Language delay in severely neglected children : A cumulative or specific effect of risk factors?

AUDETTE SYLVESTRE, Ph.D.

Département de réadaptation, Programme de maîtrise en orthophonie, Université Laval, Québec (Québec), Canada

Centre interdisciplinaire de recherche en réadaptation et intégration sociale, Québec (Québec), Canada

CHANTAL MÉRETTE, Ph.D.

Département de psychiatrie, Université Laval, Québec (Québec), Canada

Centre de recherche Université Laval-Robert Giffard, Québec (Québec), Canada

Corresponding Author :
Audette Sylvestre, Ph.D., Université Laval, Programme de maîtrise en orthophonie, Pavillon Ferdinand-Vandry, 1050, avenue de la Médecine, Québec (Québec), Canada, G1V 0A6**;** Tel: (418) 656-2131, # 8993; Fax: (418) 656-5476; e-mail: audette.sylvestre@rea.ulaval.ca

Support : Research funded by the Canada's Health Transition Fund.

Acknowledgements : We acknowledge the assistance of Claudia Émond and numerous research assistants. We would also like to thank the social workers who collaborated in the recruitment of participants and the children and mothers who generously took the time to participate in this study.

Accepté pour publication dans la revue *Child Abuse and Neglect* :

Sylvestre, A., & Mérette, C. (2010). Language delay in severely neglected children: A cumulative or specific effect of risk factors? *Child Abuse & Neglect, 34*, 414–428. doi:10.1016/j.chiabu.2009.10.003

Abstract

Objectives. This research sought to determine if the language delay of severely neglected children under three years old was better explained by a cumulative risk model or by the specificity of risk factors. The objective was also to identify the risk factors with the strongest impact on language delay among various biological, psychological and environmental factors.

Methods. Sixty-eight severely neglected children and their mothers participated in this cross-sectional study. Children were between 2 and 36 months of age. Data included information about the child's language development and biological, psychological and environmental risk factors.

Results. Prevalence of language delays is significantly higher in this subgroup of children than in the population as a whole. Although we observed that the risk of language delay significantly increased with an increase in the cumulative count of the presence of the child's biological-psychological risk factors, the one-by-one analysis of the individual factors revealed that the cumulative effect mainly reflected the specific impact of the child's cognitive development. When we considered also the environmental risk factors, multivariate logistic regression established that cognitive development, the mother's own physical and emotional abuse experience as a child, and the mother's low acceptability level towards her child are linked to language delays in severely neglected children.

Conclusions. Language development is the result of a complex interaction between risk factors. The language delay in severely neglected children is better explained by the specificity of risk factors than by the cumulative risk model.

Practice implications. Most prevention and early intervention programs promote and target an increase in the quantity and quality of language stimulation offered to the child. Our results suggest that particular attention should be given to other environmental factors, specifically the mother's psychological availability and her sensitivity towards the child. It is essential to suggest

interventions targeting various ecological dimensions of neglectful mothers to help break the intergenerational neglect transmission cycle. It is also important to develop government policies and ensure that efforts among the various response networks are concerted since in-depth changes to neglect situations can only come about when all interested parties become involved.

INTRODUCTION

The results of research conducted throughout the last twenty-five years show that severe parental neglect constitutes a very high risk factor for child development**.** Neglect refers to a child caretaker failing to meet the needs of a child that are deemed essential for its physical, intellectual and emotional development (Straus & Kantor, 2005). It also includes being inattentive to the child's emotional needs, its nurturing and its emotional well-being (Erickson & Egeland, 2002). Neglect is the most widespread form of maltreatment in Quebec where 68.7% of reports retained by Youth Protection are cases of severe neglect (Lessard, 2000). In the United States, it constitutes 54% of maltreatment victims each year (Erickson & Egeland, 2002). Furthermore, these alarming prevalence rates reflect only those for which the problem is deemed severe (Polonko, 2006).

It was also shown that severe parental neglect had the most devastating impact on language development (Hammond, Nebel-Gould & Brookes, 1989). Various studies conducted on neglected children revealed significant receptive and expressive language delays (Allen & Oliver, 1982; Hammond et al., 1989; Culp et al, 1991). More specifically, the most important language development problems involved articulation (Culp et al., 1991), the use of a language less complex syntactically than expected for children of that age (Gersten, Coster, Schneider-Rosen, Carlson & Cicchetti, 1986), pragmatic problems and a weaker lexical and morphosyntaxical development and overall maturity (Beeghly & Cicchetti, 1995; Coster, Beeghly, Gersten & Cicchetti, 1989; Eigsti & Cicchetti, 2004). The study conducted by Fox, Long and Langlois (1988) allowed for the identification of significant language comprehension problems. Moreover, the study revealed that, compared to physically abused children, neglected children had more significant language delays (Allen & Oliver, 1982; Culp et al., 1991; Fox et al., 1988). The difference between these two subgroups lies in the fact that neglected children

lack even more parental support and are confronted with greater relational stress than physically abused children (Culp et al., 1991; Fox et al., 1988), two variables that are closely linked to child language development.

This phenomenon is of concern not only because of its magnitude but also because of its impact on child cognitive (Hildyard & Wolfe, 2002), psychological (Irwin, Carter & Briggs-Gowan, 2002; Timler, 2003), social (Irwin et al., 2002; Vigil, Hodges & Klee, 2005) and academic development (Catts, Fey, Tomblin & Zhang, 2002; Manor, Shalev, Joseph & Gross-Tsur, 2001). Research has shown that young children suffering from expressive language delays are more serious, more depressed/withdrawn, less interested in play and less inclined to socialize (Irwin et al., 2002). Children with language delays in kindergarten are at a greater risk of presenting reading disabilities in second and fourth grades (Catts et al., 2002). More specifically, low scores in reasoning principles and arithmetic operations are associated with both receptive and expressive language delays (Manor et al., 2001).

In the humanities and social sciences, various theoretical models have been proposed to explain the complexity of child development. These models have been applied in an appropriate fashion to language development. Examples include the human development ecological model proposed by Bronfenbrenner in 1979, and the cumulative risk model presented by Sameroff and colleagues in 1987 (Sameroff, Seifer, Barocas, Zax & Greenspan, 1987).

The ecological model stipulates that human development results from the complex interactions among a vast array of biological, psychological and environmental factors (Bronfenbrenner 1979, 2005). Biological factors are those genetically inherited including those involved in the prenatal and perinatal history of the child whereas the psychological factors refer to other dimensions of child development, mainly behavioural and cognitive development. The environmental factors include the personal characteristics of the mothers (e.g. age, health,

education), the familial and economical situations (e.g. type of family, familial functioning, income) and the quality of the familial synergy (e.g. mother-child attachment, stimulation). The ecological model led researchers to seek and identify the risk factors susceptible of influencing language development (Chaimay, Thinkhamrop & Thinkhamrop, 2006; Prathanee, Thinkhamrop & Dechongkit, 2007; Rossetti, 2001). In terms of the biological and psychological factors, it has been shown that weaker cognitive development is closely linked to language delays (Bates, Tomasello & Slobin, 2005). As for gender, boys are more susceptible of having language problems than girls (Stanton-Chapman, Chapman, Bainbridge & Scott, 2002; Tomblin, Smith & Zhang, 1997). Being premature (Cusson, 2003) and childhood otitis media may also negatively impact language (Paradise et al., 2000), although the latter relationship may be confounded with a lower level of education in the mother (Roberts, Rosenfeld & Zeisel, 2004). Children whose pregnant mothers consumed large amounts of alcohol (Hawley, Halle, Drasin & Thomas, 1995), drugs (Lewis et al., 2004) or tobacco (Faden & Graubard, 2000) are at higher risk of presenting language problems due to a negative impact on the foetus. Also, children whose parents had language problems in their childhood are more likely to carry a genetic susceptibility which in turn increases their risk of presenting a disrupted language development (Choudhury & Benasich, 2003; DeThorne et al., 2006; Tallal et al., 2001).

In terms of environmental factors, young children from poor economic environments (Hoff, 2003; Horwitz et al., 2003) or with less educated mothers (Dollaghan et al. 1999; Tomblin et al., 1997) may also have language development problems. Moreover, mothers with little knowledge of child development show a stimulation style that is less favourable to child development (Tamis-LeMonda, Chen & Bornstein, 1998), that is, a directive style marked by interference or the lack of response to the child's communication efforts (Kloth, Janssen, Kraaimaat & Brutten, 1998; Tamis LeMonda & Bornstein, 2002). Younger mothers apparently offer an interactive environment that is significantly less stimulating for their child (Raver &

Leadbeater, 1998; Stanton-Chapman et al., 2002). Also, some researchers showed that not being the eldest child can be less favourable to language development (Horwitz et al., 2003; Stanton-Chapman et al., 2002) whereas others revealed that having older siblings has a positive impact on the development of certain communication elements (Brown & Dunn, 1992). That said, living in a family of more than five children (Evans, Maxwell & Hart, 1999) or in a single-parent family (Lee & Kahn, 2000) also appears to be less favourable to language development. Certain psychological factors affecting the mothers, such as postnatal depression (Hay et al, 2001) and severe and chronic depressive symptoms (Sohr-Preston & Scaramella, 2006), impact negatively on the mothers' perception of the child and parent role (Bornstein, Haynes & Painter, 1998). Moreover, the social isolation of the mother during the child's first few years (MacTurk, Meadow-Orlans, Sanford, Koester & Spencer, 1993) is also injurious to child language development. Finally, it is important to consider the risk of an *intergenerational neglect cycle* (Polansky, Chalmers, Buttenwieser & Williams, 1981), whereby neglect is passed on from one generation to the next. In this regard, some findings established that the proportion of neglectful parents with maltreated childhoods varied between 25% and 35% (Kaufman & Zigler, 1987). The more recent work of Erickson & Egeland (2002) estimated this rate to be as high as 78%.

According to the cumulative risk model, it is not so much the impact of a specific risk factor that influences the development in children but rather the cumulative and simultaneous exposure to several factors (Rutter, Pickels, Murray & Eaves, 2001; Sameroff et al., 1987). For example, when examining the cognitive and emotional development in children cumulating a large number of risk factors, the Rochester Longitudinal Study revealed that the cumulative risk analysis (10 conditions) better explained the variance in IQ than individual risks. More precisely, 4-year-old children with no risks scored 2 standard deviations higher on IQ tests than children who cumulated eight or more risk factors (Sameroff et al., 1987; Sameroff, Seifer, Baldwin & Baldwin, 1993). Similarly, a study conducted among children with low birth weights and from

lower socio-economical environments reported that cumulating risk factors were associated with lower IQ scores (Klebanov & Brooks-Gunn, 2006; Liaw & Brooks-Gunn, 1994). Thus, cumulative risk research has established the deleterious effects of co-occurring risk factors on cognitive outcomes. Given the close link between cognition and language (Bates et al., 2005), one would expect a similar effect of the cumulating risk factors on language development.

The confrontation of the ecological and the cumulative risk models raised various questions in the study of children exposed to severe parental neglect. It was important to verify whether language development in these children was mostly influenced by cumulating several risk factors, whatever they were, or rather by a fewer specific factors. The answer to this question could in turn determine future intervening programs. This issue is even more crucial for severely neglected children representing a subgroup of the population affected by a large number of adverse conditions (Éthier, Couture & Lacharité, 2004; McLearn, Knitzer & Carter, 2007). With this context in mind, the present study first aimed to assess the evidence of a cumulating risk factor on language delay in severely neglected children aged 2 to 36 months, and then to verify whether the cumulative risk effect truly expressed the simultaneous impact of several factors or rather reflected the effect of one or a few specific risk factors composing the cumulative score. If the latter case were to prevail we would then aim to identify which of the biological, psychological and environmental factors were mostly linked to a language delay in the children under study.

METHOD

Participants

The data included in this analytically-oriented cross-sectional study stem from the first measures taken as part of a widespread longitudinal study (N=756) the goal of which was to examine the portrait of individuals under 17 years old registered for youth protection services

with the Centres Jeunesse du Québec (Pauzé, Toupin, Déry, Mercier & Joly, 2004). The random sample of 68 Caucasian Francophone infants aged 2 to 36 months (mean: 16.7; sd: 10.7) was collected systematically and consecutively from the weekly lists of children newly registered for services offered by the participating Centres Jeunesse (Estrie, Montréal and Québec) between October 1, 1998 and September 30, 1999. In the province of Québec, the Centres Jeunesse take full charge of the children only if their development is endangered by severe negligence in their familial setting. Children experimenting less severe conditions are offered the same social services as the general population (Ministère de la Santé et des Services Sociaux du Québec, 2009). The severe neglect situations that the children of our sample were facing was confirmed by the psychosocial workers of the Centres Jeunesse.

The children in this study were selected according to the following criteria: 1- received services for severe parental neglect (YPA, Article 38, Section e) under the Youth Protection Act; 2- were not the second child of the same family to be referred for services offered by the Centres Jeunesse; 3- were met by the social worker in charge at least once; and 4- got the worker's go-ahead to involve the child and parents in the research. Among the 499 children referred throughout the target year, 139 were not selected during the random draw and 184 did not meet the acceptance criteria. Of the 176 children invited to take part in the research, 48 refused, 39 could not be reached within the period specified and 5 abandoned during the research or had incomplete files. Among the 84 remaining children, we kept only those whose main respondent was the biological mother, which brought the sample total to 68. The mother's verbal consent to participate in the study was first requested through the social worker. Once the mother approved, she was asked to sign the consent form during the first planned interview. The research was approved by the Comité d'éthique à la recherche of the Université de Sherbrooke (Québec, Canada).

Materials and procedures

Data was collected during two 90-minute interviews during the week of the reported neglect that was confirmed by the psychosocial workers. Tools measuring a wide array of variables known to be related to language development were used on the child and mother. The evaluations, other than that of the child's cognitive development, were conducted through questionnaires administered during one-on-one interviews with the mother. This method, very popular in epidemiological studies and in the maltreatment field (Haskett, Scott, Grant, Ward & Robinson, 2003), has been proven to be as valid as the use of standard evaluation procedures (Klee, Pearce & Carson, 2000; Law, Boyle, Harris, Harkness & Nye, 1998). Moreover, parent reporting is one of the main categories of language assessment techniques as it gives a truer picture of the child's abilities (Dale, 1996).

- *Language development evaluation*

The *Rossetti Infant-Toddler Language Scale* (Rossetti, 1990; Sylvestre & St-Cyr Tribble, 2001), is designed to evaluate communication skills in 0 to 36-month old children. Two of its six scales were used in this study (i.e. "*language comprehension*" and "*language expression*"). The receptive subscale measures the infant's ability to recognize and understand vocabulary and sentences. The expressive subscale measures the infant's encoding skills or ability to communicate verbally. Each scale is divided into twelve three-month intervals (i.e. 0-3 months, 3-6 months, 6-9 months, etc.) so the measure of language development is adjusted for the child's age. It is a criterion-referenced tool used in a clinical context to compare a child's performance with general developmental standards. In its original version, it therefore does not provide a standardized score. For the current study, a score was derived using a statistical saturation procedure. It consists of the percentage of correct responses to 4 age intervals per scale (i.e. the interval corresponding to the child's age as well as to the three preceding intervals). This

continuous variable was then dichotomized and the infants whose development was located in the first quartile or less in at least one of the two subscales were categorized in the group showing a language delay. In order to increase the validity of the dependant variable measure, three speech-language pathologists rendered an independent judgement on the children's comprehension and expression development by analyzing the ITLSs. The speech-language pathologists were blind to the children's risk status. For language comprehension, the ITLS matched the clinical judgement at 94.1% and became 97.1% for language expression. This shows an excellent concurrent validity between both procedures and confirms the classification of the children in the subgroups with or without a language delay.

- *Risk factor measures*

Nine measurement tools were used to evaluate the 48 risk factors separated into two groups: 14 biological and psychological factors and 34 environmental factors. Each of the original answers was then dichotomized into a "present" or "absent" state in order to be able to use the number of risk factors "present" as the cumulative risk score within each group of factors.

Sociodemographical data, family composition and medical history. The questionnaire used in the Santé-Québec Survey (Enquête santé Québec, 1992) allowed us to collect data on the child's age and gender, education, annual total income and source of income, mother's occupation, number of children, child's ranking in the family and type of family. It also allowed for the documentation of the number of pregnancy weeks, the health of the mother and child at birth, and informed us about whether the child has had feeding or hearing problems since birth, and about the mother's intake of excessive amounts of alcohol or tobacco during her pregnancy. Finally, it shed light on whether or not the mother had suffered postnatal depression and allowed for the identification of one or both of the parents' language or learning problems.

Knowledge of development. This questionnaire includes four statements that verify the mother's knowledge of infant learning processes and five statements that verify her knowledge of the age at which certain language skills appear. The questions are taken from the Knowledge of Infant Development Inventory (MacPhee, 1981). Parents respond to each statement using a 3 or 4-point Likert scale. The threshold to determine an adequate knowledge of infant development is established at five correct answers out of nine.

Parental stress. The *Indice de Stress Parental*, adapted by Bigras, LaFrenière and Abidin (1995), is the French version of the *Parenting Stress Index* (PSI: Abidin, 1990). This tool measures the stress directly associated with the parenting role. It includes 101 items separated into two groups (child and parent). The six child subscales are adaptability, demandingness, distractibility, mood, acceptability and child reinforces parent. The seven parent subscales are sense of competence, attachment, role restriction, depression, spousal relationship, social isolation and health. Parents respond to each statement using a 5-point Likert scale to indicate the degree to which that item has been disturbing to them in the past week. Clinical thresholds are established for each subscale (13), each group (2) and the total stress. High scores indicate a dysfunction. The internal consistency coefficients of the French version are established at 0.91 for the child group and 0.92 for the parent group (Bigras & LaFrenière, 1994).

Family functioning. The general Family Functioning Scale is one of the seven subscales of the *Family Assessment Device* (FAD) of Epstein, Balwin and Bishop (1983). This subscale includes 12 statements, six of which describe good family functioning and six poor family functioning. The items are a 4-point Likert scale. The failure threshold is established at the 3rd quartile or more; a high score indicates a disturbed family functioning. Internal consistency is evaluated at 0.86, using Chronbach's alpha, and between 0.86 and 0.83, using the bisection method (Byles,

Burne, Boyle & Offord, 1988). The abridged version's homogeneity shows through the correlations which vary from 0.44 to 0.63 between each item and the subscale as a whole.

Parental resources. The French translation of the *Perceived Adequacy of Resources Scale* (PARS: Rowland, Richard, Dodder & Nickols, 1985) is a questionnaire designed to measure an individual's perception of the resources available to him/her classified under seven categories (*i.e.* physical environment, health, time, financial resources, interpersonal resources, knowledge and community resources). A 4-point Likert scale is used to answer the 28 questions. The failure threshold is established at the 1st quartile or less; a low score reflects a lack of resources. A factorial analysis confirms the distinction among the seven resource categories whereas a Cronbach alpha of 0.89 indicates good internal consistency. Another study demonstrated a correlation between parental stress, as measured by the PSI, and adequacy of resources such that stress diminished as resources increased (Burrell, Thompson & Sexton, 1995). In the same study, PARS internal coherence scores were 0.87 globally.

Language stimulation styles. The language stimulation style adopted by the parent was measured using the Communication Stimulation Questionnaire (CSQ: Sylvestre, St-Cyr Tribble, Payette & Cronk, 1998). This tool helps to classify the parent's style in two different categories: *the supported style* whereby the adult follows up on verbal and non verbal communication clues provided by the child while remaining focused on the child's goals (Kloth et al., 1998) and the *directive style* whereby the adult grasps the clues provided by the child but follows up on them while remaining focused on his/her own goals (Clark & Seifer, 1985; Murray & Hornbaker, 1997) or does not follow up on the clues verbally or non-verbally (Baumwell, Tamis-LeMonda & Bornstein, 1997). The directive style is considered a child development risk factor. The tool includes seven situation scenarios for each of the six age groups (18-24, … , 30-36 months). The answers are written word for word and then analyzed. Twenty-seven indicators help to pinpoint

the style used for each situation scenario; the global style is determined by adding the result of each of the 7 scenarios. The criteria were established by comparing the results obtained using the CSQ with those obtained following the analysis of a video of a mother-child interaction. Identical conclusions were drawn in all cases (Bouchard, Daigle & Tardif, 2006; Denis, 2003).

Depression. The French version (Kovess & Fournier, 1990) of the Composite International Diagnostic Interview Simplified (CIDIS) (Robins et al., 1988) was used to diagnose from the respondent's point of view any major depression suffered in the last six months. The results analysis has a dichotomic score indicating the presence or absence of such a depression. The comparison between the diagnoses made using the CIDIS with those made by psychiatrists both in Quebec (Fournier, Lesage, Phil, Toupin & Cyr, 1997) and France (Kovess et al., unpublished) gives a kappa of 0.47 for depressive disorders.

Maltreatment history. The parent's maltreatment history was evaluated using the French version of the Child Trauma Questionnaire (Bernstein & Fink, 1998). This questionnaire includes 70 5-point Likert items divided into four separate factors depending on whether the respondent suffered physical neglect, emotional abuse, physical abuse or sexual abuse. The tool's internal consistency varies between 0.79 and 0.94 depending on the factors (Bernstein et al., 1994), while the interjudge reliability varies between 0.73 and 1.00 depending on the items (Fink, Bernstein, Handelsman, Foote & Lovejoy, 1995).

Cognitive development. The Mental Development Index (MDI) subscale of the Bayley Scales of Infant Development – II (Bayley 1993) is a well-standardized test of children's cognitive development which has sound psychometric properties (Sattler, 2001). This tool can be used to evaluate children aged 1 to 42 months and is often used in studies on French-Canadian children. The scale evaluates memory, habituation, problem solving, number concepts and generalizations, classification and language and social skills. The distribution of the MDI scores is age-

standardized within one-month intervals to a mean of 100 and a standard deviation of 15. A score of 85 corresponds to one standard deviation below the mean and is the clinical threshold used as the cut-off to locate the lower limit of the average. The tool's homogeneity is 0.88 while inter-rater agreement yields a coefficient of 0.96 and a stability coefficient of 0.83. The mental scale is highly correlated with the *Wechsler Preschool and Primary Scale of Intelligence-Revised* (Wechsler, 1989) with coefficients of 0.73 confirming good concurrent validity.

Cumulative risk scores. To calculate the cumulative risk scores, all the variables, with the exception of the child's age, were dichotomized. Each factor received one of two possible values to indicate the presence (value=1) or absence (value=0) of a risk using the cut-off established for each tool or the quartile of the distribution. For the other variables, the dichotomy was established according to the answer to an item from a questionnaire. The scores of the dichotomous variables in each category are then added to generate the cumulative scores. The scores on the child's 14 biological and psychological risk factors (gender, prematurity, health condition at birth, feeding problems at birth, recurrent otitis media, alcohol or tobacco during pregnancy, hereditary factors linked to language or learning problems within the family, hyperactivity, mood, demandingness, adaptability, cognitive development) were summarized to produce a biological/psychological cumulative risk score for each child. The same procedure was applied to the 34 environmental risk factors [mother's age upon giving birth to the target child, being the first born child in the family, number of children in the family, family type, family functioning, mother's education level, occupation outside the home, annual family income, source of income, mother's health condition upon giving birth to the child, history of post-partum or recent depression, maltreatment history (4), parent's knowledge of child development, communication stimulation style, perceived adequacy of resources (7) and the following PSI subscales : sense of competence, attachment, role restriction, depression, spousal relationship, social isolation, health, acceptability and child reinforces parent].

Data Analysis

First, we computed descriptive statistics of the demographic characteristics of participants. Then, Student t-tests were used to compare the average cumulative risk scores (child's cumulative biological/psychological factors and environmental cumulative factors) among the children presenting a language delay and those with normal language. A statistical threshold of 0.05 was used as a threshold for significance. If a cumulative risk factor met the significance threshold, we then described and tested its increasing effect by dividing its score into three categories of roughly equal proportions. Then, the Cochran-Armittage trend test was used to assess whether the proportion of children developing language delays showed a linear trend across the three levels of the cumulative risk factor. The next step was to look for the contribution of each individual risk factor composing the cumulative score by comparing again the 2 groups of children (normal language Vs language delay) on each of them, using chi-square testing or Fisher exact test and Student t-tests, depending on the type of factor under analysis (dichotomous or continuous). A statistical threshold of 0.10 was used to identify the specific factors suggesting an association with language development. Then we assessed the degree of overlapping among the suggested factors in order to select a set of variables with low overlap to be included in a multivariate analysis. For this purpose, the Pearson correlation coefficient was used for pairs of continuous variables, chi-square testing for pairs of binary variables and, for the combination of a continuous and binary variable, the Student t-test was used. The last step was to examine the independent and joint contribution of the selected risk factors by performing a multivariate logistic regression analysis using the GENMOD Procedure of SAS (Version 9.1) in which the response variable, being the presence or not of language delay, was modeled as a binary outcome linked with the potential independent risk factors through a logit function. The risk factors entered the model according to a stepwise selection requiring a level of 0.10 to allow a variable into the model, and a significance level of 0.05 to remain in the model. For the variables that

constituted the final model, we also provided an estimate of the relative risk (RR) obtained using a multivariate regression, linking the outcome response variable (language delay) to the risk factors through a logarithmic function. This function provides slope parameters that, in a transversal sample such as the one obtained in this study, can be interpreted as relative risks after taking the exponential of their estimated values. The Hosmer and Lemeshow goodness-of-fit test was used to provide the model's overall fit. Collinearity diagnostics were done according to standard procedures and residual analyses were used to assess the appropriateness of the regression assumptions and to detect outliers. Regression diagnostics were carried out according to standard techniques (Kleinbaum, 1994).

RESULTS

As indicated in Table 1, the sample consisted of children with an average age of 16.7 months (sd=10.7) and included 54.4% of boys (34/68). The sample was divided according to age groups that are critical to language development before the age of three, i.e. between 2 and 9 months old (30.9%). between 9 and 21 months old (33.8%), and between 21 and 36 months old (35.3%). Most of the children came from single-parent families (60.3%). Most mothers had only high school education (94.1%) and 85.3 % did not work outside of the home. Most families (82.4%) were under the poverty line as established by Statistics Canada (2001) with an annual income of less than $20,000, and 76.5% were on social welfare.

The sample under study was comparable in terms of age, gender and district area to the population for which the Centres Jeunesse du Québec provide services. Moreover, no significant differences were found between the initial and final sample (Pauzé et al., 2004).

Table 1 – Demographic Characteristics of Participants (n = 68)

A language delay, that is, a significant deviation with regards to developmental standards in at least one of the two language dimensions – comprehension or expression – was identified in

24 children (35.3%). More specifically, 23.8% of the children 2 to 9 months, 39.1% of those aged 9 to 21 months and 41.7% of those aged 21 to 36 months had language delays.

The bivariate analyses showed a significant association between the child's cumulative biological/psychological risk score and the presence of language delay (p=0.05) but not between the child's cumulative environmental risk score and language delay (p=0.61). When we divided the child's cumulative biological/psychological risk score into three categories representing a weak (cumulation<3), an average (cumulation=3) and a high (cumulation>3) score, we observed that the proportion of children developing a language delay increased at each level (increasing from 16.7%, to 37.5% and then to 45.8%). Furthermore, this linear trend was statistically significant (Cochran-Armitage trend test; Z=-1.99; one-sided p=0.024). These results suggested that the linear increase of a child's cumulative biological/psychological risk score had a negative impact on language development. However, among all 14 risk factors composing the cumulative biological/psychological risk score, only the cognitive development factor showed a significant association with the presence of a language delay (p=0.01) (see Table 2). When we removed the cognitive development factor from the child's cumulative biological/psychological risk score, thus obtaining up to 13 factors, we observed that the proportion of children developing a language delay no longer showed a linear trend across the weak, average and high level of the cumulative score (37.5%, 20.8% and 41.7% respectively) and the Cochran-Armitage trend test was no longer significant (Z=-1.17; one-sided p=0.12). These results revealed that the apparent effect of cumulating risk factors reflected the impact of mainly one major risk factor. In fact, we observed that the child cognitive development level was mainly responsible for the apparent cumulative effect of the biological/psychological risk score on language development.

Table 2 – Children's Biological and Psychological Risk Factors According to the Language Delay Status (n = 68)

Bivariate analyses were also performed to investigate the relationship between each of the environmental risk factors and language delay (Table 3). We noticed two trends. First, the mother's major 6-month depression prior to the data collection and second, her weak acceptability level towards the child, as measured with the ISP, were both weakly related to a language delay in the child (p=0.06 for both measures). Table 3 also shows that, on average, there were more maltreatment histories of mothers, measured on a continuous scale, among the 24 children with language delay compared to the 44 having no delay. These maltreatments included physical and emotional abuse (64.8 Vs 50.1), emotional neglect (62.0 Vs 53.1) and physical neglect (24.2 Vs 19.3) with p-values of 0.02, 0.07 and 0.08 respectively.

Table 3 – Environmental Risk Factors According to the Language Delay Status (n = 68)

The pairwise association testing among the six risk factors identified above revealed that physical and emotional abuse was highly correlated with both emotional neglect (r=0.78, p<0.0001) and physical neglect (r=0.74, p<0.0001). Therefore the two latter variables were not included in the multivariate analysis. As for the remaining risk factors, pairwise correlations were found below 0.30 among the continuous factors, while chi-square and t-tests were not significant. Hence the set of variables selected for multivariate regressions included the following four risk factors: the child's cognitive development level, the presence of major depression in the mother during the six months prior to the data collection, the mother's weak acceptability level towards the child and the mother's childhood physical/emotional abuse history.

The final regression model, built to account for all four risk factors simultaneously, is shown in Table 4. The stepwise procedure made three steps, ending with a model including the cognitive development, the mother's physical and emotional abuse history and the mother's weak acceptability level towards the child. The model reveals that, after taking into account the impact of the physical/emotional abuse and the weak acceptability level of the mother, neglected

children of less than three years old that had a cognitive development of more than one standard deviation below average were 2.03 times more likely [CI 95%: 1.13 – 3.63] of having a language delay (p=0.0095) than those located above the cut-off mark. Also, after taking into account the impact of the cognitive development and the mother's physical/emotional abuse, the children whose mothers had weak acceptability levels towards them were 1.75 times more at risk [CI 95%: 1.06 – 2.90] of presenting a language delay (p=0.0396) than those whose mothers had normal acceptability levels towards them. Finally, for each increase in a unit of the scale measuring the physical and emotional abuse, the risk of a language delay increased by 1.02 [CI 95%: 1.004 – 1.030]. When the cognitive development was studied alone, it showed a relative risk of 2.26 [CI 95%: 1.18 – 4.32] (see Step 1 in Table 4). Given that this latter relative risk is similar to the one obtained after controlling for the mother's physical/emotional abuse history and the mother's weak acceptability level towards the child, this suggests that cognitive development acts quite independently of other risk factors. The Hosmer and Lemeshow goodness-of-fit test accepted the final models' overall fit and the model correctly classified 72.1% of subjects with a sensitivity of 0.50 and a specificity of 0.84.

Table 4 – Regression Model of the Biological, Psychological and Environmental Factors Related to Language Delays (n=68)

DISCUSSION

The goal of the present study was to determine if the language delay of severely neglected children of less than three years old was better explained by a cumulative risk model or by the specificity of risk factors. The fact that we used a large number of risk factors (14 biological and psychological risk factors, and 34 environmental risk factors) allowed us to better contrast the impact of a cumulative score versus a specific one.

Our study first revealed the very high prevalence rate of language problems among neglected children, with more than one third of the children from the sample (35.3%) presenting a language delay. The prevalence is significantly higher than in the population as a whole, where it is estimated at 13.5% for children aged 18 to 23 months and 17.5% for those between 30 and 36 months old (Horwitz et al, 2003). Furthermore, we noticed that severe neglect is harmful to child language development from the very prelinguistic stages (i.e. before the age of 9 months). The presence of a significant developmental deviation with regards to the standards, while the basics needed to build oral language skills are being implemented, is highly injurious to future linguistic development (Adamson, 1996; Kail & Bassano, 2000). Moreover, the prevalence of language delays increases according to age, affecting up to 41.7% of the 21- to 36-month old children. This rate is very much a cause for concern when we consider the consequences of weak language skills in young children on future child development. Indeed, almost half of the children whose language delays are identified before the age of three will be diagnosed with a persistent language problem at age 4 or 5 (Law, Garrett & Nye, 2003). Other than the psychological (Irwin et al., 2002; Timler, 2003) and social difficulties (Irwin et al., 2002; Vigil et al., 2005) often produced by these problems, these children may have more trouble learning how to read right from the first grade (Snowling & Hulme, 2005). Even though we do not currently have prevalence data on the language learning problems of first graders, the statements made by certain researchers allow us to evaluate this risk at approximately 60% to 90% (Catts et al., 2002; Dale, Price, Bishop & Plomin, 2003).

In addition to the prevalence issue, the analysis of the data showed that the linear increase of the child's cumulative biological and psychological risk score had a negative impact on language development. Indeed, the child's cumulative biological/psychological risk score showed a significant association with language delay ($p=0.05$) as well as a significant linear trend once

divided into three levels of severity (p=0.024). The first impression was a convergence with the results that dealt with a number of risk factors rather than with specific factors and posited a pile-up effect (Rutter et al., 2001). However, the thorough examination of the individual factors composing the cumulative score revealed that this apparent cumulating effect mainly reflected the specific role of cognitive development. Indeed, this latter risk factor was even more strongly related to language delay than the cumulative score (p-values of 0.01 and 0.05, respectively) suggesting that a cumulative assessment of risk factors could have hidden the underlying impact of a single important risk factor. Moreover, when the cognitive development was removed from the cumulative score, the score accounting for the remaining 13 risk factors was no longer associated with language delay. The intertwining relationships between language development and cognitive development have been corroborated by a lot of research that has helped to establish integral links between these two child development dimensions (Bates et al., 2005; Groves, 1997; Murray & Hornbaker, 1997). However, the lack of a cumulative impact on language development was rather unexpected. This could be due to the age of the children. Indeed, the samples from the studies emphasizing the cumulative risk model comprised children of 4 years old and older (Klebanov & Brooks-Gunn, 2006; Liaw & Brooks-Gunn, 1994; Rutter et al., 2001; Sameroff et al., 1987) and some researchers contend that the consequences of environmental risks become increasingly more apparent as children get older (Johnson, Nusbaum, Bejarano & Rosen, 1999). This was the case in a study conducted on a sample of 18-month-old children and their substance-abusing mothers (Nair et al , 2003). Another study conducted by Carta et al. (2001) showed that the consequences of cumulating environmental risk factors are more significant in older children (54 months) with substance-abusing mothers.

In our study, we found that the cumulative environmental risk factors had no significant impact on language development. However, among the environmental factors, the presence of major depression in the mother during the six months prior to the data collection, the mother's

weak acceptability level towards the child and the mother's history of childhood physical/emotional abuse tended to be more closely related to the risk of language delay (with p-values of respectively 0.06, 0.06, 0.02) than the cumulative environmental score (p=0.61), again suggesting effects of specific factors. This may be due to the fact that the children of our sample were all severely neglected and, consequently, were often cumulating several environmental adverse conditions (Éthier et al., 2004; McLearn et al., 2007). Hence, our relatively homogeneous sample in terms of environmental adverse conditions may explain the lack of evidence for its cumulative effect on language delay.

In regard to the role played by cognitive development, Perry's work (1997) shows that neglect, especially when it occurs during the first six years of a child's life, often translates into an underdevelopment of the brain's cortical and limbic areas. In turn, these areas are, among others, responsible for cognition, and an attack on them may increase proneness to cognitive functioning problems. Also, Bates et al. (2005) stress that certain cognitive abilities closely precede or develop concurrently with early language development dimensions; such abilities include a child having his/her own communication intentions and wanting to share them using tools such as gestures and eventually words to communicate. It also includes a child's imitation abilities. The various skills are closely linked to the use of symbols and, thus, of words. According to this perspective, language is an integral part of a larger group of child cognitive development processes (Marchman & Thal, 2005) and these various behaviours (intention, imitation, use of tools) are based on common underlying mechanisms (Bates & Dick, 2002). Given the close relationship between these two developmental aspects, it is hard to say which one predominates. In other words, do cognitive delays cause language delays or vice versa? This question is at the heart of animated debates within the scientific community and has yet to be resolved.

The results of our study also show a significant relation between a mother's own physical and emotional abuse experience as a child and the presence of language delays in her child. In this regard, researchers have shown that a background of neglect is significantly related to the reproduction of negligence, when the past victim becomes a parent, and to an impaired mother-child interaction (Connell-Carrick & Scannapieco, 2006; Lounds, Borkowski & Whitman, 2006). Furthermore, it has been shown that mothers who were neglected as children very rarely succeeded in establishing positive interactions with their child (Zurawin, 1987), had attachment issues and were not very empathetic (Connell-Carrick & Scannapieco, 2006; Gaudin, Polansky, Kilpatrick & Shilton, 1996). These mothers were also more prone than others to use arbitrary, inconsistent and punitive discipline, and had unrealistic expectations towards their child (Connell-Carrick & Scannapieco, 2006; Dong et al., 2004). The impact of the mother's own neglect experience as a child thus apparently transits via the parent-child relationship.

Similarly, a significant relationship is also established between the mother's low acceptability level towards her child and the child's own language delay. According to the parental stress model developed by Abidin (1990) "high results are observed for this item (acceptability) when the child possesses physical, intellectual or emotional characteristics that do not match the parent's expectations (Cameron & Orr, 1989). In other words, the child is not as attractive, intelligent or pleasing as the parent would have hoped or imagined. A weak attachment or a conscious or unconscious rejection can come into play in the parent-child relationship (Bendell, Culbertson, Shelton & Carter, 1986; McKinney & Peterson, 1987; Speltz, Armsden & Clarren, 1990)" (Bigras, Abidin & LaFrenière, 1995, p. 24). The measure of the parent's acceptability level towards his/her child thus sheds light on the parent-child relationship. This relationship acts as a first influencing factor in language development. It is indeed essential to engage the child in a connected relationship in which the mother reacts promptly and contingently, shows sensitivity in her answers to the child's communication efforts and talks to

the child in a way that is adapted to his/her development level to enable the implementation of prelinguistic and linguistic abilities (Brady, Marquis, Fleming & McLean, 2004; Hoff & Naigles, 2002; McGroder, 2000).

The use of a multifactorial approach revealed that child cognitive development remained significant even after controlling for the presence of the environment factors with an adjusted relative risk of 2.03. Vice-versa, two environmental risk factors (mother's weak acceptability level towards the child and the mother's childhood physical or emotional abuse history) remained significant after adjusting for the presence of the child's cognitive development. Hence, this study shed light on the fact that, among severely neglected children below three years old, language development may be mainly influenced by a few specific factors, allowing for more targeted intervention strategies.

The relationships established between the child's cognitive development, the mother's own neglected childhood history, the mother's child acceptability level and the child's language development within our sample can also be explained in light of the contemporary explanatory models of language development. According to the emergentist model (MacWhinney, 1999; Thelen & Bates, 2003), language development depends on complex processes that involve multiple inputs. A child's inherent predisposition to acquiring language skills has been recognized; however, socialization experiences are essential in updating the child's potential. In the same theoretical line of thought, the emergentist coalition model of word learning (Hirsh-Pasek, Golinkoff, Hennon & Maguire, 2004) suggests taking into account an array of social, linguistic and cognitive factors in language learning. The importance given to each factor depends on the specificity of the learning in progress and changes with time. Thus, before the age of 9 to 12 months, language is acquired through perceptual and attentional strategies, which enables the child to isolate sound sequences in continuous speech and associate the words

identified as such to objects that attract his/her attention (Echols & Marti, 2004). In the next developmental phase, between 9 to 21 months approximately, the child follows the adult's eyes to know what object the word heard refers to, which eventually brings him/her to leave the perceptual clues behind, to rely increasingly on social clues and to verbally tag an object (Hirsh-Pasek et al., 2004). Then, when the vocabulary reaches a certain point, the child aged 18 to 24 months uses grammatical clues provided by the parent's stimulation to give new meaning to the words heard (Hirsh-Pasek et al., 2004). Towards the age of three, grammaticalization can then kick in to allow the child to produce 2 and then 3-word sentences that will eventually comply with adult language. This view of development shows how important it is to stimulate a child in such a way as to support development from a tender age. Our results greatly emphasize the fact that severely neglected children live in relational contexts in which this type of support is nonexistent or compromised. This conceptual model of language development also allows one to explain why language delay in severely neglected children appears as early as the pre-linguistic period.

Even in the presence of extremely unfavourable environmental conditions, factors involving the parent-child relationship directly modulate child language development. This explanation supports that of Culp et al. (1991) and Fox et al. (1988) who blame the significant language delay of neglected children on the lack of parental support and the relational stresses to which these children are confronted.

Limitations and strengths of the study

This study has certain limitations. First, only the mothers were interviewed. The fathers' points of view may have shed a different light. That said, it is important to consider the fact that 60% of the families making up the sample are single-parent families and that, in most severe neglect cases, fathers are not involved in their child's life (Polonko, 2006). Second, the design is

cross-sectional. This prevents the inference of the direction of the causal relationships among the phenomenon studied. Indeed, as the risk factors identified deal with the child-parent relationship, the causality relationships may be bidirectional. Third, the data was entirely based on the mothers' self-reports, and although this is a common feature of child maltreatment research (Haskett et al., 2003), a multi-method assessment of constructs would have strengthened the conclusions. Finally, the results can only be generalized in terms of populations of severely neglected children of less than three years old.

There are also numerous strengths worth mentioning in this study. First, although a few subjects invited to the study refused to participate, the size and quality of the sample is noteworthy given the recruitment issues inherent to this subgroup of the population. The severe neglect condition is homogeneous among the subjects and has been clearly defined and confirmed by field experts. Second, the procedure used for evaluating a child language delay confirms the validity of the dependant variable measure. Third, despite the fact that the data was entirely based on the mothers' self-reports, the psychometric quality of the tools used was clearly made evident.

CONCLUSION

This study gave us the opportunity to collect the first data on biological, psychological and environmental factors involved in language development in severely neglected children of less than three years old and on their cumulating score. The results allowed us to identify factors that make certain children more vulnerable than others in terms of language development in this high-risk population and point to the effects of a few specific risk factors rather than the impact of cumulating risk factors, whatever these may be. These results also emphasized the intergenerational neglect transmission cycle.

This study has give rise to some suggestions for clinical practice and future research directions. On the clinical front, the results of the present study emphasize factors that can be acted upon whereas others, more stable, must be considered in order to optimize the access and use of a full range of interventions. In this regard, most of the early prevention and intervention programs target the more general objective of alleviating the burden of the families facing various adverse conditions. Some programs target the support and improvement of the quality of parent-child relationships and the quantity and quality of language stimulation offered by parents to the child (Baxendale & Haskett, 2003; Warr-Leeper, 2001). Despite the fact that these dimensions constitute determining factors in child language development, the results of the present study specifically emphasize certain factors that may influence these variables, including the mother's psychological availability and her sensitivity towards the child.

It is indeed illusory to claim to change the mother-child relationship in a positive way and bring about renewed stimulation without considering the mother's problematic history. In this regard, research data show that mothers who succeed in breaking the intergenerational neglect transmission cycle are those living a positive marriage relationship, benefiting from a strong social support network and who have access to skilled therapists (Egeland, 1997). It is thus essential to suggest interventions targeting various ecological dimensions of neglectful mothers to help them improve their own personal well-being. Given these mothers' limited knowledge on child development and parenting (Connell-Carrick & Scannapieco, 2006), it would also seem wise to provide pre and postnatal education to help them interact with their children in a positive and efficient way (Lounds et al., 2006). To stop the intergenerational neglect transmission cycle, a nurturing and supportive cycle must be established, not only for the children, but also for the mothers who were themselves neglected as young children (Lombardo & Polonko, 2004 in Polonko, 2006). When studying the consequences of severe neglect, the focus is always on the mothers given the usual absence of the fathers in this type of sample. However, it is unfair to

blame the mothers alone for the intergenerational transmission of neglect and its problems as other influential sources also play a part in this phenomenon. We must not only look at the problems a child may have with the father when he is present but also at the negative impact of his absence. Neglect transmission patterns are complex and depend on numerous factors related to parents, family, social environment and various life situations (Bifulco et al., 2002).

Moreover, given the devastating impact of neglect on children even during their first months of life, it is critical to act when the children are still very young. It has been shown that early intervention is more efficient at a younger age (Anderson et al., 2003) and that there exists critical development periods that must not be overlooked to avoid jeopardizing child development even further (Thompson, 2001). Our data also point out the increase in language delays according to the age of the children, thus reinforcing the need to act promptly before the delays worsen. That said, the gravity of the social and family problems facing these families, and of which the psychosocial workers are aware, sometimes blurs or buries the more specific needs of children. It is actually essential to provide these children with the support needed for optimal development by giving them specialized language intervention, having them attend daycare or early care centres, and by doing everything possible to gain the support of the entire family, relatives and close friends so everyone can offer ecological conditions that will nurture the children's language development while giving the parents a break.

It is equally important to develop government policies and to ensure that efforts among the various response networks are concerted, since in-depth changes to neglect situations can only come about when all interested parties become involved (Hildyard & Wolfe, 2002). This endeavour must be a commitment not only in terms of a society's belief and value system with regards to the rights and needs of children but especially as regards the rights and obligations of parents towards their children (Lombardo & Polonko, 2005; Perry, 1997).

There is still a lot of research work to be done. Parental neglect and its negative impact on child development, especially language development, still remain somewhat of a mystery (Connell-Carrick & Scannapieco, 2006). It is essential to conduct other cross-sectional studies with samples similar to ours in order to validate these first results. Longitudinal studies will also allow researchers to follow the evolution of child language development, to study the ways in which the evolution takes place in relation to the child's characteristics and environment, and to validate the results of the present study suggesting a lack of cumulating risk factors on language development. The resilience issue is also very important. How does one explain that many children develop normally despite the adverse conditions with which they are confronted? What happens to them in the first grade and then later on in life, for example, when they enter the work force? Finally, it becomes essential to evaluate the efficiency of the interventions implemented for the benefit of these families. This is a powerful way for us to break the cycle of neglect's negative impact on the present and future of these children.

References

Abidin, R. (Ed.) (1990). *Parenting Stress Index - 3rd edition*. Charlottesville, VA: Pediatric Psychology Press.

Adamson, L. B. (Ed.) (1996). *Communication development during infancy*. Boulder, CO: Westview.

Allen, R. E., & Oliver, J. M. (1982). The effects of child maltreatment on language development. *Child Abuse and Neglect, 6*(3), 299-305.

Anderson, L. M., Shinn, C., Fullilove, M. T., Scrimshaw, S. C., Fielding, J. E., Normand, J., & Carande Kulis, V. G. (2003). The effectiveness of early childhood development programs. A systematic review. *American Journal of Preventive Medicine, 24*(3 Suppl), 32-46.

Appleyard, K., Egeland, B., van Dulmen, M.H.M., & Sroufe, L.A. (2005). When more is not better : The role of cumulative risk in child behaviour outcomes. *Journal of Child Psychology and Psychiatry, 46*(3), 235-245.

Bates, E., & Dick, F. (2002). Language, gesture, and the developing brain. *Developmental Psychobiology, 40*(3), 293-310.

Bates, E., Tomasello, M., & Slobin, D. (Eds.) (2005). *Beyond nature-nurture : Essays in honor of Elizabeth Bates*. Mahwah, NJ: Lawrence Erlbaum.

Baumwell, L., Tamis-LeMonda, C. S., & Bornstein, M. H. (1997). Maternal verbal sensitivity and child language comprehension. *Infant Behavior and Development, 20*(2), 247-258.

Baxendale, J., & Hesketh, A. (2003). Comparison of the effectiveness of the Hanen Parent Programme and traditional clinic therapy. *International Journal of Language & Communication Disorders, 38*(4), 397-415.

Bayley, N. (Ed.) (1993). *Bayley Scales of Infant development - 2nd edition*. San Antonio, TX: The Psychological Corporation.

Beeghly, M., & Cicchetti, D. (1995). Child maltreatment, attachment, and the self system : Emergence of an internal state lexicon in toddlers at high social risk. In E.M. Hertzig, & E.A. Farber (Eds.) *Annual progress in child psychiatry and child development.* New York: Brunner/Mazel.

Bendell, R. D., Culbertson, J. L., Shelton, T. L., & Carter, B. D. (1986). Interrupted infantile apnea : Impact on early development, temperament, and maternal stress. *Journal of Clinical Child Psychology, 15*, 304-310.

Bernstein, D. P., & Fink, L. (Eds.) (1998). *Childhood Trauma Questionnaire : A retrospective self-report manual.* San Antonio, TX : The Psychological Corporation.

Bernstein, D. P., Fink, L., Handelsman, L., Foote, J., Lovejoy, M., Wenzel, K., Sapareto, E., & Ruggiero, J. (1994). Initial reliability and validity of a new retrospective measure of child abuse and neglect. *American Jornal of Psychiatry, 151*(8), 1132-1136.

Bifulco, A., Moran, P. M., Ball, C., Jacobs, R., Baines, R., Bunn, A., & Cavagin, J. (2002). Childhood adversity, parental vulnerability and disorder : Examining intergenerational transmission of risk. *Journal of Child Psychology and Psychiatry, 43*(8), *1075-1086.*

Bigras, M. & LaFrenière, P.J. (1994). L'influence du risque psychosocial, des conflits conjugaux et du stress parental sur la qualité de l'interaction mère-garçon et mère-fille. *Revue Canadienne des Sciences du Comportement, 26*(2), 280-297.

Bigras, M., LaFrenière, P. J., & Abidin, R. R. (Eds.) (1995). *Indice de Stress Parental : Complément francophone à l'édition américaine*. Toronto, Ontario, Canada : Multi-Health System.

Bornstein, M. H., Haynes, M. O., & Painter, K. M. (1998). Sources of child vocabulary competence : A multivariate model. *Journal of Child Language, 25*, 367-393.

Bouchard, M.-L., Daigle, M., & Tardif, G. (2006). *Questionnaire de stimulation de la communication : Validité et fidélité chez une population d'enfants franco-québécois âgés de 24 à 36 mois*. Essai de maîtrise non publié, Université Laval, Québec, Canada.

Brady, N. C., Marquis, J., Fleming, K., & McLean, L. (2004). Prelinguistic predictors of language growth in children with developmental disabilities. *Journal of Speech, Language, and Hearing Research, 47*(3), 663-677.

Bronfenbrenner, U. (Ed.) (1979). *The ecology of human development : Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (Ed.) (2005). *Making human beings human : Bioecological perspectives on human development*. Thousand Oaks, CA: Sage Publications.

Brown, J. R., & Dunn, J. (1992). Talk with your mother or your sibling ? Developmental changes in early family conversations about feelings. *Child Development, 63*, 336-349.

Burrell, B., Thompson, B., & Sexton, D. (1995). Measurement characteristics of the perceived adequacy of ressources scale. *Educationnal and psychological measurement, 55*, 249-257.

Byles, J., Byrne, C., Boyle, M. H., & Offord, D. R. (1988). Ontario Child Health Study: Reliability and validity of the General Functioning Subscale of the McMaster Family Assessment Device. *Family Process, 27*, 97-104.

Cameron, S. J., & Orr, R. R. (1989). Stress in families of school-aged children with delayed mental development. *Canadian Journal of Rehabilitation, 2*(3), 134-144.

Carta, J. J., Atwater, J. B., Greenwood, C. R., McConnell, S. R., McEvoy, M. A., & Williams, R. (2001). Effects of cumulative prenatal drug exposure and environmental risks on children's developmental trajectories. *Journal of Clinical Child Psychology, 30,* 327-337.

Catts, H. W., Fey, M. E., Tomblin, J. B. & Zhang, X. (2002). A longitudinal investigation of reading outcomes in children with language impairments. *Journal of Speech, Language, and Hearing Research, 45*(6), 1142-1157.

Chaimay, B., Thinkhamrop, B., & Thinkhamrop, J. (2006). Risk factors associated with language development problems in childhood : A literature review. *Journal of Medical Association Thai, 89*(7), 1080-1086.

Choudhury, N., & Benasich, A. A. (2003). A family aggregation study : The influence of family history and other risk factors on language development. *Journal of Speech, Language, and Hearing Research, 46*(2), 261-272.

Clark, G. N., & Seifer, R. (1985). Assessment of parents' interactions with their developmentally delayed infants. *Infant Mental Health Journal, 6*(4), 214-225.

Connell Carrick, K., & Scannapieco, M. (2006). Ecological correlates of neglect in infants and toddlers. *Journal of Interpersonal Violence, 21*(3), 299-316.

Coster, W. J., Beeghly, M., Gersten, M. S., & Cicchetti, D. (1989). Communicative functioning in maltreated toddlers. *Developmental Psychology, 25*(6), 1020-1029.

Culp, R. E., Watkins, R. V., Lawrence, H., Letts, D., Kelly, D. J., & Rice, M. L. (1991). Maltreated children's language and speech development : Abused, neglected, and abused and neglected. *First Language, 11*, 377-389.

Cusson, R. M. (2003). Factors influencing language development in preterm infants. *Journal of Obstetric, Gynecologic, and Neonatal Nursing, 32*(3), 402-409.

Dale, P. S. (1996). Parent report assessment of language and communication. In K. N. Cole, P. S. Dale, & D. J. Thal (Eds.), *Assessment of communication and language* (pp. 161-182). Baltimore, MD: Brookes.

Dale, P., Price, T. S., Bishop, D., & Plomin, R. (2003). Outcomes of early language delay : I. Predicting persistent and transient language difficulties at 3 and 4 years. *Journal of Speech, Language, and Hearing Research, 46*(3), 544-560.

Denis, G. (2003). *Évaluation de critères du questionnaire de stimulation de la communication*. Essai de maîtrise non publié, Université Laval, Québec, Canada.

DeThorne, L.S., Hart, S.A., Petrill, S.A., Deater-Deckard, K., Thompson, L.A., Schatschneider, C. et al. (2006). Children's history of speech-language difficulties : Genetic influences and associations with reading-related measures. *Journal of Speech, Language, and Hearing Disorders, 49*(6), 1280-1293.

Dollaghan, C. A., Campbell, T. F., Paradise, J. L., Feldman, H. M., Janosky, J. E., Pitcairn, D. N., & Kurs-Lasky, M. (1999). Maternal education and measures of early speech and language. *Journal of Speech, Language, and Hearing Research, 42*(6), 1432-1443.

Dong, M., Anda, R., Felitti, V., Dube, S., Williamson, D., Thompson, T., Loo, C., & Giles, W. (2004). The interrelatedness of multiple forms of childhood abuse, neglect, and household dysfunction. *Child Abuse & Neglect, 28*(7)*,* 771-784.

Echols, C. H., & Marti, C. N. (2004). The identification of words and their meanings : From perceptual biases to language-specific cues. In D. G. Hall, & S. R. Waxman (Eds.), *Weaving a lexicon* (pp. 41-78). Cambridge, MA: MIT Press.

Egeland, B. (1997). Mediators of the effects of child maltreatment on developmental adaptation in adolescence. In D. Cicchetti, & S. Toth (Eds.), *Rochester symposium on developmental psychopathology, Volume VIII : The effects of trauma on the developmental processes* (pp. 403-434). Rochester, NY : University of Rochester Press.

Eigsti, I.-M. & Cicchetti, D. (2004). The impact of child maltreatment on expressive syntax at 60 months. *Developmental Science, 7*(1), 88-102.

Enquête Santé Québec (1992). *Enquête sociale et de santé auprès des enfants et des adolescents québécois*. Montréal, Québec, Canada : Équipe de Recherche de l'Hôpital Rivière-des-Prairies.

Epstein, N. B., Baldwin, L. M., & Bishop, D. S. (1983). The McMaster family assessment device. *Journal of Marital and Family Therapy, 9*, 171-180.

Erickson, M., & Egeland, B. (2002). Child Neglect. In J. Myers, L. Berliner, J. Briere, C. Hendrix, C. Jenny, & T. Reid. *The APSAC handbook on child maltreatment - 2nd ed.* (pp. 4-20). Thousand Oaks, CA: Sage.

Éthier, L. S., Couture, G., & Lacharité, C. (2004). Risk factors associated with the chronicity of high potential for child abuse and neglect. *Journal of Family Violence, 19*(1), 13-24.

Evans, G. W., Maxwell, L. E., & Hart, B. (1999). Parental language and verbal responsiveness to children in crowded homes. *Developmental Psychology, 35*(4), 1020-1023.

Faden, V.B. & Graubard, B.I. (2000). Maternal substance use during pregnancy and developmental outcome at age three. *Journal of Substance Abuse, 12,* 329-340.

Fink, L., Bernstein, D., Handelsman, L., Foote, J., & Lovejoy, M. (1995). Initial reliability and validity of the Childhood Trauma Interview : A new multidimensional measure of childhood interpersonal trauma. *American Journal of Psychiatry, 152*(9), 1329-1335.

Fournier, L., Lesage, A., Phil, M., Toupin, J., & Cyr, M. (1997). Telephone surveys as an alternative for estimating prevalence of mental disorders and service utilization : A Montreal catchment area study. *Canadian Journal of Psychiatry, 42*(7), 737-743.

Fox, L., Long, S. H., & Langlois, A. (1988). Patterns of language comprehension deficit in abused and neglected children. *Journal of Speech and Hearing Disorders, 53*(3), 239-244.

Gaudin, J., Polansky, N., Kilpatrick, A., & Shilton, P. (1996). Family functioning in neglectful families. *Child Abuse and Neglect, 20*(4), 363-377.

Gersten, M., Coster, W., Schneider-Rosen, K., Carlson, V., & Cicchetti, D. (1986). The socio-emotional bases of communicative functioning : Quality of attachment, language development, and early maltreatment. In M. Lamb, A. L. Brown, & B. Rogoff (Eds.), *Advances in Developmental Psychology* (pp. 105-151). Hillsdale, NJ: Lawrence Erlbaum.

Groves, B. M. A. (1997). Growing up in a violent world : The impact of family and community violence on young children and their families. *Topics in Early Childhood Special Education, 17*(1), 74-102.

Hammond, J., Nebel-Gould, A., & Brooks, J. (1989). The value of speech-language assessment in the diagnosis of child abuse. *The Journal of Trauma, 29*(9), 1258-1260.

Haskett, M. E., Smith Scott, S., Grant, R., Sabourin Ward, C., & Robinson, C. (2003). Child-related cognitions and affective functioning of physically abuse and comparison parents. *Child Abuse & Neglect, 27*(6), 663-686.

Hawley, T. L., Halle, T. G., Drasin, R. E., & Thomas, N. G. (1995). Children of addicted mothers: Effects of "crack epidemic" on the caregiving environment and the development of preschoolers. *American Journal of Orthopsychiatry, 65*(3), 364-379.

Hay, D. F., Pawlby, S., Sharp, D., Asten, P., Mills, A., & Kumar, R. (2001). Intellectual problems shown by 11-year-old children whose mothers had postnatal depression. *Journal of Child Psychology & Psychiatry, 42*(7), 871-889.

Herrenkohl, R., Herrengohl, E., Egolf, B., & Wu, P. (1991). The developmental consequences of child abuse : The Lehigh longitudinal study. In R. Starr, & D. Wolfe (Eds.), *The effects of child abuse and neglect.* New York, NY: Guilford Press.

Hildyard, K., & Wolfe, D. (2002). Child neglect : Developmental issues and outcomes. *Child Abuse & Neglect, 26*, 679-695.

Hirsh-Pasek, K., Golinkoff, R. M., Hennon, E., & Maguire, M. J. (2004). Hybrid theories at the frontier of developmental psychology : The emergentist coalition model of word learning as a case in point. In D. Hall, & S. R. Waxman (Eds.), *Weaving a lexicon* (pp. 173-204). Cambridge, MA: MIT Press.

Hoff, E. (2003). The specificity of environmental influence : Socioeconomic status affects early vocabulary development via maternal speech. *Child Development, 74*(5), 1368-1378.

Hoff, E., & Naigles, L. (2002). How children use input to acquire a lexicon. *Child Development, 73*(2), 418-433.

Horwitz, S. M., Irwin, J. R., Briggs-Gowan, M. J., Bosson Heenan, J. M., Mendoza, J., & Carter, A. S. (2003). Language delay in a community cohort of young children. *Journal of American Academy of Child and Adolescent Psychiatry, 42*(8), 932-940.

Irwin, J. R., Carter, A. S., & Briggs-Gowan, M. J. (2002). The social-emotional development of "late-talking" toddlers. *Journal of American Academy of Child and Adolescent Psychiatry, 41*(11), 1324-1332.

Johnson, H. L., Nusbaum, B. J., Bejarano, A., & Rosen, T. S. (1999). An ecological approach to development in children with prenatal drug exposure. *American Journal of Orthopsychiatry, 69,* 448-456.

Kail, M., & Bassano, D. (2000). Méthodes d'investigation et démarches heuristiques. In M. Kail, & M. Fayol (Eds.), *L'acquisition du langage. Le langage en émergence. De la naissance à trois ans* (pp. 29-60). Paris : Presses Universitaires de France.

Kaufman, J., & Zigler, E. (1987). Do abused children become abusive parents ? *American Journal of Orthopsychiatry, 57*, 186-192.

Klee, T., Pearce, K., & Carson, D. K. (2000). Improving the positive predictive value of sreening for developmental language disorder. *Journal of Speech, Language, and Hearing Research, 43*, 821-833.

Kleinbaum, D. G. (Ed.) (1994). *Logistic regression : A self-learning text*. New York, NY: Springer.

Klebanov, P. & Brooks-Gunn, J. (2006). Cumulative, human capital, and psychological risk in the context of early intervention. Links with IQ at ages 3, 5, and 8. *Annals of New York Academy of Sciences, 1094,* 63-82.

Kloth, S., Janssen, P., Kraaimaat, F., & Brutten, G. J. (1998). Communicative styles of mothers interacting with their preschool-age children : A factor analytic study. *Journal of Child Language, 25*, 149-168.

Kovess, V., & Fournier, L. (1990). The DISSA : An abredged self-administered version of the DIS. *Social Psychiatry and Psychiatric Epidemiology, 25*, 179-186.

Law, J., Boyle, J., Harris, F., Harkness, S., & Nye, C. (1998). Screening for speech and language delay : A systematic review of the literature. *Health Technology Assessment, 2*(9), 1-184.

Law, J., Garrett, Z., & Nye, C. (2003). Speech and language therapy interventions for children with primary speech and language delay or disorder. *The Cochrane Database of Systematic Reviews, 3*, Art. No.: CD004110.

Lee, S., & Kahn, J. V. (2000). A survival analysis of parent-child interaction in early intervention. *Infant-Toddler Intervention, 10*(3), 137-156.

Lessard, L. (2000). *Indicateurs Repères sur l'Application de la Loi sur la Protection de la Jeunesse: 1993-1994 à 1998-1999*. Québec, Canada : Ministère de la Santé et des Services Sociaux.

Lewis, B.A., Singer, L.T., Short, E.J., Minnes, S., Arendt, R., Weishampel, P., Klein, N. & Min, M.O. (2004). Four-year language outcomes of children exposed to cocaine in utero. *Neurotoxicology & Teratology, 26*(5), 617-627.

Liaw, F. & Brooks-Gunn, J. (1994). Cumulative familial risks and low birth weight children's cognitive and behavioural development. *Journal of Clinical Child Psychology, 23,* 360-372.

Lombardo, L., & Polonko, K. (2005). A comparative analysis of human rights and United States law on corporal punishment of children : Implications for understanding human rights and colonial models of child-adult relationships. *International Journal of Comparatives and Applied Criminal Justice, 29*(2), 173-200.

Lounds, J. L., Borkowski, J. G., & Whitman, T. L. (2006). The potential for child neglect : The case of adolescent mothers and their children. *Child Maltreatment, 11*(3), 281-294.

MacPhee, D. (Ed.) (1981). *Knowledge of infant development inventory : Human development and family studies*. Fort Collins, CO: Colorado State University.

MacTurk, R. H., Meadow-Orlans, K. P., Sanford Koester, L., & Spencer, P. E. (1993). Social support, motivation, language, and interaction. *American Annals of the Deaf, 138*(1), 19-25.

MacWhinney, B. (Ed.) (1999). *The emergence of language*. Mahwah, NJ: Lawrence Erlbaum.

Manor, O., Shalev, R. S., Joseph, A., & Gross-Tsur, V. (2001). Arithmetic skills in kindergarten children with developmental language disorders. *European Journal of Paediatric Neurology, 5*(2), 71-77.

Marchman, V., & Thal, D. (2005). Words and grammar. In M. Tomasello, & D. I. Slobin (Eds.), *Beyond nature-nurture : Essays in honor of Elizabeth Bates* (pp. 141-164). Mahwah, NJ: Lawrence Erlbaum.

McGroder, S. M. (2000). Parenting among low-income, African American single mothers with preschool-age children : Patterns, predictors, and developmental correlates. *Child Development, 71*(3), 752-771.

McKinney, B., & Peterson, R. A. (1987). Predictors of stress in parents of developmentally disabled children. *Journal of Pediatric Psychology, 12,* 133-150.

McLearn, K. T., Knitzer, J., & Carter, A. (2007). Mental health : A neglected partner in the healthy development of young children. In A. J. Lawrence, S. J. Bishop-Josef, S. M. Jones, K. McLearn, & D. A. Phillips (Eds.), *Child development and social policy : Knowledge for action* (pp. 233-248). Washington, DC : American Psychological Association.

Ministère de la Santé et des Services Sociaux du Québec : www.msss.gouv.qc.ca

Murray, A. D., & Hornbaker, A. V. (1997). Maternal directive and facilitative interaction styles : Associations with language and cognitive development of low risk and high risk toddlers. *Development and Psychopathology, 9*(3), 507-516.

Nair, P., Schuler, M. E., Black, M. M., Kettinger, L., & Harrington, D. (2003). Cumulative environmental risk in substance abusing women : Early intervention, parenting stress, child abuse potential and child development. *Child Abuse & Neglect, 27*(9), 997-1017.

Paradise, J. L., Dollaghan, C. A., Campbell, T. F., Feldman, H. M., Bernard, B. S., Colborn, D. K., Rockette, H. E., Janosky, J. E., Pitcairn, D. L., Kurs Lasky, M., & Smith, C. G. (2000). Language, speech sound production, and cognition in three-year-old children in relation to otitis media in their first three years of life. *Pediatrics, 105*(5), 1119-1130.

Pauzé, R., Toupin, J., Déry, M., Mercier, H., & Joly, J. (2004). *Portrait des jeunes âgés de 0 à 5 ans référés à la prise en charge des Centres Jeunesse du Québec, leur parcours dans les*

services et leur évolution dans le temps. Rapport de recherche. Sherbrooke, Québec, Canada : Université de Sherbrooke.

Perry, B. D. (1997). Incubated in terror : Neurodevelopmental factors in the cycle of violence. In J. Osofsky (Ed.), *Youth and violence : The search for solutions* (pp. 124-148). New York, NY : Guilford Press.

Polansky, N., Chalmers, M. A., Butenweiser, E. W., & Williams, D. P. (Eds.) (1981). *The damaged parent : An anatomy of child neglect.* Chicago, IL : University of Chicago Press.

Polonko, K. A. (2006). Exploring assumptions about child neglect in relation to the broader field of child maltreatment. *Journal of Health and Human Services Administration, 29*(3), 260-284.

Prathanee, B., Thinkhamrop, B., & Dechongkit, S. (2007). Factors associated with Specific Language Impairment and later language development during early life : A literature review. *Clinical Pediatrics, 46*(1), 22-29.

Raver, C. C., & Leadbeater, B. J. (1998). Factors influencing joint attention between socioeconomically disadvantaged adolescent mothers and their infants. In C. Moore, & P. J. Dunham (Eds.), *Joint attention : Its origin and role in development* (pp. 251-271). Hillsdale, NJ: Lawrence Erlbaum.

Roberts, J.E., Rosenfeld, R.M., & Zeisel, S.A. (2004). Otitis media and speech and language : A meta-analysis of prospective studies. *Pediatrics, 113,* e238-e248.

Robins, L. N., Wing, J., Wittchen, H. U., Helzer, J. E., Babor, T. F., Burke, J., Farmer, A., Jablenski, A., Pickens, R., & Regier, D. A. (1988). The Composite International Diagnostic Interview. An epidemiologic Instrument suitable for use in conjunction with

different diagnostic systems and in different cultures. *Archives of General Psychiatry, 45*(12), 1069-1077.

Rossetti, L. (Ed.) (1990). *Infant Toddler Language Scales*. East Moline, IL: Linguisystems.

Rossetti, L. (Ed.) (2001). *Communication intervention : Birth to three – 2nd edition.* Albany, NY: Singular.

Rowland, V.T., Richard, A., Dodder, S., & Nickols, Y. (1985). Perceived adequacy of resources : Development of a scale. *Home Economics Research Journal, 14*(2).

Rutter, M., Pickles, A., Murray, R., & Eaves, L. (2001). Testing hypotheses on specific environmental causal effects on behavior. *Psychological Bulletin, 127*(3), 291-324.

Sameroff, A.J., Seifer, R., Baldwin, A. & Baldwin, C. (1993). Stability of intelligence from preschool to adolescence : The influence of social and family risk factors. *Child Development, 64,* 80-97.

Sameroff, A. J., Seifer, R., Zax, M., & Barocas, R. (1987). Early indicators of developmental risk: Rochester Longitudinal Study. *Schizophrenia Bulletin, 13*(3), 383-394.

Sattler, J.M. (2001). *Assessment of children : Cognitive applications – 4th edition*. San Diego, CA: Jerome M. Sattler.

Snowling, M. L., & Hulme, C. (2005). Learning to read with language impairment. In M. L. Snowling, & C. Hulme (Eds.), *The science of reading : A handbook* (pp. 397-412). Oxford : Blackwell.

Sohr Preston, S. L., & Scaramella, L. V. (2006). Implications of timing of maternal depressive symptoms for early cognitive and language development. *Clinical Child and Family Psychology Review, 9*(1), 65-83.

Speltz, M. L., Armsden, G. C., & Clarren, S. S. (1990). Effects of craniofacial birth defects on maternal functioning post-infancy. *Journal of Pediatric Psychology, 15*, 177-196.

Stanton Chapman, T. L., Chapman, D. A., Bainbridge, N. L., & Scott, K. G. (2002). Identification of early risk factors for language impairment. *Research in Developmental Disabilities, 23*(6), 390-405.

Statistiques Canada (2001). *Recensement sociodémographique*. Retrieved February 5, 2008, from www.statcan.ca.

Stoel Gammon, C. (1987). Phonological skills of two-year olds. *Language, Speech, and Hearing Services in Schools, 18*, 323-329.

Straus, M. A., & Kantor, K. (2005). Definition and measurement of neglecful behaviour : Some principles and guidelines. *Child Abuse and Neglect, 29*, 19-29.

Sylvestre, A., & St-Cyr Tribble, D. (2001). Traduction autorisée par l'auteur de l'échelle de développement du langage *Rossetti Infant Toddler Language Scales*. Document inédit. Sherbrooke, Québec, Canada : Université de Sherbrooke.

Sylvestre, A., St-Cyr Tribble, D., Payette, H., & Cronk, C. (1998). Questionnaire de Stimulation de la Communication. Document inédit. Sherbrooke, Québec, Canada : Université de Sherbrooke.

Tallal, P., Hirsch, L.S., Realpe-Bonilla, T., Miller, S., Brzustowicz, L.M., Bartlett, C. et al. (2001). Familial aggregation in specific language-impairment. *Journal of Speech, Language, and Hearing Research, 44*(5), 1172-1182.

Tamis-LeMonda, C., & Bornstein, M. H. (2002). Maternal responsiveness and early language acquisition. *Advances in Child Development and Behavior, 29*, 89-127.

Tamis-LeMonda, C. S., Chen, L. A., & Bornstein, M. H. (1998). Mother's knowledge about children's play and language development : Short-term stability and interrelations. *Developmental Psychology, 34*(1), 115-124.

Thelen, E., & Bates, E. (2003). Connectionism and dynamic systems : Are they really different? *Developmental Science, 6*(4), 378-391.

Thompson, R. A. (2001). Development in the first years of life. *Future Child, 11*(1), 20-33.

Timler, G. R. (2003). Reading emotion cues : Social communication difficulties in pediatric populations. *Seminars in Speech and Language, 24*(2), 121-130.

Tomblin, J. B., Smith, E., & Zhang, X. (1997). Epidemiology of specific language impairment : Prenatal and perinatal risk factors. *Journal of Communication Disorders, 30*(4), 325-343.

Vigil, D. C., Hodges, J., & Klee, T. (2005). Quantity and quality of parental language input to late-talking toddlers during play. *Child Language Teaching and Therapy, 21*(2), 107-122.

Warr-Leeper, G. A. (2001). A review of early intervention programs and effectiveness for environmentally disadvantaged children. *Journal of Speech-Language-Pathology and Audiology, 25*(2), 89-102.

Weschler, D. (Ed.) (1989). *Weschler Preschool and Primary Scale of Intelligence - Revised*. San Antonio, TX: The Psychological Corporation.

Zurawin, S. J. (1987). Unplanned pregnancies, family planning problems, and child maltreatment. *Family Relations, 36*, 135-139.

Table 1 Demographic Characteristics of Participants (n = 68)

	N (%)
Children's gender (boys)	37 (54.4)
Marital status (single)	41 (60.3)
Education (< post-secondary)	64 (94.1)
Mother's job (none)	58 (85.3)
Income (< $20,000)	56 (82.4)
Welfare recipient (yes)	52 (76.5)

	Mean (sd)
Children's ages (months)	16.7 (10.7)

Table 2 Children's Biological and Psychological Risk Factors According to the Language Delay Status (n = 68)

		Total Sample N (%)	Normal Language N (%)	Language Delay N (%)	p-value
	Total sample	68	44 (64.7)	24 (35.3)	---
Biological Risk Factors	*Gender (male)*	54.4	22 (50)	15 (62.5)	0.32 [a]
	Prematurity (< 37 weeks)	14.7	5 (11.4)	5 (20.8)	0.31 [b]
	Health at birth (≤ fair)	5.88	2 (4.5)	2 (8.3)	0.61 [b]
	Feeding problems (yes)	22.1	9 (20.5)	6 (25)	0.67 [a]
	Hearing problems (yes)	2.9	0 (0)	2 (8.3)	0.12 [b]
	Alcohol use during pregnancy (yes)	48.5	*24 (54.5)*	*9 (37.5)*	*0.18* [a]
	Tobacco use during pregnancy (yes)	61.76	*30 (68.2)*	*12 (50)*	*0.14* [a]
	Parents with language problems as children (yes)	1.5	0 (0)	1 (4.2)	0.35 [b]
	Parents with learning problems as children (yes)	4.4	2 (4.5)	1 (4.2)	0.94 [a]
Psychological Risk Factors	*Hyperactivity (> threshold)*	23.5	9 (20.5)	7 (29.2)	0.42 [a]
	Mood (> threshold)	11.8	3 (6.8)	5 (20.8)	0.12[b]
	Demandingness (> threshold)	25.0	9 (20.5)	8 (33.3)	0.24 [a]
	Adaptability (> threshold)	26.5	10 (22.7)	8 (33.3)	0.34 [a]
	Cognitive development (< 85)	38.2	12 (27.3)	14 (58.3)	**0.01** [a]

[a] p-value resulting from a Chi-Square test for the dichotomic variables
[b] p-value resulting from an accurate Fisher test

	Total Sample mean (sd)	Normal Language mean (sd)	Language Delay mean (sd)	p-value
Cumulative biological and psychological risk factors (0 to 14)	3.4 (1.8)	3.1 (1.6)	4.0 (1.9)	**0.05** [c]

[c] p-value resulting from a Student t-test (continuous variable)

Table 3 Environmental Risk Factors According to the Language Delay Status (n = 68)

		Total Sample N (%)	Normal Language N (%)	Language Delay N (%)	p-value
	Total sample	68	44 (64.7)	24 (35.3)	---
Mother's Personal Risk Factors	Age of the mother upon the birth of the first child (< 20 years old)	57.3	26 (59.1)	13 (54.2)	0.69 [a]
	Postnatal health (≤ fair)	11.7	4 (9.1)	4 (16.7)	0.44 [b]
	Postpartum depression (yes)	29.4	15 (34.1)	5 (20.8)	0.25 [a]
	Health (> threshold)	22.1	9 (20.5)	6 (25)	0.67 [a]
	Limited knowledge - Language development (< 5)	35.3	15 (34.1)	9 (37.5)	0.78 [a]
	Limited social network (> threshold)	26.5	13 (29.6)	5 (20.8)	0.44 [a]
	Weak sense of ability (> threshold)	30.9	14 (31.8)	7 (29.2)	0.82 [a]
	Depressive feeling (> threshold)	20.6	8 (18.2)	6 (25)	0.51 [a]
	Major depression during the past six months (yes)	27.9	9 (20.5)	10 (41.7)	**0.06** [a]
	Physical environment resources (< threshold)	30.9	15 (34.1)	6 (25)	0.44 [a]
	Health resources (< threshold)	27.9	14 (31.8)	5 (20.8)	0.33 [a]
	Time resources (< threshold)	23.5	13 (29,5)	3 (12.5)	0.11 [a]
	Financial resources (< threshold)	20.6	8 (18.2)	6 (25)	0.51 [a]
	Interpersonal resources (< threshold)	23.5	10 (22.7)	6 (25)	0.83 [a]
	Knowledge resources (< threshold)	29.4	14 (31.8)	6 (25)	0.56 [a]
	Community resources (< threshold)	23.9	11 (25)	5 (20.8)	0.66 [a]

Relational Risk Factors	*Communication stimulation style (directive)*	35.3	28 (63.6)	16 (66.7)	0.80 [a]
	Weak sense of attachment (> threshold)	14.7	7 (15.9)	3 (12.5)	0.70 [a]
	Parental role restrictions (> threshold)	27.9	12 (27.3)	7 (29.2)	0.87 [a]
	Weak reinforcement (> threshold)	13.2	7 (15.9)	2 (8.3)	0.38 [a]
	Weak acceptance level (> threshold)	13.2	3 (6.8)	6 (25)	**0.06** [b]
	Marriage relationship (> threshold)	32.3	16 (36.4)	6 (25)	0.34 [a]
Familial and Economic Risk Factors	Marital status (single)	60.3	27 (61.4)	14 (58.3)	0.81 [a]
	Number of children in the family (>2)	67.6	14 (31.8)	8 (33.3)	0.90 [a]
	Rank within the family (> 1st)	50.0	20 (45.5)	14 (58.3)	0.31 [a]
	Family functioning (> threshold)	26.9	11 (25)	7 (29.2)	0.63 [a]
	Mother's job (none)	85.3	38 (86.4)	20 (45.5)	0.73 [b]
	Education (< post-secondary)	52.9	21 (47.7)	15 (62.5)	0.24 [a]
	Income (< $20,000)	82.3	36 (81.8)	20 (83.3)	0.99 [b]
	Welfare recipient (yes)	76.5	35 (79.5)	17 (70.8)	0.42 [a]

[a] p-value resulting from a Chi-Square test for the dichotomic variables
[b] p-value resulting from an accurate Fisher test

		Total Sample mean (sd)	Normal Language mean (sd)	Language Delay mean (sd)	p-value
Mother's Maltreatment History	Physical and emotional abuse (23 to 110)	55.3 (26)	50.1 (22.2)	64.8 (30.1)	**0.02** [c]
	Emotional neglect (25 to 99)	56.2 (19.6)	53.1 (18.8)	62.0 (20.3)	**0.07** [c]
	Physical neglect (11 to 55)	21 (10)	19.3 (8.1)	24.2 (12.2)	**0.08** [c]
	Sexual abuse (5 to 25)	9.4 (5.5)	8.9 (5.3)	10.2 (5.9)	0.38 [c]
	Cumulative environmental risk factors (0 to 34)	11.8 (5)	11.6 (4.6)	12.2 (5.6)	0.61 [c]

[c] p-value resulting from a Student t-test (continuous variables)

Table 4 Regression Model of the Personal and Environmental Factors Relating to a Language Delay in Neglected Children from Birth to Three Years of Age (n = 68)

	Variables in the model	B	Odds ratio ($OR=e^B$)	p-value	Relative risk (RR)	95% C.I.for RR	
						Lower	Upper
Step 1 [a]	Cognitive development (<85)	1.32	3.73	0.0121	2.26	1.18	4.32
Step 2 [b]	Cognitive development (<85)	1.71	5.55	0.0029	2.04	1.16	3.57
	Physical and emotional abuse	0.03	1.03	0.0060	1.01	1.003	1.02
Step 3 [c]	Cognitive development (<85)	1.58	4.84	0.0095	2.03	1.13	3.63
	Physical and emotional abuse	0.04	1.04	0.0023	1.02	1.004	1.03
	Weak acceptability level (> threshold)	1.67	5.33	0.0396	1.75	1.06	2.90

[a] Variable entered on step 1: Cognitive development (<85)
[b] Variable entered on step 2: Physical and emotional abuse
[c] Variable entered on step 3: Weak acceptability level (> threshold)

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	0.000	0	.
2	5.685	8	0.6825
3	5.303	8	0.7247