Purpose: Parents, professionals, and policy makers need information on the long-term prognosis for children with communication disorders. Our primary purpose in this report was to help fill this gap by profiling the family, educational, occupational, and quality of life outcomes of young adults at 25 years of age (N = 244) from the Ottawa Language Study, a 20-year, prospective, longitudinal study of a community sample of individuals with (n = 112) and without (n = 132) a history of early speech and/or language impairments. A secondary purpose of this report was to use data from earlier phases of the study to predict important, real-life outcomes at age 25.

Method: Participants were initially identified at age 5 and subsequently followed at 12, 19, and 25 years of age. Direct assessments were conducted at all 4 time periods in multiple domains (demographic, communicative, cognitive, academic, behavioral, and psychosocial).

Results: At age 25, young adults with a history of language impairments showed poorer outcomes in multiple objective domains (communication, cognitive/academic, educational attainment, and occupational status) than their peers without early communication impairments and those with early speech-only impairments. However, those with language impairments did not differ in subjective perceptions of their quality of life from those in the other 2 groups. Objective outcomes at age 25 were predicted differentially by various combinations of multiple, interrelated risk factors, including poor language and reading skills, low family socioeconomic status, low performance IQ, and child behavior problems. Subjective well-being, however, was primarily associated with strong social networks of family, friends, and others.

Conclusion: This information on the natural history of communication disorders may be useful in answering parents’ questions, anticipating challenges that children with language disorders might encounter, and planning services to address those issues.

Key Words: speech impairment, language impairment, educational outcomes, occupational outcomes, family, quality of life, longitudinal

Emerging adulthood is thought to be a distinct developmental period that spans the ages 18–25 years and is characterized by frequent changes in and independent explorations of possible life directions (Arnett, 2000, 2007). Young adults often live independently for the first time, investigate various educational and career options, make new friends, and explore possible romantic relationships. By the end of emerging adulthood, individuals may make important choices that influence their future life trajectories, roles, and responsibilities. They may choose a life partner, begin a family, pursue higher education, and/or settle on a career. Collectively, these often interrelated choices may determine the parameters of adult life for many years to come and may affect the extent to which individuals feel satisfied and fulfilled with their lives.

Relatively little is known about the important real-life choices made by individuals with a history of communication disorders during the period of emerging adulthood. Yet, for prognostic and planning purposes, parents, professionals, and policy makers need comprehensive data on real-life adult outcomes of childhood communication disorders, such as those represented by family, educational, occupational,
and quality of life data. Parents of adolescents with communication disorders have concerns about the eventual ability of their children to assume adult relationships, roles, and responsibilities (Conti-Ramsden, Botting, & Durkin, 2008). Data on these outcomes in emerging adulthood would help professionals to answer parents’ questions, to anticipate challenges that individuals with communication disorders might encounter, and to plan services to address those issues. Similarly, such data might allow policy makers to assess the impact of childhood communication disorders on individuals and society as a whole and perhaps to institute policies and to allocate resources to minimize adverse outcomes.

Existing follow-up studies of the natural history of childhood communication disorders suggest that parental, professional, and societal concerns about adult outcomes are justified. Many individuals with early communication disorders experience persistent difficulties in communication, cognition, academic achievement, social–emotional relations, educational attainment, and occupational outcomes (Conti-Ramsden, Botting, & Durkin, 2008; Felsenfeld, Broen, & McGuire, 1992, 1994; Hall & Tomblin, 1978; Howlin, Mawhood, & Rutter, 2000; King, Jones, & Lasky, 1982; Lewis & Freebairn, 1992; Mawhood, Howlin, & Rutter, 2000; Records, Tomblin, & Freese, 1992). Individuals with early language impairments appear to be at greater risk for adverse adult outcomes than those with childhood speech impairments (Hall & Tomblin, 1978; King et al., 1982; Lewis & Freebairn, 1992).

Ideally, research on outcomes in emerging adulthood would be based on prospective, longitudinal studies of large community samples of children with and without communication disorders, who were followed over time and assessed periodically in multiple domains of functioning (Law, Boyle, Harris, Harkness, & Nye, 2000). Moreover, for valid comparisons of family life, educational attainment, occupational status, quality of life, or other outcomes, all participants in an adult follow-up study should be roughly the same age (Levine & Nourse, 1998). Unfortunately, none of the existing follow-up studies into adulthood incorporated all of these desirable methodological features. Many relied on retrospective, rather than prospective, designs, in which a comparison group was identified in adulthood rather than followed from childhood (Clegg et al., 2005; Hall & Tomblin, 1978; King et al., 1982; Lewis & Freebairn, 1992; Records et al., 1992). Other methodological issues included the following: (a) cross-sectional comparisons of different age groups of participants (Lewis & Freebairn, 1992) rather than longitudinal comparisons of the same participants, (b) reliance on parental report (Hall & Tomblin, 1978; King et al., 1982) rather than direct assessment, and (c) assessment of adult participants who varied widely in age (King et al., 1982; Lewis & Freebairn, 1992; Records et al., 1992). Moreover, many adult follow-up studies included only clinic-referred individuals (Clegg et al., 2005; Hall & Tomblin, 1978; Howlin et al., 2000; King et al., 1982; Lewis & Freebairn, 1992; Mawhood et al., 2000; Records et al., 1992), who may differ in important ways from those identified by systematic community testing. For example, children with articulation/phonological disorders are more likely to be referred to clinics than are those with language disorders (C. J. Johnson, Beitchman, et al., 1999; Tomblin, Records, et al., 1997). Because of these methodological concerns, existing adult follow-up studies do not yet provide a complete picture of outcomes for children with communication disorders in emerging adulthood. In addition, only one previous adult follow-up study reported on the four domains of interest here, namely, family, educational, occupational, and quality of life outcomes (Records et al., 1992). However, participants in that study had just entered emerging adulthood, and few had yet made commitments regarding future life directions.

In contrast, this report describes the family, educational, occupational, and quality of life outcomes of 25-year-old participants from the Ottawa Language Study, a 20-year, prospective, longitudinal study of a community sample of individuals with and without early speech and/or language impairments (N = 284). Participants were first identified at age 5 (Time 1), then followed at ages 12 (Time 2) and 19 (Time 3), and ultimately assessed at age 25 (Time 4)—well into the period of emerging adulthood. At each time, information was collected in multiple domains (demographic, communicative, cognitive, academic, behavioral, and psychosocial) via direct assessments and questionnaires. Previous follow-up studies did not consistently use this unique combination of desirable methodological features found in the Ottawa Language Study.

Readers should, nonetheless, keep in mind that all longitudinal investigations of the natural history of disorders, such as the Ottawa study, have a number of inherent methodological challenges and limitations (Law et al., 2000). First, it is difficult to maintain contact with and to ensure the continuing participation of individuals from original study samples over extended periods of time (20 years in this case). Second, new theoretical perspectives and assessment tools emerge during the course of a longitudinal study. However, these new perspectives and measures cannot be retrospectively incorporated into earlier phases of the study. Thus, data collected in earlier phases of the study may not permit examination of some issues that become relevant in later phases. Finally, data collected in these observational studies are correlational in nature and do not permit causal inferences to be drawn. Multiple predictors and outcomes of interest may be interrelated, necessitating careful analysis and interpretation of possible confounding relations.

In this report, our first objective was to provide a profile of real-life adult outcomes of participants of the Ottawa Language Study at age 25 (Time 4). At age 19 (Time 3), we could only get a tentative picture regarding their eventual educational attainment, occupational status, and family life. Most participants were still in school; their jobs were temporary rather than permanent; they were too young to have permanent relationships or families. By age 25, however, many participants should have completed their schooling, chosen a career path, entered permanent relationships, and started their families. Self-assessments of quality of life would also enable a glimpse into their “perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (World Health Organization Quality of Life Group, 1995, p. 1403).
Previous follow-up studies have suggested that adults with a history of communication disorders experienced lower levels of educational attainment and occupational status than those without such a history (Clegg et al., 2005; Felsenfeld et al., 1994; Records et al., 1992). Some also experienced problems in forming or maintaining permanent relationships (Clegg et al., 2005; Howlin et al., 2000). Despite these objective differences in life outcomes, adults with and without a history of communication disorders did not differ in their subjective perceptions of overall quality of life (Felsenfeld et al., 1994; Records et al., 1992).

Here, we used our Time 4 data to determine whether similar findings were apparent in the Ottawa Language Study. We expected that objective educational and occupational outcomes would be less positive for individuals from the language disorder group than for those from the control and speech-only disorders groups, who would not differ from each other. We did not have strong predictions regarding family outcomes, as the few previous reports were based on a relatively small sample of individuals with severe language disorders (Clegg et al., 2005; Howlin et al., 2000). Finally, on the basis of previous research (Felsenfeld et al., 1994; Records et al., 1992), we expected similar ratings of subjective quality of life from participants in all three groups.

A second objective in this report was to take advantage of our unique longitudinal data set to identify early predictors of key family, educational, occupational, and quality of life outcomes at age 25. Such predictions are of interest for both theoretical and practical reasons. For example, they may enhance the theoretical understanding of specific risk and/or protective factors associated with different patterns of life choices during emerging adulthood, which may, in turn, improve prognostic and perhaps intervention efforts.

Earlier research has identified some possible predictors of outcomes in children with communication disorders. Among the child characteristics that may predict outcomes in various domains are (a) persistence of language impairment (e.g., Bishop & Edmundson, 1987; Catts, Fey, Tomblin, & Zhang, 2002; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998), (b) low nonverbal IQ (e.g., Bishop & Edmundson, 1987; Botting, Faragher, Simkin, Knox, & Conti-Ramsden, 2001; Catts et al., 2002; Stothard et al., 1998), (c) poor early literacy and reading skills (e.g., Catts et al., 2002; Catts, Fey, Zhang, & Tomblin, 2001), (d) early behavior problems (Conti-Ramsden & Botting, 2008; Durkin & Conti-Ramsden, 2007), and (e) measures of child health (e.g., Nelson, Nygren, Walker, & Panoscha, 2006). Among family characteristics that may predict outcomes are (a) a family history of speech, language, and learning problems (e.g., Tomblin, Smith, & Zhang, 1997); (b) low family socioeconomic status (SES), as indexed by the mother’s education (e.g., Catts et al., 2001; Tomblin, Smith, & Zhang, 1997), family income, or parental occupation (e.g., Nelson et al., 2006); and (c) family adversity, as indexed by other measures, such as a single parent household or parental mental health problems (e.g., Conti-Ramsden & Botting, 2008; Nelson et al., 2006). Most previous follow-up studies have focused on predicting relatively short-term outcomes in domains closely related to language, such as cognition or reading, using earlier measures of skills in these areas as predictors. In contrast, we focus here on predicting real-life outcomes over a relatively long period of time (20 years) using early predictors from a variety of domains.

Method

Overview of Previous Phases of the Ottawa Language Study

We first provide an overview of key methods and results from earlier phases of the Ottawa Language Study. This overview is critical to understanding the context, limitations, and interpretations of the Time 4 study that we then describe.

Time 1 (1982). The Ottawa Language Study began in 1982 with a three-stage epidemiological survey of 5-year-olds in the Ottawa–Carleton region of Ontario, Canada (Beitchman, Nair, Clegg, & Patel, 1986). In Stage 1, screening for possible speech and language impairments was conducted for a one-in-three sample of all kindergarten children attending English-language schools (N = 1,655). Children who did not pass the screening and whose parents agreed to further participation (n = 301) proceeded to Stage 2, in which qualified speech-language pathologists conducted diagnostic assessments. Of these, 180 children were diagnosed with speech and/or language difficulties. Parents gave permission for further testing of 142 of these youngsters (92 boys and 50 girls), who constituted the longitudinal sample with speech and/or language impairments (S/L group). A control group, matched to the S/L group on age, gender, and school, was then selected from those who passed the initial screening (for further details on sampling, screening, and testing, see Beitchman, Nair, Clegg, & Patel, 1986). These 284 participants represented the Time 1 sample, which has been followed longitudinally at regular intervals since 1982. As mentioned earlier, data were collected in multiple domains of interest at each follow-up point.

Time 2 (1989) and Time 3 (1996) longitudinal follow-ups. In 1989–1990, when the children were 12–13 years of age, 244 (86%) participants agreed to take part in the Time 2 study. Given practical constraints (e.g., geographical location), 215 of these participants (75.7%; 101 from the S/L group and 114 from the control group) were administered the full assessment battery. Participants and families who were unavailable for testing were asked to complete questionnaires (for further details, see Beitchman et al., 1994).

In 1995–1997, participants were invited to take part in the Time 3 study, and 258 (91.5%; 123 from the S/L group and 135 from the control group) agreed. Complete speech-language assessments were obtained for 242 of these participants (85.2% of the original sample; 114 from the S/L group and 128 from the control group; for details, see C. J. Johnson, Beitchman, et al., 1999).

Original criteria for determining speech and language impairments. Table 1 shows the measures and criteria used to determine speech and language impairments at age 5. For accurate interpretation of the Ottawa Language Study results, it is critical to have a clear understanding of these original criteria for determining speech and language impairments.

One key point is that the original S/L group included children with all types of communication impairments (e.g.,...
The overall prevalence estimate of 19.0% for all communication impairments in 5-year-old children (Beitchman, Nair, Clegg, & Patel, 1986) consisted of 6.4% for speech-only impairments (articulation, voice, fluency, or combinations thereof) and 12.6% for language impairments (with or without accompanying speech impairments).

A second point is that communication impairments were defined solely by observed speech and/or language performances less than expected for chronological age. No cognitive referencing or other exclusionary criteria were applied. In other words, some participants in our sample had communication impairments that were accompanied by additional deficits in cognitive (e.g., low IQ, autism), neurological (e.g., epilepsy, cerebral palsy), sensory (e.g., hearing, vision), or structural (e.g., cleft palate) domains, whereas others had communication impairments that were unaccompanied by such additional deficits. At age 5, the majority of participants with communication impairments had specific impairments (87%)—that is, those unaccompanied by other cognitive, neurological, sensory, or structural deficits (C. J. Johnson, Beitchman, et al., 1999). A third definitional issue concerns the level of tested language performance used to determine language impairment. Our original criteria were relatively liberal, with language impairments identified for participants who scored more than 1 SD below the mean on one or more language measures. By definition, approximately 16% of the population would be expected to meet these criteria for language impairment. Fortunately, when such liberal criteria are used in a longitudinal study, one can examine retrospectively the influence of more stringent criteria on subsequent outcomes. If initial criteria are stringent, participants with mild language impairments are excluded from the sample, and, therefore, their long-term outcomes cannot be studied. Our report on Time 3 (19 years of age) communication outcomes (C. J. Johnson, Beitchman, et al., 1999) included a comparison of outcomes for those with language impairments defined by our original liberal criteria and by more stringent clinical criteria.

Originally, three subgroups were identified within the longitudinal sample of children with communication impairments (N = 142): those with speech-only impairments (n = 39), those with language-only impairments (n = 62), and those with both speech and language impairments (n = 41). In later follow-up studies, however, we usually collapsed results for the two groups with language impairments (i.e., those with and without accompanying speech impairments), as their outcomes were generally indistinguishable statistically. We continued to report separate results for the group with speech-only impairments, as they outperformed those with language impairments on most outcome measures.

The majority of participants with speech-only impairments (72%) had articulation deficits at age 5. However, Time 3 (age 19) results for the group with speech-only impairments were not substantially changed by the exclusion of those without articulation impairments.

### Time 4 Study Method

**Recruiting procedures and success.** In 2002–2003, we invited the original participants, now 24–26 years of age, to take part in the Time 4 follow-up study. We located participants who had moved since the earlier studies through (a) contact persons they had identified at Times 1, 2, or 3; (b) government agencies; (c) telephone directory searches; and (d) other participants who knew their whereabouts.

We successfully located 268 (94%) of the 284 original participants, and 244 (86%) agreed to participate. Of those who did not participate at Time 4, 22 (7.7%) refused, 13 (4.6%) could not be located, and five (1.8%) were deceased.

**Participants.** The 244 Time 4 participants consisted of 132 (93%) from the original control group and 112 (79%) from the original S/L group. From the latter group, we assessed 37 (95%) of those from the original subgroup with speech-only impairments but only 75 (73%) of those from the subgroup with language impairments. Participants averaged 24.7 years of age (SD = 0.58) at the Time 4 testing; 62% were male (because more boys than girls had been identified at Time 1 with communication impairments). At Time 1, children in the control group came from families with higher average SES on the basis of parental occupation (Blishen, Carroll, & Moore, 1987) than those in the S/L group, despite the fact that the control and S/L groups had been initially matched on school. When the three subgroups were compared, the language disorders group had lower SES values at Time 1 than either the control or speech-only groups, which did not differ significantly.

**Attrition.** Time 4 participants (n = 244) were compared with nonparticipants (n = 40) on Time 1 measures to assess the effects of attrition on the sample. Attritors were more likely than follow-up participants to come from the S/L group, and thus, not surprisingly, they also had lower Time 1 IQs (Wechsler, 1967). Within the S/L group, attritors were more likely to come from the original subgroup with language impairments than from the subgroup with speech-only impairments. Thus, the analyses here may underestimate the severity of long-term outcomes for the subgroup with language impairments.

**Assessment battery and procedures.** As at Times 1, 2, and 3, the full assessment battery at Time 4 included cognitive and academic tests, demographic questionnaires, developmental/medical histories, and psychiatric measures.
At Time 4, speech-language testing was limited to a few measures to allow more time for collection of psychosocial, family, educational, and occupational information. Moreover, language performance was expected to be relatively stable in adults.

Participants were tested individually in a quiet room by trained, experienced examiners who were blind to the participants’ original group (S/L or control). The complete protocol took approximately 5.5 hr per person and was usually completed in a single day with rest breaks, as required. Participants received $100.00 (Canadian) upon completion of the assessment to defray costs of transportation, lunch, parking, and lost wages. Seventeen participants who could not attend in person (usually because they no longer lived in the Ottawa region) were tested via telephone interviews, which included measures that did not require visual stimuli. Seven additional participants completed some measures via telephone, but they also completed additional face-to-face assessments administered by examiners who were contracted to do this testing in participants’ current communities.

Language, cognitive, and academic measures. At Time 4, the only standardized language measure was the Peabody Picture Vocabulary Test—III (PPVT—III; Dunn & Dunn, 1997). Cognitive testing consisted of a four-subtest (Vocabulary, Similarities, Picture Completion, Block Design) short form of the Wechsler Adult Intelligence Scale—Third Edition (Wechsler, 1997). Subtest scores were used to estimate verbal and performance IQs, on the basis of available formulae (Atkinson, 1991; Tellegen & Briggs, 1967) and Canadian normative information (Wechsler, 2001).

Reading achievement was assessed with three subtests (Word Identification, Word Attack, and Passage Comprehension) from the Woodcock Reading Mastery Tests—Revised (WRMT—R; Woodcock, 1998). Mathematics achievement was tested with the Arithmetic subtest of the Wide Range Achievement Test 3 (Wilkinson, 1993).

Family life and educational/occupational outcomes. Information regarding family life, educational attainment, and occupational status was obtained from structured interviews conducted with the participants. Questions covered marital status, number of children, the highest level of education attained, and information on current schooling, if applicable. The highest level of educational attainment was measured on a scale ranging from 0 to 10 (0 = elementary school, 1 = some high school, 2 = completed high school, 3 = some vocational/technical training, 4 = completed vocational/technical training, 5 = some community college, 6 = completed community college, 7 = some undergraduate university, 8 = completed undergraduate university, 9 = some postgraduate university, 10 = completed postgraduate university). Participants also reported on their current occupation(s) and whether they were working full- or part-time. They also provided information on personal income, in categories based on increments of $5,000 (e.g., no income; $1–$4,999; $5,000–$9,999) up to a limit of $100,000 or more. Participants who were employed also reported whether they were satisfied overall with their job(s).

Occupational data were used to code the Time 4 SES of participants, according to the Canadian index developed by Blasich et al. (1987). For newer occupations not listed in Blasich et al., such as those in information technology, decisions were based on matching participants’ job descriptions as closely as possible to similar occupations in the index. When an individual had more than one job, Blasich et al.’s scores were assigned to each job with the highest score used in subsequent analyses. To further capture the nature of the jobs, occupational data were also coded into 21 job categories (e.g., food service, administration, education).

Quality of life measures. Participants also completed two self-report measures in which they rated aspects of their quality of life. Life satisfaction was measured using the Quality of Life Inventory (QOLI; Frisch, 1994), in which participants rated both their satisfaction with and the importance of 16 different life domains (e.g., work, love, neighborhood). Satisfaction was rated on a 6-point scale ranging from −3 to 3. Importance was rated on a 3-point scale ranging from 0 to 2. These values from the 16 domains were combined to obtain an overall weighted satisfaction score, which was then converted to a T score (M = 50, SD = 10) for comparison with normative data. The QOLI test manual reports reliability (internal consistency) values of .77–.89, test–retest reliability of .73, and preliminary evidence of both convergent and discriminative validity (Barnes, n.d.; R. W. Johnson, n.d.).

Participants also completed the Social Support Appraisals (SS-A) Scale (Vaux et al., 1986), which assesses the extent to which an individual believes he or she is loved by, esteemed by, and involved with family, friends, and others. The SS-A Scale consists of 23 statements (e.g., “People admire me”; “My family cares for me very much”). Participants rated the extent to which they agreed or disagreed with each statement using a 4-point scale. Lower scores represented higher levels of perceived support. Across 10 different samples of participants, Vaux et al. (1986) reported reliability (internal consistency) values of greater than .80 and evidence of concurrent validity (correlations of .50–.80) with other social support appraisal measures.

Results

The first objective of this report was to profile the Time 4 family, educational, occupational, and quality of life outcomes for our sample. Preliminary analyses revealed few differences in outcomes for participants who, at Time 1, had language impairments only and those who also had concomitant speech impairments. Accordingly, these groups were collapsed into a single group with Time 1 language impairments, including those with and without speech impairments, as in past reports on the Ottawa Language Study. Preliminary analyses also suggested that the pattern of long-term results for those with articulation impairments at Time 1 was similar to that for the larger group with speech-only impairments, which included voice and fluency problems. Thus, consistent with previous reports, we report results for the larger group with speech-only impairments.

Planned comparisons were then used to assess pairwise differences in Time 4 outcomes among the three Time 1 groups (control, speech-only impairments, and language
impairments). For ordinal data, independent $t$ tests were conducted; for categorical data, chi-square analyses were used. All statistical tests were assessed at an alpha level of $p < .01$. Effect sizes ($d$ and $w$) were reported for $t$-test and chi-square analyses, respectively (Cohen, 1992; Portney & Watkins, 2000). Conventional interpretations of these effect sizes are as follows: For $d$, 0.20 = small, 0.50 = medium, 0.80 = large; for $w$, 0.10 = small, 0.30 = medium, 0.50 = large (Cohen, 1992).

**Language, Cognitive, and Academic Performance**

As mentioned, standardized language testing at Time 4 was limited to a single measure, the PPVT–III, in part because we expected minimal changes in language abilities between Times 3 and 4. The validity of this assumption was supported by strong correlations between Time 4 scores for the PPVT–III and Time 3 scores for the Peabody Picture Vocabulary Test—Revised (Dunn & Dunn, 1981), $r = .87$, and for the Test of Adolescent/Adult Language—3 (Hammill, Brown, Larsen, & Wiederholt, 1994) Spoken Language Quotient (local norms; C. J. Johnson, Taback, Escobar, Wilson, & Beitchman, 1999), $r = .83$.

The top section of Table 2 shows the Time 4 PPVT–III scores, the estimated Wechsler Adult Intelligence Scale—Third Edition performance IQ scores, and two measures of academic achievement in reading and mathematics as a function of the three Time 1 subgroups: those with no speech-language impairments (control), those with speech-only impairments, and those with language impairments (with or without accompanying speech impairments). As at Time 3, the usual pattern of performance was evident. The Time 1 control and speech-only groups did not differ significantly from each other and both outperformed the Time 1 language disorders group. Other cognitive and academic measures not reported in Table 2 (i.e., Verbal IQ, certain subtasks of the Wechsler Adult Intelligence Scale—Third Edition).

**TABLE 2. Means and standard deviations (in parentheses) or percentages for Time 4 (T4) outcomes in various domains for the Time 1 (T1) groups with no communication impairments (C = control), speech-only impairments (SI), and language impairments (LI) with effect sizes for group differences.**

<table>
<thead>
<tr>
<th>T4 outcomes</th>
<th>Group</th>
<th>C vs. LI</th>
<th>C vs. SI</th>
<th>SI vs. LI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$d$</td>
<td>$w$</td>
<td>$d$</td>
</tr>
<tr>
<td>Language/cognitive/academic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPVT–III</td>
<td>109 (10)</td>
<td>107 (10)</td>
<td>93 (11)</td>
<td>1.55*</td>
</tr>
<tr>
<td>Performance IQ$^b$</td>
<td>113 (14)</td>
<td>113 (13)</td>
<td>99 (13)</td>
<td>1.07*</td>
</tr>
<tr>
<td>WRMT–R passage comprehension</td>
<td>106 (14)</td>
<td>104 (13)</td>
<td>86 (15)</td>
<td>1.43*</td>
</tr>
<tr>
<td>WRAT3 Arithmetic</td>
<td>97 (13)</td>
<td>97 (11)</td>
<td>85 (14)</td>
<td>0.88*</td>
</tr>
<tr>
<td>Family life</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% married</td>
<td>13</td>
<td>8</td>
<td>14</td>
<td>0.01</td>
</tr>
<tr>
<td>% living with partner$^c$</td>
<td>40</td>
<td>30</td>
<td>43</td>
<td>0.03</td>
</tr>
<tr>
<td>% with children</td>
<td>15</td>
<td>8</td>
<td>35</td>
<td>0.24*</td>
</tr>
<tr>
<td>Educational</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest level of education$^d$</td>
<td>5.8 (2.5)</td>
<td>5.7 (2.5)</td>
<td>3.7 (2.3)</td>
<td>0.87*</td>
</tr>
<tr>
<td>% completed high school</td>
<td>92</td>
<td>92</td>
<td>76</td>
<td>0.22*</td>
</tr>
<tr>
<td>% completed university$^e$</td>
<td>32</td>
<td>27</td>
<td>3</td>
<td>0.34*</td>
</tr>
<tr>
<td>% currently in school</td>
<td>25</td>
<td>30</td>
<td>20</td>
<td>0.06</td>
</tr>
<tr>
<td>Occupational</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% full-time job</td>
<td>67</td>
<td>68</td>
<td>61</td>
<td>0.06</td>
</tr>
<tr>
<td>% full- or part-time job</td>
<td>82</td>
<td>76</td>
<td>76</td>
<td>0.08</td>
</tr>
<tr>
<td>SES occupation$^f$</td>
<td>45 (12)</td>
<td>46 (14)</td>
<td>36 (11)</td>
<td>0.83*</td>
</tr>
<tr>
<td>% satisfied with job</td>
<td>84</td>
<td>65</td>
<td>69</td>
<td>0.17</td>
</tr>
<tr>
<td>% earning &lt;$20,000/year</td>
<td>36</td>
<td>27</td>
<td>50</td>
<td>0.14</td>
</tr>
<tr>
<td>% earning $50,000+/year</td>
<td>12</td>
<td>22</td>
<td>3</td>
<td>0.15</td>
</tr>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QOLI T score</td>
<td>51 (9)</td>
<td>49 (9)</td>
<td>49 (12)</td>
<td>0.15</td>
</tr>
<tr>
<td>SS-A Scale total score</td>
<td>1.65 (0.37)</td>
<td>1.60 (0.36)</td>
<td>1.76 (0.41)</td>
<td>0.29</td>
</tr>
</tbody>
</table>

**Note.** PPVT–III = Peabody Picture Vocabulary Test—III; WRMT–R = Woodcock Reading Mastery Tests—Revised; WRAT3 = Wide Range Achievement Test 3; SES = socioeconomic status; QOLI = Quality of Life Inventory; SS-A Scale = Social Support Appraisals Scale.

$^a$d = Effect size estimate based on independent-groups $t$ test (0.20 = small, 0.50 = medium, 0.80 = large); $w$ = effect size estimate based on chi-square (0.10 = small, 0.30 = medium, 0.50 = large; Cohen, 1992; Portney & Watkins, 2000).

$^b$Estimated from the Block Design and Picture Completion subtests of the Wechsler Adult Intelligence Scale—Third Edition.

$^c$Includes those who are married.

$^d$On the basis of a scale ranging from 0 to 10 (see the Method section for details).

$^e$Completed at least an undergraduate degree.

$^f$SES for occupation, on the basis of Blishen et al. (1987).

$p < .01$. 
WRMT–R Word Identification and Word Attack subtests) yielded similar overall patterns.

**Family Life**

The second section of Table 2 includes information on family life. Approximately 12% of participants reported that they were married. An additional 27% indicated that they were living with a partner, for an overall rate of 39% in permanent relationships. The rates for marriages and permanent relationships did not vary significantly across the original subgroups.

Participants from the original language impairment group were more likely to have children (35%) than those from the control (15%) or speech-only (8%) groups, whose rates did not differ significantly (see Table 2). For those with children, however, there were no significant differences among the groups in their average numbers of children (overall \( M = 1.56, SD = 0.85 \)).

**Educational Attainment**

The third section of Table 2 presents information on educational attainment. Participants in the control and speech-only groups attained significantly higher levels of overall educational attainment than those in the language impairment group. Fully 92% of participants in both the control and speech-only groups reported that they had completed high school, significantly higher rates than the 76% for the language impairment group. Only 3% of those from the language disorders group reported that they had completed an undergraduate university degree, as compared with the significantly higher rates of 27% and 32% for the speech-only and control groups, respectively, which did not differ significantly from each other.

Approximately 24% of participants in all groups were in school at the Time 4 testing, with rates not significantly different across groups. Not surprisingly, this rate was much lower than at Time 3 (19 years of age), when 75% of participants were still in school. There was also evidence that group disparities in educational attainment might increase further over time. Specifically, the percentages of those in school at Time 4 who were pursuing university degrees (undergraduate or postgraduate) in the three groups were 61% control, 33% speech-only, and 14% language. Approximately half of those in school at Time 4 also had full- or part-time jobs (control = 58%, speech-only = 55%, and language = 33%).

**Occupational Outcomes**

The fourth section of Table 2 shows occupational outcomes at Time 4. Approximately 65% of participants reported that they were employed full-time. When part-time jobs were also included, the employment rate rose to 80%. As shown in Table 2, the rates for full-time and overall employment did not differ significantly across the three groups. For comparison purposes, only 14% of participants at age 19 reported having a full-time job, but 59% were employed when part-time jobs were also included.

SES ratings based on occupation (Blishen et al., 1987) are also shown in Table 2. The occupations listed in Blishen et al.’s (1987) index have SES ratings ranging from 17.81 to 101.74, with a mean of 42.74 (\( SD = 13.28 \)). For the Ottawa Language Study sample, Time 4 SES ratings ranged from 21.24 to 79.23, with a mean of 42.50 (\( SD = 12.84 \)). As shown in Table 2, the group with early language impairments received significantly lower SES ratings for their occupations than did those in the other two groups.

Figure 1 shows the numbers of participants (\( n = 193 \)) whose primary paid occupations fell into each of the 21 coded job categories. Also shown is the extent to which individuals from the three groups held occupations within each category. Overall, the five most common job categories were trades/construction/mechanical, information technology, sales/retail, administration/clerical, and food service. The two most common categories for participants from the control group were information technology and sales/retail; those for participants with early speech-only impairments were trades/construction/mechanical and information technology. Those for the participants with early language impairments were trades/construction/mechanical and food service.

Participants who were employed also rated their satisfaction with their current job(s). No significant differences in job satisfaction were evident among the three groups (see Table 2).

The fourth section of Table 2 also shows the percentages of individuals (both employed and not employed) within each group who reported personal incomes of less than $20,000 per year. According to Statistics Canada (2004), the low-income cutoff value (i.e., poverty line) for a single

![FIGURE 1. Number of participants (N = 193) from the Time 1 diagnostic subgroups (Control = no communication impairments; Speech = speech-only impairments; Lang = language impairments) with occupations in various job categories (Trade = trades/construction/mechanical; IT = information technology; Sales = sales/retail; Admin = administration/clerical; Food = food service; Finan = financial services; Educ = education; Arts = arts/entertainment; Maint = building/grounds maintenance; Health = health care; Gov = government services; Manuf = processing/manufacturing; Cust = customer service; Ad = advertising/marketing; Milt = military; QA = quality assurance; Ath = athletics/fitness/recreation; Agric = agriculture; Res = research).](image)
person was slightly less than $20,000 per year in 2003 when the Time 4 data were being collected. Across groups, the percentages of those with low incomes did not vary significantly. Also shown are the percentages of individuals who reported personal incomes of $50,000 or more. Here, there was one significant difference; the group with speech-only impairments showed a significantly higher percentage (22%) than the group with language impairments (3%).

**Quality of Life Ratings**

The final section of Table 2 shows that participants from the three subgroups did not differ significantly in their ratings of overall quality of life. All groups had QOLI T scores roughly at the population mean, indicating average levels of satisfaction with various aspects of their lives.

The SS-A Scale also yielded no significant differences in ratings for the subgroups. This pattern was consistent with Time 3 ratings on the same measure.

**Predictors of Key Time 4 Outcomes**

The second objective of this report was to predict selected Time 4 outcomes from data collected at earlier phases of the Ottawa Language Study. For these prediction analyses, four key outcomes served as dependent variables: one from each domain of interest here. The outcomes selected were parenthood, highest educational attainment, occupational SES, and QOLI ratings. Recall that earlier analyses suggested that a history of language impairment was associated with the first three of these outcomes but not with QOLI ratings. The prediction analyses reported here allowed us to assess whether other early predictors might share stronger relationships than early language impairment with the Time 4 outcomes. In interpreting these analyses, it is also important to appreciate that some of these four Time 4 outcomes were correlated with each other, as shown in Table 3.

**Selection of Time 1 predictors for Time 4 outcomes.**

We selected a set of 11 possible Time 1 predictors of Time 4 outcomes, on the basis of the earlier literature review and the availability of suitable measures in our Time 1 data set. Six predictors measured child characteristics. The first was a language composite measure based on the mean of each participant’s percentile scores from the Bankson Language Screening Test (Bankson, 1977) and the Screening Test for Auditory Comprehension of Language (Carrow, 1973). These screening tests were used instead of the diagnostic language measures from Time 1 (see Table 1) because only a random sample of the children in the control group completed the diagnostic measures (for details, see Beitchman, Nair, Clegg, & Patel, 1986). By using the screening scores, we could include the maximum number of participants in our prediction analyses. Three other Time 1 child characteristics were represented by continuous variables, including (a) performance IQ (Wechsler, 1967), (b) parent ratings of child behavior (sum T score for total problem behaviors) on the Child Behavior Checklist (Achenbach & Edelbrock, 1983), and (c) teacher ratings of child behavior problems (overall composite score square-root transformed) on the Teacher Rating Scale (Comers, 1969). Two binary variables represented (a) the child’s gender and (b) a parental rating of whether the child was in excellent health at Time 1. Five additional measures represented family characteristics. Three predictors were continuous: (a) family SES at Time 1, as indexed by Blishen et al.’s (1987) scale; (b) mother’s highest level of education; and (c) mental health of the primary parent (usually the mother) as measured on a self-report index—the Center for Epidemiological Studies—Depression scale (Radloff, 1977). Two predictors were binary: (a) whether parents reported a family history of speech, language, or reading problems in the child’s immediate family (parents and/or siblings) and (b) whether the household included one or two parents (married or common-law).

**Selection of Time 2 and Time 3 predictors for Time 4 outcomes.**

Similarly, we identified several possible Time 2 and 3 predictors of Time 4 outcomes. We chose two Time 2 continuous variables representing (a) Time 2 parent ratings of child behavior (sum T score for total problem behaviors) on the Child Behavior Checklist, and (b) Time 2 teacher ratings of child behavior (sum T score for total problem behaviors) on the Teacher Report Form (Achenbach & Edelbrock, 1983). Time 2 reading and language measures were highly correlated with Time 3 measures of the same constructs. However, because more participants had been tested at Time 3 than at Time 2, we chose Time 3 variables for these measures to maximize our sample size. Three Time 3 variables were continuous, representing (a) Time 3 Spoken Language Quotients from the Test of Adolescent/Adult Language—3, calculated on the basis of local norms (C. J. Johnson, Taback, et al., 1999); (b) Time 3 reading performance as measured by the Broad Reading composite of the WRMT–R; and (c) Time 3 ratings on the SS-A Scale. The final predictor was a binary variable indicating whether a participant had a psychiatric diagnosis at Time 3, as measured by the University of Michigan adaptation of the Composite International Diagnostic Interview (Kessler et al., 1994).

**Correlations among predictors.** One important consideration in regression analyses is to select predictors that are not highly correlated so that they will account for unique variance in the dependent variables. Table 4 shows the correlations that were above .40 in our set of Time 1 and Time 2/Time 3 predictors. Note that two correlations exceeded .70, namely, the correlation of Time 1 and Time 3 language scores ($r = .74$) and the correlation of Time 3 language and Time 3 reading scores ($r = .79$). Nonetheless, collinearity statistics calculated during the subsequent regression analyses

<table>
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<th>TABLE 3. Correlations among key Time 4 outcomes.</th>
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<td>Highest education level</td>
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<td>Occupation SES</td>
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*a On the basis of a scale ranging from 0 to 10 (see the Method section for details).

*b SES for occupation, on the basis of Blishen et al. (1987).

*p < .01.
TABLE 4. Correlations of predictor variables that exceeded \( r = .40 \).

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Note.  
T2 = Time 2; T3 = Time 3; PIQ = performance IQ; M Educ = mother’s education; Bhv Tchr = teacher ratings of child behavior problems; Bhv Par = parent ratings of child behavior problems.

aComposite measure based on mean percentile scores from the Bankson Language Screening Test and the Screening Test for Auditory Comprehension of Language.

bOn the basis of the Wechsler Preschool and Primary Scale of Intelligence.

bSES for occupation, on the basis of Blishen et al. (1987).

doOn the basis of a scale ranging from 0 to 10 (see the Method section for details).

Teacher ratings of child behavior problems on the Teacher Rating Scale.

Parent ratings of child behavior problems on the Child Behavior Checklist.

Teacher ratings of child behavior problems on the Teacher Report Form.

Spoken Language Quotient from the Test of Adolescent/Adult Language–3, calculated on the basis of local norms (C. J. Johnson, Taback, et al., 1999).

Broad Reading composite of the WRMT–R.

suggested that these relatively high correlations did not adversely influence the stability of the prediction equations.

Regression procedures. Logistic regression analysis was used for the dichotomous dependent variable of Time 4 parenthood; multiple linear regression analyses were used for the three continuous dependent variables. The alpha to enter was set at \( p < .01 \) in all analyses; the alpha to remove was set at \( p < .05 \). For each analysis, the Time 1 predictors were allowed to enter stepwise at the first step; the Time 2/Time 3 predictors were then allowed to enter stepwise at the second step. This method allowed us to determine (a) how well Time 1 predictors accounted for Time 4 outcomes and (b) to what extent Time 2/Time 3 predictors contributed unique variance, over and above that accounted for by the Time 1 measures.

Predictors of parenthood. At the first step of a stepwise (forward Wald) logistic regression analysis, family SES and mother’s education were the best Time 1 predictors of parenthood at Time 4. Family SES accounted for 27.9% of the variance, \( OR = 0.913 \), Wald \( \chi^2(1, N = 226) = 28.81, p < .001 \), and mother’s education accounted for an additional 4.8% of variance, \( OR = 0.785 \), Wald \( \chi^2(1, N = 226) = 7.24, p < .007 \). Lower family SES and lower levels of maternal education were associated with a higher chance of being a parent at Time 4. The only later predictor to enter at the second step was Time 2 teacher ratings of child behavior problems, \( OR = 1.105 \), Wald \( \chi^2(1, N = 226) = 11.47, p < .001 \). Higher teacher ratings of Time 2 child behavior problems predicted parenthood at Time 4. The final three-variable equation accounted for 40.5% (Nagelkerke \( R^2 \)) of the variance in Time 4 parenthood.

Predictors of educational attainment. At the first step of a stepwise, linear multiple regression, three Time 1 measures were significant predictors of the highest level of education attained at Time 4. Family SES accounted for 22.5% of the variance, \( F(1, 189) = 66.54, p < .001 \); performance IQ accounted for an additional 9.4%, \( F(1, 188) = 31.41, p < .001 \); and teacher ratings of child behavior accounted for a further 2.8%, \( F(1, 187) = 9.74, p = .002 \). Higher Time 1 family SES and performance IQ scores predicted higher levels of educational attainment, whereas higher values on the teacher ratings of child behavior problems predicted lower educational attainment. At the second regression step, three later predictors also entered the equation. Time 2 teacher ratings of child behavior accounted for 7.6% of additional variance, \( F(1, 186) = 24.46, p < .001 \); Time 3 reading scores added 3.6% of the variance, \( F(1, 185) = 12.30, p = .001 \); and the presence of a Time 3 psychiatric diagnosis accounted for 2.1% more, \( F(1, 184) = 7.42, p < .007 \). Higher Time 3 reading scores were associated with higher educational attainment. Higher Time 2 teacher ratings of problem behaviors and the presence of a Time 3 psychiatric diagnosis predicted lower educational attainment at Time 4. After Time 2 teacher ratings of child behavior were entered at the second step, Time 1 teacher ratings of child behavior no longer contributed significantly to the equation \( (p = .283) \). The final equation accounted for 46.3% of the variance (adjusted \( R^2 \)) in the highest level of Time 4 education attained.

Predictors of occupational SES. The only significant early predictor of Time 4 occupational SES was the composite Time 1 language score, which accounted for 16.9% of...
the variance, $F(1, 158) = 32.03, p < .001$. Participants who received higher language scores at Time 1 also had higher occupational status at Time 4. At the second regression step, the only later predictor to enter the equation was Time 2 teacher ratings of child behavior, which accounted for an additional 6.3%, $F(1, 157) = 12.98, p < .001$. Higher teacher ratings of problem behaviors at Time 2 were associated with lower occupational SES at Time 4. The final two-variable equation accounted for 22.2% of the variance (adjusted $R^2$) in Time 4 occupational status.

**Predictors of QOLI ratings.** Gender was the only significant Time 1 predictor of Time 4 QOLI ratings, but it accounted for only 4.1% of the variance, $F(1, 189) = 8.03, p < .005$, with women rating their quality of life slightly higher than men. At the second regression step, Time 3 ratings on the SS-A Scale accounted for an additional 12.6% of the variance, $F(1, 188) = 28.45, p < .001$. Those who felt they had strong social support networks at Time 3 reported higher QOLI scores at Time 4. The two-predictor final equation accounted for just 15.8% of the variance (adjusted $R^2$) in Time 4 self-ratings of quality of life.

**Discussion**

The Ottawa Language Study is the first longitudinal investigation to follow a large community sample of children with and without communication disorders into emerging adulthood in a prospective manner. Participants were directly assessed in multiple domains of functioning at regular intervals over a 20-year period. At this Time 4 assessment, all participants were approximately 25 years of age, permitting valid comparisons of family life, educational attainment, occupational status, and quality of life across subgroups within our sample, which was our first objective in this report. The combination of methodological strengths of the Ottawa study allowed greater confidence in the results, compared with those of previous adult follow-up studies. However, many of the main conclusions were remarkably similar to those of earlier studies. In particular, individuals with early language impairments showed less favorable adult outcomes in multiple objective domains relative to participants with early speech-only impairments, whose adult outcomes were generally comparable with those for individuals without a history of early communication disorders. This overall pattern was noted previously in the results of the Ottawa study at ages 12 and 19 (Beitchman et al., 1994; C. J. Johnson, Beitchman, et al., 1999) and was suggested in other follow-up studies of adults with a history of communication disorders (Hall & Tomblin, 1978; King et al., 1982; Lewis & Freebairn, 1992). In contrast, the three subgroups gave similar subjective ratings of their quality of life—a result also consistent with earlier findings (Felsenfeld et al., 1994; Records et al., 1992).

**Age 25 Outcomes for Those With Early Language Impairments**

Most professionals will not be surprised to learn that a history of language disorders was predictive of multiple adverse outcomes in adulthood. On this point, the Ottawa study results are consistent with a large body of existing literature, including other follow-up studies of language disorders into adulthood (Clegg et al., 2005; Hall & Tomblin, 1978; Howlin et al., 2000; King et al., 1982; Mawhood et al., 2000; Records et al., 1992). Three points, however, should be emphasized. First, these and other follow-up results demonstrated only correlations, not causal relations, between language disorders and adverse outcomes. Second, a range of good and poor outcomes occurred across individuals in all subgroups, including those with early language disorders. Thus, a history of language disorder does not, in and of itself, predetermine outcomes for individuals. Third, in our sample, a history of language disorder was associated with a variety of other risk factors, such as low family SES, low performance IQ, poor reading skills, and higher levels of reported behavior problems. As shown in our regression analyses, these factors often predicted adverse outcomes as well or even better than did language skills. Therefore, readers need to be cautious in interpretation, taking account of these complex interrelationships and perhaps others that might not have been examined specifically in this report.

**Language, cognitive, and academic measures.** Consistent with previous findings, individuals with early language disorders performed more poorly than those without communication disorders on all language, cognitive, and academic measures collected at age 25. The PPVT–III and performance IQ standard scores from our subgroup ($M_s = 93$ and 99, respectively) allowed for a rough comparison with the adults with language disorders assessed in the two other follow-up studies that tested participants in their early to mid-20s on outcome measures similar to those we report. These clinic-referred samples of young adults with language disorders received lower mean PPVT–III and performance IQ standard scores than did those in our community sample ($M_s = 81$ and 92, respectively, in Records et al., 1992; and $M_s = 65$ and 78, respectively, in Howlin et al., 2000; Mawhood et al., 2000). In subsequent sections, outcomes for these samples with more severe language impairments are compared with those from the Ottawa study.

**Family life, educational attainment, and occupational status.** Few of the participants in the Ottawa Language Study were married at age 25 (12%); however, many more were living with a partner in a relatively permanent relationship (27%), with no differences noted across subgroups on either of these measures. Records et al. (1992) also reported no differences in rates of marriage or living with a partner for their participants with and without a history of language disorders, although the overall rates for both (5% and 14%, respectively) were lower than in our study, likely because their participants were on average 4 years younger than our study results. Records et al. (1992) also reported no differences in the rates of marriage or living with a partner for their participants with and without a history of language disorders, although the overall rates for both (5% and 14%, respectively) were lower than in our study, likely because their participants were on average 4 years younger than our community sample ($M_s = 81$ and 92, respectively, in Records et al., 1992; and $M_s = 65$ and 78, respectively, in Howlin et al., 2000; Mawhood et al., 2000). In subsequent sections, outcomes for these samples with more severe language impairments are compared with those from the Ottawa study.

To our knowledge, this is the first report to identify early parenthood as an adult outcome associated with a history of language disorders, although such results have been reported, albeit not consistently, for the related diagnostic category of learning disabilities (Levine & Edgar, 1994; Levine & Nourse, 1998; Seo, Abbott, & Hawkins, 2008).
Neither Records et al. (1992) nor Howlin et al. (2000) provided comprehensive information on parenthood in their samples. Early parenthood, with its accompanying need for child care arrangements and a steady income, may restrict an individual’s options with respect to further education and/or employment opportunities. Some support for this interpretation was apparent in the negative Time 4 correlations of parenthood with educational attainment and occupational SES (see Table 3).

Participants with language disorders attained lower levels of formal education than those without language disorders. Directly comparable figures could not be derived from Records et al. (1992), because some of their participants were too young to have completed high school, or from Howlin et al. (2000), because the British educational system is different than that in North America. However, a supplementary analysis permitted all three studies to be compared, albeit roughly, on the percentage of individuals with language disorders who had completed at least some postsecondary education: Ottawa Language Study (55%), Records et al. (41%), and Howlin et al. (32%). Comparison figures for those without language disorders were Ottawa Language Study (81%) and Records et al. (79%).

Approximately 65% of Ottawa study participants were employed full-time, with another 15% employed part-time. Employment rates, personal incomes, and job satisfaction did not differ significantly for those with and without a history of language disorders. Records et al. (1992) also found no differences in incomes and job satisfaction, but they reported a higher full-time employment rate for those with language disorders than for those without (59% vs. 31%)—perhaps attributable to the fact that more participants in their control group were still in school at 21 years of age. Howlin et al. (2000) reported an employment rate of 71% for their language disorders group but did not report whether this figure included part-time employment, and they did not provide information on income or job satisfaction.

Participants with a history of language disorders held jobs that were classified as lower in SES (Blishen et al., 1987) than did those without such a history. These jobs likely required lower levels of education and provided fewer opportunities for advancement. For example, participants from both the language disorders and control groups held jobs in the broad category of food service. However, within this category, only 10% of those from the language disorders group were restaurant managers, and 90% were food servers (e.g., waitress, bartender), as compared with 43% managers and 56% servers in the control group. Howlin et al. (2000) also noted that individuals with language disorders in their study tended to hold low-status jobs requiring limited education (e.g., cleaning, gardening).

These disparities in occupational status between young adults with and without language disorders may well increase over time. Fewer participants with language disorders were currently pursuing university degrees (3% vs. 15%, respectively), which might eventually widen the gaps that were already evident in educational attainment and occupational SES. Individuals with higher education generally secure jobs with more opportunities for advancement, which may translate into increased job status and higher earning power over their careers. At age 25, few significant differences in personal incomes were noted for those with and without a history of language disorders. Nonetheless, there were hints that income differences might eventually emerge. Of the three subgroups, those with language disorders had the highest percentage (50%) reporting low personal incomes (i.e., under the poverty line of $20,000 per year) and the lowest percentage (3%) reporting high personal incomes (i.e., greater than $50,000 per year).

**Quality of life evaluations.** Despite differences on many objective measures of adult achievements, participants in all groups perceived their quality of life and social support networks in a similar, relatively positive light. Records et al. (1992) also found differences in objective outcomes, but not the subjective life perceptions, of young adults with and without language disorders. These results seem to indicate similar views for young adults with and without histories of language impairment. If, as suggested, objective disparities gradually increase over time, it will be interesting to see whether life satisfaction ratings remain similar or begin to diverge.

**Age 25 Outcomes for Those With Early Speech Impairments**

For individuals with a history of speech sound disorders, the Ottawa Language Study results may, at first glance, seem to be at odds with those of other investigations, which have reported long-term or concurrent deficits in language and academic performance relative to individuals without such a history (e.g., Felsenfeld et al., 1992, 1994; Nathan, Stackhouse, Goulandris, & Snowling, 2004; Raitano, Pennington, Tunick, Boada, & Shriberg, 2004). Several definitional issues may be key to understanding and, perhaps, resolving these discrepancies. First, the speech-only disorders group in the Ottawa study did not include those who initially had both speech and language disorders. Rather, these individuals were included in the language impairment subgroup. In contrast, individuals with comorbid language disorders were not excluded explicitly from Felsenfeld et al.’s (1992, 1994) adult follow-up studies. Comorbid language problems and the persistence of speech sound disorders have been identified recently as key predictors of language and academic problems in children with speech sound disorders (Nathan et al., 2004; Raitano et al., 2004).

Second, the Ottawa speech-only group was based on a community sample, as opposed to a clinic-referred sample. Clinic-referred samples may include individuals with more severe speech sound disorders (Hayiou-Thomas, 2008; C. J. Johnson, Beitchman, et al., 1999; Tomblin, Records, et al., 1997), which perhaps are more likely to be persistent.

Third, the similarity of outcomes for the speech-only and control groups in the Ottawa study was not attributable to the inclusion of some individuals with other speech-only disorders, such as voice or fluency disorders. The overall pattern of results reported here is similar to that of a preliminary analysis, which excluded participants with only voice or fluency disorders.

Finally, the methods used to identify articulation disorders in the initial 1982 Ottawa Language Study were not the same.
as the comprehensive procedures used to identify and describe such disorders in more recent studies. Detailed analyses of spontaneous speech productions and phonological awareness testing, in particular, were not commonplace in 1982 and, therefore, were not part of the original identification procedures used for the Ottawa study. Differences in identification procedures might be responsible for some discrepancies between studies.

Predictors of Key Time 4 Outcomes

A unique contribution of this report was the prediction of four real-life outcomes in emerging adulthood (parenthood, educational attainment, occupational SES, and quality of life) from measures of child and family characteristics collected at earlier stages of our 20-year longitudinal study. In interpretation, several caveats should be remembered: (a) These predictions pertain to our entire sample of participants with and without a history of communication disorders; (b) the sample overrepresents individuals with a history of communication disorders relative to their occurrence in the general population; and (c) results from regression analyses are dependent on the nature and extent of predictors included. Thus, the results reported here should be interpreted cautiously and may not generalize to other samples for these or other reasons.

Overall, we had varied success in accounting for key outcomes at age 25: educational attainment was fairly well predicted (46.3% of variance), whereas quality of life ratings were not as well predicted (only 15.8% of variance). For all outcomes, both early predictors (age 5) and later measures (age 12 or age 19) contributed.

Early language impairment was associated with three of the four outcomes used as dependent variables in our prediction analyses. However, when other predictor variables were included in our regression analyses, early language scores remained as a significant predictor only for the Time 4 outcome of occupational SES. Parenthood and educational attainment were better predicted by other factors, including variables representing early family SES, teacher-rated child behavior problems, performance IQ, and later reading scores.

Participants from families with low SES, as measured by both parental occupation and mother’s education, were most likely to have children by age 25. Additional risk was associated with teacher-rated behavior problems at age 12. Thus, low family SES and behavior problems in early adolescence are prognostic indicators that a young person may experience early parenthood. Having a child during emerging adulthood may, in turn, curtail eventual educational and occupational opportunities, perhaps especially for women who usually assume child care responsibilities. In another publication from the Ottawa Language Study, we also found evidence that women with a history of language impairment were particularly at risk for sexual abuse, even after family SES was taken into account (Brownlie, Jabbar, Beitchman, Vida, & Atkinson, 2007). Taken together, these findings suggest that education on sexual abuse and family planning may be important interventions for children and adolescents with language impairments, especially girls. Our results regarding parenthood are also consistent with the idea that differing values, expectations, and opportunities associated with SES may be important theoretically as mediators of transitions experienced during emerging adulthood (Arnett, 2007).

Low family SES was also the best age 5 predictor of low educational attainment, followed by low performance IQ, and high levels of teacher-rated behavior problems. Later predictors of low attainment included high levels of teacher-rated behavior problems (age 12), low reading levels (age 19), and presence of a psychiatric diagnosis (age 19). As noted in the introduction, both low family SES (e.g., Blackorby & Wagner, 1996; Catts et al., 2001; Hart & Risley, 1995) and low nonverbal IQ (e.g., Bishop & Edmundson, 1987; Botting et al., 2001; Catts et al., 2002; Stothard et al., 1998) are known to be associated with poor academic achievement, both in general and in those with language impairments.

What is not clear (and cannot be determined from our data) is to what extent these interrelated predictors might represent environmental and/or genetic influences on eventual educational attainment. Hart and Risley (1995) documented dramatic differences in home language use and subsequent child vocabulary development, as a function of family SES, perhaps supporting an argument for environmental influences. However, IQ scores, which are related to family SES, are known to be highly heritable (e.g., Plomin & Spinath, 2002), perhaps supporting an argument for genetic influences. In a recent article, Hayiou-Thomas (2008) concluded that there is relatively strong evidence of genetic influences for early speech disorders, but that genetic influences on early language disorder are found only when samples are ascertained via clinic referrals and not when they are ascertained via community testing. Hayiou-Thomas further suggested that this discrepancy was attributable to the fact that clinic-referred children who have language disorders were more likely to have accompanying speech disorders. Readers will recall that the participants of the Ottawa Language Study were ascertained via community testing and that children with language disorders who received speech-language intervention were likely to have accompanying speech disorders. Moreover, those with both speech and language disorders were included in the language disorder group in this report. Obviously, further work will be required to sort out the complex potential causal relationships that may underlie the predictive relationships noted here.

Teacher-rated behavior problems, reading achievement, and psychiatric diagnosis were also later predictors (12 or 19 years of age) of eventual academic achievement. All three of these variables have been consistently associated with language impairment in our earlier results of the Ottawa Language Study (e.g., Beitchman, Nair, Clegg, Ferguson, & Patel, 1986; Beitchman, Wilson, Brownlie, Inglis, & Lancee, 1996, Beitchman et al., 2001; Young et al., 2002) and in other similar studies in the literature (e.g., Catts et al., 2002; Clegg et al., 2005; Tomblin, Zhang, & Buckwalter, 2000). Teacher-rated measures of child behavior problems entered the prediction equation, not just for educational attainment but also for parenthood and occupational status. Teacher
ratings consistently proved to be better predictors of these outcomes than did parent ratings of child behavior problems. One possible reason for this is that teachers have the benefit of being able to judge a child’s behavior in relation to a comparison group of same-age peers, whereas many parents may not be as familiar with such a standard. Moreover, teachers judge a child’s behavior in an academic setting, where attention and conformity may be more important than in the less structured situations found in family, leisure, and social interactions. With respect to reading, astute readers may have noted that we did not include an early measure of emergent literacy skills, such as print concepts and phonological awareness, in our prediction equations. Although well-established today, the importance of emergent literacy skills in predicting later reading and academic performance was not well known in 1982 when the Ottawa study began. Therefore, these skills were not measured when our sample was first identified at age 5.

As mentioned earlier, the outcome of Time 4 occupational SES was best predicted by early language skills, with an additional contribution from teacher-rated child behavior problems at age 12. One plausible explanation for the prediction attributable to early language might be that strong communication skills are more important for success in occupations that are rated higher in status than in occupations rated lower on the scale. The additional contribution of teacher-rated behavior problems suggests that it may be children with both early language problems and behavioral difficulties who are most at risk for holding low-status jobs in emerging adulthood. Given that these low-status jobs were also associated with low educational attainment (see Table 3), individuals in these jobs may have limited future opportunities for advancement and increased earning potential.

One possible implication of our results on educational attainment and occupational status is that parents, professionals, and policy makers need to continue to search for effective interventions for at-risk individuals that will enhance their ability and motivation to remain in school and that will maximize their opportunities for eventual job success. Such interventions are likely to require concerted efforts but may pay off in benefits for individuals and society in the long term.

The final outcome of self-rated quality of life was not associated with early language impairment. Quality of life ratings appeared distinct from the other three Time 4 outcomes in other ways as well. First, they were not strongly related to the other dependent variables used in our regression equations (see Table 3). Second, the predictors identified for quality of life ratings (gender, Time 3 SS-A Scale scores) did not overlap with those identified for the other Time 4 outcomes. Of the two predictors, the Time 3 SS-A Scale was the best predictor of later quality of life ratings. Perhaps connectedness with family, friends, and others, which is the construct measured by the SS-A Scale, is an important determinant of satisfaction with one’s life circumstances. Consistent with this suggestion, Svetaz, Ireland, and Blum (2000) found that connectedness to family and school served as protective factors for adolescents with learning disabilities with respect to their emotional well-being.

Conclusion

This report provided the first comprehensive overview of and prediction equations related to family life, educational attainment, occupation status, and subjective well-being in 25-year-old individuals with and without a history of communication disorders. Objective, real-life outcomes were predicted differentially by combinations of multiple, interrelated risk factors, including poor language and reading skills, low family SES, low performance IQ, and child behavior problems. Subjective well-being, however, was primarily associated with strong social networks of family, friends, and others. These findings should be useful in counseling parents, planning services, and developing policies regarding individuals with early language impairments.

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