

Relationship between parenting behaviours and specific language impairment in children

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Abstract

This study investigated the relationship between parenting behaviours and specific language impairment (SLI) in children. Using a case-control design, data on 177 kindergarten children with SLI and 925 kindergarten children who were typically developing were collected using a parental questionnaire. Parents were interviewed about parenting practices classified into the following categories: conversing with children, teaching behaviours, the child's daily routine and discipline. The results revealed that parents of children who were normally developing had engaged their children in particular conversational activities more frequently than had parents with children with SLI. Parents of children diagnosed with SLI tended to teach their children school readiness skills (the alphabet and colours) and discipline their children more frequently. These relationships continued to hold after controlling for maternal education and family economic need with the exception of teaching children colour names. The results suggested that additional investigations that examine the association between these parental behaviours and children's language status through direct observation are warranted.

Keywords: specific language impairment, parenting.

Introduction

Specific language impairment (SLI) is a common developmental communication disorder. Children with SLI by definition do not present syndromic conditions at birth nor do they present with sensory disorders that lead to early identification. Despite being healthy and otherwise typically developing, the language difficulties of these children are manifested in their second year of life. Tomblin *et al.* (1997)

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conducted a large-scale epidemiological investigation to study SLI among kindergartners. Lubker and Tomblin (1998: 3) defined epidemiology as 'the study of the distribution and determinants of diseases, disorders, and disabilities and of desirable health events in populations'. Epidemiological studies focus on determining prevalence rates for a particular disorder and on identifying risk and protective factors for disorders.

This study is one in a series that investigated possible determinants of risk factors for SLI. In the tradition of most epidemiological studies, the present examination for determinants and risk factors focused on environmental factors. Tomblin *et al.* (1996, 1998) reported the effects of biological exposures on children's language status. The studies investigated risk factors for SLI that included prenatal and perinatal exposures to (i.e. contact with) disease, tobacco and chemical substances. Risk factors were examined within a case-control design, which is one of two primary designs used in epidemiological studies. Case-control designs compare the rates of exposures of individuals either affected or not based on historical data. Exposure data for the present investigations were obtained via a questionnaire administered to the parents of children with and without SLI. The two studies found that prenatal and perinatal exposures to disease, chemical substances and tobacco were not elevated for the SLI cases once the educational level of the mothers was controlled for. The findings of these studies are consistent with the existing literature on potential risk factors for developmental language impairments. These studies have shown that in most instances prenatal and perinatal birth events that are sufficient for producing language impairments also result in generalized developmental deficits rather than deficits limited primarily to language (cf. Streissguth *et al.* 1980, D'Souza *et al.* 1981, Creevy 1986, Greene *et al.* 1990, Abkarian 1992, Fried *et al.* 1992, Tomblin 1992).

In contrast to the lack of evidence that prenatal and perinatal biological exposures lead to increased risk for SLI, there is more consistent evidence of an association between language development and parental behaviour. Thus, experiential exposures rather than biological factors may be implicated as risk factors for SLI. There is well-documented evidence in the literature that parenting behaviours have an impact on children's language development. For example, parental use of a conversational style of speech has been associated with more advanced syntactic development (Nelson 1973, Furrow *et al.* 1979, McDonald and Pien 1982). In addition, the amount of speech directed at children has been related to children's vocabulary development (Hart and Risley 1995).

More general parenting behaviours have also been associated with language development. Better language outcomes were related to higher parental scores on four subscales of the Home Observation for Measurement of the Environment (HOME): emotional and verbal responsiveness of the mother, provision of appropriate play materials, maternal involvement with the child, and opportunities for variety in the daily routine (Elardo *et al.* 1977).

There is also evidence to suggest that children's language abilities influence parents' interactional behaviours. Mothers of language-delayed children have been shown to use different speech styles than mothers of typically developing children (e.g. Petersen and Sherrod 1982, Pelligrini *et al.* 1985, Conti-Ramsden 1990). It has been argued that parents of children with language delays engage in various communicative behaviours to a greater or lesser extent (e.g. recasts, degree of responsiveness, use of directives and demanding teaching strategies), because they need to:

(1) assume 'more of the responsibility for the dyad's conversations' (Pelligrini *et al.* 1985: 519); (2) work harder to engage their child in conversation; and/or (3) compensate for the child's more passive participation in the conversation (Conti-Ramsden 1990).

With regard to more general parenting behaviours of parents of children with SLI, Wulbert *et al.* (1975) investigated the discipline practices of mothers of children with language impairments. Their study revealed that mothers of young children with language impairments were less responsive and stricter with their children, meaning that they were more likely to shout at, threaten and spank them.

Given that the relationships between biological risk factors and children's language status have not been found, and given the considerable evidence of associations between parenting behaviours and children's language development, this preliminary study was conducted to investigate the relationship between children's language status and general parenting behaviours. The fundamental question addressed in this study was whether general child-rearing practices reported by the parents differed between SLI cases and controls particularly when important factors of parental education, economic resources and culture were addressed. The present aim was to identify possible patterns of differential parental behaviour through a large epidemiologically sampled population. It should be noted that this method does not allow one to determine the direction of causality between parenting behaviours and children's language status. It does, however, allow one to identify significant relationships that then can be examined in prospective, observational studies. These subsequent studies permit one to verify the results of this study as well as allowing one to understand more fully the causal relationship between parenting practices and SLI in children.

When investigating the relationship between parental behaviours and children's language abilities, it is important to identify demographic variables that may be related to SLI and to control for them when analysing the data. Otherwise, differences in parenting practices associated with these factors may be considered as primary causes of the language impairment rather than a correlate with another variable. Factors to consider include parental education, race, poverty status and the economic well being of the children's neighbourhood.

Parental education has been related to differences in parenting practices (Wadsworth 1986, Kelley *et al.* 1992, Melby and Conger 1996, Brody and Flor 1998) and to child outcomes (Ittenbach and Harrison 1990, Auerbach *et al.* 1992). In general, children of parents with higher levels of education have higher academic achievement, perform better on cognitive measures (Auerbach *et al.* 1992), and have better language outcomes than children of parents with lower educational levels (Schacter 1979, Beitchman *et al.* 1988, Hoff-Ginsberg 1991, Tomblin *et al.* 1991, Hart and Risley 1995, Tomblin *et al.* 1997).

Maternal race is another factor that may be associated with SLI. It is not believed that racial factors result in language impairments in children; rather, children who are not from the mainstream culture may perform poorly on standardized tests due to cultural differences and thus may fall into the diagnostic category of SLI.

The final variables considered are familial and neighbourhood poverty level. It is conceivable that economic need of the family and/or of the neighbourhood may influence parental behaviour (Bronfenbrenner 1979) and impact children's language outcomes. Therefore, these demographic variables were attended to in this investigation.

Methods

Participants

The association between parenting behaviours and SLI was examined using a case-control design that employed contrast groups that varied with regard to language outcome. The case and control groups consisted of kindergarten children, each with a mean age of 6.0 ($SD = 0.32$). The groups were comparable because they consisted of samples recruited from the same communities and residential status. Specifically, all children had participated in a larger, cross-sectional study with a sample size of 7218 monolingual, English-speaking children. Tomblin *et al.* (1997) has a discussion of how the sample was obtained. The case group consisted of 171 (79%) of the 216 children diagnosed with SLI in the larger study. The randomly selected control group consisted of 984 children proportionately matched with the SLI participants on gender and residential stratum. Of this group, 886 controls (96%) participated in this investigation. In total, 1057 children participated in the study with 43% of the sample consisting of females and 57% of males.

Diagnosis of SLI

Children were diagnosed with SLI based on the results of the following: (1) performance IQ estimates determined by administration of the Block Design and Picture Completion subtests of the *Wechsler Preschool and Primary Scale of Intelligence—Revised* (WPPSI; Wechsler 1989), (2) a battery of language tests which consisted of the *Test of Oral Language Development Primary—2* (Newcomer and Hammill 1988) and the Culatta *et al.* (1983) narrative task, (3) a pure tone hearing test and (4) parental report of developmental, sensory and neuromotor problems. Children were diagnosed as having SLI if they scored at or below -1.25 SD on at least two of the five language tests, demonstrated a normal performance IQ (> 85), had normal hearing, and had no parental report of mental retardation, autism, visual impairment, cerebral palsy or severe head injury. The diagnostic standard used in this study was that described by Tomblin *et al.* (1996). This standard requires that the child obtain two scores out of a possible set of five at or below -1.25 SD for age matches. This standard was established by comparing clinician judgements of language impairment with various scoring interpretations. Children who served as controls also demonstrated normal performance IQ, normal hearing and an absence of developmental or sensory impairments. They differed in that they had no language impairment.

Telephone survey and questionnaire

Development of the questionnaire

The 65-item questionnaire used in this study was compiled by Tomblin *et al.* after a careful review of the literature on predisposing features of familial health, education, employment, interaction methods and style, and general parenting behaviours. The questionnaire was piloted and changes made based on information from the interviewers about items that appeared to be problematic for the respondents in terms of their ambiguity.

Administration of the questionnaire

A statistical laboratory associated with a large, Midwestern university was contracted by the investigators to carry out the telephone interviewing for this study. The final version of the questionnaire was administered via the telephone with the parents of the SLI and control children. The data were collected over 3 years, with a new cohort beginning each year. During this time information about the children's exposures to various risk factors was collected. The interviews, which lasted 45 minutes, were conducted with the biological mothers. Occasionally, the biological fathers were interviewed when the children's mothers were unavailable. Fathers accounted for only 2% of the interviewed parents. To prevent response bias, parents were questioned before receiving the results of the language battery that had been administered to their children.

The trained interviewers did not have knowledge of the children's case or control status. They followed a standard protocol and were supplied with a manual with definitions of terms contained in each question that could be used for the purpose of clarification.

The risk interview protocol consisted of questions about maternal and paternal socio-demographic information including parental ages, marital status, race, education and income, and parenting behaviours. Parents were asked to indicate the frequency with which they engaged in the following behaviours when the children were between 2 and 4 years of age: (1) read to the children, (2) told stories to the children, (3) discussed daily activities, friends or feelings, (4) got up at the same time every morning and (5) ate at least one meal together. Parents were also asked to indicate the frequency with which they engaged in the following behaviours at the time of the study: (1) teaching the children the alphabet, numbers, colours and new words, (2) encouraging the children to talk and to listen (3) talking to the children about a television program, (4) taking their children shopping and (5) having a set bedtime on school nights. See the appendix for a complete list of the questions asked.

In addition, parents were questioned about their disciplinary practices. Specifically, they were asked about how frequently they used the following: used time out, scolded or yelled at their children, took away privileges, spanked their children with a hand, spanked them with an object, and talked about the problem. Although questions were also asked of the parents that dealt with parental medical history, medical condition of the mothers during pregnancy and delivery, the method of feeding children (e.g. breast or bottle-feeding), and parental use of drugs, none of these data will be addressed here.

Reliability

A supervisor from the statistical laboratory oversaw the administration of the telephone questionnaire. Throughout the process of data collection, she randomly called families to question them about the quality of the interview. In addition, during the pilot phase and the first two years of the study, she re-administered 10–15 items of the questionnaire to between 8 and 10% of the families. She compared the parents' responses with their initial responses and only rarely found discrepancies between the parents' answers from the first to second administration, indicating what was believed to be sufficient test–retest reliability.

Validity of parental report

Researchers have documented high correlations between parent report of behaviours and children's language development. For example, Dale (1991) found high correlations between parental report of their 24-month-old children's vocabulary and syntax development and children's scores on various standardized tests of language and cognition. Similarly, Tomblin *et al.* (1989) concluded that the expressive language scale of the Minnesota Child Development Inventory (a parent questionnaire; Ireton and Thwing 1974) was a valid predictor of children's expressive language development. Thus, this research supports the use of parental report as a method for collecting data; however, it must be pointed out that no studies were identified in the literature that investigated parental report of behaviours that occurred several years in the past as the present study had done. Case-control designs in which data are collected retrospectively, however, are well accepted and are commonly employed in the field of epidemiology. See Koo *et al.* (1988) and McGee and Stanton (1993) for examples of other behavioural studies that employed a case-control design.

*Data analysis**Association between parenting behaviours and SLI*

The data were examined for differences in the frequency with which parents of case and control children engaged in the targeted behaviours. When making the comparisons between the case and control groups, one level of the parenting behaviour served as the referent (e.g. every day) and another level was the target (e.g. one to five times per week). When a parenting behaviour had more than two levels, multiple runs were performed so that all levels were compared with the referent. It should be noted that when fewer than five responses occurred in a particular response category, that level was combined with an adjacent level.

'Everyday' was chosen as the referent for most items for two reasons. First, 'everyday' was the most common response for the majority of questions. Comparing with a more common response has greater power to detect a difference. Second, 'everyday' was the response at one end of the scale. It was expected that the farther two responses were apart from one another, the more remarkable the difference between the two response groups could be with regard to language ability if there was an association between the response category and language status. If the referent had been set at the midpoint of the scale, the difference between the two ends of the scale may not have been detected because both would have been compared with the midpoint.

Each run of this statistical analysis provided a χ^2 -test result, an odds ratio and corresponding confidence interval. The χ^2 -test result indicated whether the frequency distribution of the two levels of parenting behaviour was significantly different between the case and control groups. The odds ratio indicated how much the targeted behaviour level had increased the risk for having a language-impaired child. (For additional information about odds ratios, see Tomblin *et al.* 1997.) Significant differences existed between the two language groups when the confidence intervals for the odds ratios did not include an odds ratio = 1.0.

The above statistical procedures were conducted for all of the parental behaviours targeted. In addition, a composite discipline score was created to ascertain an overall frequency of discipline that the children received. The composite discipline

score combined parents' responses to all parts of the question on discipline. (See question 6 in the appendix.)

In addition, effect size was determined for each variable using the approach introduced by Cohen (1988). According to Cohen, an effect size of 0.20 is considered small; 0.50 is a medium effect and 0.80 is a large effect. Also, power analyses were conducted to determine if the sample size was sufficient to provide power for detecting an effect size of 0.30 (tables 3 and 4).

Familial background variables related to SLI

Determination of potential confounding variables. The demographic variables thought to be associated with SLI in children were identified *before* analysis of the data. These potentially confounding variables included: mothers' race, mothers' educational level, ratio of household income to poverty threshold (family income-to-needs ratio), neighbourhood income per capita, and neighbourhood ratio of income to poverty threshold. Determination of the mothers' educational level and race was a straightforward process as the mothers reported the number of years of their education and their race during the telephone interview.

The remaining three variables were derived from information provided by the parents in combination with information from the US Census Bureau. The ratio of household income to poverty threshold was designed to serve as an indicator of a family's level of economic need, with the lower the ratio, the greater the family's level of economic need. This ratio was defined as a family's household income divided by the corresponding poverty level of 1994 (the year these data were collected; Brooks-Gunn *et al.* 1996). For example, a family with a household income of US\$7500 would have an income-to-needs ratio of 0.75 (i.e. \$7500 divided by \$9976, the poverty level for a family of two); a family of three with an income level of \$35 000 would have an income-to-needs ratio of 2.96 (i.e. \$35 000 divided by \$11 821, the poverty level for a family of three).

The neighbourhood income per capita was determined for each child using data from the 1990 Census. Information about the average income per individual from the 'block group' in which each family resided was ascertained from the Summary Tape Files 3A for Iowa and Illinois (US Census Bureau 1992). As defined by the US Census Bureau (p. A-4), block groups consist of 'small geographic areas bounded on all sides by visible features such as streets, roads, streams, and railroad tracts, and by invisible boundaries such as city, town, township and county limits. Block groups typically contain between 250 and 500 housing units, with 400 housing units being considered the ideal size.

The neighbourhood ratio of income to poverty threshold was designed to serve as a measure of the economic need of the neighbourhood or block group in which each child was being raised. To calculate this ratio, the number of persons that fell into each of nine income-to-poverty ratio categories was determined for each child's neighbourhood. The nine categories were: 0.5 (which included households with incomes at least 50% below the poverty level), 0.67, 0.87, 1.12, 1.37, 1.62, 1.795, 1.92 and 2.0, which equalled household incomes twice above the poverty level or greater. The number of persons in each child's neighbourhood that fell into each of the nine categories was then multiplied by the appropriate poverty level. The numbers across poverty levels were summed and then divided by the

number of persons in a given child's block group. This variable served as an indication of the economic need of the children's neighbourhoods.

Determination of the familial background variables related to SLI. To determine which of the familial background variables were related to children's language status, a univariate logistic regression was performed with each of the following continuous variables: mothers' education, ratio of household income-to-poverty ratio, neighbourhood income per capita, and neighbourhood ratio of income to poverty threshold. The case-control status of the children served as the dependent variable. The categorical background variable, maternal race and its association with case-control status were examined through a Cochran–Mantel–Haenszel test. All continuous and categorical variables significantly related to SLI were then entered into a multivariate logistic regression to identify a unique set of variables associated with SLI.

Association between parenting behaviours and SLI with familial background variables controlled

The SAS Institute logistic procedure (1997) was used when examining the association between parenting behaviours and SLI with familial background variables controlled. The children's language status served as the dependent variable. The independent variables were mothers' education, the ratio of household income to poverty threshold and two frequency levels of the parenting behaviours (one level was the referent and the other was the target behaviour level). The procedure revealed a significance level and odds ratios and their confidence intervals for the parenting behaviour while the other independent variables were adjusted for.

Power analyses and Type One error rate

Power analyses were performed for each of the items in the questionnaire. The results are reported in table 3. In addition, after determining which parental behaviours were associated with children's language status, the Type One error was computed using the binomial distribution function. The findings are discussed below.

Results

Familial background variables related to SLI

The univariate logistic regression revealed that all four continuous variables (i.e. maternal education, ratio of household income to poverty threshold, neighbourhood ratio of income to poverty threshold) were significantly associated with the children's case-control status (table 1). This indicated that SLI in children was associated with lower maternal educational levels, lower income-to-poverty ratios, lower neighbourhood incomes per capita and higher neighbourhood economic need.

In addition, the categorical variable, maternal race if it were African American, was significantly associated ($p=0.0001$) with case-control status (table 1). That is, children with black mothers were more likely to be diagnosed as having SLI than those with white or Latina mothers.

The analysis designed to determine which of these variables were uniquely associated with SLI revealed that the educational level of the mothers ($p=0.003$)

Table 1. Association between familial background variables and children's language status (modelling probability of SLI)

Variable	Odds ratio	95% CI	<i>p</i>
Mothers' education in years	0.80	0.73–0.88	0.0001
Ratio of household income to poverty threshold	0.67	0.57–0.79	0.0001
Neighbourhood income per capita	1.00	1.00–1.00	0.0047
Neighbourhood ratio of income to poverty threshold	0.25	0.12–0.54	0.0004
Mother African American compared with white	2.68	1.52–4.72	0.0001
Mother Latina compared with white	0.71	0.16–3.09	0.645

and the ratio of household income to poverty threshold ($p = 0.005$) were significantly related to the children's case-control status (table 2). Thus, education and income were uniquely related to children's language status and not race. In the univariate logistic regression analysis, race may have been identified as a potential confounding variable because African American individuals are more likely to have lower educational levels and income levels in the USA. As a result, the racial factor is confounded by parents' education and income and so is not a contributing variable. Therefore, education and income to poverty threshold were used as the control variables when analysing the association between parenting behaviours and SLI.

Association between parenting behaviours and SLI

For the purpose of discussion, the parenting behaviours explored through the questionnaire were grouped into four major categories: (1) conversing with the target children: read to, told story to, and discussed daily activities, feelings and friends with children during the preschool years, and talked about a television show with the children, encouraged children to talk, and encouraged their children to listen at the time of the study (kindergarten age); (2) teaching the target children: taught the children the alphabet, colours, and new words at the time of the study; (3) involving the children in daily routines/activities: had a set bedtime at the time of the study and regular wake up time, took the children shopping and ate at least one meal a day with the children during the preschool years; and (4) disciplining: used timeout, scolded children, took away privileges, spanked children with a hand, spanked children with an object, and talked about problems with children at the time of the study.

For the first two categories of parenting behaviours (i.e. conversing with children, teaching the target children), comparisons were made between the two groups of children in terms of whether parents reported engaging in a given activity every day, one to three or one to five times a week (depending on the option given

Table 2. Demographic variables uniquely related to SLI

Variable	χ^2	<i>p</i>
Mothers' education in years	8.60	0.003
Ratio of household income to poverty threshold	7.84	0.005
Neighbourhood income per capita	0.80	0.370
Neighbourhood ratio of income to poverty threshold	1.50	0.220
Mother African American compared with white	2.62	0.106

to the parents during the interview) and less than one to three times a month. In terms of daily routines, comparisons were conducted about whether children got up at a regular time and parents ate at least one meal with the children on a daily basis versus one to five times a week or less. The data were also examined to determine if there was a difference between case and control parents in terms of whether they took their child shopping always, often, sometimes, and whether their children had a set bedtime.

Conversing with children

The following three parenting behaviours in the 'conversing with children' category were significantly associated ($p < 0.05$) with SLI for at least one frequency level: (1) reading to children one to five times a week (crude odds ratio (COR) = -1.68) and one to three times a month or less (COR = 2.72); (2) telling a story to children one to three times a month or less (COR = 1.64) and (3) discussing daily activities and feelings one to three times a month or less (COR = 4.31; table 3). Recall that parents were questioned about these behaviours during their children's preschool years. The adjusted odds ratios (adj. OR) were: read to the children one to five times per week, adj. OR = 1.51; told stories to the children one to three times a month or less, adj. OR = 1.66; and discussed daily activities, feelings, and friends with the children one to three times a month or less (adj. OR = 3.89; table 3). As shown in table 3, the effect sizes for these behaviours ranged from 0.26 to 0.38, indicating a small to medium effect. In other words, parents of children with SLI engaged in these behaviours significantly less often when their children were preschoolers than parents of the control children.

Differences were not observed in terms of the targeted conversational behaviours parents engaged in at the time of the study. Neither talking about a television program with their kindergarten children nor encouraging children to talk or to listen were associated with SLI in children (table 3).

Teaching behaviours and the daily routine

Parental teaching of the alphabet (COR = 0.52) and teaching colours (COR = 0.57) when the children were in kindergarten one to three times a month or less were significantly related to the children's language status. After controlling for the two demographic variables, only teaching the children the alphabet remained significant. Parents of children with SLI were significantly more likely to teach their children the alphabet on a daily basis (adj. OR = 0.59), with an effect size of 0.32. The frequencies with which children got up at the same time and ate at least one meal a day with a parent during the preschool years, and parents taught their children new words and had a set bed time for their children at the time of the study were not significantly different between the two groups.

Discipline practices

Comparisons of the discipline composite scores revealed that parents of children diagnosed as SLI were significantly more likely to discipline their kindergarten children than parents of the control children (COR = 1.09). Additionally, significant differences were found between the frequencies with which parents of case and

Table 3. Relationship between parenting behaviours and children's language status

Variable	SLI	Controls	Odds ratio	95% CI	Adj. OR ¹	95% CI	Effect size	Power to detect effect of size 0.30
How often read to child?								
Everyday	77	524	(referent)					
1-5 times a week	80	325	1.68*	1.19-2.35	1.51*	1.06-2.15	0.26	0.92
1-3 times a month or less	14	35	2.72*	1.43-5.18	1.85	0.92-3.71	0.36	0.75
How often tell the child a story?								
Everyday	46	278	(referent)					
1-5 times a week	64	380	1.02	0.68-1.53	1.10	0.72-1.66	0.01	0.79
1-3 times a month or less	61	225	1.64*	1.08-2.49	1.66*	1.07-2.56	0.25	0.77
How often discuss daily activities, etc. with the child?								
Everyday	122	719	(referent)					
1-5 times a week	30	139	0.95	0.65-1.39	1.03	0.76-1.85	0.09	0.92
1-3 times a month or less	19	26	4.31*	2.42-7.68	3.89*	2.06-7.33	0.38	0.89
How often talk with the child about a television show?								
Everyday	93	516	(referent)					
1-5 times a week	60	296	1.13	0.79-1.60	1.27	0.89-1.84	0.06	0.92
1-3 times a month or less	18	72	1.39	0.79-2.43	1.59	0.90-2.84	0.11	0.81
How often encourage the child to talk?								
Everyday	121	615	(referent)					
1-3 times a week	17	83	1.04	0.60-1.82	1.02	0.58-1.79	0.01	0.88
1-3 times a month or less	33	187	0.90	0.59-1.36	0.95	0.62-1.46	0.05	0.90

Table 3. (Continued)

Variable	SLI	Controls	Odds ratio	95% CI	Adj. OR ¹	95% CI	Effect size	Power to detect effect of size 0.30
How often encourage the child to listen?								
Everyday	142	721	(referent)					
1-3 times a week	21	112	0.95	0.58-1.57	1.07	0.64-1.78	0.02	0.90
1-3 times a month or less	8	53	0.77	0.36-1.64	0.94	0.43-2.06	0.06	0.78
How often teach the child the alphabet?								
Everyday	52	224	(referent)					
1-3 times a week	87	396	0.95	0.65-1.39	1.03	0.70-1.52	0.03	0.88
1-3 times a month or less	32	265	0.52*	0.33-0.83	0.59*	0.36-0.96	0.32	0.68
How often teach the child colours?								
Everyday	42	182	(referent)					
1-3 times a week	71	268	1.15	0.75-1.75	1.25	0.81-1.94	0.07	0.77
1-3 times a month or less	47	436	0.57*	0.37-0.87	0.67	0.43-1.06	0.22	0.77
How often teach the child new words?								
Everyday	75	404	(referent)					
1-3 times a week	67	348	1.04	0.72-1.49	1.07	0.74-1.54	0.02	0.89
1-3 times a month or less	29	134	1.17	0.73-1.87	1.16	0.72-1.88	0.07	0.78

Table 3. (Continued)

Variable	SLI	Controls	Odds ratio	95% CI	Adj. OR ¹	95% CI	Effect size	Power to detect effect of size 0.30
How often does the child get up at the same time?								
Everyday	134	741	(referent)					
All others	37	143	1.43	0.96–2.14	1.34	0.88–2.02	0.14	0.94
Does the child have a set bedtime?								
Yes	164	842	(referent)					
No	7	44	0.82	0.36–1.84	1.15	0.51–2.63	0.04	0.79
How often do you take your child shopping?								
Always	58	292	(referent)					
Often	81	449	0.91	0.63–1.31	1.01	0.69–1.47	0.05	0.89
Sometimes	32	145	1.11	0.69–1.79	1.13	0.69–1.84	0.05	0.71
How often do you eat at least one meal a day with the child?								
Everyday	166	870	(referent)					
1–5 times a week or less	5	14	1.87	0.68–5.19	1.17	0.38–3.64	0.09	0.92

¹ OR and CI were adjusted for mothers' education and family income to needs ratio.

* $p \leq 0.05$.

Table 4. Relationship between discipline practices and children's language status

Variable	SLI	Controls	Odds ratio	95% CI	Adj. OR ¹	95% CI	Effect size	Power to detect effect of size 0.30
Composite score								
Amount of discipline used	167	870	1.09*	1.02–1.16	1.07*	1.01–1.14 ⁺		
How often do you use timeout?								
Never or seldom	18	151	(referent)					
Sometimes	43	283	1.28	0.71–2.29	1.35	0.75–2.43	0.11	0.49
Often	50	228	1.84*	1.04–3.26	1.76	0.97–3.17	0.29	0.54
Very often	60	224	2.25*	1.29–3.92	(collinear variables)	with control	0.37	0.60
How often do you scold children?								
Never or seldom	23	139	(referent)					
Sometimes	76	440	1.04	0.63–1.73	1.02	0.61–1.71	0.02	0.70
Often	56	222	1.52	0.90–2.58	1.47	0.86–2.52	0.20	0.60
Very often	16	85	1.14	0.57–2.28	1.10	0.54–2.22	0.06	0.35
How often do you take away privileges?								
Never	10	46	(referent)					
Seldom	37	217	0.78	0.36–1.69	0.79	0.36–1.74	0.10	0.45
Sometimes	66	379	0.80	0.36–1.69	0.79	0.36–1.74	0.07	0.66
Often	45	188	1.10	0.52–2.35	1.14	0.52–2.52	0.04	0.34
Very often	13	55	1.09	0.44–2.72	1.00	0.38–2.67	0.04	0.17

Table 4. (Continued)

Variable	SLI	Controls	Odds ratio	95% CI	Adj. OR ¹	95% CI	Effect size	Power to detect effect of size 0.30
How often do you spank the child with your hand?								
Never	32	152	(referent)					
Seldom	91	533	0.81	0.52-1.26	0.82	0.52-1.29	0.09	0.85
Sometimes	41	181	1.08	0.65-1.79	0.88	0.52-1.51	0.04	0.58
Often or very often	7	19	1.75	0.68-4.48	1.45	0.52-4.03	0.20	0.37
How often do you spank the child with an object?								
Never	139	788	(referent)					
Seldom	23	78	1.67*	1.02-2.74	1.47	0.88-2.45	0.16	0.93
Sometimes	8	17	2.67	1.17-6.11	2.09	0.86-5.07	0.18	0.89
How often do you talk with the child about problems?								
Sometimes	12	63	(referent)					
Often	61	326	0.98	0.59-1.93	1.05	0.53-2.08	0.01	0.64
Very often	98	497	1.04	0.54-1.99	1.15	0.59-2.24	0.01	0.66

¹OR and CI were adjusted for mothers' education and family income to needs ratio.

+ Amount of discipline was used as a continuous predictor of language status. Both the crude and adjusted odds' ratios and their confidence intervals were obtained using a logistic regression.

* $p \leq 0.05$.

control children used time out and spanked their children with an object at the time of the study. Parents of children with SLI reported using time out often (COR = 1.84) and very often (COR = 2.25). Similarly, parents of children with SLI indicated that they spanked their children with an object sometimes (COR = 2.67; table 4).

After controlling for maternal education and family income, the total amount of discipline used by parents continued to differ between the two groups (adj. OR = 1.07; table 4). Parents of children with SLI engaged in more discipline overall. In addition, parental use of time out was consistent with the parents' educational level and income (adj. OR = collinear with control variables). In other words, parents with more education and higher incomes used time out more frequently as a disciplinary technique.

Type One error rate

There were 39 statistical tests made when investigating the relationship between parenting behaviours and children's language status. Five tests were significant when background variables were controlled for. Using the binomial distribution function, the probability of getting five or more significant associations out of 39 tests was 0.044 or 4%.

Use of a more stringent diagnostic criterion

In keeping with the argument made by Dale *et al.* (1998) that the fifth percentile may be a more appropriate diagnostic cut-off for SLI, the present authors also ran the analyses using this criterion. After controlling for socio-economic status, it was found that the results only changed with respect to two areas. First, there was a stronger relationship between punishment and language impairment such that more levels of punishment (e.g. strike with hand) were significant. Second, a relationship was found between parental teaching of colours, numbers and language impairment. These patterns are explainable in that the children with more severe language problems probably evoke more of these behaviours from their parents.

Discussion

The purpose of this investigation was to examine the relationship between general parenting behaviours and SLI in children using a case control design. The results demonstrated that parents of the case and control children reported engaging in many of the targeted behaviours with similar frequencies. Specifically, no differences were observed in terms of how frequently the parents of typically developing and SLI children reported structuring their children's daily routine during the preschool years or during kindergarten. Parents also engaged their children in the following behaviours with similar frequencies when their children at the time of the study (i.e. when the children were in kindergarten): (1) talking about television programs, (2) verbally encouraging their children to talk or to listen and (3) teaching their children colour names (after controlling for the two demographic variables) and new words. Similarly, parents employed several discipline techniques with similar frequencies. These included scolding their children, taking away privileges, spanking their children with their hand, and talking to their children about problems.

Differences, however, existed between the two groups for a subset of the behaviours. Specifically, parents of children whose language was normally developing were more likely to have read to their children, told stories to their children, and discussed daily events, activities and feelings during the preschool years than were parents of children with SLI. Parents of children with SLI, on the other hand, more frequently taught their kindergarten children the alphabet, a skill typically mastered by children before they enter school. The results of this investigation combined with previous investigations suggest that not only do parents of SLI children spend more time teaching their children the alphabet and engage their offspring in conversational/reading activities less often, but once engaged in such activities they employ a different interactional style (e.g. Petersen and Sherrod 1982, Pelligrini *et al.* 1985, Conti-Ramsden 1990).

In addition, parents of children with SLI employed more discipline when their children were in kindergarten than did parents of typically developing children. This result is consistent with the results of Wulbert *et al.*'s (1975) investigation, which also demonstrated that parents of children with language impairments were stricter with their children.

These relationships continued to hold after controlling for the two demographic variables that were uniquely related to children's language status: maternal education and family economic needs. Maternal education, in particular, and socio-economic status, in general, have been closely associated with children's developmental outcomes and language abilities (e.g. Schacter 1979, Ittenbach and Harrison 1990, Hoff-Ginsberg 1991, Auerbach *et al.* 1992, Hart and Risley 1995). However, children's language status appears to have a greater association than the other two variables with these particular parental behaviours.

It is concluded that this investigation aids the present understanding of the associations between parenting behaviours and children's language status. It does not allow, however, for a definitive answer as to the direction of the causal relationship between parenting behaviours and children's language status. When Bates *et al.* (1988) described a relationship between parental style and children's language behaviours, they were not suggesting that the parents must have caused the language style of the child. Instead, the children's style may have had an affect on the parents' behaviours. The same argument holds true for parenting behaviours and language impairments.

Offered here are two possible hypotheses about the causal relationship between parenting behaviours and SLI. Given that studies have demonstrated that SLI aggregates in families (Neils and Aram 1986, Tallal *et al.* 1989, Tomblin 1989, Beitchman *et al.* 1992), it may be that parents of the children with SLI may have language deficits themselves. As a result, they may avoid conversational activities with their children. Instead, they engage their children in readiness activities, an easier task for both the parents and children, as a way of fostering their children's 'language' skills. Additionally, they may discipline their children more because they believe that they need to keep their children focused and on task.

However, the preferred hypothesis is that the parents alter their behaviours in response to their children's abilities. The work of Pelligrini *et al.* (1985) and Conti-Ramsden (1990) supports this assertion. These investigators concluded that parents of children with language impairments compensated for their children's difficulties with language by adjusting the frequency with which the parents produced specific communication behaviours, such as recasts, directives, etc. Similarly, parents who

participated in this study adjusted the frequency with which they engaged their children in general language activities and disciplined their children as well. In other words, parents may compensate for their children's language impairment by avoiding difficult tasks such as conversation. Instead, they may engage their children in activities they may perceive as being important and less linguistically demanding for their children. Parents may also find that their children are more successful when participating in these activities, and this may serve to reinforce the selected patterns of interaction. Additionally, they may discipline their children more often, because their children have difficulty understanding directions or rationales provided to them for making changes in their behaviours.

When placing the results of this study in the context of our other findings, it appears that parental behaviours, and not pre- and perinatal biological exposures to disease and chemical substances, may serve as indicators of language impairments. From the current research, it is concluded that parental report of infrequently reading to, telling stories to or discussing experiences with children during the preschool years as well as emphasis on teaching children the alphabet and/or more frequent disciplining of children appear to be risk factors for the identification of SLI in children who are kindergarten age. Although none of these factors in isolation can be used to suggest a language impairment, these factors may serve as warning signs that help identify children who are in need of a screening and/or careful monitoring of their developing language abilities.

Although a case-control design is a well-accepted design in epidemiology, it is acknowledged that a limitation of this investigation is the retrospective nature of the design. Therefore, using the preliminary findings from this investigation, additional studies are warranted to understand the relationship between parenting behaviours and SLI in children better. A longitudinal, prospective study is needed to examine the significant parenting behaviours identified in this investigation. Parental reports about how frequently they converse with, teach their children readiness tasks and discipline their children could be collected on a regular basis. This information could be supplemented with periodic observations of parent-child interactions by investigators to examine more closely the behaviours of the parents and children and perhaps to put to rest further concerns about subjective responding by parents. Additionally, parents could be interviewed about their parenting practices and the processes by which they engage their children in particular behaviours. This might yield valuable information about the relationship between those parenting practices and children's language status. Using the results of these studies, intervention programs could be developed that targeted activities that children with SLI are exposed to less often. Intervention programmes could then be implemented that encourage parents to engage their children in conversational activities and assist parents in determining how to adjust the demands placed on their children so that the children are successful in participating at these necessary activities.

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Appendix: Interview questions concerning parent behaviours as read by examiners

- (1) Think back to when (child) was between 2 and 4 years old. During that time, how often did someone (activity)? Would you say that happened everyday or most days, 1–5 times a week, 1–3 times a month, 1–10 times a year, or less often than that?
Activity: Tell him/her stories? Read to him/her? Talk with and listen to (child) about daily activities, friends or feelings?
- (2) During that time, how often did (s/he) (activity)? Would you say that happened everyday or most days, 1–5 times a week, 1–3 times a month, 1–10 times a year, or less often than that?
Activity: Get up at about the same time everyday (within a half-hour)? Eat at least one meal a day with you or his/her dad?

- (3) Do you have a set bedtime for (child) on school nights? (yes/no).
- (4) How often does someone talk with (child) about the television s/he watches? Would you say that happened everyday, on most days, 1–5 times a week, 1–3 times a month, 1–10 times a year, or less often than that?
- (5) Currently, how frequently do you spend time with (child) on each of the following activities? How frequently do you spend time (activity)? Would you say everyday, on most days, 1–3 times a week, 1–3 times a month, 1–10 times a year, or less than once a year?
Activity: Teaching (child) alphabet? Teaching (child) numbers? Teaching (child) colours? Encouraging (child to talk)? Encouraging (child) to listen? Teaching (child) new words?
- (6) Now let's talk about the type of discipline (child) is used to. For each type of discipline I mention, tell me how often you have used the method to discipline (child). How frequently has someone (type)? Would you say very often, often, sometimes, seldom, or never?
Type of Discipline: Use time out such as sent him/her to his/her room as punishment? Scolded or yelled at him/her? Taken away a privilege? Spanked him/her with a hand? Spanked him/her with an object like a belt or board? Talked to him/her about the problem?