just prior to kindergarten entrance, and the extent to which profile membership is associated with characteristics of children's homes and preschool experiences. Questions addressed were twofold: (1) To what extent are there reliable profiles of children with LI with respect to their school readiness? (2) To what extent is children's profile membership associated with characteristics of their homes and preschool classrooms?

Methods & Procedures: Participants were 136 children with LI from early childhood special education classrooms. We utilized latent class analysis (LCA) to classify individuals into profiles based on individual responses on school readiness measures. We then used multilevel hierarchical generalized linear models to examine the relations between profile membership and children's home/classroom experiences.

Outcomes & Results: LCA analyses revealed that a four-profile solution was the most appropriate fit for the data and that classroom experiences were predictive of these profiles, such that children in classrooms with more instructional/emotional support were more likely to be placed in profiles characterized by higher school readiness skills.

Conclusions & Implications: These results suggest that the school readiness profiles of young children with LI are associated with the quality of children's classroom experiences, and that high-quality classroom experiences can be influential for ensuring that young children with LI arrive in kindergarten ready to learn.

Keywords: language impairment, school readiness, classroom experiences.

What this paper adds?

This work presents an important advance to our understanding of the nature of school readiness among children with language impairment (LI). Improving our understanding of readiness among these youngsters is an important endeavour, given that the academic, social–emotional and behavioural competencies with which children arrive at kindergarten affect the nature of their future educational experiences, and their overall academic achievement. The present study revealed that children with LI could be reliably placed within four profiles based upon their school readiness, and that classroom experiences were predictive of these profiles: children in classrooms with higher levels of instructional/emotional support were more likely to have school readiness profiles characterized by higher skill levels. The results suggest that high-quality classroom experiences can be influential for ensuring that young children with LI arrive in kindergarten ready to learn.

Introduction

School readiness is a multidimensional construct making reference to whether a child exhibits, at entrance to kindergarten, the academic, social–emotional, and behavioural competence to perform and engage successfully in the academic settings characteristic of formal schooling (Claessens *et al.* 2009). The present research examines the extent to which children with language impairment (LI) exhibit specific profiles of school readiness, as there are salient theoretical and practical reasons for improving our understanding of patterns of school readiness among children with LI. Children with LI exhibit depressed language skills, either unexpectedly (referred to as specific language impairment) or co-morbid with intellectual disability or other impairments (e.g. autism, hearing loss), and are considered highly susceptible to academic underperformance. In this study, we explored whether there are specific profiles that characterize children with LI with respect to school readiness, such that one or several profiles may identify children most susceptible to future academic problems, and we also assessed the extent to which school and home experiences predicted profile membership.

What is school readiness?

School readiness is best conceived as a qualitative assessment of whether a child exhibits the academic, social–emotional, and behavioural competencies needed to facilitate her successful transition to formal education. School readiness, also referred to as kindergarten readiness (given that the transition to formal schooling in the United States increasingly occurs at kindergarten when a child is typically five years of age), is a multidimensional construct that references children's academic skills (e.g. language, literacy and math skills), social–emotional well-being (e.g. ability to interact well with others), and behavioural competence (e.g. ability to manage behaviours in a prosocial way). Although longitudinal studies have suggested that children's *academic skills* at kindergarten entry are most relevant to predicting children's future academic performance (Claessens *et al.* 2009), social–emotional well-being and behavioural competence exert direct influence upon whether children have the capacity to regulate and engage themselves within the classroom milieu and, in turn, serve indirectly to promote children's academic achievement (Hinshaw 1992).

To date, research has yet to identify specific 'thresholds' demarcating when a child might be considered ready for school, although some kindergarten-readiness screening programs do identify children warranting surveillance and/or supplemental interventions (Goffreda *et al.* 2009, Invernizzi *et al.* 2004, Simmons

et al. 2008). However, there is widespread and well-established agreement that children who arrive at school with well-developed academic, social–emotional, and behavioural competencies are more likely to have an easier adjustment to schooling (e.g. Catts *et al.* 2002, Duncan *et al.* 2007, Rimm-Kaufman *et al.* 2000) and better short- and long-term academic outcomes (Claessens *et al.* 2009), relative to children with less-developed competencies. For instance, in the area of academics, Catts and colleagues found that kindergarteners with relatively well-developed language and literacy skills were less likely to be poor readers at second grade compared to kindergarteners with more limited language and literacy skills (Catts *et al.* 2002). In the social–emotional and behavioural domains, Buhs and Ladd demonstrated that children who have challenges managing their emotions and behaviours during kindergarten are more prone to rejection by their peers, which in turn negatively impacts their academic development and school adjustment during kindergarten (Buhs and Ladd 2001).

Models of school readiness have helped to establish the primacy of skills as observed at or around the child's entrance to kindergarten (rather than later in the academic year), given the presence of child-by-environment interactions in which children's skills at entry appear to affect the environment they subsequently experience in kindergarten. Put differently, the skills children exhibit as they enter the kindergarten classroom then serve to shape (i.e. evoke) the environment they subsequently experience (Ladd *et al.* 1999). To illustrate such child-by-environment interactions and their relevance to understanding the importance of school readiness, we might speculate that children who arrive at kindergarten and, at the time, have relatively limited oral language skills may foster friendships with classmates who themselves have limited language skills (Ladd *et al.* 1999). At the same time, children with limited language skills also tend to be less close to their teachers than children with higher levels of oral language skill (Justice *et al.* 2008). These environmental consequences of children's skills at school entry (i.e. engaging with classmates who themselves have limited language skills, not having a close relationship with one's teacher), can in turn have significant impacts on children's oral language growth over the academic year (Justice *et al.* 2011, Downer *et al.* 2010).

School readiness and children with LI

For children with LI, both theory and evidence indicate that many will enter kindergarten lacking the readiness skills required for a successful transition to formal schooling and that will provide the foundation for academic success. One such skill is young children's language competencies, as research suggests an

important aspect of school readiness is well-developed oral language skills (Duncan *et al.* 2007). For children with LI, difficulties across the varied domains of language skill, including lexical and grammatical abilities, are the primary phenotype of this disorder (Clahsen and Almazan 2001, Oetting *et al.* 1995, Windfuhr *et al.* 2002). Language skills represent only one dimension of school readiness, however, and there is evidence that children with LI may also be compromised in these other dimensions. For instance, children with LI show difficulties in other areas of academics beyond language skill, most prominently in the area of reading (Tomblin *et al.* 2000). Social-emotional and behavioural problems are often observed to occur at subclinical levels among children with LI (Botting and Conti-Ramsden 2000). Specifically, children with LI as a group perform less well than non-impaired peers on measures of social competence (e.g. assertiveness, cooperation) and prevalence of behavioural problems (Botting and Conti-Ramsden 2000, Stanton-Chapman *et al.* 2007), with some evidence suggesting that children with LI are more susceptible to clinically significant problems in these areas compared to typically developing children (Stanton-Chapman *et al.* 2007, Tomblin *et al.* 2000). Further, this link between social competence and behaviour problems and LI can be seen in older children as well, as young offender populations have been found to include an over-representation of young people with LI (Bryan 2004).

Few studies to date, however, have explicitly sought to examine the range of skills and competencies constituting school readiness among children with LI, as observed to correspond to the time at which children arrive at kindergarten. As noted previously, the skills children exhibit at entrance to kindergarten are likely to have significant influence on their subsequent experiences during kindergarten (Ladd *et al.* 1999); thus, documenting children's skills at or near this particular juncture is an important feature of school-readiness research. One relevant effort to examine the school readiness of children with LI studied the academic (language, literacy, math), social (assertion, cooperation, self-control), and behavioural (externalizing and internalizing problems) competencies of children near the start of kindergarten, based on teacher-report instruments (Justice *et al.* 2009); researchers compared multiple indices of school readiness for children who had exhibited LI at 54 months compared to children with typical language skills at that time. On all measures except that corresponding to prevalence of internalizing-behaviour problems, children with LI had significantly poorer kindergarten-readiness skills than their peers, and the differences were medium to large in size. The greatest differentiation between the two groups of children with respect to readiness was within the academic domains; on measures of

language, literacy, and math skills, those with LI performed nearly 1 SD (standard deviation) lower than their peers.

An interesting finding in the Justice *et al.* (2009) research was that children with LI were shown to be considerably heterogeneous with respect to kindergarten readiness; indeed, in some readiness dimensions, variability in skills among children with LI was greater than that seen among the typical peers, to include the areas of language, literacy, and math. This finding suggests that among children with LI, there may be meaningful differences in readiness for schooling at kindergarten entry. Further, child-by-environment models of school readiness would imply that these differences in readiness skill, when comparing children with LI to their typical peers, may have significant impacts on their subsequent experiences during kindergarten (Ladd *et al.* 1999). Consequently, it is important to enhance our understanding of school readiness among children with LI, to include determining whether there are antecedents of readiness that may serve to help children arrive at kindergarten ready to learn.

In the present work, we contribute to the literature on school readiness by exploring whether children with LI exhibit *profiles* by which to characterize their school readiness across key dimensions of academic, social-emotional, and behavioural competencies. Prior work has shown definitively that children with LI are vulnerable for arriving to school at a disadvantage relative to their peers across all three dimensions of school readiness (e.g. Catts *et al.* 2002); such variable-centred research is typically concerned with studying relations among variables, such as the relations between language-impairment status at four years and school readiness at kindergarten. An alternative to variable-centred work is person-centred analytic techniques (Laursen and Hoff 2006), which seek to understand the multivariate, non-linear relations among variables within people. Person-centred methods can help to understand these relations among variables as they occur within distinctive classes of people (Muthén and Muthén 2000). Said differently, person-centred research using quantitative methodologies (e.g. cluster analysis, latent class analysis, and finite mixture modelling) can be defined as those methods which focus on relationships among people; the goal of these analyses is to classify people into distinct groups based upon their response patterns, such that people *within* these groups are more similar than people *between* groups (Jung and Wickrama 2008). An example of an area of research in which person-centred methods have been particularly fruitful is that of depression; methods such as LCA have identified profiles (or subtypes) of persons with depression with respect to presence or absence of major symptoms (e.g. sleep problems, fatigue) as well as level of severity (e.g. mild versus

major depression; Lee *et al.* 2012, Sullivan *et al.* 1998). Variable-centred research methods, such as regression analyses, can be mixed with person-centred methods in an effort to predict profile membership from specific variables; for instance, depression subtypes among adults can be predicted from personality traits, demographic background, and psychiatric history (Sullivan *et al.* 1998). Integrating variable-centred and person-centred analytic techniques can allow for a more comprehensive understanding of the patterns and processes of development (Laursen and Hoff 2006). Specifically, use of person-centred methods have been recently extended to research with young children in regard to their language and reading development (e.g. Torppa *et al.* 2007, Ukoumunne *et al.* 2012).

Given that school readiness is a multidimensional construct, it is reasonable to expect that there may be relations among the readiness dimensions that characterize groups of children with LI. For instance, we might speculate that some children with LI would have poor readiness across all dimensions (academic, social-emotional, behavioural), whereas others may have poor readiness in some dimensions (e.g. academic) but not others (e.g. social-emotional, behavioural). This expectation is based on several recent efforts seeking to profile the school readiness of children who are typically developing yet experience academic-related risk factors; three of these studies focused on generating readiness profiles of pre-kindergarten children and establishing validity of the profiles to kindergarten or first-grade achievement (Cabell *et al.* 2011, 2013, Konold and Pianta 2005), whereas the other profiled children at kindergarten entry with follow-up to first grade (Hair *et al.* 2006). Although results of these studies have been variable with respect to the exact number of reliable profiles of readiness observed among the children (which ranged from four to six), this body of work shows the following: (1) children's readiness skills do lend themselves to profiling of strength and weakness across the various dimensions, (2) some children exhibit relatively healthy profiles of readiness, whereas others exhibit relatively poor profiles of readiness, and (3) children exhibiting poor readiness profiles tend to be highly susceptible to future social and academic risks as compared to children in healthier profiles. Of further interest, recent work by Cabell and colleagues sought to determine the stability of profile membership over an academic year (Cabell *et al.* 2013); results of this study showed that children whose skills fitted a profile characteristic of poor readiness were more likely to stay in that profile compared to children in more desirable profiles. Work such as this suggests that children's profiles at school entry may serve as a reliable index for forecasting future academic risks, although it may be important to consider which indicators are used to create these profiles of children given that the

extent to which some school readiness measures predict subsequent academic achievement has yielded equivocal results (e.g. socio-emotional skills; Claessens *et al.* 2009, Duncan *et al.* 2007, Konold and Pianta 2005).

Predictors of school-readiness profiles

Prior studies have shown that characteristics of children's homes (e.g. Hair *et al.* 2006), and their preschool classroom experiences (e.g. Howes *et al.* 2008, are related to the skills and competencies they exhibit at kindergarten entry. Hair and colleagues, who identified profile membership for more than 17 000 kindergarteners with respect to school readiness, found that children from households with many socioeconomic disadvantages were likely to be members of one of two observed poor readiness profiles. Although not measured directly in the Hair *et al.* study, we might speculate that socioeconomically disadvantaged households provide children with fewer opportunities to develop readiness skills, as compared to children in advantaged homes. For instance, in the former, caregivers may engage their children infrequently in literacy-focused activities (e.g. parent-child book-reading; see Roberts *et al.* 2005) and some such households may be highly disorganized and chaotic (Petrill *et al.* 2004). Participating frequently in literacy-focused activities and residing in calm, organized households both appear to exert direct effects on children's development of school readiness, to include language and literacy skills, social-emotional competence, and behavioural competence (Bus *et al.* 1995, Hughes and Ensor 2009, Petrill *et al.* 2004, Roberts *et al.* 2005). For instance, the extent to which children's homes are calm and organized appears to be directly related to children's ability to manage their own emotions and behaviours at kindergarten entry (Dumas *et al.* 2005). It should be noted that it is possible that some socioeconomically advantaged homes may also be chaotic and disorganized, however the impacts of such chaos may be masked by other factors, such as the number of books available.

At the same time, the nature of children's schooling experiences prior to entrance to kindergarten, to include whether they have participated in centre-based care versus other options (e.g. family/home care; Ansari and Winsler 2012), are also influential to their readiness. For children who attend centre-based preschool programs, a growing volume of research points to the importance of classroom quality to children's gains in skills that transcend academic, social-emotional, and behavioural competencies (Burchinal *et al.* 2000, Howes 2000, Howes *et al.* 2008, Mashburn *et al.* 2008). Work by Mashburn *et al.* (2008) has advanced the perspective that there may be alignment between dimensions of classroom quality and dimensions of school readiness.

Preschool classrooms that are high quality with respect to emotional support appear to promote children's school readiness with respect to social-emotional competence and prosocial behaviours; classrooms that are high quality with respect to instructional support appear to promote school readiness with respect to children's language, literacy, and math skills. Although such work has largely used variable-centred methods, we might anticipate that profiles of school readiness may be conditional upon the quality of children's preschool experiences.

Aims of the present study

The work reported here represents an effort to advance our understanding of the nature of school readiness among children with LI, a population of children acknowledged to be at risk for poor academic achievement due to a myriad of circumstances associated with their disability (e.g. co-morbidity with reading disability; Tomblin *et al.* 2000). The academic, social-emotional, and behavioural competencies with which children arrive at kindergarten affect the nature of their future educational experiences (Ladd *et al.* 1999), and their overall academic achievement (Claessens *et al.* 2009). In the present work, we used person-centred methods to examine whether there may be reliable profiles that characterize children with LI just prior to kindergarten entrance, and the extent to which profile membership may be associated with characteristics of children's homes and preschool experiences. Questions addressed were twofold: (1) To what extent are there reliable profiles of children with LI with respect to their school readiness? (2) To what extent is children's profile membership associated with characteristics of their homes (participation in literacy-related activities, level of household chaos) and preschool classrooms (level of instructional support, level of emotional support)?

Methods

Participants

Participants in the present study were 136 children with LI sampled from 62 early childhood special education classrooms located in two different regions of a Midwestern state. The children were a subset of the participants in a larger multi-year study, Sit Together and Read-2 (STAR-2), a randomized controlled trial (RCT) of a classroom-based early-literacy programme implemented in early childhood special education classrooms. The STAR-2 study received formal ethical approval from the Institutional Review Board. In STAR-2, teachers were randomly assigned to three different conditions, comprising two experimental conditions and a control condition. With random assignment occurring at the

classroom level, children were exposed to the condition assigned to their teachers for a 30-week period during preschool. For the present study, all data used were collected after the intervention was completed, in the spring of preschool and again in the spring of kindergarten (one year later). In the United States, kindergarten is generally considered the first year of formal education; children begin kindergarten at age 5 to 6 and attend for one year. When addressing research question one (see Statistical Analyses), treatment status was examined for its relation to children's profile membership. It was not significantly associated with children's profile membership and thus was not included in the subsequent models. Put differently, the condition to which children were exposed in STAR-2 was not reliably associated with children's spring-of-preschool profile membership, and thus can be ignored in the conduct of the present study.

The STAR-2 database contains data on 291 three-five-year-old children with disabilities enrolled in 83 early childhood special education classrooms; 90% of the children were receiving direct services from speech-language pathologists for speech/language disabilities. For the present study, a subset of the children from the STAR-2 database was included, based on the following inclusionary criteria. First, children were included if they exhibited language scores characteristic of LI at entrance to the STAR-2 study, based on the *Clinical Evaluation of Language Fundamentals: Preschool—2* (CELF-P:2; Wiig *et al.* 2004). Children who received a score of ≤ 85 (≤ -1 SD of the mean) on the expressive or receptive composites were included in our study. Second, children were included if they matriculated to kindergarten in the second year of the STAR-2 study, as this would allow us to study kindergarten-readiness skills.

The 136 children in the present study were, on average, four years, eight months of age ($SD = 4.5$ months; range 48–69 months), and 78% ($n = 106$) were male. The majority of children in the sample (97%) were receiving speech/language services from a speech-language pathologist. Children's mean expressive language and receptive language standard scores, respectively, were 70 ($SD = 14.4$, range 45–102) and 71 ($SD = 14.5$, range 45–100); both expressive and receptive language scores were normally distributed (skew values of -0.59 and -0.76 respectively). Children's nonverbal intelligence (as measured by the Kaufman-Brief Intelligence Test (K-BIT); Kaufman and Kaufman 1990), ranged from 53 to 116 with a mean of 76.5 ($SD = 15.86$), and scores were normally distributed (skew value of 0.51). The normal distribution (i.e. lack of skew) seen for these skills signifies that the majority of values were centred around the mean, indicating that the majority of children had average scores for this particular sample in respect to language skills and nonverbal intelligence. Co-existing disabilities were reported for 22% ($n = 29$)

of the children, to include autism or autism spectrum disorders ($n = 12$), attention deficit hyperactivity disorder ($n = 2$), Down syndrome ($n = 2$), developmental delay ($n = 2$), hearing loss ($n = 1$), and fetal alcohol syndrome ($n = 1$). Six per cent ($n = 8$) of the children were reported to have severe or profound cognitive impairment. It is important to note that the children in this study, who exhibit LI based on clinician- and researcher-based criteria, are more heterogeneous than children with LI often described in the research literature (Catts *et al.* 2002, LaParo *et al.* 2004). However, as the children in this study are participants in special education and are receiving services from speech-language pathologists, the external validity of these findings is strengthened.

The majority of children were White/Non-Hispanic (74%), although some children were Black (17%) and White/Hispanic (6%); 3% reported as 'other'. English was spoken in the home for 98% of the children and Spanish was spoken at home for 2%. Annual family incomes varied considerably; 43% reported an annual income of < US\$25 000; 16% reported US\$25 000–50 000; 25% reported US\$50 000–85 000; and 17% reported > US\$85 001. (Due to missing data, household income was not available for 18 children). As a point of reference, the poverty threshold (i.e. minimum level of income deemed adequate) for a family of four in the United States is an annual income of US\$23 550 (US Department of Health and Human Services 2013). Seven per cent of mothers had completed some high school, 21% had a high school diploma or GED, 42% had some college but no degree, 15% had a bachelor's degree, 10% had a master's degree, and 4% had a doctorate (1% no response). Mothers' education levels are reported as a proxy for parental education, given that fathers' education levels demonstrate a strong positive correlation with mothers' education levels (Rowe *et al.* 2012).

Data collection and procedures

Data collection procedures from the larger STAR-2 study that are relevant to the present study are described here. These included collection of child assessments, observation of children's preschool classroom environments, and collection of questionnaires from children's caregivers. In the spring of children's preschool year and again in the spring of the kindergarten year, children's cognitive, language, and literacy skills were assessed by trained examiners over one or two separate sessions. The same battery was used at each time-point and consisted of six measures. The examiners conducted assessments in a one-on-one environment at the child's school. Assessor training included a rigorous multi-step set of procedures which included field-reliability tests requiring

100% adherence to administration protocols. All assessment protocols were scored centrally by research staff and entered into study databases with 100% of data double-entered. Note that only the data collected in the spring of the preschool year were used in this study. The spring assessment window was implemented in the last four weeks of the academic year. As the children in the present study were purposefully selected based on their entrance to kindergarten following the spring assessments, their performance at this time point represents their skill levels in the spring just prior to kindergarten entry.

Caregiver questionnaires were collected in person or via email at the start of the children's participation in the study. This occurred in the autumn of children's preschool year. The questionnaires contained information about demographics, caregivers' academic reading history, book-reading practices, and home literacy environment.

Classroom observations were conducted during the children's preschool year via videotape and were subsequently coded for indices of classroom quality (coding procedures are described under Measures).

Measures

Measures pertinent to the present study were collected to represent three sets of variables: (1) children's school readiness (academic, social-emotional, and behavioural), (2) children's home experiences (i.e. literacy-related practices at home and household chaos), and (3) children's preschool classroom experiences (i.e. classroom instructional and emotional support).

Children's school readiness

In the spring of the children's preschool year, three areas of school readiness were examined, approximately three months prior to kindergarten entry. These included: (1) academic skills (oral language and early literacy), (2) social-emotional skills, and (3) behavioural skills.

Academic skills

Children's oral language and early literacy skills were assessed in the spring of preschool using four measures. First, the CELF-P2 (Wiig *et al.* 2004) was administered to evaluate children's oral language skills. We utilized the Core Language Index of the CELF-P:2, which is a composite of three subtests—Sentence Structure, Word Structure, and Expressive Vocabulary—measuring receptive and expressive language with respect to grammar, morphology, and vocabulary. The Sentence Structure subtest asks children to interpret spoken sentences of increasing complexity and length, and select pictures

that most closely match a verbal stimulus (maximum score of 22). The Word Structure subtest asks children to use correct grammatical elements such as inflections, deviations, and pronouns. Children are supplied with a verbal model and asked to finish the sentence with one word (maximum score of 24). The Expressive Vocabulary subtest asks children to label actions, objects, and people in pictures. The majority of items are scored as two points for correct responses and one point for partially correct responses (maximum score of 20). Satisfactory levels of reliability and validity for the CELF-P:2 are reported by the authors (Wiig *et al.* 2004), with test–retest reliability ranging from 0.77–0.91, internal consistency (Cronbach's alpha) of 0.77–0.95, and moderate to high correlations reported with other tests of language disorders. For the purposes of this study, the raw composite score of the Core Language Index was utilized in analyses.

Second, the *Preschool Word and Print Awareness* test (PWPA; Justice *et al.* 2006) was administered to assess children's concepts about print. The PWPA uses the fictional storybook *Nine Ducks Nine* (Hayes 1990) to ask children to explain or identify 12 print concepts (e.g. upper- versus lower-case letters, print directionality). Specific examples of items include, 'Show me the name of the book,' and 'Show me the first letter on this page.' The maximum score for the PWPA is 17. Test developers reported an inter-rater reliability coefficient of 0.94 (Justice *et al.* 2006). Children's raw scores from the PWPA were utilized in analyses.

Third, the Alphabet Knowledge subtest from the *Phonological Awareness Literacy Screening* (PALS; Invernizzi *et al.* 2004) was utilized to assess children's upper- and lower-case letter knowledge. Children are shown an 8.5 by 11-inch page with all of the upper-case letters and a similar sheet with lower-case letters in random order and asked to name the letters one by one. Test-developers reported internal consistency ranging from 0.77 to 0.93 and inter-rater reliability with a Pearson product–moment correlation coefficient of 0.99 (Invernizzi *et al.* 2004). Validity for this task showed correlations with similar assessments of 0.61 and 0.71, and internal consistency of 0.97 (Cabell *et al.* 2011). The raw score of upper- and lower-case letters identified correctly (out of 52) was utilized in analyses.

Fourth, the Phonological Awareness subtest from the *Test of Preschool Early Literacy* (TOPEL; Lonigan *et al.* 2007) was used to assess children's phonological awareness skills. Tasks in this subtest assess elision skills (asking children to say a word, then to say what is left after dropping out specific sounds) and blending skills (asking children to listen to separate sounds and combine them to form a word). Internal consistency for this subtest is reported as 0.86 for 3–4-year-olds, and 0.88 for 5-year-olds. Criterion-prediction validity has

been found with the *Comprehensive Test of Phonological Processing* (CTOPP; Wagner *et al.* 1999) subtests of Elision (0.59) and Blending (0.65). The raw score on the Phonological Awareness subtest was utilized in analyses.

Social–emotional skills

Children's social–emotional skills were assessed using two measures to span four constructs (pragmatics, cooperation, assertion, self-control). The former three constructs generally represent children's social skills, the self-control construct reflect one aspect of children's emotional development (i.e. ability to regulate one's emotions). First, teacher report from the *Descriptive Pragmatics Profile* (DPP; Wiig *et al.* 2004) provided information about children's pragmatic skills (i.e. social communication). The DPP contains 26 items, with which teachers are asked to rate how often children demonstrate a skill, with a scale of 1 (never) to 4 (always). Three categories of skills are measured with the DPP: nonverbal communication skills, conversational routines and skills, and asking for, giving, and responding to information. Ratings are totalled for an overall score (with a range of 26 to 104). Test-developers report high internal consistency (Cronbach's alpha = 0.95) and test–retest reliability (0.87). The overall raw score for the DPP was used as a measure of social–emotional skills.

Second, the *Social Skills Rating System* (SSRS; Gresham and Elliott 1990) was used to assess cooperation, assertion and self-control. The Social Skills scale of the SSRS includes a 30-item checklist that asks the teacher to rate the frequency of children's cooperation, assertion and self-control on a three-point scale (ranging from never to very often). Internal consistency for the teacher-rated Social Skills scale for the SSRS is strong, 0.94, and test–retest reliability ranges from 0.85 to 0.88. Criterion-related validity testing between the SSRS and Social Behaviour Assessment (SBA; Stephens 1978), a 136-item teacher rating of children's social skills behaviours, revealed a Total Scale correlation of –0.68 for Social Skills. Raw scores from the cooperation, assertion, and self-control scales were utilized in analyses.

Behavioural skills

Children's behavioural skills were assessed with the Problem Behaviours Scale of the SSRS. The Problem Behaviours Scale includes 10 questions which ask teachers to rate the frequency of children's internalizing and externalizing behaviours on a three-point scale (ranging from never to very often). Internal consistency for the Problem Behaviours scale is reported at 0.82 and test–retest reliability ranges from 0.85 to 0.88 for teachers. Criterion-related validity testing between the Problem Behaviours scale of the SSRS and SBA (Stephens 1978)

resulted in a Total Scale correlation of 0.55 for Problem Behaviours. Raw scores for externalizing and internalizing subscales were utilized in our analyses.

Assessments of children's home experiences

Information specific to children's participation in literacy-related activities at home and the overall level of chaos and disorganization in children's homes was captured from information provided in a caregiver questionnaire completed during children's preschool year.

Literacy-related practices at home

A comprehensive inventory of home-literacy practices was completed by caregivers using questionnaire items drawn from many sources (e.g. Griffin and Morrison 1997, Hood *et al.* 2008). Two empirically derived factors represented among items in this questionnaire (Sawyer *et al.* 2013), provided two variables representative of literacy-related practices. The first, *frequency of shared book reading* (eigenvalue of 2.13), comprised three items specific to the frequency with which children (1) are read to on a weekly basis (factor loading of 0.90), (2) ask to be read to on a weekly basis (factor loading of 0.89), and (3) look at books on their own on a weekly basis (factor loading of 0.72). The second, *literacy teaching during shared book reading* (eigenvalue of 1.77), comprised two items specific to the frequency with which caregivers taught children during shared reading about (1) individual words (factor loading of 0.94) and (2) alphabet letters (factor loading of 0.94). Cronbach alphas were 0.79 and 0.87, respectively. For both factors, responses were summed to create a composite (maximum score of 24 for the frequency of shared book reading factor and 16 for the literacy teaching during shared book reading factor). In our sample, caregivers received a mean score of 13.93 (SD = 6.41, range of 0–24) for the frequency of shared book reading factor and a mean score of 7.03 (SD = 5.01, range of 0–16) for the literacy teaching during shared book reading factor.

Household chaos

The *Confusion, Hubbub, and Order Scale* (CHAOS; Matheny *et al.* 1995) was used to measure children's experiences in the home in regard to the level of organization or, conversely, chaos. The CHAOS was designed as an economical measure to evaluate a home's environmental confusion, such that homes with lower levels of environmental confusion could be considered more supportive environments. The original CHAOS contains 15 questions to which caregivers respond by selecting either true or false. In this study, a six-item modified scale was used. Caregivers respond to each

item (e.g. 'It's a real zoo in our home.') on a scale of 1 (Definitely Untrue) to 5 (Definitely True), where higher scores indicated higher levels of chaos in the home. Internal consistency for the original CHAOS scale (all 15 items) was reported at 0.79 (Matheny *et al.* 1995). In our sample, caregiver report resulted in a mean score of 15.14 (SD = 4.10, range of 3–24, maximum score of 30), with higher scores indicating higher levels of chaos.

Assessments of children's preschool classroom experiences

The *Classroom Assessment Scoring System—PreK* (CLASS Pre-K; Pianta *et al.* 2005) was utilized to assess children's classroom experiences in regard to both *instructional* and *emotional* support in the preschool year. The CLASS Pre-K is a systematic observational tool designed to rate the quality of preschool classrooms. The tool is divided into three domains comprised of 10 dimensions. For the purposes of the present study, two domains (Instructional Support and Emotional Support) were used in analyses, given their established relations to the outcomes of interest in this study (Mashburn *et al.* 2008). The Instructional Support domain is comprised of the dimensions of concept development, quality of feedback, and language modelling. The Emotional Support domain is comprised of the dimensions of positive climate, negative climate, teacher sensitivity, and regard for student perspectives. CLASS scales are rated on a seven-point Likert-type continuum (1, 2 = low levels of observed construct; 3, 4, 5 = moderate levels; 6, 7 = high levels). CLASS scores were obtained from 90-min videotaped sessions intended to capture what typically occurs in a classroom. Classroom videos were then coded in the research laboratory by reliable CLASS coders. Reliability protocols for coders included a 2-day training workshop given by a certified CLASS coder and achieving 90% agreement with six gold-standard master coded videos. Possible scores on the Instructional Support and Emotional Support domains range from 0 to 7. Teachers in our sample had a mean score of 2.15 (SD = 0.70, range of 1–4) for the Instructional Support domain and mean score of 5.18 (SD = 0.62, range of 3.60–6.30) for the Emotional Support domain. These scores are comparable to these seen in large-scale investigations of early childhood programs (e.g. 2.08 and 5.57, respectively, as reported in Mashburn *et al.* 2008).

Statistical analyses

To address the two research aims of this study, two phases of analyses occurred. First, we utilized latent class analysis (LCA) to classify individuals into classes based on individual responses (Samuelsen and Dayton 2010). LCA determines group membership from a person-centred

Table 1. Descriptive statistics for children's school-readiness skills ($N = 136$)

	Range	Mean	SD
<i>Academic</i>			
Oral language (CELF-P:2 composite)	45–116	76.53	15.86
Print concepts (PWPA)	46–161	95.27	19.34
Alphabet knowledge (PALS)	0–52	25.85	18.78
Phonological awareness (TOPEL)	54–118	76.71	14.30
<i>Social</i>			
Pragmatics (DPP)	26–104	78.38	17.06
Cooperation (SSRS)	5–20	13.31	3.78
Assertion (SSRS)	0–20	10.60	4.88
Self-control (SSRS)	2–20	13.38	4.32
Social Skills Scale (SSRS)*	46–130	96.32	16.26
<i>Behavioural</i>			
Internalizing (SSRS)	0–6	0.95	1.30
Externalizing (SSRS)	0–12	3.32	3.08
Problem Behaviours Scale (SSRS)	85–134	98.39	12.28

Note: For CELF-P:2, PWPA, TOPEL and SSRS, standard scores are reported for descriptive purposes, but raw scores were used in analyses. CELF-P:2 = Clinical Evaluation of Language Fundamentals—Preschool: 2nd Edition, PWPA = *Preschool Word and Print Awareness*, PALS = Phonological Awareness Literacy Screening, TOPEL = Test of Preschool Early Literacy, DPP = Descriptive Pragmatics Profile, and SSRS = *Social Skills Rating System*.

approach based on children's school readiness skills. In this study, we used Latent Profile Analysis (LPA), a subtype of LCA, which is conceptually identical to LCA except that the LPA indicators are continuous; in LCA, the indicators are categorical (Logan and Petscher 2010). As noted previously, when the final number of profiles was determined from the LPA analyses, treatment status was examined for its relation to children's profile membership. It was not significantly associated with children's profile membership and thus was not included in the subsequent models.

Second, we utilized multilevel logistic regression, also referred to as hierarchical generalized linear models (HGLM; O'Connell *et al.* 2008), to examine the relations between profile membership and children's home and classroom experiences, with five predictors included to represent literacy-related practices at home (frequency of shared book reading, literacy teaching during shared book reading), household chaos, preschool classroom quality (emotional support, instructional support). HGLM was used given that our chosen outcome variable (children's profile membership) is categorical. HGLM provides the methodology necessary to model variation across contexts for non-normally distributed outcomes.

Results

Prior to addressing the first study aim, we investigated children's school-readiness skills descriptively, as shown in table 1. Given that the children in the present study exhibited LI and were purposefully selected using a criterion specific to the CELF-P:2, the observed low scores

on measures of language were to be expected. Children's mean score (mean = 95.27) on the measure of print concepts (PWPA) is similar to that in prior reports in which this measure was used with children with specific language impairment (mean = 94, Justice *et al.* 2006); however, it is lower than that seen with non-impaired peers (mean = 111). Children's mean score for the alphabet knowledge measure (mean = 25.85), which represents children's ability to name all 26 letters in upper- and lower-case format, seems somewhat high relative to some published reports of letter-name knowledge in children with LI (Cabell *et al.* 2010); however, such studies only examined the upper-case format, making interpretation difficult. With respect to phonological awareness, children in this study performed below normative expectations (mean = 76.71), which is expected based on prior assessments of phonological awareness among children with LI (Bishop and Adams 1990) and consistent with other reports (Catts *et al.* 2006). Overall, the descriptive data suggest that these youngsters, as a group, are under-developed in several key school-readiness skills within the academic domain.

Social-emotional skills based on the DPP and SSRS also appear in table 1. The DPP shows that the children varied substantially on this measure (range 26–104). The same was also true for the SSRS subscales. In an effort to understand children's social-emotional skills relative to the general population, we reviewed descriptive data from the standard scores for the SSRS Social Skills Scale (a composite of Cooperation, Assertion, and Self-control scales). The results revealed that children in the present study scored in the average range on this scale (mean = 96.32, SD = 16.26), although some children had quite low scores (range 46–130).

With respect to children's internalizing and externalizing behaviours, also derived from the SSRS, children showed only a modest range in their scores on these measures. On the Problem Behaviours scale (a composite of Externalizing and Internalizing), participants scored in the average range on this scale (mean = 98.39, SD = 12.28), with none performing outside of the normal range (range 85–134).

Table 2 presents the inter-correlations among variables in this study, which served to represent children's school readiness just prior to kindergarten entry. As expected, many variables were positively correlated with one another, with significant coefficients ranging in size from small (e.g. print concepts and externalizing behaviour, $r = 0.18$) to very large (e.g. pragmatics and assertion, $r = 0.78$). An underlying assumption of LCA (the method of analysis used in the present study) is that all observed variables are uncorrelated within a profile, therefore any multicollinearity that may be found among variables is not of concern for the present analyses.

Table 2. Inter-correlations among school-readiness indices ($N = 136$)

Variable	2	3	4	5	6	7	8	9	10
1. Oral language	0.74*	0.41**	0.61**	0.50**	0.43**	0.45**	0.48**	0.08	0.32**
2. Print concepts		0.29**	0.58**	0.36**	0.26**	0.29**	0.30**	0.22*	0.18*
3. Alphabet knowledge			0.40**	0.15	0.24**	0.05	0.27**	0.11	0.21*
4. Phonological awareness				0.42**	0.38**	0.29**	0.30**	0.07	0.28**
5. Pragmatics					0.71**	0.78**	0.69**	0.31**	0.53**
6. Cooperation						0.70**	0.72**	0.27**	0.58**
7. Assertion							0.72**	0.27**	0.41**
8. Self-control								0.31**	0.67**
9. Internalizing behaviours									0.24**
10. Externalizing behaviours									—

Note: * $p < 0.05$, ** $p < 0.01$.

Table 3. Fit indices from model testing

Groups	AIC	BIC	TECH 11	Entropy
2	3390.87	3480.24	0.00	0.94
3	3280.99	3402.07	0.10	0.90
4	3217.18	3369.97	0.06	0.92
5	3197.15	3381.65	0.71	0.91

Note: AIC = Akaike information criteria, BIC = Bayesian information criterion, and TECH 11 = Lo–Mendell–Rubin likelihood ratio test.

Profiles of school readiness

The first study aim was to explore profiles of school-readiness skills of children with LI. LPA-derived models were tested for two- to five-group solutions, using a variety of model fit indices to evaluate the data. In all analyses, z -scores were used to allow for comparison of scores across measures, which was a necessary step given the varying range of scores across measures. Table 3 provides the model fit indices for all models (group sizes of two through five). Using the recommendations of Logan and Petscher (2010), multiple indices were examined to determine that a four-group solution was the most appropriate fit for the data.

The first two indices are the Akaike information criteria (AIC; Kaplan 2000) and Bayesian information criterion (BIC; Kaplan 2000); the AIC and BIC evaluate model parsimony, with lower values indicating a more parsimonious model fit. Model results showed that both of these indices declined as the number of groups tested increased. Given that simulation studies show that the BIC surpasses the AIC on consistency and efficiency (Yu 2002), we plotted BIC values to examine model fit results visually. The plot of the BIC demonstrates that the slope of the curve decreases after the four-group model, signifying that the four-group model is the best fitting for these data. Additionally, the Lo–Mendell–Rubin likelihood ratio test (TECH11; Lo *et al.* 2001) was used as a model fit index as reported in the MPlus programme (Muthén and Muthén 2006). TECH 11 demonstrates whether the model being tested fits sig-

nificantly better than a model with one less group as indicated with significant p -values ($p < 0.05$). TECH 11 was significant for Group 2 and showed a trend toward significance for Group 4 ($p = 0.06$). TECH 11 was not significant for both the three- and five-group model, indicating that these two models were not the best fit for our data. Finally, entropy values offer information about group membership classification and are indicators of model fit. In examining entropy, values greater than 0.80 indicate a good separation of the identified groups (Ramaswamy *et al.* 1993). For these data, entropy was acceptable for all five models. As a final examination of model fit, posterior probabilities were studied, which provide information about the probability of children's membership in the five groups. Given that specific guidelines suggesting the acceptability of level of posterior probability fit do not exist, for the purposes of the proposed study 80% was used as the cut-off value. The mean probability for children's membership in the given groups ranged from 90% to 99%. To sum, accounting for all model fit indices, the four-group model was determined to be the best fit for our data. Due to missing data, 132 children were placed in profiles.

In order to examine visually the nature of the four groups identified by the LPA, we graphed children's school readiness z -scores by group (figure 1). Below, we provide brief descriptive overviews for the four identified profiles based on children's school readiness skills. We also provide information relevant to each profile's demographic characteristics (e.g. race/ethnicity, family income; see also table 4). Profile names were created with the intention of capturing the most salient feature of each profile.

Profile 1—Socially Ready

Children in this profile (20% of the sample) exhibited slightly above average scores on our measures of academic skills (approximately 0.5 SDs above the group

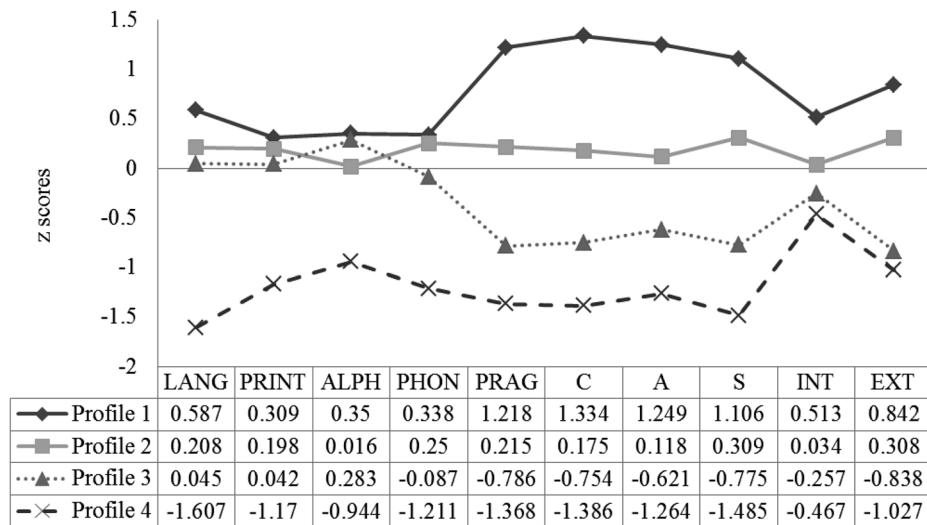


Figure 1. School readiness scores (Z-scores) by profile. LANG = oral language, PRINT = print, ALPH = alphabet knowledge, PHON = phonological awareness, PRAG = pragmatics, C = cooperation, A = assertion, S = self-control, INT = internalizing behaviours, and EXT = externalizing behaviours. Internalizing behaviours and externalizing behaviours are reverse scored such that lower scores represent more problem behaviours.

mean), well above average social skills (more than 1 SD above the group mean), and slightly above average skills for both externalizing behaviours (1 SD above the mean) and internalizing behaviours (0.5 SDs above the mean). In general, children in this profile were 4 years 9 months old, predominantly Caucasian and males (76.9%) and had cognitive skills within the average range (mean = 84.27 on the KBIT). About half (47.8%) of the families of the children in this profile had annual incomes above US\$35 000 per year and about 30% of mothers had a bachelor's degree or above.

Profile 2—Absolutely Average

Children in the second profile (the largest extracted group, accounting for 47%) exhibited average skills across all school readiness measures. Children in this profile were on average 4 years 8 months old, primarily male (79.4%) and Caucasian with cognitive ability scores that were slightly below average (mean = 81.13 on the KBIT). On average, 61% of the families of children in this profile reported annual incomes of above US\$35 000 per year and 31% of mothers had a bachelor's degree or above.

Profile 3—Socially Awkward

Children in the third extracted profile (prevalence of 19%) had average scores on our measures of academic skills. However, these children exhibited below average scores on social and behavioural measures, although teacher report of internalizing behaviour skills was only slightly below average. As with the second profile, chil-

dren in this third profile were on average 4 years 8 months old, primarily male (84%) and Caucasian with slightly below average cognitive skills (mean = 78.76 on the KBIT). About half (47.6%) of families of children in this profile reported average annual family incomes above US\$35 000 per year and 24% of mothers reported having a bachelor's degree or above.

Profile 4—Limited Readiness

The fourth profile of children (14%) demonstrated below average skills on both academic and social skills. Children's scores on our measure of externalizing behaviours were also below average, although their scores for internalizing behaviours were only slightly below average. On average, children in this profile were 4 years 9 months old. As with the other three profiles, children in this profile were predominately male (72.2%); however, unlike the other profiles the majority of children in this profile were non-Caucasian (66.7%). Additionally, the children in this fourth profile exhibited the lowest cognitive skills in comparison with all other profiles (mean = 59.44 on the KBIT). Approximately 31% of the families of the children in this profile reported an annual family income of above US\$35 000 and 21% of mothers reported having a bachelor's degree or above.

Prediction of profile membership from home and classroom experiences

The second research aim was to predict membership in the four identified profiles with respect to home

Table 4. Demographic and school-readiness characteristics by profile

	Profile 1 Socially Ready	Profile 2 Absolutely Average	Profile 3 Socially Awkward	Profile 4 Limited Readiness
<i>N</i> (prevalence)	26 (20%)	63 (47%)	25 (19%)	18 (14%)
Mean age (months)	57.22 (4.10)	55.57 (4.62)	55.63 (3.95)	56.54 (5.29)
Per cent female	23.1	20.6	16	27.8
Per cent non-Caucasian	26.9	23.8	32	66.7
Maternal education (%) bachelor's degree or above)	29.2	30.6	24	21.3
Family annual income (per cent non-poor/above US\$35 000 per year)	47.8	60.7	47.6	30.8
Cognitive ability (KBIT scores)	84.3 (14.9)	81.1 (16.3)	78.8 (15.9)	59.4 (11.0)
Percent with co-morbid disability	11.5	15.9	36	55.6
<i>Academic</i>				
Oral language (CELF-P:2)	84.2 (12.2)	81.4 (11.7)	78.2 (14.0)	52.2 (11.4)
Print concepts (PWPA)	105.5 (17.6)	103.1 (15.2)	101.9 (19.5)	71.1 (17.5)
Alphabet knowledge (PALS)	32.5 (18.1)	25.7 (16.8)	31.6 (18.7)	7.8 (15.4)
Phonological awareness (TOPEL)	80.3 (15.4)	80.2 (12.6)	74.8 (14.2)	61.6 (9.2)
<i>Social</i>				
Pragmatics (DPP)	99.7 (4.5)	82.3 (8.0)	64.4 (9.5)	54.9 (13.9)
Cooperation (SSRS)	18.4 (1.2)	13.9 (2.2)	10.3 (1.6)	8.0 (1.5)
Assertion (SSRS)	16.8 (3.2)	11.3 (3.0)	7.5 (2.9)	4.4 (3.0)
Self-control (SSRS)	18.2 (1.6)	14.7 (2.7)	10.0 (1.8)	6.9 (2.6)
Social Skills Scale (SSRS)	120.4 (8.5)	102.8 (6.9)	88.8 (5.9)	74.7 (9.1)
<i>Behavioural</i>				
Internalizing (SSRS)	0.2 (0.6)	0.9 (1.2)	1.3 (1.4)	1.6 (1.9)
Externalizing (SSRS)	0.7 (1.1)	2.4 (1.9)	6.0 (3.0)	6.5 (3.3)
Problem behaviours scale (SSRS)	86.9 (5.0)	95.1 (8.5)	108.2 (11.2)	111.7 (12.5)

Table 5. Results of HGLM analyses

Home/classroom experience	Intercept	Estimate	Standard error of estimate	Odds ratio
Home experiences				
<i>Literacy-related activities—frequency of SBR</i>				
Profile 1 versus 2	1.17	−0.02	0.04	0.98
Profile 1 versus 3	−0.23	0.02	0.05	1.02
Profile 1 versus 4	−0.66	0.01	0.05	1.01
<i>Literacy-related activities—frequency of LT</i>				
Profile 1 versus 2	0.73	0.03	0.05	1.03
Profile 1 versus 3	−0.38	0.04	0.06	1.04
Profile 1 versus 4	−1.58	0.13	0.07	1.14
<i>Chaos</i>				
Profile 1 versus 2	2.12	−0.07	0.06	0.93
Profile 1 versus 3	2.15	−0.14	0.07	0.87
Profile 1 versus 4	1.45	−0.13	0.09	0.88
Classroom experiences				
<i>Instructional support—CLASS</i>				
Profile 1 versus 2	1.01	−0.50	0.34	0.61
Profile 1 versus 3	0.02	−1.06	0.44	0.35*
Profile 1 versus 4	−0.40	−1.55	0.51	0.21*
<i>Emotional support—CLASS</i>				
Profile 1 versus 2	1.08	−0.24	0.48	0.78
Profile 1 versus 3	0.09	−1.05	0.60	0.35*
Profile 1 versus 4	−0.31	−1.49	0.65	0.22*

Notes: SBR = shared book reading, and LT = literacy teaching during shared book reading.

* $p < 0.05$.

and classroom experiences. To conduct this analysis, the significance of these relationships was examined using HGLM (O'Connell *et al.* 2008). First, two models were conducted to examine the relationship between profile membership and children's experiences in their homes. These two models examined children's participation in literacy-related activities (the first model using frequency of shared book reading in the home as a predictor and the second examining literacy teaching in the home as a predictor). See table 5 for model results. Both frequency of shared book reading and literacy teaching in the home showed no significant difference in profile membership. Finally, a model was conducted to examine the relationship between profile membership and household chaos (as measured by scores on the CHAOS). CHAOS scores showed no significant difference in profile membership.

Next, two models were conducted to understand the relationships between profile membership and children's preschool classroom experiences (the first using instructional support in the classroom as a predictor and the second using emotional support in the classroom as a predictor). Model results are presented in table 5. A significant relation was found between profile membership and instructional support in children's preschool classroom. With increases in CLASS instructional support scores during preschool, the likelihood of placement in Profile 1 (Socially Ready) increases as compared to Profiles 3 and 4 (Socially Awkward, Limited Readiness). More specifically, as instructional support scores increase the odds of children being placed into Profile 3 in comparison with Profile 1 decreases by 65% and the odds of being placed into Profile 4 in comparison with Profile 1 decreases by 79% (see Odds Ratio column in table 5).

Additionally, a significant relationship was also found between profile membership and emotional support in children's preschool classroom. With increases in CLASS emotional support scores, the likelihood of placement in Profile 1 (Socially Ready) increases as compared to Profiles 3 and 4 (Socially Awkward, Limited Readiness). Specifically, as emotional support scores increase the odds of children being placed into Profile 3 in comparison with Profile 1 decreases by 65% and the odds of being placed into Profile 4 in comparison with Profile 1 decreases by 78% (see the odds ratio column in table 5).

Discussion

The present study was conducted to advance our understanding of school readiness among children with LI. Although many studies have shown that children with LI, as a group, are susceptible to difficulties at school entry, due in part to challenges related to a lower level

of language and literacy skill, social competence, and behavioural difficulties (Cabell *et al.* 2011, Justice *et al.* 2009, Morgan *et al.* 2011, Catts *et al.* 2002), our interest in this study was to examine whether these youngsters show reliable *profiles* of readiness skills. We questioned, for instance, whether there may be certain profiles of children who appear well-prepared for the transition to kindergarten relative to other profiles of children who seem less prepared and, by consequence, at greater risk for immediate and future academic challenges. Several of the major findings of this work are that (1) four empirically derived profiles serve to characterize the school readiness of children with LI, (2) two profiles (Socially Awkward, Limited Readiness), which together represent one-third (33%) of the children, reflect groups of children in which limited readiness is observed across some of the readiness dimensions measured, and (3) the quality of children's preschool experiences, but not their home environment, appear to be associated with profile membership.

With respect to the first finding of note, children with LI at kindergarten entry show four distinct profiles of readiness skills. Drawing upon person-centred research methods, the results suggest meaningful relations among readiness skills that characterize specific groups of children. The most dominant profile is that which we refer to as 'Absolutely Average', as these children (47% of the sample) exhibit language, literacy, social, and behavioural competencies that are average relative to their peers. This profile represents children who are largely male (80%), White (76%), and are socioeconomically stable (69% of their mothers have higher education credentials). Relatively few of these youngsters have diagnoses co-morbid with LI, and their nonverbal cognition is slightly lower than average (mean = 81). Their literacy skills, social skills, and problem behaviours occur within the average range, and we might speculate that their transition to kindergarten will be relatively seamless.

The other three profiles, by comparison, show significant deviations from the readiness profiles of the Absolutely Average group. Children in the Socially Ready Profile (20% of the sample) have academic skills similar to those in the Absolutely Average group, but have social and behavioural competencies well above that of the other profiles. For instance, children in this profile receive an average standard score of 120 on the Social Skills Scale of the SSRS. Few of these children have co-morbid diagnoses (about 12%), and their nonverbal cognitive skills are the highest of all four profiles (mean = 84). We might speculate that children in this profile will also have a relatively easy adjustment to kindergarten, particularly in the social milieu. On the other hand, the remaining two profiles (Socially Awkward, Limited Readiness) exhibit patterns of readiness skill that should raise concerns about their capacity to thrive in the context of formal

schooling. Together, children in these profiles represent one in three of the children studied.

Concerning this second major finding, analysis suggested two reliable profiles of children—Profile 3 (Socially Awkward) and Profile 4 (Limited Readiness)—whose patterns of readiness skill were less-developed relative to the other groups. Those in the Socially Awkward group had average academic skills but social and behavioural competencies significantly less-developed than children in Profiles 1 and 2. Their abilities in such areas as cooperation, assertion, and self-control were more than 1 SD below those in Profiles 1 and 2, raising the possibility that these youngsters will have significant difficulties navigating the social realm of the kindergarten classroom. While prior studies employing variable-centred approaches have shown that children with LI are more likely than other children to have difficulties in such areas (Fujiki *et al.* 1996, 2002), the present work shows that there are specific profiles of children in which under-developed social-behavioural competencies are a defining characteristic of their academic profile. While children in two of the profiles (1 and 2) had social-behavioural competencies in the average range, those in Profile 3 (as well as Profile 4, discussed shortly) are likely those who drive effects in variable-centred work showing that children with LI have lower social competence than typically developing children.

Children in Profile 4 (Limited Readiness) exhibited the poorest readiness profiles, displaying markedly under-developed skills in language, literacy, social, and behavioural competencies. Representing 14% of the children studied, these children have the lowest non-verbal cognition (mean = 59) and are likely to have co-morbid diagnoses. It is important to note the extent of impairment the children in this profile exhibit in key readiness areas; for instance, their phonological-awareness skills are more than 2 SD units lower than those in Profile 1, as are their print-concept skills, alphabet knowledge, and social skills. The qualitative and quantitative distinctions between children in this profile and those in the other profiles indicate the importance of recognizing heterogeneity among these children with respect to skill profiles on school entry. Given prior research showing the stability of readiness profiles over time as well the positive predictive relations between kindergarten readiness and future academic achievement (Cabell *et al.* 2013, Hair *et al.* 2006), we anticipate that children in Profile 4 may require and benefit from intensive, comprehensive interventions designed to improve their readiness skills during kindergarten, so that they might better be able to benefit from the experiences afforded by formal education.

Although the present work is correlational in design, our results endorse the developmental benefit afforded by exposure to a high-quality preschool classroom

experience, particularly with respect to profile membership. Many prior studies have linked the quality of the preschool classroom environment, as measured by the same instrument used here (CLASS PreK), to children's short- and long-term academic and social skills (e.g. Burchinal *et al.* 2010, Mashburn *et al.* 2008). For instance, in their study of over 2000 preschool children enrolled in publicly funded PreK, Mashburn *et al.* (2008) found that instructional interactions in the preschool classroom (as measured by the CLASS PreK) predicted young children's academic and language skills and that emotional interactions were related to children's social skills. Such findings suggest that exposure to high-quality environments may promote children's growth in key school readiness skills.

The benefits afforded children through exposure to high-quality early educational experiences may be especially critical for those children who demonstrate less-developed school readiness skills and are in turn at-risk for later academic difficulties (such as those children identified in Profiles 3 and 4 of the present study). The identification of these two at-risk groups coupled with our finding relevant to the relationship between high-quality preschool environments and profile membership highlights the importance of understanding potential environmental mechanisms that may impact the school readiness skills of children with LI. We are aware of few if any studies, outside of the present work, linking the quality of preschool classroom environments to the school readiness of children with LI using variable- or person-centred analyses. However, in interpreting our findings relative to classroom environments it is important to consider possible child-by-environment interactions, in which children's skills serve to shape the environment they experience in their preschool classrooms. Such interactions should be investigated in future research to fully understand the potential impact exposure to rich classroom environments may have on the school readiness skills of children with LI. An additional avenue for future research is to understand the role parental choice in preschool programme may play in the relationship between classroom quality and children's skills, as this factor may serve as a potential confound in the present work.

The association between preschool classroom quality, represented by indices of both emotional support and instructional support in the early childhood special education classroom, suggests at least in part that readiness profiles may be malleable. Although inherently correlational in design, our study's results offer support to the argument that provision of high-quality early experiences (particularly those in the preschool classroom context) may serve as a means for ensuring that young children with LI arrive in kindergarten with the skills necessary to be prepared for future academic success. It

may be especially important that these early experiences focus on those skills shown to be beneficial to future success in school (e.g. maths, reading, attentional skills; Duncan *et al.* 2007).

Limitations and conclusions

Several limitations to the present study warrant consideration. First, this study is limited by its reliance on teacher report for the estimates of children's socio-emotional skills. Although we have no reason to question the accuracy of teacher report, future studies should consider additional sources of information, such as direct measures of such skills. Second, we must acknowledge that other potentially relevant indicators of school readiness are not represented in the present work. Perhaps most importantly, this study does not include measures of children's attention, which have been found to be a component of school readiness that is predictive of future academic skills (Duncan *et al.* 2007). At the same time, representation of children's academic skills is limited to language and literacy skill, and does not include math or other content areas. Third, measures of children's school readiness were collected in the spring of the preschool year, as opposed to immediately prior to arrival to kindergarten. Although the juncture of time separating the observations in this study from kindergarten entrance is small (about three months), it is unknown whether children's skills may change over the summer months. Indeed, future work should explore potential changes that may occur in children's skills in the several weeks between their exit from preschool and entry to kindergarten. Fourth, the relatively small sample size and possible demographic bias found in the sample warrants future work in this area with a larger, more representative group of young children. Finally, it is possible that characteristics of caregivers (e.g. parental education level, reading ability) may have played a mediating role in the relationship between home characteristics and profile membership; this potential relationship should therefore be explored in future research.

In sum, this work presents an important advance in our understanding of the nature of school readiness among children with LI, a population of children at risk for poor academic achievement (e.g. co-morbidity with reading disability; Tomblin *et al.* 2000). Findings revealed that children could be reliably placed within four profiles based upon their school readiness, and that classroom experiences were related to membership in these profiles: children in classrooms with higher levels of instructional/emotional support were more likely to have school readiness profiles characterized by higher skill levels. The results suggest that high-quality classroom experiences can be influential for ensuring that

young children with LI arrive in kindergarten ready to learn.

Acknowledgements

This research was supported by Grant # R324A080037 from the National Center for Special Education Research, Institute of Education Sciences. **Declaration of interest:** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper

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