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LONGITUDINAL STUDY OF CHILD
DEVELOPMENT IN QUÉBEC
(ÉLDEQ 1998-2002)

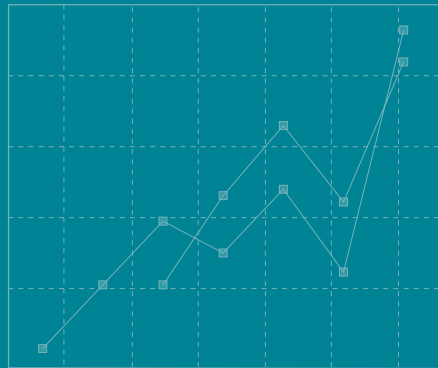
5-MONTH-OLD INFANTS

COLLECTION
**Health and
Well-Being**

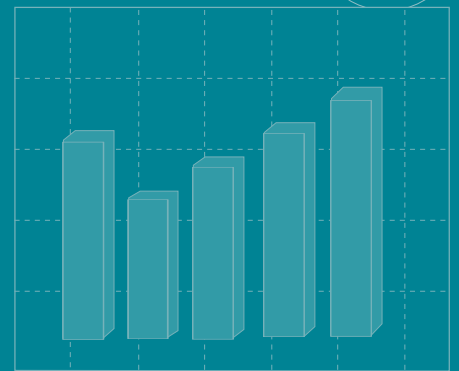
Motor, Social and Cognitive
Development

Volume 1, Number 8

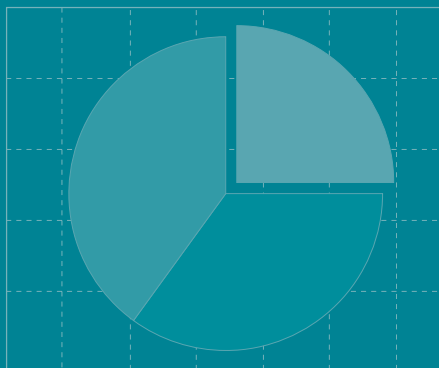
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November 2001

Foreword

Similar to what has been observed in the majority of industrialized nations over the past twenty years, Québec and Canada have seen a significant increase in the costs related to maladjustment, particularly in young people. The Longitudinal Study of Child Development in Québec (*l'Étude longitudinale du développement des enfants du Québec*) (ÉLDEQ 1998-2002) being conducted by *Santé Québec* (Health Québec),¹ a division of *l'Institut de la statistique du Québec (ISQ)*² (Québec Institute of Statistics) in collaboration with a group of university researchers, will provide an indispensable tool for action and prevention on the part of government, professionals and practitioners in the field, who every day must face maladjustment in children.

More precisely, a major purpose of this longitudinal study of a cohort of newborns is to give Québec a means of preventing extremely costly human and social problems, such as school dropout, delinquency, suicide, drug addiction, domestic violence, etc. Similar to what is being done elsewhere (in the UK, New Zealand, the US), *Santé Québec* and a group of researchers have designed and developed a longitudinal study of children 0 to 5 years of age (2,223 children in this study and 600 twins in a related one). It will help gain a better understanding of the factors influencing child development and psychosocial adjustment.

The general goal of ÉLDEQ 1998-2002 is to learn the PRECURSORS, PATHS and EFFECTS, over the medium and long terms, of children's adjustment to

school. ÉLDEQ is the logical extension of the National Longitudinal Study of Children and Youth (NLSCY, Canada). These Québec and Canada-wide longitudinal studies are both comparable and complementary. They employ distinct survey methods, and use different techniques to obtain the initial samples. Though many of the instruments are practically identical, about a third of those being used in ÉLDEQ are not the same.

This first report casts light on the enormous potential of the data generated by this study. From the descriptive analyses of the results of the first year of the study to the longitudinal analyses of subsequent years, there will be an enormous wealth of data. With updated knowledge on the development of the cohort of young children, the annual longitudinal follow-up will respond to the needs which the *ministère de la Santé et des Services Sociaux du Québec - MSSS* (Ministry of Health and Social Services), who financed the data collection, expressed in both the Report of the Working Group on Youth (*Rapport Bouchard, 1991, Un Québec fou de ses enfants* - the Bouchard Report, 1991, A Québec in Love with its Children) and the policy papers entitled *Politique de la santé et du bien-être, 1992* (Health and Well-Being) and *les Priorités nationales de santé publique 1997-2002* (Public Health Priorities 1997-2002).

Director General

Yvon Fortin

-
1. Certain French appellations in italics in the text do not have official English translations. The first time one of these appears, the unofficial English translation is shown immediately after it. Following this, for ease in reading, only the official French name appears in the text in italics, and it is suggested the reader refer to the Glossary for the English translation.
 2. *Santé Québec* officially became a division of the *ISQ* on April 1, 1999.

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Caution:

Unless indicated otherwise, "n" in tables represents data weighted to the size of the initial sample.

Because the data were rounded off, tables do not necessarily correspond to the sum of the parts.

To facilitate readability in Section I, proportions higher than 5% were rounded off to the nearest whole unit in the text and to the nearest decimal in tables and figures.

In section I, weighting and the complex sample design were taken into account in calculating the results and their precision. The precision of the estimates of proportions was calculated using a mean design effect. This was also used for the chi-square tests, except in questionable cases for which the SUDAAN software program was used. In all other analyses, SUDAAN was used. Basic hypotheses, such as the normality of the data, were verified before applying the selected statistical tests.

The second part of this paper presents certain results which could not be verified by the Santé Québec Division and the Methodology and Special Surveys Division, namely those derived from Latent Class Analysis (LCA). Though this type of model may prove to be the most appropriate and promising for assessing cognitive development and behaviours in children (see Baillargeon, Tremblay and Willms, 1999), it does not allow for calculating estimates of variance that take into account the complex sample design of ÉLDEQ. Therefore, the results and the paper presented herein are the sole responsibility of the authors and not the ISQ.

Symbols:

.. Data non available
... Not applicable (N/A)
– Nil or zero
p < Refers to the threshold of significance

Abbreviations

CV Coefficient of variation
Not avail. Not available
Non signif. Not significant

Acknowledgements

Santé Québec recognizes that the development and implementation of the Longitudinal Study of Child Development in Québec (ÉLDEQ 1998-2002) flows directly from the synergy of effort and professionalism of many people throughout the whole process of mounting a survey of this size. Since 1995, individuals, various groups and organizations, a survey firm and the staff of *Santé Québec* have become indispensable links in making this ambitious project a reality - the first annual longitudinal survey of Québec infants.

A major characteristic of this project is that a pretest and survey are conducted every year. To accomplish this, we must annually: 1) make two sets of instruments (pretest and survey), 2) conduct two data collections, 3) analyze two sets of data, and 4) produce two types of communications materials. The results of each pretest means fine-tuning and developing instruments for the survey, which follows 17 months later. The results are sent to the parents (highlights), published in reports, and communicated to the scientific community and the public at large. The professionals and staff involved in collecting the data, as well as those involved before and after, must put their nose to the grindstone every year. We cannot over-emphasize our profound recognition of the incredible, concerted effort they are putting into this project over an 8-YEAR period, from the first pretest in 1996 to the final report to be published in 2004!

First, it must be said that without Daniel Tremblay, Director of *Santé Québec* (now part of the *ISQ*) since 1994, Christine Colin, Assistant Deputy Minister responsible for Public Health 1993-1998, Aline Émond, Director of *Santé Québec* 1986-1993, Richard E. Tremblay, Director of the ÉLDEQ research project, and Marc Renaud, President of *le Conseil québécois de la recherche sociale - CQRS* 1991-1997. ÉLDEQ 1998-2002, also known as "In 2002...I'll Be 5 Years Old!," would have never seen the light of day. In turn and together, they developed, defended and obtained the financing for this study. Thank you for your indefatigable tenacity.

A warm thanks to all the researchers and the support staff of their respective research groups, whose determination over the years has never wavered. Putting

their research grants together every year has contributed to the development of the instruments, analysis of the data and publication of the copious results.

I would like to thank Lyne Des Groseilliers, ÉLDEQ's statistician since 1996, Robert Courtemanche, statistical advisor, and France Lapointe, ÉLDEQ's statistician 1995-1996. These three colleagues in the *Direction de la méthodologie et des enquêtes spéciales* (Methodology and Special Surveys Division) (*ISQ*) managed, with great skill, to set the signposts and navigate the somewhat winding course of this large-scale survey first.

A very special thanks to all the master designers of the National Longitudinal Study of Children and Youth (NLSCY, Canada). Without their expertise, advice and generosity, our survey would never have been accomplished. In many senses of the word "modeling," ÉLDEQ has learnt a lot from the NLSCY.

We would also like to extend out gratitude to the staff of the *Groupe de recherche sur l'inadaptation psychosociale chez l'enfant - GRIP* (Research Unit on Children's Psychosocial Maladjustment) at the University of Montréal. Without their expertise, some of our survey instruments would have never been computerized to such a high level of quality.

We would like to thank the personnel in the *Service de support aux opérations de la Régie de l'assurance-maladie du Québec - RAMQ* (Operations Support Section of the Québec Health Insurance Board). Without their efficiency, fewer letters of introduction would have found their way to the correct addresses of respondents.

Our sincerest thanks go to our survey firm, *Bureau d'interviewers professionnels (BIP)*. Since 1996, this polling company has been responsible for data collection in the pretests and surveys, and follow-up of families both inside and outside of Québec. Lucie Leclerc, President of *BIP*, has set the standard of quality for our numerous and complex data collections. Assisted by Véronique Dorison, she has instilled in her interviewers a great sense of respect for the respondent families, as well as a rigorous regard for all the norms governing this first-of-a-kind survey in Québec.

A big thank-you to the directors-general, directors of professional services, and staff of the medical records departments of some 80 hospitals in the province who accepted to collaborate in our study at a time when resources were rare and time was at a premium, and when the medical records departments in many hospitals were merging or in the process of doing so. Their support was exceptional. Birthing centres also graciously accepted to participate in this first Québec longitudinal study of children. A special thanks to Julie Martineau, medical records specialist, who contributed to the analysis of indispensable medical information by ensuring very rigorous coding of the data, which often lay concealed in the medical files of the infants and their mothers.

It goes without saying that the staff of *Santé Québec* Division directly attached to ÉLDEQ 1998-2002 are the cornerstone of its success from practically every point of view. Special thanks for their ongoing contribution and constant hard work go to Hélène Desrosiers and Josette Thibault, responsible respectively for analysis of the data and creation of the measurement instruments; Martin Boivin, Rolland Gaudet and Gérald Benoît, who constantly pushed the limits of what computer software can do in terms of programming and data processing; Suzanne Bernier-Messier and Diane Lord, who give meaning to the word versatility, who must organize, code and manage incredible quantities of data to ensure the progress of the study. Not directly attached to the team but who made extremely important contributions are: France Lacoursière, France Lozeau and Thérèse Cloutier, who put the finishing touches to the *Santé Québec* "look" in the survey instruments, reports and conference publications; Lise Ménard-Godin, who conducted fruitful literature searches and advised on many aspects of the collection instruments. The hard work, constant availability, ability to adapt, and finely-honed skills of the people working on this project match the enthusiasm that all our partners have demonstrated in making this study a resounding success.

Finally, I would like to extend a very special thank-you to the 2,223 families who responded to our survey. Thank you for the trust you have shown in *Santé Québec*, our partners and collaborators. Thanks to your participation, your children have become the veritable stars of ÉLDEQ 1998-2002, and are making it possible, in the short term, to gain a better understanding of psychosocial adjustment in children. In the medium and long terms, they will likely be in large part responsible for the establishment of early detection programs, better designed prevention programs, and more effective interventions for such an important clientele - all of Québec's children.



Mireille Jetté
Project Coordinator
Santé Québec Division, ISQ

Introduction of ÉLDEQ 1998-2002

Preventing Social Maladjustment

It suffices to consider the costs engendered by behavioural problems in children - school dropout, delinquency, alcoholism, drug addiction, family violence, mental disorders and suicide - to conclude that they largely surpass what a modern society can accept, morally and economically. Faced with the enormity of these problems, the first reflex is to provide services to these people which will, ideally, make the problems disappear, or at the very least, lessen their severity. For many years we have tried to offer quality services to children and adults who suffer from antisocial disorders, alcoholism, drug addiction, depression, and physical or sexual abuse. However, in spite of enormous investment, these curative services are far from being able to respond to the demand.

Although the idea of early intervention as a preventive measure can be traced at least as far back as ancient Greece, the second half of the 20th century will certainly be recognized as the dawn of the field of social maladjustment prevention (Coie *et al*, 1993; Mrazek & Haggerty, 1994). Numerous programs have been developed for adolescents and teenagers to prevent school dropout, delinquency, drug addiction and suicide. Scientific evaluations of these programs have been far too few in number, but they tend to demonstrate that it is extremely difficult to help those most at risk in this age group (Rosenbaum & Hanson, 1998; Rutter, Giller & Hagell, 1998; Tremblay & Craig, 1995). It is becoming increasingly clear that the factors which lead to serious adaptation problems are in place long before adolescence. Hence the idea that the prevention of social adaptation problems should start at least during childhood, and preferably right from pregnancy (Olds *et al*, 1998; Tremblay, LeMarquand & Vitaro, 1999). These principles are clearly outlined in the objectives of the *Politique de la santé et du bien-être* (Policy on Health and Well-Being) and *les Priorités nationales de santé publique* (Priorities for Public Health) set by the government of Québec (ministère de la Santé et des Services sociaux, 1992; 1997).

The Need to Understand Early Childhood Development

If the field of maladjustment prevention appeared at the end of the 20th century, it has certainly come on the heels of child development. "*Émile*," by Jean-Jacques Rousseau, needs to be re-read in light of recent studies to realize just to what degree it is impossible to understand the complexity of child development, and therefore the means of preventing deviant paths, simply by reflection or introspection. Although considerable knowledge has been acquired in the neurological, motor, cognitive, affective and social development of children, what really hits home is that Jean-Jacques Rousseau and his followers in education seemed to have had more certainty about the ways of educating children than we do today.

Progress in child development research has made us realize that things are not as simple as we can or would like to imagine. We have obviously all been children, and most of us have become parents, indeed, relatively well-adjusted ones. But we still do not clearly understand when, how and why adjustment problems appear, and above all, how to prevent and correct them.

Our ignorance is obvious when we examine the debates among specialists on the role of parents in the development of maladjustment problems in children. Some suggest that social maladjustment in children is largely determined by genetic factors (Bock & Goode, 1996; Rowe, 1994). Some accentuate economic factors (Duncan & Brooks-Gunn, 1997). Other researchers attribute a determining role to peer influence (Harris, 1998; Harris, 1995; Vitaro *et al*, 1997). These larger questions lead to narrower ones which focus on particular aspects - the role of fathers in childhood maladjustment, the impact of alcohol and cigarette consumption during pregnancy, the effect of prenatal and birthing problems, the importance of breast feeding and diet; the role of sleep, cognitive development, temperament, and so on.

The majority of these questions are at the heart of the daily concerns of parents, grandparents, educators, family service providers, and legislators. What can we do to maximize the development of our children, to prevent severe psychosocial maladjustment? What should we do when problems begin to appear, when pregnant mothers, or fathers themselves have a long history of disorders? The answers to these questions obviously have an effect on the policies put forth by Québec government Ministries such as *ministères de la Famille et de l'Enfance* (Family and Child Welfare), *de l'Éducation* (Education), *de la Santé et des Services sociaux*, *de la Solidarité sociale* (Social Solidarity - formerly Income Security (Welfare)), *de la Sécurité publique* (Public Security), *de la Justice* (Justice), and *le ministère de la Recherche, Science et Technologie* (Research, Science and Technology).

The Contribution of ÉLDEQ 1998-2002

The Longitudinal Study of Child Development in Québec (ÉLDEQ 1998-2002) was conceived in order to contribute to our knowledge of the development of children in their first 5 years of life. The main goal is to gain a better understanding of the factors, in the years of rapid growth, which lead to success or failure upon entry into the school system. The goal of the second phase (if approved) is to better understand development in elementary school, in light of development in early childhood.

We know that this survey cannot be a definitive one on child development in Québec, but it is the first representative study of a provincial cohort of children who will be measured annually from birth to entry into the school system. It specifically aims at understanding the development of basic skills needed for educational success.

Although the effort to set up this study began in 1989, the first data collection coincided with the Québec government's implementation of its *Politique Familiale* (Policy on Families). The policy has virtually the same objectives as our study:

"These services for children 5 years and under should give all Québec children, whatever the socioeconomic status of their parents, the chance to acquire and develop the skills that will allow them to succeed in school (1997, p. 10)."

On March 3 1999, in the speech opening the 36th session of the Québec legislature, Premier Lucien Bouchard confirmed that early childhood development was a priority for the government:

"The theme that will dominate our actions this year, next year, and throughout our mandate, is youth... The priority... with regards to youth in Québec, begins with the family and childhood... This massive investment in early childhood... will give our children the best chance of success in the short, medium and long terms. It is our best asset against alienation and despair. It is our best preparation for personal, social and economic success."

Because of this historic coincidence, ÉLDEQ has the potential of becoming an invaluable tool for monitoring the effects of Québec's massive investment in early childhood which began in 1997. Thanks to the data collected by the federal government's National Longitudinal Study of Children and Youth (NLSCY, Canada), we will be able to compare child development in Québec with that elsewhere in Canada, before and after the implementation of Québec's new policy on the family.

However, our initial objectives are more modest. The 12 or 13 papers in this series present the results of our first annual data collection. They describe the characteristics of the families and children when the latter were 5 months old³ They cover sociodemographic characteristics, nature of the birthing process, health and social adaptation of the parents, family and couple

3. To simplify the text in this report, the phrase "5-month-old infants" will be used to refer to infants whose mean age was 5 months during data collection in 1998. In section 3.1.3 (Volume 1, Number 1), we explain why the infants were not all exactly the same age. As indicated in no. 2 of this series, 52% of the infants were less than 5 months, and 3.4% were 6 months of age or over.

relations, parent-infant relations, and characteristics of the 5-month-old, such as sleep, diet, oral hygiene, temperament, and motor, cognitive and social development. These data will eventually be compared to those on children the same age collected by the NLSCY in 1994 and 1996.

An Interdisciplinary, Multi-University Team of Researchers

This study saw the light of day because of the collaboration of many people. In the preceding pages, Mireille Jetté thanked a number of them. I would like to take advantage of this introduction to emphasize that the survey was set up and continues forward because of the dedication and hard work of a group of researchers from a variety of disciplines and universities. I would particularly like to thank Michel Boivin, School of Psychology at *Université Laval*, and Mark Zoccolillo, Department of Psychiatry at McGill University, who have been actively involved in this project since 1992. It was in that year that we prepared our first grant application for the Social Sciences and Humanities Research Council of Canada. A second group of researchers joined the team in 1993 and 1994: Ronald G. Barr, pediatrician, Montréal Children's Hospital Research Institute, McGill University; Lise Dubois, dietitian and sociologist, *Université Laval*; Nicole Marcil-Gratton, demographer, University of Montréal and Daniel Pérusse, anthropologist, University of Montréal. Jacques Montplaisir, Department of Psychiatry, University of Montréal, joined the team in 1995. Louise Séguin, Department of Social and Preventive Medicine, University of Montréal and Ginette Veilleux, *Direction de la santé publique de la Régie régionale de la santé et des services sociaux de Montréal-Centre* (Public Health Department, Montréal-Centre Regional Health Board), joined in 1998. Three post-doctoral researchers have also made an important contribution. Raymond Baillargeon developed the task for measuring cognitive development. Christa Japel is the assistant to the scientific director for planning, analysis and presentation of the results. Heather Juby collaborates in the analysis of the data on couple and family history.

A Unique Confluence of Circumstances

A study such as this requires the coordination of many researchers over many years, enormous financial resources, and a long period of preparation. Though in the early 1990s the research team was convinced of the need for the survey, those responsible for the public purse had also to be convinced. We must therefore acknowledge the happy confluence of circumstances that allowed the players to take advantage of the opportunity at hand. When a number of civil servants in the *ministère de la Santé et des Services sociaux* understood the essential role of prevention, the creation of a committee on children and youth in 1991 led to an increased awareness of the importance of early childhood. At the same time, the president of the CQRS, Marc Renaud, had come to the same realization with his colleagues in the Population Health Program at the Canadian Institute for Advanced Research (CIAR). Aline Émond, the Director of *Santé Québec*, was ready to apply her formidable determination to work for the cause. For their part, Health Minister Jean Rochon and his Assistant Deputy Minister for Public Health, Christine Colin, aware of the importance and benefit of longitudinal studies on early childhood development, authorized the investment of large sums of money during a period of draconian budget cuts. This occurred at the same time as the federal government decided to create its own longitudinal study of children and youth (NLSCY). It is in this context that ÉLDEQ 1998-2002 materialized. Our survey also came to fruition because Mireille Jetté did everything in her power to make the researchers' dreams a reality, and Daniel Tremblay gave her all the support she needed by making various resources available for the project.



Richard E. Tremblay, Ph.D., M.S.R.C.
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Review of the Methodology

This analytical paper is one of a series presenting cross-sectional data collected on a large sample of 5-month-old infants surveyed in 1998. It reports on the first of 5 annual data collections on 2,120 children in Québec who will be studied until they are 5 years old. In the first year of data collection, the results on 2,223 infants were retained.⁴

The target population of the survey is Québec babies, singleton births only,⁵ who were 59 or 60 weeks of gestational age⁶ at the beginning of each data collection period, born to mothers residing in Québec, excluding those living in the Northern Québec, Cree, and Inuit regions, and on Indian reserves, and those for whom the duration of pregnancy was unknown. Due to variations in the duration of pregnancy and the 4 or 5 weeks allotted for each data collection wave, the infants were not all exactly the same age (gestational or chronological) at the time of the survey. Therefore, the children in Year 1 (1998) of the survey had a mean gestational age of 61 weeks - about 5 chronological months.

The survey had a stratified, three-stage sampling design, with a mean design effect for the proportions estimated at 1.3. To infer the sample data to the target population, each respondent was given a weight corresponding to the number of people he/she "represented" in the population. ÉLDEQ 1998 comprised eight main collection instruments which obtained data from the person who was closest to the baby (called the Person Most Knowledgeable - PMK), the spouse (married or common-law), the infant and the absent biological

parent, if applicable. Given variation in the response rates to each instrument, three series of weights had to be calculated to ensure inferences to the population were accurate. Except for the Self-Administered Questionnaire for the Absent Father (SAQFABS) and a series of questions in the Computerized Questionnaire Completed by the Interviewer (CQCI) on absent fathers – the overall or partial response rates of which were too high – the results of all the instruments could be weighted. Therefore, the data presented here have all weighted to reduce the biases.

All data that had coefficients of variation (CV) 15% or higher are shown with one or two asterisks to clearly indicate the variability of the estimate concerned. In addition, if the partial non-response rate was higher than 5%, there is a note specifying for which sub-group of the population the estimate is less accurate.

Similar to any cross-sectional population study, the Year 1 part (5-month-old infants) of ÉLDEQ 1998-2002 has certain limits. However, the vast majority of the results are valid and accurate, and provide a particularly detailed portrait, for the first time, of 5-month-old infants in Québec.

Note to the reader: For more details information on the methodology, see Volume 1, Number 1, of this collection.

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4. Though the results for 2,223 children were retained for the first year of data collection, 2,120 will be retained for the rest of the longitudinal study; the extra 103 were part of an over-sample used to measure the effects of the January 1998 ice storm.
 5. Twins (twins births) and other multiple births were not targeted by the survey.
 6. Gestational age is defined as the sum of the duration of gestation (pregnancy) and the age of the baby.

Motor, Social and Cognitive Development

Section I

Motor and Social Development



Introduction

Watching their children take their first steps and hearing them say their first words are unique and marvellous moments in the life of any parent. For the children, those first steps and first words are among their most significant achievements – crucial steps on the road to autonomy. In fact, the acquisition of such skills is part and parcel of a developmental progression that begins very early in life. Shortly after birth, infants start exploring their physical and social environment. Gradually acquiring new skills, they learn to coordinate their movements and interact with the people around them, and thus to adapt to the changing conditions in which they are growing up.

The acquisition of new motor and social skills is linked to brain development, the pace of which accelerates during pregnancy and childhood. With increasing neuropsychological maturity, children can engage in more and more complex movements and interactions. The stages and sequence of the acquisition of motor and social skills appear to be universal. This suggests that the pathway of motor and social development among human beings is largely determined by the genetic characteristics of our species.

It has been observed, however, that the age at which children manifest certain behaviours varies. Some infants present delayed development while others progress more rapidly than the average child or even skip developmental stages. The unequal pace of development in children has an impact on their later adjustment. Studies based on longitudinal data have shown that the level of motor and social development during early childhood is associated with success in school and the risk of manifesting behavioural problems in the early school years (Baker *et al.*, 1993) or in adolescence (White *et al.*, 1990). Delays in the acquisition of motor, social or language skills in very young children may be detrimental to their later psychosocial adjustment. The value of identifying the factors associated with motor and social development from the earliest months of life thus becomes clear.

Indeed, that is the purpose of Part I of this paper. In it, we briefly examine the findings of various studies on the sequence of motor and social development in children as well as the factors likely to foster or hinder such development. We then present data on the prevalence of a variety of motor and social skills in the sample of infants in Québec targeted by ÉLDEQ 1998. Finally, we attempt to identify the links between various factors outlined in the literature on motor and social development and the acquisition of these skills by children in Québec.

As a starting point, it should be noted that this portrait of motor and social development in Québec children is based on the parents' description of their child's development. To complete the portrait, tests on the children's cognitive skills were conducted by ÉLDEQ interviewers. The results of those direct evaluations are presented in Part II of this paper.

1. Motor and Social Development in Infants

1.1 The Sequence of Motor and Social Development

Studies on the sequence of development in young children are far from new. At the end of the 19th century, William Preyer, a German researcher, wrote about the growth of young children and noted the age at which they demonstrate specific behaviours. His work inspired the American Arnold Gesell, who was the first to identify norms for the physical and motor development of young children. Then, in the 1930s and 1940s, several other scientists carried out detailed studies on the stages of development in infants and young children. Their work led to the creation of various standardized measures to assess child development. One of the best known and most often used of these instruments is the *Bayley Scales of Infant Development*, created by Nancy Bayley (BSID-II; Bayley, 1993).

At the clinical level, an evaluation of psychomotor development is normally part of the examination given by pediatricians to detect signs of neurological delays in infants. Pediatricians verify that infants who are 2 months old can follow a person who moves around with their eyes, make different sounds and hold their heads upright while being held. According to a standard widely accepted today (Illingworth, 1988), babies in their fourth month start grasping objects, get closer to objects they wish to reach for, hide their faces under their blanket, laugh out loud and turn their heads to look at someone who says their name. Because such standards were established on the basis of "average" babies, there is some variation in the age at which infants commence certain behaviours; each child follows its own developmental pathway.

1.2 Factors Associated with Motor and Social Development in Infants

The variations in development in infants are linked to several factors. Babies who are born prematurely or with low birth weight or congenital illness are more likely to exhibit delays in development (Illingworth, 1988; McCarton *et al.*, 1996; Ross *et al.*, 1996). The quality of care received by infants is, however, even more important to their development. For example, incidents of trauma, emotional deprivation, malnutrition or physical abuse may compromise normal development and result in significant delays in the development of motor and social skills (Illingworth, 1988; Mrazek, 1993; Yarrow *et al.*, 1982). In contrast, parents who are able to stimulate their babies as well as discern and respond to their needs adequately and in a positive manner seem to enhance the development of their child's motor, social and language skills (Eisenberg, 1999; Tamis-Lemonda *et al.*, 1998; Yarrow *et al.*, 1982). Analyses of data from the National Longitudinal Survey of Children and Youth (NLSCY) conducted by Statistics Canada have revealed that positive interactions between parents and their children under 2 years of age are associated with the children's motor and social development (Landy & Tam, 1996). The correlation seems to be relatively weak, however; this suggests that parenting practices are but one of numerous factors influencing the social and motor development of young children.

The characteristics of the family such as whether it is a single-parent household (Pedersen *et al.*, 1979) or a low-income household (Halpern, 1993; Miller, 1998) and even the birth rank of the child in the family (Eaton *et al.*, 1989; Hoff-Ginsberg, 1998) have also been linked to the neuropsychological and cognitive development of the child.

Finally, studies on motor and social development in children have reported differences between the sexes from the first year of life (Nordberg, 1996) as well as developmental variations resulting from interactions between some characteristics of the family environment and the sex of the child (Baker *et al.*, 1993; Nordberg *et al.*, 1991).

We therefore examined those factors in this study of motor and social development in infants in Québec.

2. The Data

To assess motor and social development in infants in Québec, ÉLDEQ adopted a scale used in numerous other large studies such as the National Longitudinal Survey of Youth (NLSY) in the United States, the National Child Development Survey (NCDS) in Britain and the National Longitudinal Study of Children and Youth (NLSCY) in Canada. Completed during a face-to-face interview with the person who best knows the child, or Person Most Knowledgeable (PMK), this scale on motor and social development was developed by Dr Gail Poe of the National Center for Health Statistics in the United States. It comprises a series of questions drawn from standardized developmental measurements (Bayley, 1993; Knobloch & Pasamanick, 1975; Frankenburg *et al.*, 1987). The validity and reliability of this instrument are widely acknowledged.

The questions, totalling 15 in all, are integrated in the Computerized Questionnaire Completed by the Interviewer (PQCI).⁷ Among other things, they aim at discerning if the baby has already rolled over without help and voluntarily, that is, entirely on his/her own, if the baby has looked around with his/her eyes for an object that is missing or not nearby, or has laughed out loud without having been tickled or touched. In essence, these questions measure the infants' motor skills. To obtain an idea of their social behaviours, 11 questions were adopted from the socialization scale in the Vineland Adaptive Behavior Scales (Sparrow *et al.*, 1984). Note that these questions on social adjustment were developed to be administered during a conversation between an interviewer specially trained for this and a parent. For ÉLDEQ, the questions were adapted for inclusion in the PQCI.

The data cover 1,136 boys and 1,087 girls representative of infants in Québec approximately 5 months old in 1998. As indicated in Volume 1, Number 2 of the present collection, the children targeted by ÉLDEQ 1998 were between 56 and 65 weeks of gestational age⁸ during the period of data collection; their mean age was 60.8 weeks (SD \pm 1.1 weeks). Because of the variation in gestational age, the infants were not all exactly the same chronological age at the time of the interview; while virtually all of them were 4 (52%) or 5 (45%) months of age, some, namely those born prematurely, were 6 to 8 months old (3.4%).

7. Because this scale varies with the age of the infant, we used all the questions covering infants 4 to 6 months old.

8. Gestational age is defined as the sum of the duration of gestation (pregnancy) and the age of the baby.

3. The Results

3.1 The Prevalence of Motor and Social Skills in Infants in Québec

Table 3.1 shows the percentages of male and female infants who had demonstrated certain motor and social skills, as reported by the PMK, who in virtually all cases (99.7%) was the biological mother of the infant. As may be seen, the majority of infants had already, by this age, manifested the first seven of the motor and social tasks

in the scale. In contrast, fewer than 1 child in 5 was capable of the other eight skills. Of those skills, four were carried out by 7% to 19% of the infants. However, the behaviours such as having already walked at least 2 steps, stayed sitting for 10 minutes, stood up without help and waved "bye-bye" were rarely reported. They were part of the repertoire of fewer than 5% of infants approximately 5 months old in Québec in 1998.

Table 3.1
Proportion of Infants Approximately 5 Months of Age Manifesting Certain Motor and Social Skills¹, by Gender, 1998

	Infants who are capable	
	Boys	Girls
	%	
Holds head up straight	97.3	97.7
Laughs out loud †	93.3	90.2
Holds a medium-size object in his/her hand †	98.5	99.6
Rolls over by him/herself	72.1	70.3
Seems to enjoy looking at him/herself in mirror	93.2	93.5
Supports him/herself with legs stretched out †	90.0	86.9
Look for missing object with his/her eyes	76.1	75.4
Sits up by him/herself	17.7	14.4
Stays sitting for 10 minutes	4.4*	2.8*
Stands up without help	0.6**	1.1**
Crawls	19.1	16.8
Says recognizable words ("mama", "dada") †	10.0	7.5
Picks up small objects	6.8	7.3
Walks at least 2 steps	4.5*	3.0*
Waves "bye-bye"	0.9**	0.9**

† $p < 0,05$

1. As reported by the Person Most Knowledgeable (PMK).

* Coefficient of variation between 15% and 25%; interpret with caution.

** Coefficient of variation higher than 25%; imprecise estimate for descriptive purposes only.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table 3.2 presents the breakdown (%) of infants who manifested certain social behaviours usually, sometimes or never. Almost all of the babies demonstrated the majority of behaviours usually or sometimes. In contrast, only somewhat more than two-thirds had played interactive games, while fewer than half had reached for a familiar person.

The data in Tables 3.1 and 3.2 also reveal differences between boys and girls in their acquisition of motor and social skills. According to the reports by the PMK, somewhat more boys than girls had laughed out loud, supported their weight with their legs or said recognizable words at the age of 5 months. In contrast, proportionally more girls had held a moderate-sized object in their hands and showed interest in novel objects or new people. Although significant statistically, the differences seem nonetheless slight, and in some cases, minimal.

Recall that we had no expectation that the infants would demonstrate all of the skills evaluated by this scale, which assesses not only behaviours that may be anticipated of children this age, but also behaviours normally acquired at a later stage. Furthermore, as stated, the percentages shown in Tables 3.1 and 3.2 were generated from information collected from the PMK and not on the basis of examination or observation by a third party. The data must therefore be interpreted with caution. For example, according to child development experts, children of about 5 months of age are not likely to be able to say recognizable words, and it is only around 9 months that the average child starts to crawl (Illingworth, 1988).

Table 3.2
Distribution of Infants Approximately 5 Months Old, by Frequency of Social Behaviours and Gender, 1998

	Frequency of behaviour ¹					
	Usually		Sometimes		Never	
	Boys	Girls	Boys	Girls	Boys	Girls
	%					
Looks at the face of the caregiver	98.1	97.2	1.9*	2.8*	-	-
Responds to the voices of people around him/her	97.7	97.4	2.3*	2.6*	-	-
Distinguishes the caregiver from other people	94.8	95.2	4.3*	3.9*	0.8**	0.9**
Shows interest in novel objects or new people [†]	82.4	86.5	14.8	11.7	2.8*	1.8**
Expresses 2 or more recognizable emotions	93.3	93.7	6.1	6.0	0.6**	0.3**
Responds to being picked up	95.0	94.6	3.8*	4.6	1.2**	0.8**
Shows affection toward familiar people	85.8	85.7	8.7	8.9	5.5	5.4
Shows interest in children or peers ²	67.7	70.4	22.5	22.2	9.8	7.4
Reaches for a familiar person ²	28.6	26.9	18.4	17.8	53.0	55.3
Plays with a toy	87.1	87.1	10.3	10.7	2.6*	2.2*
Plays interactive games ²	42.9	44.8	24.9	24.0	32.2	31.2

† p < 0,05

1. As reported by the Person Most Knowledgeable (PMK).

2. Rate of partial non-response higher than 5% for the boys and for the girls; possible bias.

* Coefficient of variation between 15% and 25%; interpret with caution.

** Coefficient of variation higher than 25%; imprecise estimate for descriptive purposes only.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

3.2 Factors Associated with the Level of Motor and Social Development

What are the factors that play a role in the acquisition of motor and social skills in infants in Québec? To answer that question, the researchers selected variables from ÉLDEQ that had been shown, in previous studies on child development, to be associated with motor and social skills. We also took into account certain characteristics of the family environment of the child, such as the socioeconomic status and age of the mother and her degree of depression, that have an impact on the educational activities and the modalities of the parent-child relationship (see Volume 1, Number 10, of the collection). For this number we decided to consider the individual characteristics of the mother only. Those of the father were not included for two reasons: First, in virtually all cases, the biological mother was the respondent to the scale on motor and social development. Second, the relevant data on fathers are available only for a sub-population of infants, namely, those whose fathers live in the household.⁹

Four sets of variables are examined:

Characteristics of the infant

- ? gestational age at the time of the survey (chronological age adjusted for the duration of the pregnancy, as discussed in Section 3)
- ? birth weight

Characteristics of the mother

- ? age of the mother
- ? degree of depression

9. For more information on the data on fathers, whether they lived in or apart from the household, see Numbers 1 and 2 of Volume 1.

Characteristics of the family

- ? socioeconomic status¹⁰
- ? type of family as characterized by the presence or absence of the father or spouse in the household
- ? number of children present in the household

Perceptions and parenting practices:

- ? positive parenting practices¹¹
- ? mother's perception of the infant's qualities¹² (Scale of Parental Perceptions and Behaviours Regarding the Infant, or SPPBI)
- ? level of stimulation of the child, as reported by the interviewer¹³

Among the questions from the scale of motor and social development addressed to the PMK, some proved particularly interesting because the responses to them varied widely. These were then used to examine whether the manifestation of the measured behaviours is related to the various characteristics listed above.

10. Socioeconomic status is determined on the basis of five sources: educational level of the PMK and the spouse/partner, if applicable; occupational prestige of the PMK and the spouse/partner, if applicable; and household income (for more information, see Number 12 in this collection as well as Willms & Shields, 1996).

11. The scale on positive parenting practices is also used in the National Longitudinal Study of Children and Youth (NLSCY). For infants from 0 to 23 months, it has five items (see Number 10 of the present collection).

12. The *Échelle de cognitions et de conduites parentales à l'égard du nourrisson* (ÉCOPAN) (Scale of Parental Perceptions and Behaviours Regarding the Infant) was developed for ÉLDEQ. We retained the dimension on the mother's perception of the physical attractions and cognitive abilities of the infant (see Number 10 of the present collection).

13. The scale on stimulation is drawn from the Observations of Family Life (OFL), which is an adapted and abridged version of HOME, developed by Caldwell and Bradley (1984).

The questions related to the infant's motor skills are:

- ? Has he/she ever voluntarily rolled over completely on his/her own?
- ? When he/she is sitting and you raise him/her to a standing position, has he/she supported his/her own weight with legs stretched out?
- ? Has he/she ever looked around with his/her eyes for a toy that was missing or not nearby?
- ? Has he/she sat alone without help, except for leaning forward on his/her hands or with just a little help from someone else?
- ? Has he/she crawled when left lying on his/her stomach?

The five questions related to the infant's social skills are:

- ? Has he/she shown interest in novel objects or new people?
- ? Has he/she shown affection toward familiar people?
- ? Does he/she reach for a familiar person?
- ? Has he/she played with a toy or other object, alone or with others?
- ? Has he/she played simple interactive games with others (for example, imitating a sound, noise or gesture)?

It would, of course, have been preferable to calculate a global score for each of the scales, that is, the scale evaluating motor skills, on the one hand, and the scale on social skills, on the other hand. We were not able to proceed this way because of the weak correlation between the items within each of the scales.¹⁴

Finally, recall that the results for ÉLDEQ 1998 revealed

14. The data for ÉLDEQ 1998 reveal that the scale of motor and social development, like the scale of social behaviour, demonstrates an internal consistency that is too weak (alpha coefficients under the acceptable threshold) to derive a global score.

few differences between boys and girls (Tables 3.1 and 3.2). Nonetheless, because some studies have reported variation in the level of motor and social development based on the interactions between some characteristics of the family environment and the sex of the child (Baker *et al.*, 1993; Nordberg *et al.*, 1991), we present below an analysis of our data according to the gender of the infants.

For each question on motor and social development, the analysis is undertaken by means of simple cross-tabulations or mean comparison tests. With respect to social skills, the responses were grouped into two categories based on whether the child performed the queried behaviours either (a) usually or (b) sometimes or never.¹⁵

3.2.1 Characteristics of the Child and the Family Environment

Characteristics of the child

The data in Tables 3.3 and 3.4 indicate that only some skills are associated with the age of the child at the time of the survey. Thus the results show that infants, either boys or girls, who are older in terms of gestational age¹⁶ are somewhat more likely to have rolled over without help and voluntarily. Among the boys of at least 60 weeks of gestational age at the time of data collection, 69% or more had already carried out this behaviour versus 58% of younger boys. Almost the same spread is observed among the girls. Greater gestational age is

15. It appears that several of the characteristics presumably linked to the level of the child's development are themselves interrelated; thus, a multivariate analysis might have been required for each measure of motor and social development. Given the difficulty of establishing a global score (*mesure synthétique*) of motor and social development for infants 5 months old, this option was not considered further.

16. For this analysis, the gestational age of the infants was regrouped in 5 categories, that is 59 weeks and less, 60, 61, 62 and 63 weeks and over.

also associated with the acquisition of social skills such as holding out the arms toward a familiar person in boys or displaying affection for familiar persons and playing with a toy in girls (Tables 3.3 and 3.4). Birth weight, on the other hand, is associated with the onset of two skills, but in boys only ("crawls" and "reaches for a familiar person"). Contrary to expectations, boys with low birth weight are more likely than other infants to demonstrate these behaviours (37% vs. 18% and 48% vs. 28%, respectively). These results may be explained in part by the impact of other variables such as socioeconomic status (see below).

Table 3.3

Proportion of Male Infants Manifesting Various Motor and Social Skills, by Gestational Age and Birth Weight, 1998

	Gestational age at the time of the survey (in weeks)					Birth weight	
	59 weeks and less	60	61	62	63 weeks and over	Less than 2,500 g	2,500 g and over
Motor skills							
Rolls over by himself	57.9	72.6	71.8	79.7	69.3†	76.5	71.9
Supports his weight with his legs	89.2	88.3	91.1	90.8	91.8	85.4	90.4
Looks for a missing object with his eyes	73.7	74.8	73.9	80.7	83.1	77.2	76.1
Sits up by himself	16.2**	13.1	19.8	19.9*	24.4*	12.6**	18.1
Crawls	10.2**	19.9	17.0	24.7	21.5*	37.1*	18.3
Social skills¹							
Shows interest in novel objects/new people	81.5	80.6	81.8	87.4	82.6	81.1	82.3
Shows affection for familiar persons	84.8	87.7	86.3	84.1	81.2	82.2	86.0
Reaches for a familiar person	21.6*	22.9	29.4	36.4	39.0†*	47.9*	28.0†
Plays with a toy	87.2	87.5	84.7	91.3	87.0	80.8	87.3
Plays interactive games	39.5	40.9	44.5	39.8	53.6	50.8*	42.4

† p < 0.05.

1. For social skills, the percentages represent infants who manifest the skills usually, rather than sometimes or never.

* Coefficient of variation between 15% and 25%; interpret with caution.

** Coefficient of variation higher than 25%; imprecise estimate for descriptive purposes only.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table 3.4

Proportion of Female Infants Manifesting Various Motor and Social Skills, by Gestational Age and Birth Weight, 1998

	Gestational age at the time of the survey (in weeks)					Birth weight	
	59 weeks and less	60	61	62	63 weeks and over	Less than 2,500 g	2,500 g and over
Motor skills							
Rolls over by herself	56.7	70.7	68.5	73.2	84.8†	77.5	69.9
Supports her weight with her legs	78.7	87.9	86.8	88.9	85.2	93.5	86.4
Looks for a missing object with her eyes	69.9	73.2	74.2	80.9	86.4	64.0	75.8
Sits up by herself	13.6**	11.8	14.4	17.8*	22.3*	11.7**	14.4
Crawls	8.6**	16.0	16.5	20.2	23.3*	25.1*	16.3†
Social skills¹							
Shows interest in novel objects/new people	84.0	84.8	87.6	88.3	89.1	80.5	86.8
Shows affection toward familiar people	86.6	81.4	87.1	89.2	94.3†	85.3	85.7
Reaches for a familiar person	14.5**	26.1	28.1	29.7	32.8†	19.1**	27.0†
Plays with a toy	81.9	83.7	88.7	92.7	93.3†	80.5	87.4
Plays interactive games	42.2	41.6	48.4	45.3	48.6	59.8*	43.9

† p < 0.05.

1. For social skills, the percentages represent infants who manifest the skills usually, rather than sometime or never.

* Coefficient of variation between 15% and 25%; interpret with caution.

** Coefficient of variation higher than 25%; imprecise estimate for descriptive purposes only.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Characteristics of the Family Environment

From the data presented in Tables 3.5 and 3.6 as well as in Figures 3.1 and 3.2, several features stand out:

- 1) Given the large number of cross-checks that were done, relatively few motor and social skills seem significantly linked to characteristics of the family environment in 5-month-old infants.
- 2) The observed associations vary from one item to the next and by the gender of the infant. Allowing for exceptions, the observed associations nonetheless reveal a high prevalence of certain motor behaviours

in the groups most at risk, that is, in infants whose mothers are young and without spouses or who exhibit depressive tendencies (Tables 3.5 and 3.6), or infants from families of low socioeconomic status (Figure 3.1). In contrast, with the exception of a skill that is both motor and social — "reaches for a familiar person"—the most typically social skills such as "shows interest in novel objects or new people" and "plays simple interactive games" were more often reported in the groups often judged to be less "at risk", such as two-parent families and families in a higher socioeconomic bracket (Tables 3.5 and 3.6 and Figure 3.2).

Table 3.5
Proportion of Male Infants Manifesting Various Motor and Social Skills, by Characteristics of the Family Environment, 1998

	Number of children		Type of family		Age group of the mother			High degree of depression (mother) ¹	
	1	2+	Two-parent	Single-parent	? 25 years	25-34 years	35 years and +	Yes	No
Motor skills									
Rolls over by himself	71.7	72.3	71.4	78.7	78.6	70.0	70.8†	67.0	72.8
Supports his weight	92.2	88.5	90.2	87.8	93.6	88.8	90.3	86.9	90.6
Looks for a missing object with his eyes	76.3	76.0	75.4	83.8	82.5	75.0	70.3†	85.8	74.9†
Sits up by himself	19.0	16.9	16.3	32.0†*	17.5	16.7	23.1*	17.3*	17.8
Crawls	19.1	19.1	17.6	32.8†*	23.3	17.6	18.4*	22.0*	18.7
Social skills²									
Shows interest in novel objects/new people	87.3	79.0†	82.3	83.3	79.3	83.4	82.8	83.6	82.2
Shows affection toward familiar people	86.5	85.3	85.6	89.0	87.6	84.6	88.2	84.7	86.0
Reaches for a familiar person	33.2	25.6†	27.7	39.6†	32.6	26.8	31.0	33.3	28.2
Plays with a toy	86.2	87.8	87.8	81.7	85.4	88.3	84.4	81.5	87.8
Plays interactive games	45.0	41.4	43.7	34.0*	44.4	41.9	45.0	42.9	42.9

† $p < 0.05$.

1. Mothers whose score on the depression scale ranks above the 90th percentile, that is, among the 10% with the highest scores, are considered to present a high degree of depression.
2. For social skills, the percentages represent infants who engage in this usually rather than sometimes or never.

* Coefficient of variation between 15% and 25%; interpret with caution.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table 3.6

Proportion of Female Infants Manifesting Various Motor and Social Skills, by Characteristics of the Family Environment, 1998

	Number of children		Type of family		Age group of the mother			High degree of depression (mother) ¹	
	1	2+	Two-parent	Single-parent	? 25 years	25-34 years	35 years and +	Yes	No
Motor skills									
Rolls over by herself	70.1	70.4	68.9	83.8†	72.8	69.1	71.6	75.6	69.7
Supports her weight	89.5	84.8†	86.7	88.5	90.6	86.7	81.1†	84.7	87.0
Looks for a missing object with her eyes	76.0	74.9	74.9	80.2	77.0	75.0	74.5	82.6	74.5
Sits up by herself	18.3	11.6†	14.0	16.9**	7.7**	16.6	15.9†*	18.8*	13.9
Crawls	16.9	16.6	15.5	28.4†*	17.7	14.4	25.3†*	32.8	14.7†
Social skills²									
Shows interest in novel objects/new people	87.6	85.7	87.6	74.6†	82.4	87.6	88.1	82.0	87.0
Shows affection toward familiar people	84.0	87.0	86.1	82.3	84.6	85.6	88.2	79.3	86.5
Reaches for a familiar person	28.6	25.6	25.1	42.3†	30.1	22.4	40.8†	40.9	25.1†
Plays with a toy	86.7	87.5	87.5	83.5	87.6	87.6	84.6	90.7	86.8
Plays interactive games	47.4	42.9	46.1	32.0†*	44.5	44.9	45.0	42.3	45.1

† p < 0.05.

1. Mothers whose score on the depression scale ranks above the 90th percentile, that is, among the 10% with the highest scores, are considered to present a high degree of depression.
2. For social skills, the percentages represent infants who engage in this usually rather than sometimes or never.

* Coefficient of variation between 15% and 25%; interpret with caution.

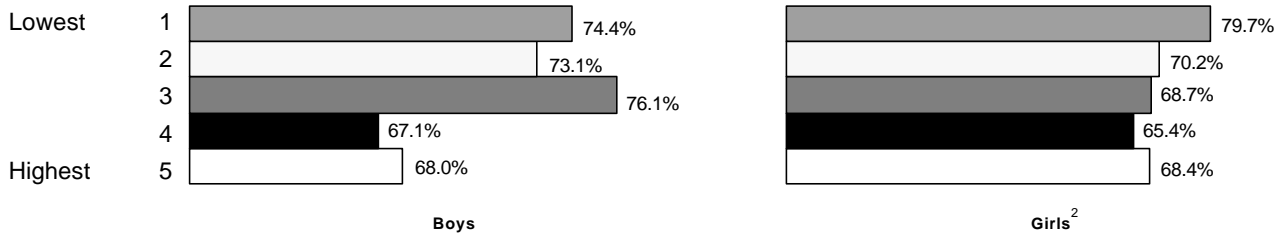
** Coefficient of variation higher than 25%; imprecise estimate for descriptive purposes only.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Figure 3.1
Proportion of Infants Manifesting Certain Motor Skills, by Family's Socioeconomic Status and by Gender, 1998

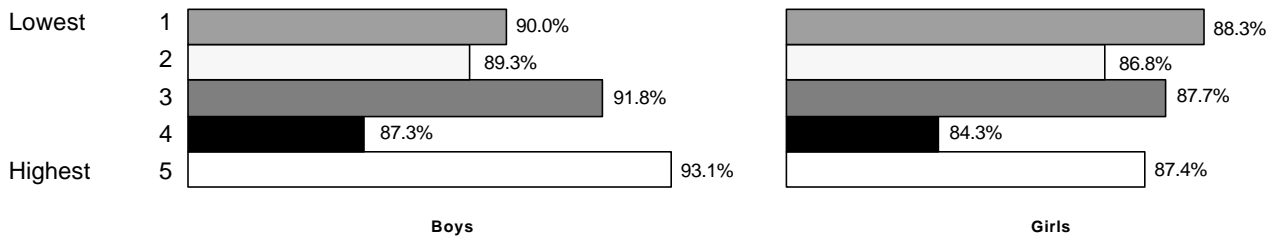
Rolls over without help

Quintile of socioeconomic status¹



Supports his/her weight

Quintile of socioeconomic status¹



Looks for a missing object

Quintile of socioeconomic status¹

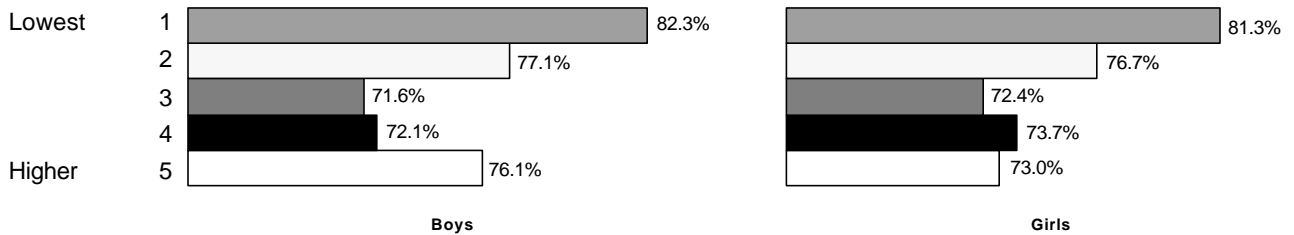
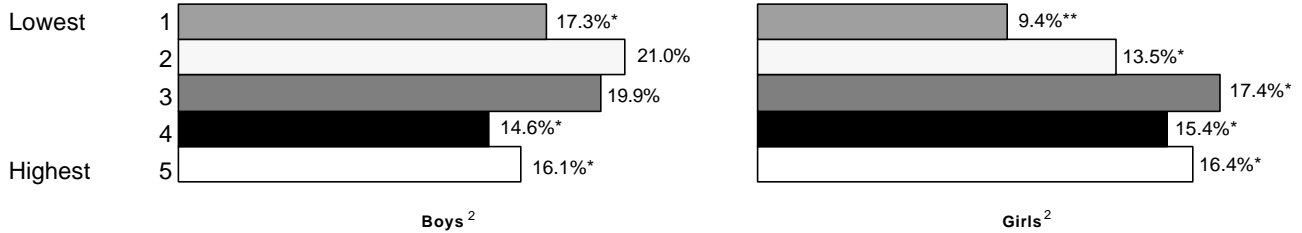


Figure 3.1 (cont'd)
Proportion of Infants Manifesting Certain Motor Skills, by Family's Socioeconomic Status and by Gender, 1998

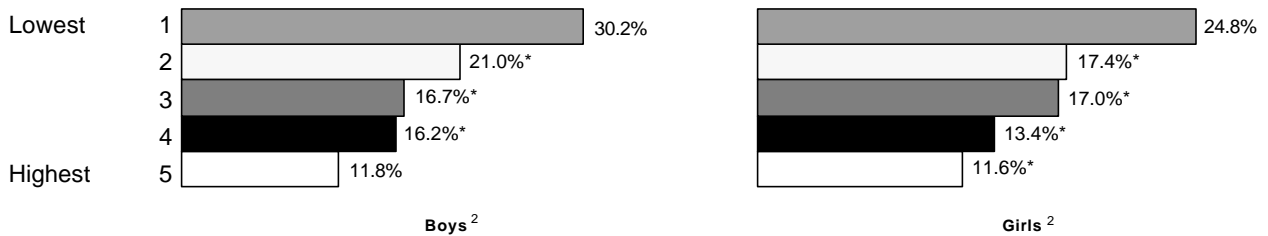
Sits up without help

Quintile of socioeconomic status¹



Crawls

Quintile of socioeconomic status¹



1. The families are classified by increasing rank of socioeconomic status. Thus, the 1st quintile comprises the 20% of families with the lowest socioeconomic status.

2. $p < 0.05$.

* Coefficient of variation between 15% and 25%; interpret with caution.

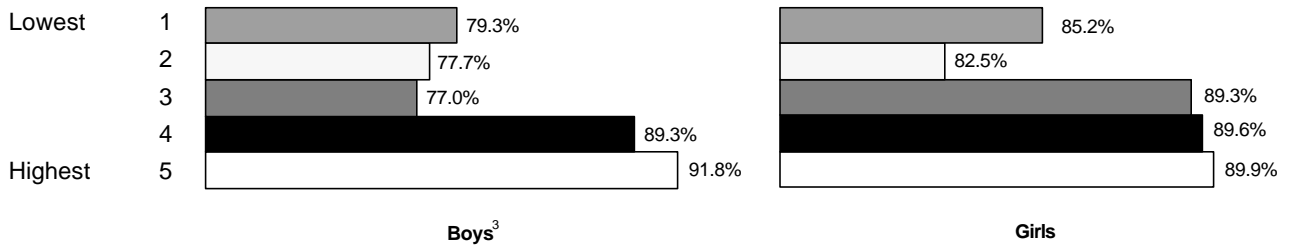
** Coefficient of variation higher than 25%; imprecise estimate for descriptive purposes only.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Figure 3.2
Proportion of Infants Usually¹ Manifesting Certain Social Skills, by Family's Socioeconomic Status and by Gender, 1998

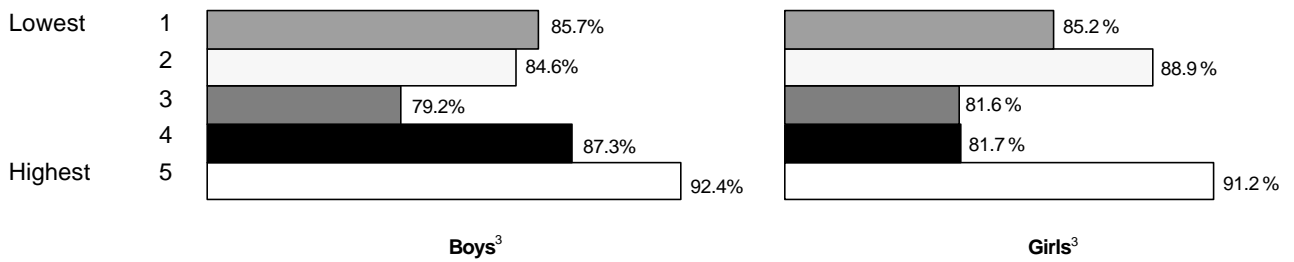
Shows interest in novel objects / new people

Quintile of socioeconomic status²



Shows affection for familiar people

Quintile of socioeconomic status²



Reaches for a familiar person

Quintile of socioeconomic status²

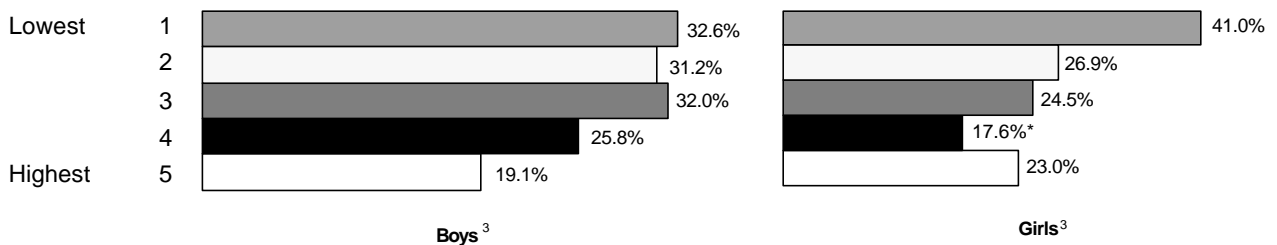
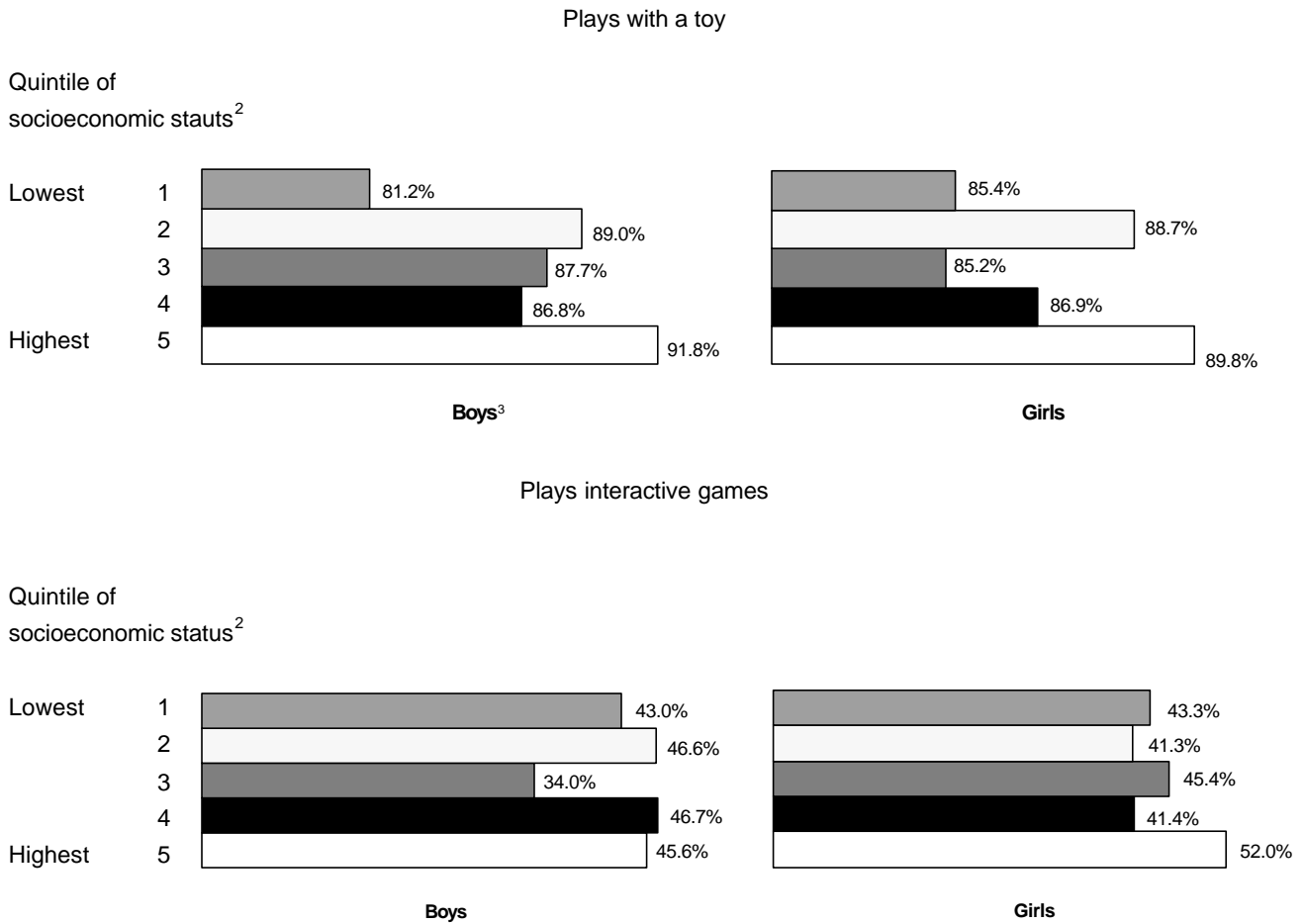


Figure 3.2
Proportion of Infants Usually¹ Manifesting Certain Social Skills, by Family's Socioeconomic Status and by Gender, 1998



1. As opposed to sometimes or never.

2. The families are classified by increasing socioeconomic status. Thus, the 1st quintile regroups the 20% of families with the lowest socioeconomic status.

3. $p < 0,05$

Source: Institut de la statistique du Québec, ÉLDEQ 1998-2002.

For example, with respect to the link between the socioeconomic status of the family and motor development in the infant, the activity rolling over by him/herself in girls and crawling in infants of both sexes appears to be significantly linked to the socioeconomic status of the family. In each case, the proportion of infants who had already manifested the behaviour decreases in relation to an increase in socioeconomic status (Figure 3.1). With respect to the skill crawling, the proportions fall from 30% to 12% in boys and from 25% to 12% in girls when passing from the lowest to the highest quintile. Compared to other PMKs, those reporting low socioeconomic status are also most likely to report that the infant, whether a boy or a girl, usually reaches for a familiar person (Figure 3.2).

The examination of some more typically social skills reveals, however, an entirely different picture. As seen in Figure 3.2, the following social behaviours are more often reported in families with higher socioeconomic status: "shows interest in novel objects or new persons" (in boys only), "shows affection toward familiar people" (in infants of both sexes) or "plays with a toy" (in boys only). With respect to playing, the demarcation falls between the lowest quintile and the other quintiles (81% vs. nearly 90% in boys in quintiles 2 to 5) (Figure 3.2).

An analysis of the links between motor and social skills and the other characteristics of the family environment such as the mother's age, her degree of depression¹⁷ or the type of family generally reveals the same tendencies, that is, a positive link between these risk factors and the prevalence of some motor behaviours, varying according to the sex of the child (Tables 3.5 and 3.6). In contrast, for some more typically social skills (excluding the skill "reaches for a familiar person"), the links seem to be negative, at least in the girls. For example, proportionally more girls living in a

two-parent family usually show interest in novel objects or new people (88% vs. 75%) or usually play simple interactive games such as imitating a sound, noise or gesture compared to girls living in a single-parent family (46% vs. 32%). However, these associations were not observed among the boys (Table 3.6).

Furthermore, in addition to the characteristics already considered, the birth rank of the child is a central aspect of family environment likely to influence the child's development.

The data for ÉLDEQ 1998 reveal that proportionally more girls than boys who are the only child (without brothers or sisters living in the household) had, according to the PMK, carried out skills such as supporting their own weight with legs stretched out or sitting alone (90% vs. 85% and 18% vs. 12%). In boys, although the result does not seem significant, a similar trend is observed between the skill "supports own weight with legs stretched out" and birth rank in the family (92% vs. 89%; $p = 0.06$). Interestingly, with respect to social skills, the number of children in the family seems to have an impact only among the boys. Boys who are the only child are more inclined to show interest in novel objects or new people (87% vs. 79%) or to reach for a familiar person (33% vs. 26%) than their counterparts living with brothers or sisters.

Finally, several parental characteristics seem to be associated with the responses given to the ten questions on the motor and social development of the infant. Thus, the motor skills and social behaviours varied according to certain sociodemographic or parental characteristics such as the age of the mother, socioeconomic status of the family, type of family, birth rank of the child and degree of depression of the mother. Generally, the associations varied from one item to the next and by the sex of the infant in such a way that it is difficult to come up with a clear, overall picture of the factors associated with motor and social development. This may indicate that the acquisition of some motor or social skills is the result of complex

17. For the analysis, mothers who reported a high degree of depression are those whose scores on the depression scale used for ÉLDEQ were above the 90th percentile.

interactions between the family environment and the sex of the child. To support this hypothesis, it would be necessary to carry out further analysis of the ÉLDEQ data; for example, to model the link between the skills and the explanatory variables to take into account gender and the potential interaction of gender and these variables.

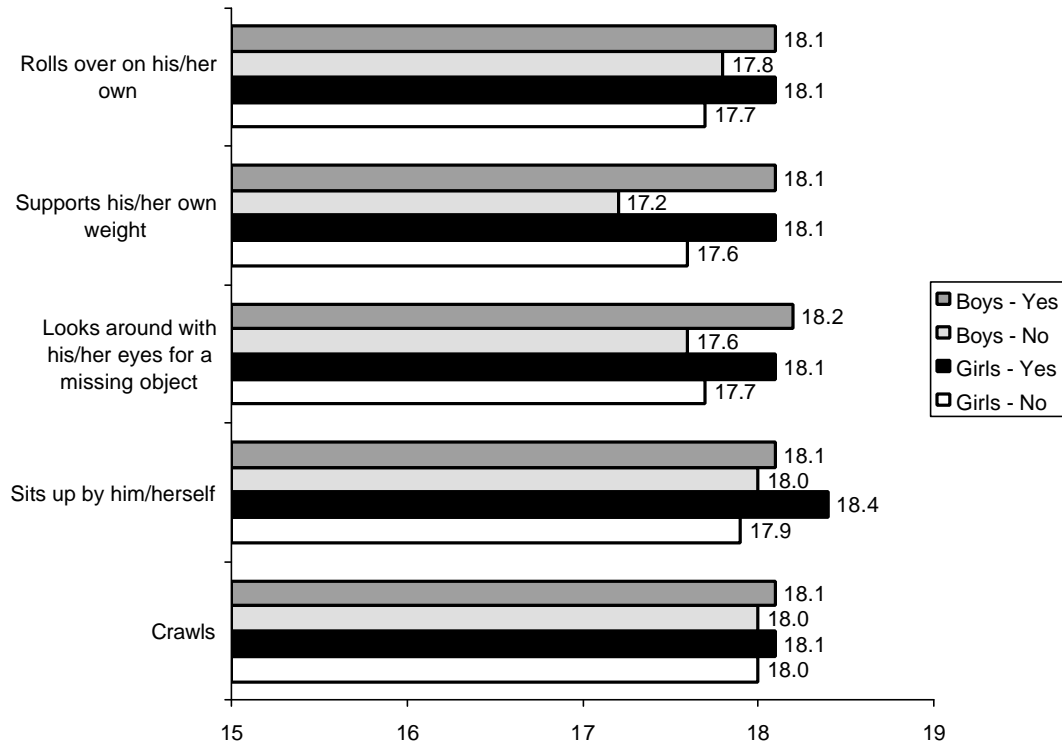
Furthermore, the results might explain the effect of other characteristics such as the type of relationship between the parent and child and, more precisely, the level of stimulation accorded to the infant, based on whether it is a boy or a girl. The data assembled for ÉLDEQ 1998 provide a means to explore this question, as shown in the second part of this paper.

3.2.2 Parenting Practices and Motor and Social Development in Infants

When we examine the link between motor and social development in babies and the quality of the parent-child relationship, the picture becomes clearer. Thus, the frequency of positive interactions between the PMK — the biological mother in virtually all cases — and the child, such as praising the infant and playing or talking to and laughing with him/her, is positively associated with the performance of most of the motor and social skills examined in this survey. As Figures 3.3 and 3.4 show, the mean of the scale on positive parenting practices is generally highest for the infants who had already carried out the skills in question than for the others, in girls as well as in boys.¹⁸

18. The data for several of the ÉLDEQ scales did not show a normal distribution. Here and in the remainder of Part I, when mean comparison tests were applied, chi-square tests were done to confirm the results. These categorized the variables related to the scales into three relatively equal categories (tertiles). The analyses confirm the trends observed by comparing the means. Furthermore, the level of significance observed in the mean comparison tests was close to that obtained in the chi-square tests.

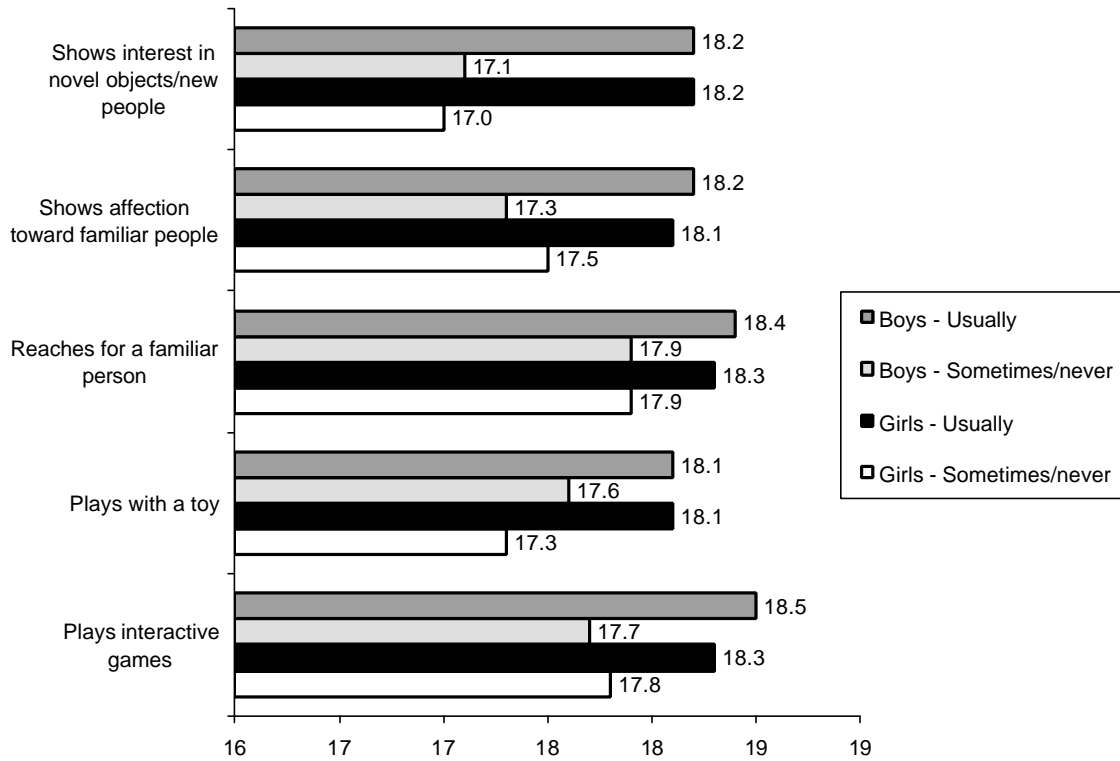
Figure 3.3
Mean Scores Obtained from the PMK on the Scale of Positive Parenting Practices, by Infant's Manifestation of Certain Motor Skills and Gender, 1998¹



1. For each sex and each skill retained, the mean scores on the scale of positive parenting practices were compared. All the results here presented are significant at the threshold of 0.05, except the skill "support own weight with legs stretched out" in girls and "sits up" in boys and "crawls" in both sexes.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Figure 3.4
Mean Scores Obtained from the PMK on the Positive Parenting Practices Scale, by Infant's Manifestation of Certain Social Skills and by Gender, 1998¹



1. For each sex and each skill, the mean scores on the scale of positive parenting practices were compared. All the results presented here are significant at the threshold of 0.05.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

We wanted to know if there was a relationship between the mother's perception of the physical attractions of her child and its cognitive abilities — one dimension of the *Échelle de cognitions et de conduites parentales à l'égard du nourrisson* (ÉCOPAN) (Scale of Parental Perceptions and Behaviours Regarding the Infant) developed for ÉLDEQ (Boivin *et al.*, 1997) and the motor and social skills that were examined. Unlike the measurements for social and motor development, the assessment by the mother of the physical attractions and cognitive abilities of the infant was conducted using a self-administered questionnaire. The responses are thus less likely to be affected by the bias of social desirability than the responses obtained during the face-to-face interviews. The perception of the parent is evaluated using the following questions: "I get the impression that my baby is particularly intelligent compared to other children his/her age", "I get the impression that my baby is particularly cute compared to other children his/her age". Two similarly formulated questions, on the child's level of curiosity and whether she/he has an endearing nature, complete the scale.

Based on the data for ÉLDEQ 1998, the mother's perception of the physical attractions and cognitive abilities of her child is positively associated with the level of perceived motor and social development. In general, girl babies who had already demonstrated or who usually demonstrate the examined motor and social skills are perceived more favourably by their mothers with respect to physical attractions and cognitive abilities than those who have not yet shown these behaviours or do so less frequently. The exceptions have to do with the motor skill of crawling as well as some social behaviours (specifically, "plays with a toy alone or with others", "plays simple interactive games" or "shows affection toward familiar people"). In boys, significant differences are observed in the qualities attributed to the infant by the mother and the presence or absence of certain social behaviours (e.g., "shows interest in novel objects or new people", "shows affection toward familiar people" or "plays simple interactive games"). Note that, unlike in the girls, this

relationship is observed only for one of the motor behaviours ("looks around for an object that is missing or not nearby") (for which the data are not presented).¹⁹

Finally, the demonstration of some skills seems to be linked to processes observed by the interviewers during their visits. For example, showing an interest in novel objects and new people in boys is associated with the infant's level of stimulation as observed by the interviewer. As Figure 3.5 shows, boys who usually demonstrate this behaviour seem to have been slightly more stimulated than the other boys (mean = 14.4 vs. 13.4).

Figure 3.5
Mean Scores Obtained by the PMK on the Infant Stimulation Scale, by Infant Having Shown Interest in Novel Objects and New People and by Gender, 1998



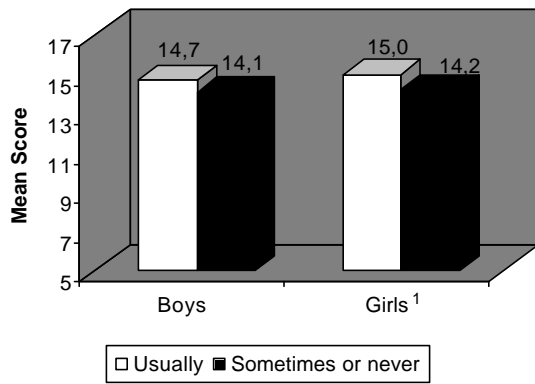
1. $p < 0,05$

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

19. The data for several of the ÉLDEQ scales did not show a normal distribution. Here and in the remainder of Part I, when mean comparison tests were applied, chi-square tests were done to confirm the results. These categorized the variables related to the scales into three relatively equal categories (tertile). The analyses confirm the trends observed by comparing the means. Furthermore, the level of significance observed in the mean comparison tests was close to that obtained in the chi-square tests.)

Reaching for a familiar person is, on the other hand, a behaviour that may be associated with the level of stimulation in girl babies. Thus, a higher degree of stimulation is observed in girls who usually display this social behaviour than in girls who do so sometimes or never (mean = 15.0 vs. 14.2; see Figure 3.6). A similar trend is observed in boys, but the results do not appear significant at the threshold of 0.05 ($p = 0.10$). Finally, note that girls who sit up without help also seem to have been somewhat more stimulated (mean = 15.2 vs. 14.3, $p = 0.05$; data are not presented).

Figure 3.6
Mean Scores Obtained by the PMK on the Infant Stimulation Scale, by Infant Having Reached for a Familiar Person and by Gender, 1998



1. $p < 0,05$

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Conclusion

What conclusion may be drawn from these results? First, they suggest that a very large majority of children in Québec are developing well because the children exhibit the motor and social skills expected of an infant of approximately 5 months of age. The evaluation of the child's skills was not, however, based on an examination by an expert in child development but rather on parental perception. The latter may have been influenced by a number of factors, including age, socioeconomic status, family situation and the parents' level of psychological well-being.

In our analyses, some of these characteristics are associated with the evaluation by the parent of the child's motor and social development. Our results suggest, for example, that younger parents, living without a spouse, in the lowest socioeconomic bracket and exhibiting a higher degree of depression report more often than other parents the presence of certain skills in their children. These results seem counter-intuitive given that these risk factors increase the probability of developmental delays in children. It appears that factors linked to the parents themselves colour their perception of the accomplishments of their child.

Analyses of data from the National Longitudinal Study of Children and Youth (NLSCY), conducted by Statistics Canada, have revealed a similar link between parental risk factors and parental evaluation of the motor and social development of their children 0 to 3 years of age (Landy & Tam, 1996). Since the questions on the motor and social development of the child are among those directed to the PMK, the most vulnerable parents are perhaps more likely to give responses that they believe are socially acceptable.

Motor and social skills are nonetheless linked in different ways to the sociodemographic characteristics of parents. More precisely, compared to other parents, single parents and those with low socioeconomic status and those displaying depressive tendencies are more likely

to report certain motor skills, whereas certain social skills are more often present in infants in two-parent families or those at the highest socioeconomic level. These associations may be interpreted in two ways. First, parents whose living conditions make them vulnerable may be more likely to perceive their child's motor skills than their social skills, whereas the opposite holds true for parents in the highest socioeconomic level. Nevertheless, it seems that motor and social development in children is also a reflection of certain dimensions of the relationship between the parent and the child. Parents at risk may engage, in particular, in physical interactions with their child whereas parents in higher socioeconomic levels may engage more in social interactions with the child (Hoff-Ginsberg & Tardif, 1995).

It is interesting to note that infants from single-child homes are proportionally more likely to display certain social or motor skills than infants with brothers or sisters. It may be that parents of only children are more inclined to perceive certain behaviours in their infant than those who must divide their attention among several children. The result may also reflect the fact that only children receive more stimulation from their parents or, more precisely, are more likely to seek stimulation from them, given that they have fewer chances to interact with other children in their daily lives (Eaton *et al.*, 1989).

Recall, moreover, that for numerous items the relationship between the variables and the motor or social skills varies according to the sex of the child. This finding merits greater attention; it may indicate that the differences in the acquisition of motor or social skills are the result of interactions between certain characteristics of the child or its family environment and its gender. To support this hypothesis, further analysis of the data collected on the 5-month-old infants is required.

For the time being, the associations between the sociodemographic characteristics of parents and the motor and social skills of infants, taken together with the weak internal consistency of the scales used in ÉLDEQ, prompt us to ask the following questions: Are the queries addressed to the PMK appropriate, given the age of the children? Is this method of data collection, that is, by means of face-to-face interviews with a parent, adequate for evaluating motor and social development in the infant? An examination by a third party may be required to obtain a more objective profile of the child's motor and social growth and, therefore, a more reliable means of detecting a potential delay in his or her development.

The initial results of research on the relationship between the quality of the parent-child interaction and the child's development nonetheless confirm the findings of previous studies (Eisenberg, 1999; Landy & Tam, 1996; Tamis-Lemonda *et al.*, 1998; Yarrow *et al.*, 1982). Thus, in boys as well as in girls, the manifestation at about 5 months of age of some social behaviours and, to a lesser extent, some motor behaviours is associated with the frequency of positive interactions between the mother and the child. These interactions include praising, talking to, playing or laughing with or taking part in a special activity with the child. The degree of stimulation of the child by the mother, as observed by the interviewer, also seems to be associated with the absence or presence of certain motor or social skills in children.

Because the data collected for ÉLDEQ 1998 are cross-sectional, no causal link may be drawn between parenting practices and motor and social development in children. It may be that an environment that provides a high degree of stimulation and attention to children accelerates their development, but it is also possible that children who are more alert and sociable solicit more positive behaviours towards themselves from others than do those who interact less with their environment. Sylva (1997) has suggested that human beings are born with an innate predisposition ("hard wiring") that makes babies pay attention to certain things in their

environment, in particular, messages directed to them by their caregivers. Thus the nature of these messages can shape the development of the innate abilities of the child with respect to motor, cognitive, social and language skills. The longitudinal data for ÉLDEQ will enable us to examine in greater depth the role of parental practices in the developmental pathway of children, from birth through to school entry.

Motor, Social and Cognitive Development

Section II Cognitive Development



Introduction

According to many specialists in the field, cognitive development in children progresses through a number of stages. Between the ages of 0 and 18 months, six stages constitute what is called the sensory-motor period of cognitive development (Piaget, 1936, 1937).

Table 1
Relationship between the Six Stages of the Sensory-Motor Period of Cognitive Development and Mental-Attentional Capacity in Children

Mental-Attentional Capacity	Stage	Approximate Age in Months
0	Reflex acts	0-1
1	Primary circular reactions and begins to develop skills.	1-4
2	Secondary circular reactions and repeats actions that by chance produce interesting results.	4-8
3	Secondary circular reactions and applies acquired skills to new situations.	8-12
4	Tertiary circular reactions and seeks to acquire new skills through active experimentation.	12-18
5	Invents new skills by interiorizing combinations of them.	18-26

Source: Piaget (1936, 1937).

The passage from one stage to the next may be due, at least in part, to the growth of the mental-attentional capacity of the child with age. Mental-attentional capacity is defined as the number of units of information or schemes a child can simultaneously coordinate in a single action directed towards a goal. (Alp, 1988, 1994; Benson, 1989; Pascual-Leone & Johnson, 1991). Table 1 illustrates the relationship between the six stages of the sensory-motor period and the mental-attentional capacity of children. For example, a child progresses to the third stage when he is able to coordinate two schemes. A typical achievement in this period, which appears around the age of five months, is the ability to visually track an object, reach for it and grasp it in the field of vision. Studies conducted over 30 years ago demonstrate that the exercise of the schemes of visual tracking and grasping can considerably accelerate the acquisition of the vision-grasping super-

scheme (White, 1967, 1971; White, Castle & Held, 1964; White & Held, 1966). Thus, infant experience may play a determining role in cognitive development in the first year of life.

A possible indicator of the quality of experience provided by the environment is the socioeconomic status of the family²⁰. Some studies show a link between family socioeconomic status and infant cognitive development in the first year of life, while others have not observed this (for a literature review (see Golden & Birns, 1983; Slater, 1995). This divergence in results may be explained by a number of factors. According to the model developed by Wachs (Haywood & Wachs, 1981; Wachs & Gruen, 1982) on the role of experience in cognitive development, at least four factors can explain the divergence.

First, family socioeconomic status is a variable with many aspects – ages and educational levels of the mother and father, family income, number of children, etc. It is possible that one of these could have an impact on the cognitive development of the child in the first year, and another might not.

Second, cognitive development in the first year of life is a complex phenomenon that covers various domains such as spatial-temporal and logical-mathematical. It is possible that one of these may be affected by family socioeconomic status and another not. In this regard, mental-attentional capacity defined as the ability to coordinate a number of schemes in one action directed

20. Please note that the authors of this section use “socioeconomic status of the family” to designate a possible indicator of the quality of experience provided by the environment. This indicator is different from the derivative variable “socioeconomic status” developed by *Santé Québec* and used in the majority of analytical papers in Volume 1 of the ÉLDEQ 1998-2002 series. This derivative variable is called **ainfd08** in ÉLDEQ’s databank.

towards a goal is considered to be independent of these domains, because the number is not supposed to be dependent on the type of scheme – spatial-temporal, logical-mathematical, etc.

Third, the possible influence of family socioeconomic status on infant cognitive development in the first year of life may depend on characteristics of the child. For example, there could be an association with boys, but not with girls.

Fourth, an influence could vary with the age of the child. An association may be present at a given age, while it may not be at a younger or an older age.

Furthermore, another factor could explain, at least in part, the aforementioned seemingly contradictory results. None of the above studies examined a representative sample of the target population. Therefore, they may have produced biased estimates of the relationship between family socioeconomic status and cognitive development in the first year of life. All these factors could explain, at least in part, why there is absence of consensus in the scientific community on this question.

The main objective of this study was to assess mental-attentional capacity of 5-month-old infants. Do infants at 5 months of age in the population differ in terms of the rate of growth of their mental-attentional capacity? If so, is there a link between certain characteristics of the socioeconomic status of the family and the rate of growth of mental-attentional capacity during the first 5 months of life?

1. Testing Infant Mental-Attentional Capacity: The One, Two, Three Hands Task and Socioeconomic Status of the Family

In the 1998 cycle of the ÉLDEQ survey, the mental-attentional capacity of 5-month-old infants was assessed using the One, Two, Three Hands Task. It comprises two eliciting situations adapted from Uzgiris and Hunt (1989). In the first situation, called “facilitating,” the infant has to grasp a plastic ring presented to him/her in front of the nose or mouth. In the second situation, called “misleading,” the infant has to grasp a small object (i.e. a plastic farm animal), after a ring had been placed in each of his/her hands. Both of these situations require coordinating the visual tracking and grasping schemes in order to grab an object in their field of vision.²¹ In addition, the misleading situation requires prior inhibition of the grasping scheme to one or the other or both rings.

Administering the task always begins with the facilitating situation. Each situation comprises three trials. The procedures of administering the One, Two, Three Hands Task are described in detail in the Appendix.

A number of socioeconomic characteristics of the family were analyzed in this study: (a) mother’s age at the time of the survey (i.e., under 20, 20-24, 25-29, 30-34 or 35 years of age and over); (b) father’s age (i.e., under 25, 25-29, 30-34, 35-39 or 40 years of age and over); (c) and (d) educational level of the mother and father (i.e., no high school diploma, high school diploma, partial high school, vocational/technical school diploma,

CEGEP (junior college) diploma or university degree); (e) type of family (i.e., intact two-parent, stepfamily or single-parent); (f) income level (i.e., above or below the low-income cut-off);²² (g) number of brothers and sisters usually living in the household, including step brothers or sisters (i.e., 0, 1, 2 or 3 and more); (h) mother’s immigrant status (i.e., non-immigrant, immigrant of European origin or immigrant of non-European origin);²³ (i) mother’s age at the birth of her firstborn (i.e., under 21 years of age or not).

21. The schemes of visual tracking and grasping are considered to be in the repertory of schemes of 5-month-old infants, except perhaps in those who have particular disabling diseases such as cerebral palsy. Children with serious disabilities were excluded from the study. However, 9% of ÉLDEQ children had a chronic health condition diagnosed by a doctor at about five months of age such as allergies, kidney or heart problems, epilepsy, etc. (see no. 3 in this series).

22. In this study, income sufficiency status is based on the low income cut-off for a given size of household and region of residence as defined by Statistics Canada (see numbers 2 and 12 in this series of analytical papers).

23. In this study, immigrant status of the father was not analyzed.

2. Statistical Models Used to Account for the 5-Month-Old Infants' Behaviours in the One, Two, Three Hands Task

Latent Class Analysis (LCA) (Lazarsfeld & Henry, 1968) was the main statistical method used in this study. For each situation in the One, Two, Three Hands Task, there were 3 trials with 5 response options for each. Therefore, *a priori*, there were 125 (5^3) categories (i.e., latent classes) of infants for each of the two situations. The main objective of latent class analysis was to identify a limited number of categories of 5-month-old infants from the data collected from the Task's six trials. By definition, infants belonging to the same category will all present the same ability to coordinate visual tracking and grasping. Infants in two different categories will differ as to this same ability. The three LCA models used to analyze infants' behaviours in the Task are presented in the Appendix. The Appendix also contains a brief description of the three statistical models used to examine the possible link between each characteristic of family socioeconomic status and the rate of growth of infant mental-attentional capacity. It also contains technical details on the estimation of the parameters of these statistical models and an assessment of their fit with the data collected in the survey.

3. Results

3.1 Mental-Attentional Capacity of 5-Month-Old Infants in the Population

Among the 2,120 infants who participated in the One, Two, Three Hands Task, 1,851 (87.3%), that is 946 boys and 905 girls, completed the three trials for each of the two situations.²⁴ The results presented in this paper were obtained from the data on these 1,851 babies. They were specially weighted for the Task so that they could be generalized to the Québec population of infants approximately 5 months of age.

Did these infants differ in terms of the rate of growth of their mental-attentional capacity? The results showed that indeed there was a differential, and that the observed differences were not associated with the sex of the infants. The results obtained from the three latent class models are shown in the Appendix. They reveal that the infants belonged to five different categories for both situations, those who: (a) look at the object but do not try to reach for it; (b) try to reach for it but neither touch nor grasp it; (c) touch the object but do not grasp it; (d) grasp it without having previously opened their hand(s); and, (e) grasp it having previously opened their hand(s). Five-month-old infants in the fourth or fifth categories were able to coordinate the schemes of visual tracking and grasping. Infants in the third category were able only in part, whereas those in the first and second were not. Figures A.1 to A.6 in the appendix present the cumulative probabilities of demonstrating a behaviour of a given level of complexity or lower in light of membership in a given category for each of the six trials in the One, Two, Three Hands Task.

Table 3.1 shows the distribution of category membership for the facilitating situation: 56.2% of 5-month-old infants coordinated the visual tracking and grasping schemes to grab an object in their field of vision (i.e., categories 4 and 5); 10.0% coordinated these two schemes in part (i.e., category 3); and 33.8% (i.e., categories 1 and 2) did not demonstrate coordination of these two schemes.

However, we can gain a better understanding of the infants' capacity to coordinate the two schemes by simultaneously examining their performance in both the facilitating situation and the misleading one. Table 3.2 shows the joint conditional distribution of category membership for the misleading situation by given category membership for the facilitating one.

Table 3.1
Distribution of Category Membership in the Facilitating Situation, 1998

Category	Description	Estimated Percentage
1	Looks at the object but does not try to reach for it	25.5
2	Tries to reach for the object but neither touches nor grasps it	8.3
3	Touches the object but does not grasp it	10.0
4	Grasps the object without having previously opened the hand(s)	9.7
5	Grasps the object having previously opened the hand(s)	46.4

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

24. For more details, see no. 1 in this series of papers.

It was observed that only 51.0% of 5-month-old infants in the fifth category for the facilitating situation were in this same category for the misleading one (see Table 3.2). Table 3.2 also shows, in parentheses, the joint non-conditional distribution of category membership for both situations. The findings were as follows: 23.5% of infants belonged to the fifth category in both situations (see Table 3.2); 61.9% coordinated the two schemes (i.e., categories 4 and 5), in at least one of the two situations (percentages identified by the letter "a"), that is 20.6% in the facilitating situation only, 5.7% in the misleading

situation only, and 35.6% in both situations. It was found that 10.8% of infants 5 months of age coordinated, in part, the visual tracking and the grasping schemes (i.e., category 3) in at least one of the two situations (percentages indicated by the letter "b"); namely, 5.4% in the facilitating situation only, 2.6% in the misleading situation only, and 2.7% in both situations. Finally, 27.3% did not coordinate the two schemes (i.e., categories 1 and 2) in either situation (percentages indicated by the letter "c").

Table 3.2
Joint Conditional Distribution of Category Membership in the Misleading Situation Given Category Membership in the Facilitating Situation, 1998

Category Membership in the Facilitating Situation	Category Membership in the Misleading Situation				
	Looks at the object but does not try to reach for it (1)	Tries to reach for the object but neither touches nor grasps it (2)	Touches the object but does not grasp it (3)	Grasps the object without having previously opened the hand(s) (4)	Grasps the object having previously opened the hand(s) (5)
1. Looks at the object but does not try to reach for it	0.79 (20.1) ^c	0.09 (2.3) ^c	0.03 (0.8) ^b	0.03 (0.7) ^a	0.07 (1.7) ^a
2. Tries to reach for the object but neither touches nor grasps it	0.43 (3.6) ^c	0.16 (1.4) ^c	0.22 (1.8) ^b	0.10 (0.8) ^a	0.09 (0.7) ^a
3. Touches the object but does not grasp it	0.33 (3.3) ^b	0.21 (2.1) ^b	0.27 (2.7) ^b	0.07 (0.7) ^a	0.11 (1.1) ^a
4. Grasps the object without having previously opened the hand(s)	0.33 (3.2) ^a	0.06 (0.6) ^a	0.17 (1.6) ^a	0.33 (3.2) ^a	0.11 (1.1) ^a
5. Grasps the object having previously opened the hand(s)	0.18 (8.2) ^a	0.04 (1.9) ^a	0.11 (5.1) ^a	0.17 (7.8) ^a	0.51 (23.5) ^a

Note : The joint non-conditional distribution of category membership for the two situations are indicated in parentheses.

- a. Infants who coordinated the schemes of visual tracking and to grab an object in the field of vision.
- b. Infants who coordinated in part the schemes of visual tracking and to grab an object in the field of vision.
- c. Infants who did not coordinate the schemes of visual tracking and to grab an object in the field of vision.

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

3.2 Links Between Socioeconomic Characteristics and the Growth Rate of Mental-Attentional Capacity in 5-month-old Infants

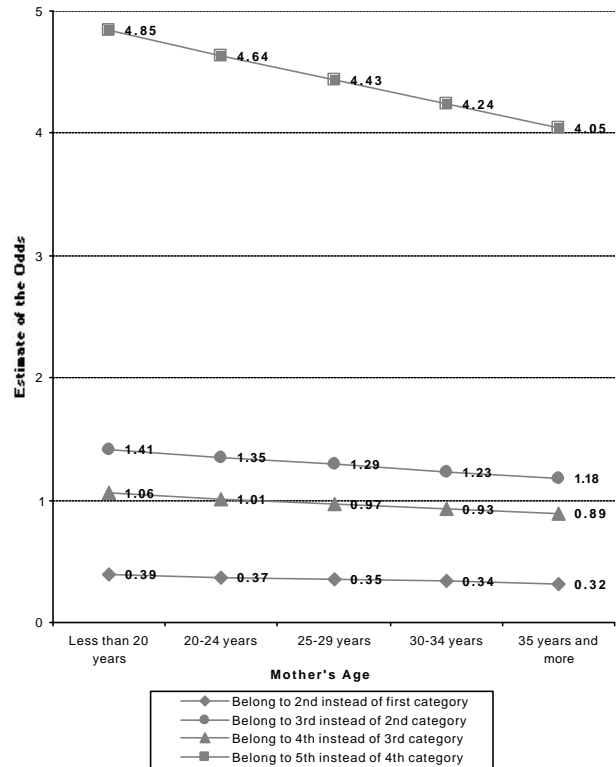
Are there links between certain family socioeconomic characteristics and the growth rate of mental-attentional capacity during the first 5 months of life? The results did not show a link between mental-attentional capacity and the following: mother's and father's educational levels, type of family, and mother's age at the birth of her firstborn.

However, the results showed that mother's and father's ages, household income sufficiency status, number of brothers and sisters, and mother's immigrant status were associated with the rate of growth of mental-attentional capacity in the Québec population of 5-month-old infants. Furthermore, the results showed that these associations did not differ for boys and girls except for income sufficiency in the misleading situation. The results of the three statistical models used to estimate the possible effect of each family socioeconomic characteristics on mental-attentional capacity in 5-month-old infants are shown in the Appendix (Tables A.1 to A.9). What follows are details on the statistically significant associations.

3.2.1 Association Between Mother's Age and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants in the Québec Population

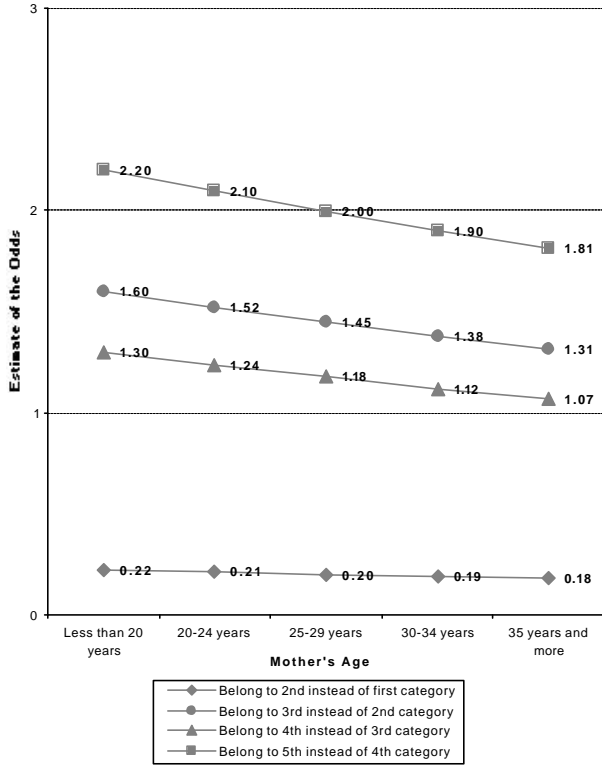
Five-month-old infants with younger mothers were more likely to coordinate the schemes of visual tracking and to grab an object in their field of vision. Figures 3.1a and 3.1b show the estimates of the odds of being in a given category rather than in the next lower one given the age of the mother for the facilitating and misleading situation respectively. For example, for the facilitating situation, infants whose mothers were under 20 years of age were 4.6 times more likely (5.0 for the misleading situation) to be in the fifth rather than the fourth category, compared to those whose mothers were between 20 and 24 years of age.

Figure 3.1a
Odds of Being in a Given Category Rather Than the Next Lower One Given Mother's Age for the Facilitating Situation, 1998



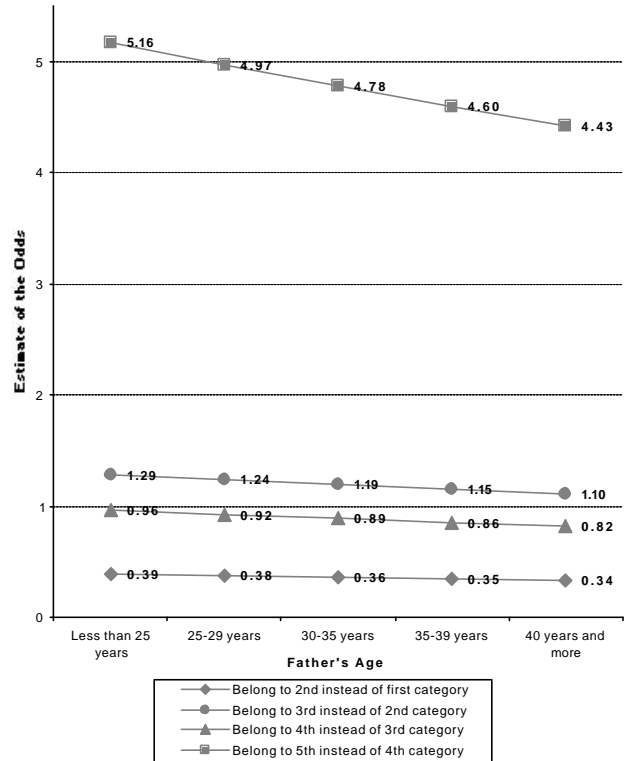
Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Figure 3.1b
Odds of Being in a Given Category Rather Than the Next Lower One Given Mother's Age for the Misleading Situation, 1998



Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Figure 3.2a
Odds of Being in a Given Category Rather Than the Next Lower One Given Father's Age for the Facilitating Situation, 1998

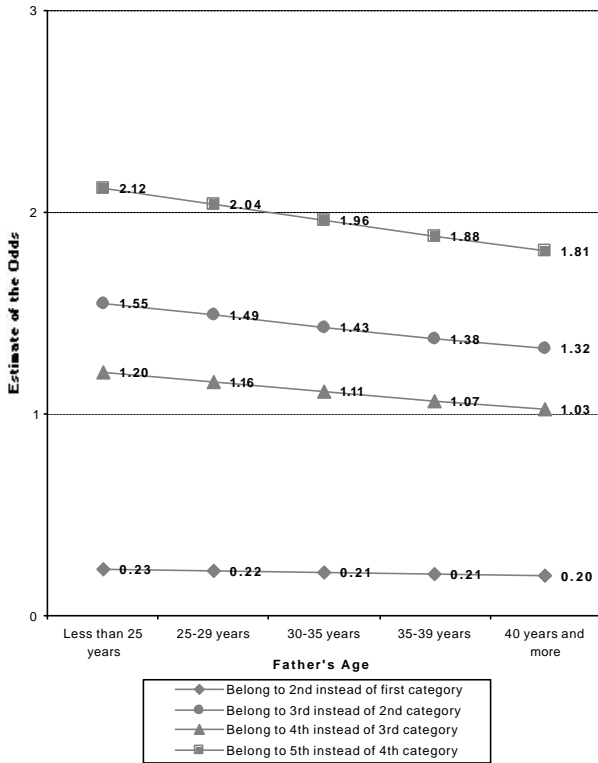


Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

3.2.2 Association Between Father's Age and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

Five-month-old infants with younger fathers were more likely to coordinate the schemes of visual tracking and to grab an object in their field of vision. Figures 3.2a and 3.2b show the estimates of the odds of being in a given category rather than the next lower one, given the age of the father for the facilitating and misleading situation respectively. For example, for the facilitating situation, infants whose fathers were under 25 years of age were 3.9 times more likely (4.1 for the misleading situation) to be in the fifth rather than the fourth category, compared to those whose fathers were between 25 and 29 years of age.

Figure 3.2b
Odds of Being in a Given Category Rather Than the Next Lower One Given Father's Age for the Misleading Situation, 1998



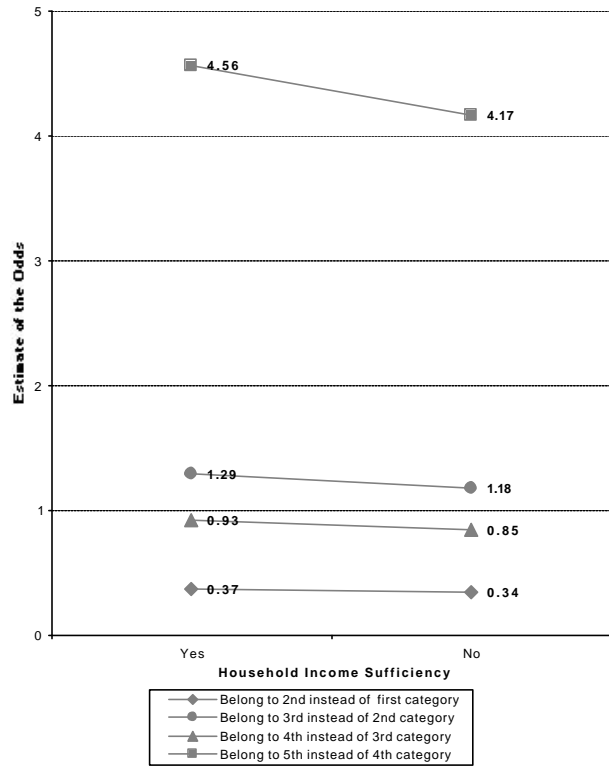
Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

3.2.3 Association Between Household Income Sufficiency Status and the Growth Rate of Mental-Attentional Capacity in 5-month-old Infants

Five-month-old infants in households with income below the low income cut off were less likely to coordinate the schemes of visual tracking and to grab an object in their field of vision. Figure 3.3a shows the estimates of the odds, for the facilitating situation, of being in a given category rather than the next lower one, given income sufficiency status. Infants whose family income was below the low income cut off were 9.3 times less likely to be in the fifth rather than the fourth category compared to those whose family income was above the cut off. Figure 3.3b shows the odds, for the misleading situation, of being in given category rather than the next lower

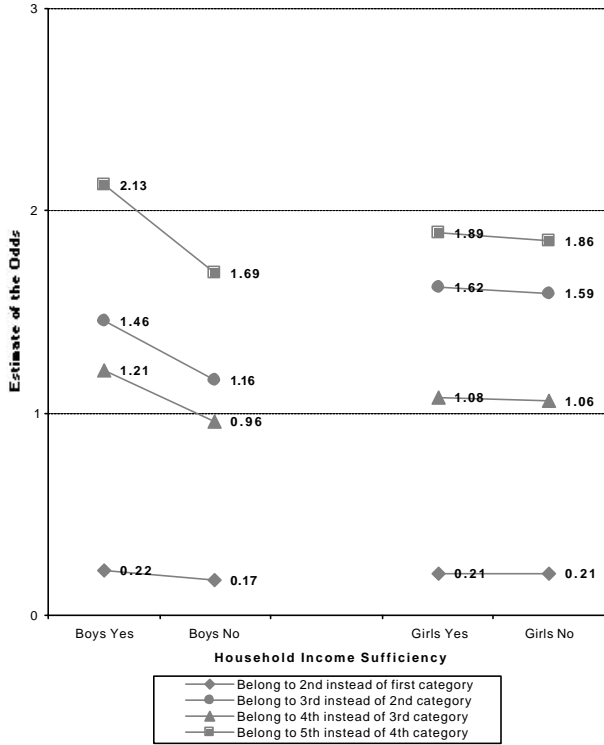
one, given household income sufficiency status. Five-month-old boys in the population whose family income was below the low-income cut off were 29 times less (2.1 times for girls) likely to be in the fifth rather than the fourth category, compared to those whose family income was above the cut off.

Figure 3.3a
Odds of Being in a Given Category Rather Than the Next Lower One Given Household Income Sufficiency Status for the Facilitating Situation, 1998



Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Figure 3.3b
Odds of Being in a Given Category Rather Than the Next Lower One Given Household Income Sufficiency Status for the Misleading Situation, 1998

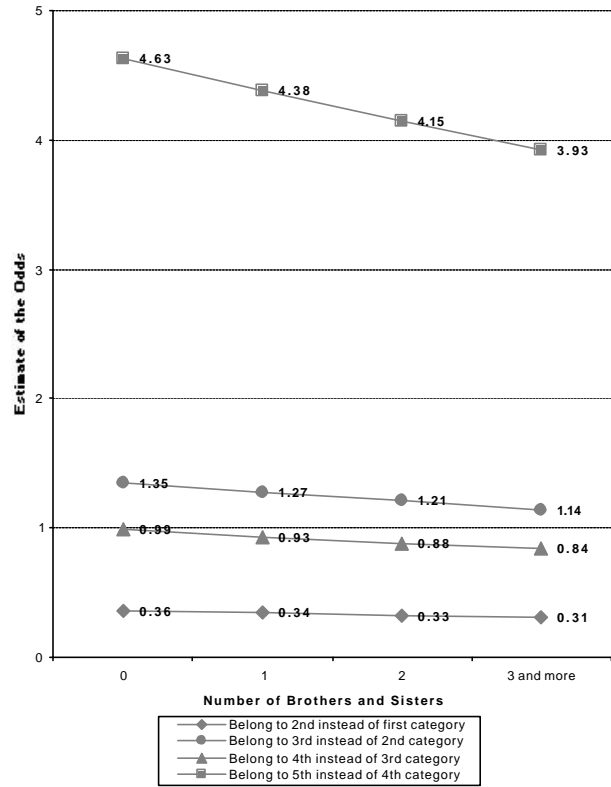


Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

3.2.4 Association Between Number of Brothers and Sisters and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

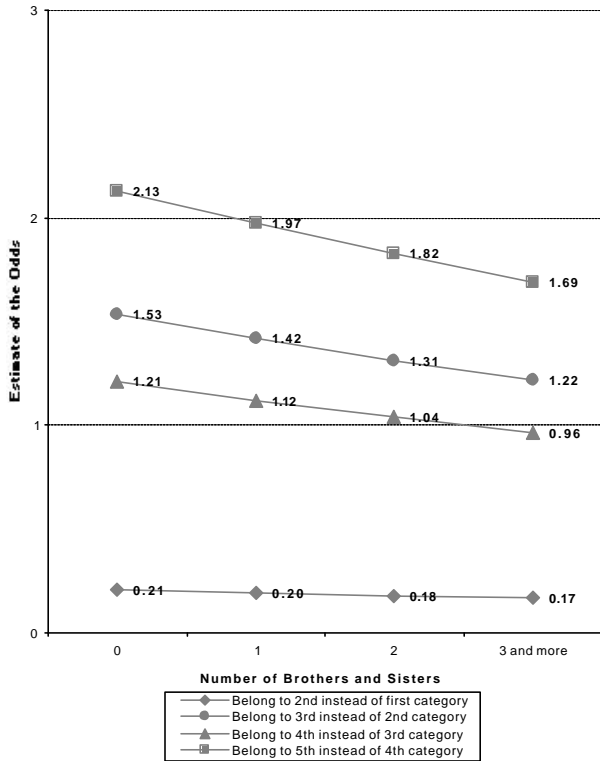
Five-month-old infants in the population who had fewer brothers and sisters were more likely to coordinate the schemes of visual tracking and to grab an object in their field of vision. Figures 3.4a and 3.4b present the odds of being in a given category rather than the next lower one, given the number of brothers and sisters for the facilitating and misleading situation respectively. Infants with no brothers and sisters were, for the facilitating situation, 5.6 times more likely (8.0 times for the misleading situation) to be in the fifth rather than the fourth category, compared to those who had a brother or sister.

Figure 3.4a
Odds of Being in a Given Category Rather Than the Next Lower One Given Number of Brothers and Sisters for the Facilitating Situation, 1998



Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Figure 3.4b
Odds of Being in a Given Category Rather Than the Next Lower One Given Number of Brothers and Sisters for the Misleading Situation, 1998

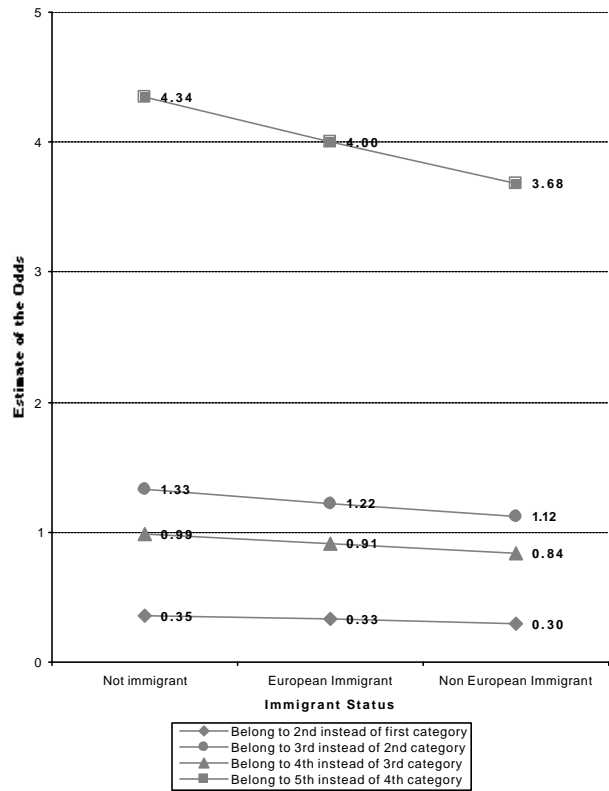


Source: Institut de la statistique du Québec, ÉLDEQ 1998-2002.

3.2.5 Association Between Mother’s Immigrant Status and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

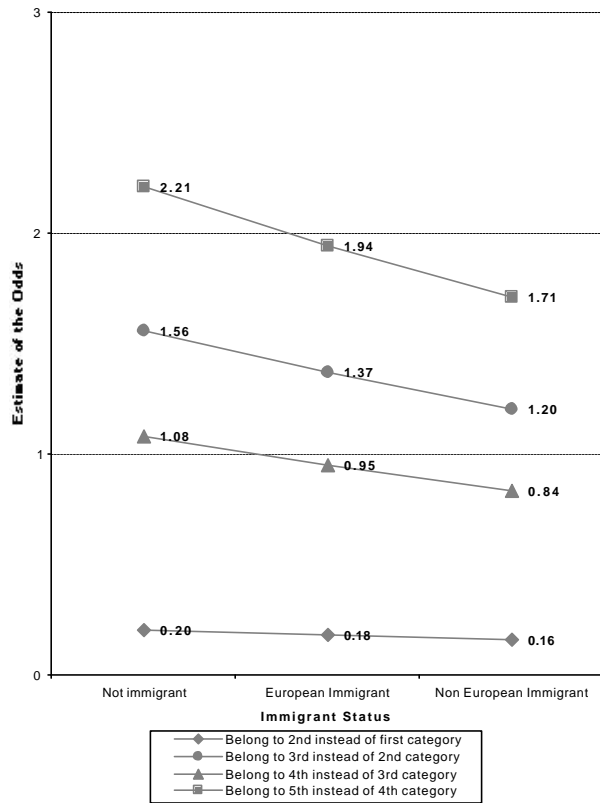
Five-month-old infants whose mother was not an immigrant (or immigrant of European origin) were more likely to coordinate the schemes of visual tracking and to grab an object in their field of vision. Figures 3.5a and 3.5b present the estimates of the odds of being in a given category rather than in the next lower one, given the immigrant status of the mother for the facilitating and misleading situation respectively. Five-month-old infants whose mother was not an immigrant were, for the facilitating situation, 8.7 times more likely (13.7 times for the misleading situation) to be in the fifth rather than the fourth category, compared to those whose mother was of European immigrant origin.

Figure 3.5a
Odds of Being in a Given Category Rather Than the Next Lower One Given Mother’s Immigrant Status for the Facilitating Situation, 1998



Source: Institut de la statistique du Québec, ÉLDEQ 1998-2002.

Figure 3.5b
Odds of Being in a Given Category Rather Than the Next Lower One Given Mother's Immigrant Status for the Misleading Situation, 1998



Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Conclusion

This study has shown that 5-month-old infants in the Québec population differ in terms of mental-attentional capacity growth rate. It was estimated that 38.1% of 5-month-old infants in Québec did not demonstrate the capacity to coordinate the schemes of visual tracking and to grab an object in their field of vision. However, this finding should be interpreted in light of the fact that the One, Two, Three Hands Task, as with any good screening tool, tends to minimize false negatives, namely those who were not able to coordinate two schemes but not identified as such. Therefore, the above figure is likely an over-estimation of the percentage of 5-month-old infants in the Québec population who are not able to coordinate two schemes in one action directed towards a goal. Following these infants over the coming years in the longitudinal survey will allow researchers to determine whether the infants who presented what appears to be a slower rate of development will eventually catch up to the other infants, or if this differential will remain the same or even become larger.

This study has also shown a link between the rate of growth of mental-attentional capacity of 5-month-old infants in the Québec population and certain family socioeconomic characteristics. These were age of the mother and father, income sufficiency status, number of brothers and sisters, and immigrant status of the mother. No doubt all of these characteristics are inter-related, but several studies suggest that the number of brothers and sisters maybe at the heart of the mechanism behind the observed link (Zajonc, 2001; Zajonc & Markus, 1975). For example, older or immigrant parents generally have more children. In addition, for a given income, the number of children in the family determines in large part income sufficiency status. Five-month-old infants who have fewer brothers and sisters may possibly benefit from greater attention on the part of their parents, which might contribute to accelerated cognitive development (Blake, 1981; Downey, 2001). If this is the case, this

socioeconomic characteristic may increase rather than decrease the differences among children in the same family with regards to the growth rate of their mental-attentional capacity. It is still too early to say whether the number of brothers and sisters could have a more or less long-term impact on the mental-attentional capacity of infants. Once again, only longitudinal monitoring will allow for determining whether or not this is the case.

This study was not without limits, however. First, only the coordination of the visual tracking and grasping schemes to grab an object in the field of vision was used to assess the capacity of the infant to coordinate two schemes, whatever they may be, in one action directed towards a goal. Second, visual tracking and grasping coordination, as conceived by Piaget, implies grabbing an object that is not immediately in the child's field of vision. Therefore, this study did not demonstrate that infants who succeeded at grasping an object would have done so if the object had not been in their field of vision.

1. Administering the One, Two, Three Hands Task

1.1 Facilitating Situation

The interviewer presents a coloured ring in front of the infant's nose or mouth at a distance of approximately 12.5 to 15 centimeters from his/her face. The object of this part of the task is for the infant to grab the ring. The procedure is repeated three times with different coloured rings. For each of the three trials, the interviewer notes the infant's behaviour by using the following six descriptions: (a) looks at but does not try to reach for the ring; (b) tries to reach for the ring but neither touches nor grasps it; (c) touches the ring; (d) grasps the ring without having previously opened the hand(s); (e) grasps the ring having previously opened the hand(s); and (f) other (e.g., the test was not administered because the infant was not available).

1.2 Misleading Situation

The interviewer presents a small plastic farm animal in front of the infant's nose or mouth approximately 12.5 to 15 centimeters from the face. The interviewer had previously placed a ring in each of the infant's hands. The object of this part of the task is for the infant to grab the animal. This procedure is repeated three times with different animals. For each trial, the interviewer notes the infant's behaviours using one of the following six descriptions: (a) looks at but does not try to reach for the animal; (b) tries to reach for the animal with his/her hands full but neither touches nor grasps it; (c) tries to reach for the animal with his/her hands full, drops one or both rings to touch the animal; (d) tries to reach for the animal with his/her hands full, drops one or both rings to grasp the animal; (e) drops one/both ring(s) and to grasp the animal; and (f) other (e.g., the test was not administered because the infant was not available).

Administering this task always begins with the facilitating situation. During the entire experiment the infant remains comfortably seated in the arms of an adult, usually the mother, or in a car seat or high chair. The interviewer ensures that the infant has both hands free, except of course in the misleading situation, and as much as possible, nothing in his/her mouth, such as a soother.

2. Latent Class Models Used to Account for the Behaviours of 5-Month-Old Infants in the One, Two, Three Hands Task

1. A model with two, so-called latent variables, one for the facilitating situation, and the other for the misleading one. Each comprises a single latent class, i.e. a single category of infant.
2. A model with two latent variables, one for the facilitating situation, and the other for the misleading one. The following is a description of the characteristics of this model. First, each of the two latent variables comprise five latent classes: (a) infants who look at but do not try to reach for the object; (b) infants who try to reach for the object but neither touch nor grasp it; (c) infants who touch the object but do not grasp it; (d) infants who grasp the object without having previously opened their hand(s); (e) infants who grasp the object having previously opened their hand(s). Infants in the first latent class tend to look at the object but do not try to reach for it. However, the probability of these infants showing other behaviours is not nil, given that an infant can show behaviours that differ from one trial to another. Second, the cumulative probability of showing a behaviour of a given level of complexity or lower decreases or remains the same from the first to the fifth latent class. For example, the probability of looking at an object but not trying to reach for it decreases or remains the same from the first to the fifth latent class. Third, being in a latent class for the

misleading situation is dependent on latent class membership for the facilitating situation, since the former was administered after the latter. Fourth, the cumulative probability of being in a given latent class or lower for the misleading situation decreases or remains the same from the first to the fifth latent class of the facilitating situation. Fifth, this model's parameters do not vary with the sex of the infants.

3. A model similar to the preceding one, except that the parameters could vary with the infant's sex.

3. Statistical Models Used to Estimate the Possible Relationship Between Socioeconomic Characteristics and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

1. A null association model between the family socioeconomic characteristic and the mental-attentional capacity of 5-month-old infants.
2. A model of association between the family socioeconomic characteristic and the mental-attentional capacity of 5-month-old infants which does not vary with the sex of the infants.
3. A model similar to the preceding, but the association between the family socioeconomic characteristic and the mental-attentional capacity of 5-month-old infants may vary with the sex of the infants.

These last two association models do not vary with the joint conditional distribution region (Clogg & Shihadeh, 1994). This means a single parameter is sufficient to describe the association between the family socioeconomic characteristic and the mental-attentional capacity of 5-month-old infants.

4. Parameters Estimates of the Statistical Models and Evaluation of their Fit with the Survey Data

The parameter estimates of the various statistical models described above were obtained using the IEM program, version 1 (Vermunt, September 18, 1997). For each model, these estimates were obtained from one set of initial values. Unfortunately, the version of IEM used in this study did not provide standard errors for these estimates given the aforementioned constraints (see sections 2 and 3 above). However, IEM did allow for weighting specially designed for the One, Two, Three Hands Task, which made it possible to make inferences about the results for the target population, namely 5-month-old Québec children. Given that SUDAAN does not estimate latent class models, a statistical threshold of 0.25 was adopted to take into account the design effect of the survey.

The fit of the statistical models to the data collected in the survey was assessed using the likelihood-ratio chi-square statistic (L^2). The L^2 follows asymptotically the chi-square distribution with a certain number of degrees of freedom. A high L^2 value compared to the degrees of freedom indicates that the model is not a good fit to the data. Conversely, a low L^2 value compared to the degrees of freedom indicates that the model is a good fit to the data. In addition, given that the L^2 can be precisely partitioned, it can be used to compare the adjustment of two hierarchically related models (i.e., one model includes a sub-group of the other's parameters) by subtracting the L^2 and the degrees of freedom associated with the two models in question (Fienberg, 1980). The comparison of models was also conducted using the AIC [Akaike's Information Criterion; AIC: $L^2 - (2 \times \text{degrees of freedom})$] and the BIC [Bayesian Information Criterion; BIC: $L^2 - (\text{degrees of freedom}) (\log N)$]. The model with the lowest AIC (BIC) value was considered to be the most parsimonious and was therefore retained (Bollen, 1989).

5. Results of the Three Latent Class Models Used to Analyze the Behaviours of 5-Month-Old Infants in the One, Two, Three Hands Task

The L^2 associated with the model of the two latent variables each comprising five classes of which the parameters may vary according to infant sex was 3,862.22 with 31,055 degrees of freedom ($p = 1.0$),²⁵ which suggests that this model is appropriate for describing the behaviours of the 5-month-old infants in the One, Two, Three Hands Task. The L^2 associated with the model of the two latent variables each comprising one class was 12,024.27 with 31,200 degrees of freedom ($p = 1.0$). This shows a substantial increase in the L^2 compared to that of the degrees of freedom (i.e., $L^2 = 12,024.27 - 3,862.22 = 8,162.05$; degree of freedom = $31,200 - 31,055 = 145$; $p = .00$). This means that the hypothesis that 5-month-old infants do not differ in terms of the growth rate of their mental-attentional capacity can be discarded. The L^2 associated with the model of the two latent variables each comprising five classes the parameters of which do not vary with infant sex was 3,955.40 with 31,129 degrees of freedom ($p = .07$).²⁶ This increase in the L^2 was not a substantial one compared to the increase in the degrees of freedom ($L^2 = 3,955.40 - 3,862.22 = 93.19$; degree of freedom = $31,129 - 31,055 = 74$; $p = .07$). Moreover, it is this last model that presented the lowest AIC and BIC values. This means, therefore, that the hypothesis that 5-month-old boys and girls in the population do not differ in terms of the growth rate of their mental capacity cannot be discarded.

25. The probability of obtaining an equal or smaller L^2 value given that the model is true.

26. This model explained 67.11% (i.e., $1 - [3,955.40 / 12,024.27]$) of the variance observed in the behaviours of the 5-month-old infants in the Imitation Sorting Task.

6. Cumulative Probabilities of Showing a Behaviour of Given Complexity or Lower Given Membership in a Latent Class for Each of the Six Trials in the One, Two, Three Hands Task

Figures A.1 to A.6 show the cumulative probabilities of showing a behaviour of a given complexity or lower given membership in a latent class for each of the six trials of the One, Two, Three Hands Task. A look at these cumulative probabilities indicates that the five latent classes represent increasing levels of performance:

1. The cumulative probability of looking at the object but not trying to reach for it was relatively high in 5-month-old infants in the first latent class whereas it was much lower for those in the other four latent classes.
2. The cumulative probability of at most attempting to reach for the object but not touching or grasping it was relatively high in 5-month-old infants in the first two latent classes whereas it was much lower for those in the three other latent classes.
3. The cumulative probability of at most touching the object but not grasping it was relatively high in 5-month-old infants in the first three latent classes whereas it was much lower for those in the other two latent classes.
4. The cumulative probability of at most grasping the object without having previously opened the hand(s) was relatively high in 5-month-old infants who were in the first four latent classes whereas it was much lower for those in the fifth latent class.

Figure A.1
Cumulative Probability of Showing a Behaviour of a Given Complexity or Lower By Category for the First Trial in the Facilitating Situation, 1998

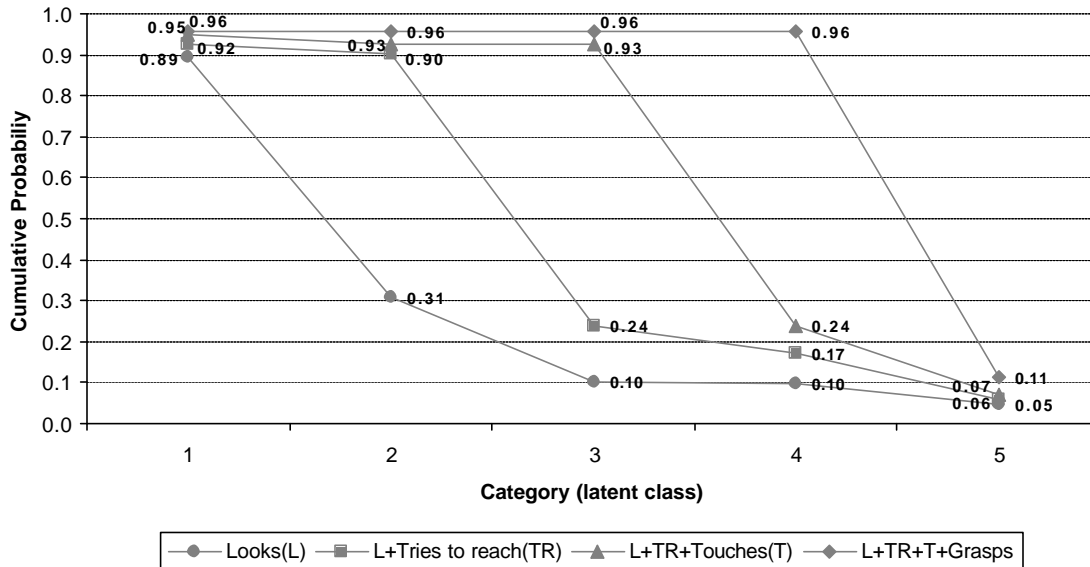
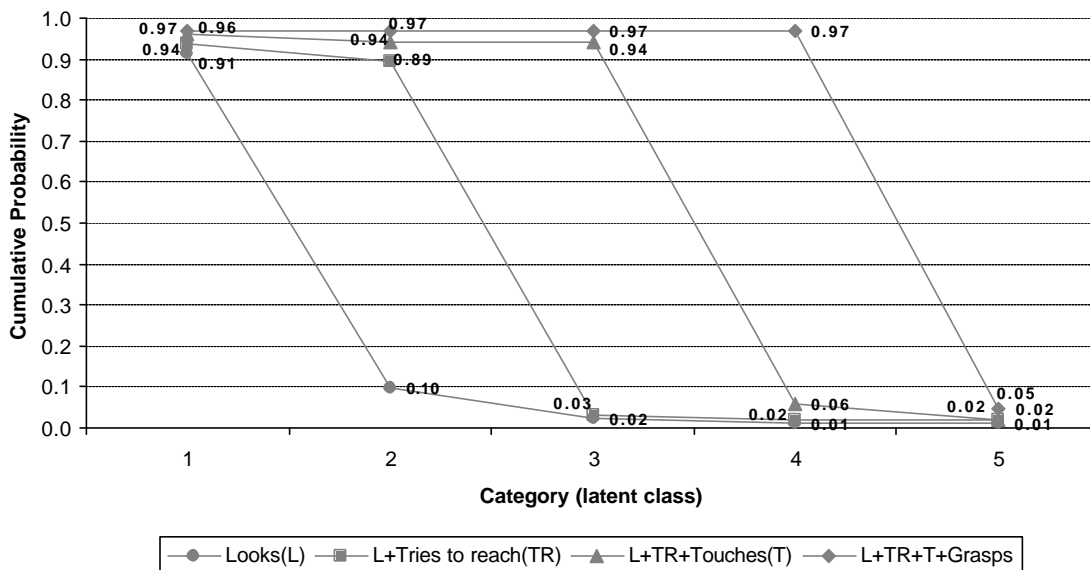


Figure A.2
Cumulative Probability of Showing a Behaviour of a Given Complexity or Lower By Category for the Second Trial in the Facilitating Situation, 1998



Source: Institut de la statistique du Québec, ÉLDEQ 1998-2002.

Figure A.3
Cumulative Probability of Showing a Behaviour of a Given Complexity or Lower By Category for the Third Trial in the Facilitating Situation, 1998

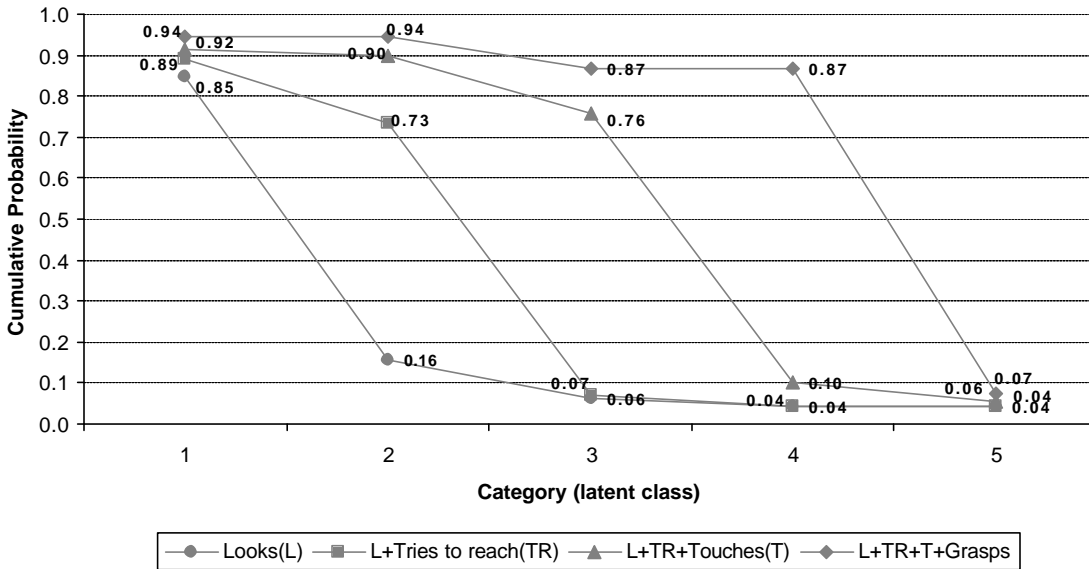
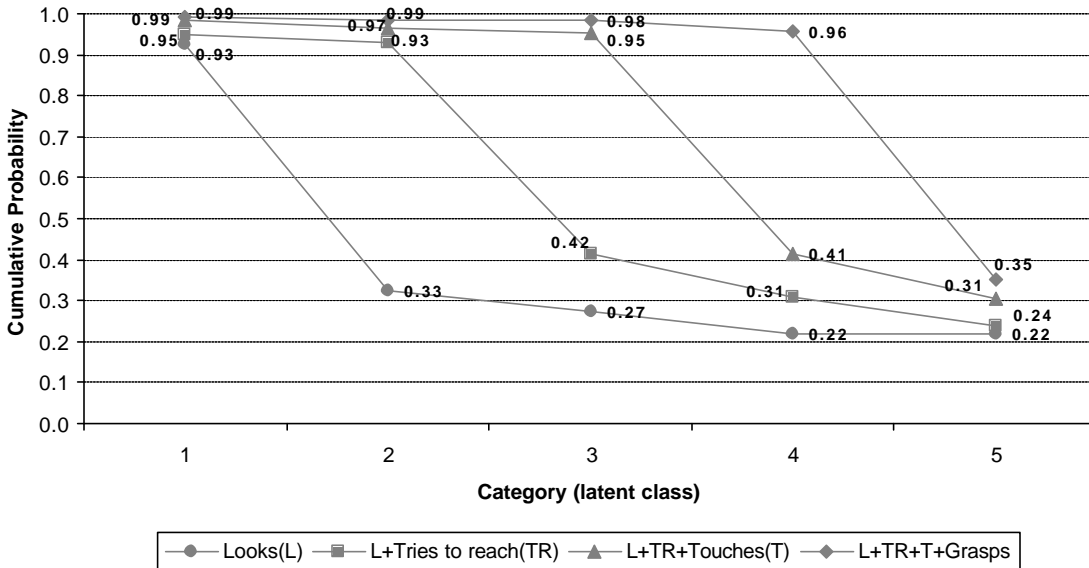


Figure A.4
Cumulative Probability of Showing a Behaviour of a Given Complexity or Lower By Category for the First Trial in the Misleading Situation, 1998



Source: Institut de la statistique du Québec, ÉLDEQ 1998-2002.

Figure A.5
Cumulative Probability of Showing a Behaviour of a Given Complexity or Lower By Category for the Second Trial in the Misleading Situation, 1998

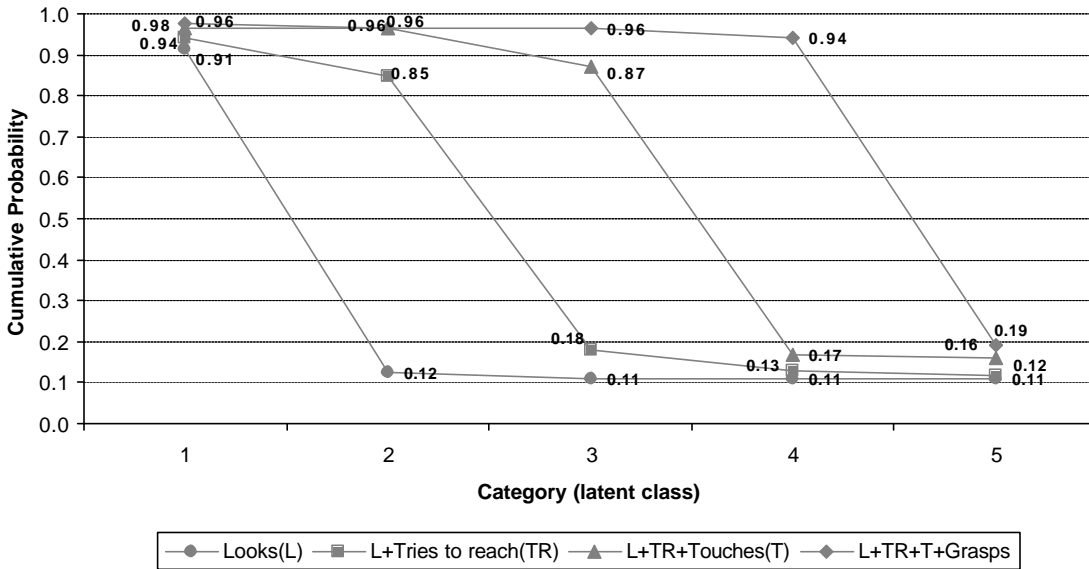
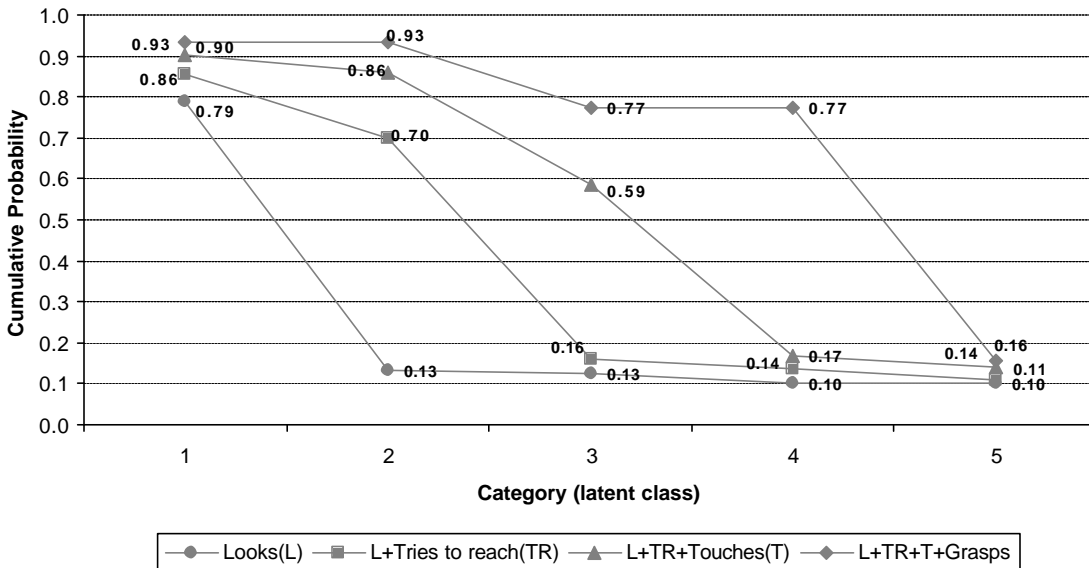


Figure A.6
Cumulative Probability of Showing a Behaviour of a Given Complexity or Lower By Category for the Third Trial in the Misleading Situation, 1998



Source: Institut de la statistique du Québec, ÉLDEQ 1999-2002.

7. Results of the Three Statistical Models Used to Estimate the Possible Relationships Between Family Socioeconomic Characteristics and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

Tables A.1 to A.9 show the results of the three statistical models used to estimate the possible relationship between each characteristic of family socioeconomic status and the growth rate of mental-attentional capacity in 5-month-old infants. For both situations, for each characteristic, the L^2 associated with the model of association between the socioeconomic characteristic and mental-attentional capacity which varied with infant sex was small compared to the degrees of freedom (see Tables A.1 to A.9). Therefore this model was an appropriate one for indicating the association between the socioeconomic characteristic of the family and mental-attentional capacity. For both situations, the model of null association between the socioeconomic characteristic and the mental-attentional capacity showed a substantial increase in the L^2 compared to that in the degrees of freedom for age of the mother and father, household income sufficiency status,²⁷ number of brothers and sisters, and mother's immigrant status (see Tables A.1 to A.9). Therefore, for these particular characteristics, the hypothesis that there would be no association between socioeconomic status and the mental-attentional capacity of 5-month-old infants was discarded. Indeed, for these characteristics, the model of association between socioeconomic characteristics and mental-attentional capacity which does not vary

with infant sex, did not show a substantial increase in the L^2 compared to that in the degrees of freedom for the two situations, except for income sufficiency status in the misleading situation (see Tables A.1 to A.9). Moreover, it was this model that had the lowest AIC and BIC²⁸ values for both situations, except for income sufficiency status in the misleading situation.

27. In the facilitating situation, for household income sufficiency status, it became clear that the hypothesis of no association between household income sufficiency and mental-attentional capacity should be discarded if we compare the null association model to the association model that does not vary with infant sex ($L^2 = 427.57 - 420.26 = 7.31$; degree of freedom = $440 - 439 = 1$; $p = .01$).

28. In the facilitating situation, for income insufficiency status, the BIC suggests that the null association model is the most parsimonious, whereas the AIC and the L^2 values suggest that the model of association that does not vary with infant sex is a better model, and was therefore the one retained.

Table A.1

Mother's Age and Mental-Attentional Capacity of 5-Month-Old Infants, 1998

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	916.74	1,185	1	- 1,453.26	- 7,997.94
2	905.83	1,184	1	- 1,462.17	- 8,001.33
3	905.76	1,183	1	- 1,460.24	- 7,993.88
1 versus 3	10.99	2	0.004	–	–
2 versus 3	0.07	1	0.79	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	1,022.08	1,180	1	- 1,337.92	- 7,854.99
2	1,010.64	1,179	1	- 1,347.36	- 7,858.91
3	1,009.78	1,178	1	- 1,346.22	- 7,852.24
1 versus 3	12.30	2	0.002	–	–
2 versus 3	0.86	1	0.35	–	–

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Note for Tables A.1 to A.9 : Model 1: Null association between a given socioeconomic characteristic and mental-attentional capacity of 5-month-old infants. Model 2: Association between a given socioeconomic characteristic and mental-attentional capacity of 5-month-old infants which does not vary with infant sex. Model 3: Association between a given socioeconomic characteristic and mental-attentional capacity of 5-month-old infants that varies with infant sex. L²: Likelihood-ratio chi-square statistic. df: degree of freedom. AIC: (Akaike's Information Criterion): L² – (2df). BIC (Byesian Information Criterion): L² – (df) (log N).

Table A.2

Father's Age and Mental-Attentional Capacity of 5-Month-Old Infants¹, 1998

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	869.68	1,183	1	- 1,496.32	- 7,938.25
2	861.51	1,182	1	- 1,502.45	- 7,938.97
3	861.07	1,181	1	- 1,500.93	- 7,931.97
1 versus 3	8.61	2	0.01	–	–
2 versus 3	0.44	1	0.51	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	1,047.12	1,179	1	- 1,310.88	- 7,731.03
2	1,039.61	1,178	1	- 1,316.39	- 7,731.09
3	1,037.96	1,177	1	- 1,316.04	- 7,725.29
1 versus 3	9.15	2	0,01	–	–
2 versus 3	1.65	1	0,20	–	–

1. Given that the partial non-response rate was higher than 5% namely 7.51%, these results are for information purposes only

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table A.3

Mother's Educational Level and Mental-Attentional Capacity of 5-Month-Old Infants, 1998

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	1,038.22	1,433	1	- 1,827.79	- 9,741.38
2	1,038.12	1,432	1	- 1,825.88	- 9,733.96
3	1,038.11	1,431	1	- 1,823.89	- 9,726.44
1 versus 3	0.10	2	0.95	–	–
2 versus 3	0.01	1	0.93	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	1,291.35	1,428	1	- 1,564.65	- 9,450.64
2	1,288.70	1,426	1	- 1,563.30	- 9,438.24
3	1,286.84	1,425	1	- 1,563.17	- 9,432.59
1 versus 3	4.51	2	0.10	–	–
2 versus 3	1.87	1	0.17	–	–

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table A.4

Father's Educational Level and Mental-Attentional Capacity of 5-Month-Old Infants, 1998¹

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	1,033.10	1,431	1	- 1,828.90	- 9,607.01
2	1,030.55	1,430	1	- 1,829.45	- 9,602.13
3	1,030.43	1,429	1	- 1,827.57	- 9,594.81
1 versus 3	2.67	2	0.26	–	–
2 versus 3	0.12	1	0.73	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	1,248.19	1,427	1	- 1,605.81	- 9,362.18
2	1,248.04	1,426	1	- 1,603.96	- 9,354.89
3	1,247.95	1,426	1	- 1,604.05	- 9,354.98
1 versus 3	0.24	2	0.89	–	–
2 versus 3	0.09	1	0.76	–	–

1. Given that the partial non-response rate was higher than 5% namely 8.43%, these results are for information purposes only

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table A.5

Type of Family and Mental-Attentional Capacity of 5-Month-Old Infants, 1998

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	517.67	689	1	- 860.33	- 4,663.40
2	517.23	688	1	- 858.77	- 4,656.32
3	515.55	687	1	- 858.45	- 4,650.48
1 versus 3	2.12	2	0.3466	–	–
2 versus 3	1.68	1	0.1953	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	581.43	683	1	- 784.57	- 4,554.52
2	579.96	681	1	- 782.04	- 4,540.95
3	579.50	680	1	- 780.50	- 4,533.89
1 versus 3	1.93	2	0.38	–	–
2 versus 3	0.46	1	0.50	–	–

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table A.6

Income Sufficiency Status and Mental-Attentional Capacity of 5-Month-Old Infants, 1998

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	427.57	441	0.7	- 454.43	- 2,883.08
2	420.26	440	0.7	- 459.74	- 2,882.88
3	420.25	439	0.7	- 457.76	- 2,875.39
1 versus 3	7.33	2	0.03	–	–
2 versus 3	0.02	1	0.90	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	491.60	436	0.03	- 380.40	- 2,781.51
2	478.60	434	0.07	- 389.40	- 2,779.50
3	470.12	434	0.11	- 397.88	- 2,787.98
1 versus 3	21.48	2	0	–	–
2 versus 3	8.48	1	0.004	–	–

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table A.7

Number of Brothers/Sisters and Mental-Attentional Capacity of 5-Month-Old Infants, 1998

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	762.43	937	1	- 1,111.57	- 6,287.08
2	751.40	936	1	- 1,120.61	- 6,290.58
3	750.45	935	1	- 1,119.55	- 6,284.00
1 versus 3	11.97	2	0.003	–	–
2 versus 3	0.94	1	0.33	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	810.99	932	1	- 1,053.01	- 6,200.89
2	791.74	931	1	- 1,070.26	- 6,212.62
3	791.64	930	1	- 1,068.36	- 6,205.20
1 versus 3	19.35	2	0	–	–
2 versus 3	0.10	1	0.76	–	–

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table A.8

Mother's Immigrant Status and Mental-Attentional Capacity of 5-Month-Old Infants, 1998

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	445.59	689	1	- 932.41	- 4,737.34
2	433.91	688	1	- 942.09	- 4,741.50
3	432.72	687	1	- 941.28	- 4,735.17
1 versus 3	12.87	2	0.002	–	–
2 versus 3	1.18	1	0.28	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	533.38	684	1	- 834.62	- 4,611.94
2	511.09	682	1	- 852.91	- 4,619.19
3	510.97	681	1	- 851.04	- 4,611.79
1 versus 3	22.42	2	0	–	–
2 versus 3	0.13	1	0.72	–	–

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

Table A.9

Mother's Age at Birth of Firstborn and Mental-Attentional Capacity of 5-Month-Old Infants, 1998

	Facilitating Situation				
	L ²	df	p	AIC	BIC
Model					
1	420.78	441	0.75	- 461.22	- 2,896.83
2	419.31	440	0.75	- 460.69	- 2,890.79
3	413.52	438	0.79	- 462.48	- 2,881.53
1 versus 3	7.27	2	0.03	–	–
2 versus 3	5.79	1	0.02	–	–
	Misleading Situation				
	L ²	df	p	AIC	BIC
Model					
1	443.01	436	0.40	- 428.99	- 2,836.99
2	442.71	435	0.39	- 427.29	- 2,829.77
3	442.48	434	0.38	- 425.52	- 2,822.48
1 versus 3	0.53	2	0.77	–	–
2 versus 3	0.86	1	0.35	–	–

Source: *Institut de la statistique du Québec, ÉLDEQ 1998-2002.*

7.1 Association Between Mother's Age and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants in the Québec population

For the facilitating (misleading) situation, 5-month-old infants whose mother was a given age were 4.6 (5.0) times more likely to be in a given latent class than in the next lower one, compared to those whose mother was in the next higher age group (see Figures 3.1a and 3.1b).

7.2 Association Between Father's Age and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

For the facilitating (misleading) situation, 5-month-old infants whose father was of a given age were 3.9 (4.1) times more likely to be in a given latent class than in the next lower one, compared to those whose father was in the next higher age group (see Figures 3.2a and 3.2b).

7.3 Association Between Household Income Sufficiency Status and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

For the facilitating situation, 5-month-old infants whose family income was below the low-income cut off, were 9.3 times less likely to be in a given latent class rather than the next lower one (see Figure 3.3a). For the misleading situation, 5-month-old boys whose family income was below the low-income cut off, were 29.0 times less likely to be in a given latent class than the next lower one (see Figure 3.3b). However, this stimuli was only 2.1 for 5-month-old girls (see Figure 3.3b).

7.4 Association Between Number of Brothers and Sisters and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

For the facilitating (misleading) situation, 5-month-old infants who had a given number of brothers and sisters were 5.6 (8.0) times more likely to be in a given latent class than in the next lower one, compared to those who had an additional brother or sister (see Figures 3.4a and 3.4b).

7.5 Association Between Mother's Immigrant Status and the Growth Rate of Mental-Attentional Capacity in 5-Month-Old Infants

For the facilitating (misleading) situation, 5-month-old infants whose mother was not an immigrant (European immigrant origin) were 8.7 (13.7) times more likely to be in a given latent class than in the next lower one lower, compared those whose mother was of European immigrant origin (non-European immigrant origin) (see Figures 3.5a and 3.5b).

References

- ALP, I. E. (1988). *Mental capacity and working memory in 1- to 3-year-olds*, unpublished doctoral dissertation, York University, Toronto, Ontario, Canada.
- ALP, I. E. (1994). "Measuring the size of working memory in very young children: The imitation sorting task", *International Journal of Behavioral Development*, 17, p. 125-141.
- BAKER, P. C., C. K. KECK, F. L. MOTT and S. V. QUINLAN (1993). *NLSY child handbook – revised edition: A guide to the 1986-1990 National Longitudinal Survey of Youth child data*, Columbus, Ohio, Centre for Human Resource Research.
- BAILLARGEON, R. H., R. E., TREMBLAY and J. D., WILLMS. (1999). *The prevalence of Physical Aggression in Canadian Children: A Multi-Group Latent Class Analysis of Data from the First Collection Cycle (1994-1995) of the National Longitudinal Survey of Children and Youth (NLSCY)*, Applied Research Branch, Strategic Policy, Human Resources Development Canada, 54 p.
- BAYLEY, N. (1993). *Bayley Scales of Infant Development – Second Edition (BSID-II)*, San Antonio, Texas, The Psychological Corporation.
- BENSON, N. (1989). *Mental capacity constraints on early symbolic processing: The origin of language from a cognitive perspective*, unpublished doctoral dissertation, York University, Toronto, Ontario, Canada.
- BLAKE, J. (1981). "Family size and quality of children", *Demography*, 18, p. 421-442.
- BOIVIN, M., D. PÉRUSSE, N. TREMBLAY, V. SAYSSET, C. PICHÉ and R. E. TREMBLAY (1997). "Mother-Child Relationship" in SANTÉ QUÉBEC, JETTÉ, M., H. DESROSIERS and R. E. TREMBLAY (dir.). *In 2001... I'll be 5 years old!*, Survey of 5-month-old Infants 1996), Preliminary Report of the Longitudinal Study of Child Development in Québec, Montréal, Ministère de la Santé et des Services Sociaux, Gouvernement du Québec, 237 p.
- BOLLEN, K. A. (1989). *Structural equations with latent variables*, New York, John Wiley & Sons, 514 p.
- CALDWELL, B. M., and R. H. BRADLEY (1984). *Home Observation for Measurement of the Environment*, Little Rock, University of Arkansas at Little Rock.
- CLOGG, C. C. and E. S. SHIHADDEH (1994). *Statistical models for ordinal variables*, London, Sage, 192 p.
- DOWNEY, D. B. (2001). "Number of siblings and intellectual development: The resource dilution explanation", *American Psychologist*, 56, p. 497-504.
- EATON, W. O., J. G. CHIPPERFIELD and C. E. SINGBEIL (1989). "Birth order and activity level in children", *Developmental Psychology*, vol. 25, n° 4, p. 668-672.
- EISENBERG, L. (1999). "Experience, brain, and behavior", *Pediatrics*, vol. 103, n° 5, p. 1031-1035.
- FIENBERG, S. E. (1980). *The analysis of cross-classified categorical data*, 2nd edition, Cambridge, MA, MIT press, 198 p.
- FRANKENBURG, W. K., A. W. FANDAL and S. M. THORNTON (1987). "Revision of Denver Prescreening Developmental Questionnaire", *Journal of Pediatrics*, vol. 110, n° 4, p. 653-657.
- GOLDEN, M., and B. BIRNS (1983). "Social class and infant intelligence" in LEWIS M. (Ed.) *Origins of intelligence: Infancy and early childhood*, 2nd edition, New York, Plenum Press, p. 347-398.
- HALPERN, R. (1993). "Poverty and infant development" in ZEANA, C. H., Jr (ed.). *Handbook of infant health*, New York, The Guilford Press, p. 73-86.

- HAYWOOD, H. C., and T. D. WACHS (1981). "Intelligence, cognition, and individual differences" in BEGAB, M. J., H. C. HAYWOOD and H. L. GARBER (Eds.) *Psychosocial influences in retarded performance* (Vol. 1, Issues and theories in development), Baltimore, University Park Press, p. 95-126.
- HOFF-GINSBERG, E. (1998). "The relation of birth order and socioeconomic status to children's language experience and language development", *Applied Psycholinguistics*, vol. 19, n° 4, p. 603-629.
- HOFF-GINSBERG, E., and T. TARDIF (1995). "Socioeconomic status and parenting" in BORNSTEIN, M. H. (ed.). *Handbook of parenting, vol. 2: Biology and ecology of parenting*, Mahwah, N. J., Laurence Erlbaum, p. 161-187.
- ILLINGWORTH, R. S. (1988). *Basic developmental screening 0-4 years* (4th ed.), Oxford, U.K, Blackwell Scientific Publications, 62 p.
- KNOBLOCH, H., and B. PASAMANICK (1975). *Gesell and Amatruda's developmental diagnosis: the evaluation and management of normal and abnormal neuropsychologic development in infancy and early childhood* (3rd ed. rev.), Hagerstown, MD, Harper and Row.
- LANDY, S., and K. K. TAM (1996). "Les pratiques parentales influencent bel and bien le développement des enfants du Canada" in Statistique Canada and Développement des ressources humaines Canada, *Grandir au Canada*, Ottawa, Ministre de l'Industrie, n° 89-550-MPF au catalogue (Enquête nationale longitudinale sur les enfants et les jeunes [Canada]), 1205-6855, n° 1, p. 117-134.
- LAZARSELD, P. F., and N. W. HENRY (1968). *Latent structure analysis*, Boston, Houghton Mifflin, 294 p.
- MCCARTON, C. M., I. F. WALLACE, M. DIVON and H. G. VAUGHAN (1996). "Cognitive and neurologic development of the premature, small for gestational age infant through age 6: Comparison by birth weight and gestational age", *Pediatrics*, vol. 98, n° 6, p. 1167-1178.
- MILLER, J. E. (1998). "Development screening scores among preschool-aged children: the roles of poverty and child health", *Journal of Urban Health*, vol. 75, n° 1, p. 135-152.
- MRAZEK, P. J. (1993). "Maltreatment and infant development" in ZEANA, C. H. (Ed.). *Handbook of infant mental health*, New York, The Guilford Press, p. 159-170.
- NORDBERG, L. (1996). "Sex differences in psychomotor and mental development. Results from Children in a new Stockholm suburb – a longitudinal prospective study on children from a general population starting at the beginning of pregnancy", *European Child & Adolescent Psychiatry*, vol. 5 (Suppl. 1), p. 76-78.
- NORDBERG, L., P. A. RYDELIUS and R. ZETTERSTROM (1991). "Psychomotor and mental development from birth to age of four years; sex differences and their relation to home environment", *Acta Paediatrica Scandinavica*, vol. 378, p. 1-25.
- PASCUAL-LEONE, J. and J. JOHNSON (1991). "The psychological unit and its role in task analysis: A reinterpretation of object permanence" in CHANDLER, C., and M. CHAPMAN (Eds.). *Criteria for competence*, Hillsdale, New Jersey, Erlbaum, p. 153-187.
- PEDERSEN, F. A., J. L. RUBENSTEIN and L. J. YARROW (1979). "Infant development in father-absent families", *Journal of Genetic Psychology*, vol. 135, p. 51-61.
- PIAGET, J (1936). *La naissance de l'intelligence chez l'enfant*, 8th Edition, 1975. Neuchâtel, Suisse, Delachaux et Niestlé, 370 p.
- PIAGET, J. (1937). *La construction du réel chez l'enfant*, 5th Edition, 1973, Neuchâtel, Suisse, Delachaux et Niestlé, 342 p.

- ROSS, D. P., K. SCOTT and M. A. KELLY (1996). "Aperçu : les enfants du Canada durant les années 90" in Statistique Canada and Développement des ressources humaines Canada, *Grandir au Canada*, Ottawa, Ministre de l'Industrie, n° 89-550-MPF au catalogue (Enquête nationale longitudinale sur les enfants et les jeunes [Canada]), 1205-6855, n° 1, p. 17-51.
- SLATER, A. (1995). "Individual differences in infancy and later IQ", *Journal of Child Psychology and Psychiatry*, 36, p. 69-112.
- SPARROW, S. S., D. A. BALLA and D. V. CICCHETTI (1984). *Vineland Adaptive Behavior Scales*, Circle Pines, MN, American Guidance Service, 321 p.
- SYLVA, K. (1997). "Critical periods in childhood learning", *British Medical Bulletin*, vol. 53, n° 1, p. 85-197.
- TAMIS-LEMONDA, C. S., M. H. BORNSTEIN, R. KAHANA-KALMAN, L. BAUMWELL and L. CYPHERS (1998). "Predicting variations in the timing of language milestones in the second year: An events history approach", *Journal of Child Language*, vol. 25, n° 3, p. 675-700.
- UZGIRIS, I. C., and J. Mc V. HUNT (1989). *Assessment in infancy: Ordinal scales of psychological development*, Chicago, University of Illinois Press, 263 p.
- VERMUNT, J. K. (1997). *IEM: A general program for the analysis of categorical data*, Tilburg University, Price.
- WACHS, T. D., and G. E. GRUEN (1982). *Early experience and human development*, New York, Plenum Press, 297 p.
- WHITE, B. L. (1967). "An experimental approach to the effects of experience on early human behavior" in J. P. HILL (Ed.), *Minnesota symposia on child psychology* (Vol. 1), Minneapolis, University of Minnesota Press, p. 201-226.
- WHITE, B. L. (1971). *Human infants. Experience and psychological development*, Englewood, Cliffs, NJ, Prentice-Hall, 160 p.
- WHITE, B. L., and R. HELD (1966). "Plasticity of sensorimotor development in the human infant" in ROSENBLITH J. F., and W. ALLINSMITH (Eds.). *The causes of behavior II: Readings in child development and educational psychology*, 2nd edition, Boston, MA, Allyn & Bacon, p. 60-70.
- WHITE, B. L., P. CASTLE and R. HELD (1964). "Observations on the development of visually-directed reaching", *Child Development*, 35, p. 349-364.
- WHITE, J. L., T. E. MOFFITT, F. EARLS, L. ROBINS and P. A. SILVA (1990). "How early can we tell? Predictors of childhood conduct disorder and adolescent delinquency", *Criminology*, vol. 28, n° 4, p. 507-528.
- WILLMS, D. J., and M. SHIELDS (1996). *A measure of socioeconomic status for the National Longitudinal Survey of Children*, Atlantic Center for Policy Research in Education, University of New Brunswick and Statistics Canada.
- YARROW, L. J., J. L. RUBENSTEIN, F. A. PEDERSEN and J. J. JANKOWSKI (1982). "Dimensions of early stimulation and their differential effects on infant development" in BELSKY, J. (ed.). *In the beginning: Readings on infancy*, New York, Columbia University Press, p. 183-193.
- ZAJONC, R. B. (2001). "The family dynamics of intellectual development", *American Psychologist*, 56, p. 490-496.
- ZAJONC, R. B., and G. B. MARKUS (1975). "Birth order and intellectual development", *Psychological Review*, 82, p. 74-88.

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Glossary

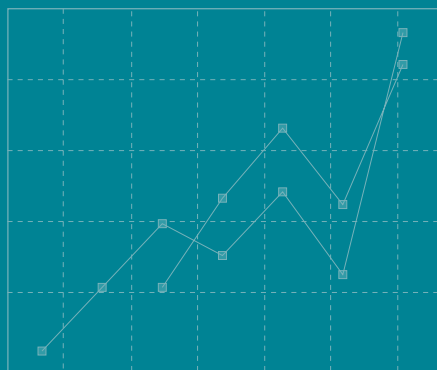
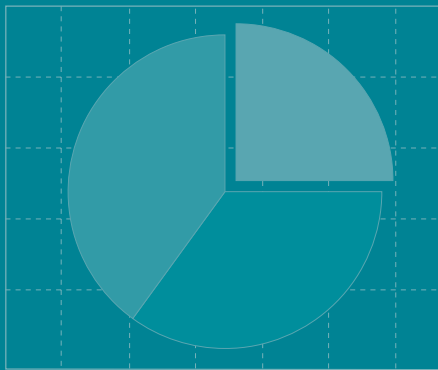
<i>Centre de la petite enfance</i>	Child-care centre
<i>Commission d'accès à l'information du Québec – CAI</i>	Québec Access to Information Commission
<i>Conseil québécois de la recherche sociale</i>	Social Research Council of Québec
<i>Direction de la méthodologie et des enquêtes spéciales, ISQ</i>	Methodology and Special Surveys Division, ISQ
<i>Direction de la santé publique de la Régie régionale de la Santé et des services sociaux de Montréal-Centre</i>	Public Health Department, Montréal-Centre, Regional Health Board
<i>Direction de la technologie et des opérations statistiques, ISQ</i>	Technology and Statistical Operations Division, ISQ
<i>Direction des normes et de l'information, ISQ</i>	Standards and Information Division, ISQ
<i>Direction Santé Québec, ISQ</i>	Health Québec Division, ISQ
<i>Étude des jumeaux nouveaux-nés au Québec – ÉJNQ</i>	Québec Study of Newborn Twins
<i>Fichier maître des naissances</i>	Master Birth Register
<i>Fonds de la recherche en santé du Québec (FRSQ)</i>	Health Research Fund of Québec
<i>Fonds pour la formation de chercheurs et l'aide à la recherche (FCAR)</i>	Researcher Education and Research Assistance Fund
<i>Groupe de recherche sur l'inadaptation psychosociale chez l'enfant – GRIP</i>	Research Unit on Children's Psychological Maladjustment
<i>Institut de la statistique du Québec</i>	Québec Institute of Statistics
<i>La Politique Familiale</i>	Policy on Families
<i>Le Rapport Bouchard (1991)</i>	The Bouchard Report, 1991: A Québec
<i>« Un Québec fou de ses enfants »</i>	In Love with its Children
<i>Les Priorités nationales de santé publique</i>	Priorities for Public Health
<i>ministère de l'éducation</i>	Ministry of Education
<i>ministère de la Famille et de l'Enfance</i>	Ministry of Family and Child Welfare
<i>ministère de la Justice</i>	Ministry of Justice
<i>ministère de la Recherche, Science et Technologie</i>	Ministry of Research, Science and Technology
<i>ministère de la Santé et des Services sociaux du Québec (MSSS)</i>	Ministry of Health and Social Services of Québec
<i>ministère de la Sécurité publique</i>	Ministry of Public Security
<i>ministère de la Solidarité sociale</i>	Ministry of Social Solidarity – formerly Income Security (Welfare)
<i>Personne qui connaît le mieux l'enfant (PCM)</i>	Person Most Knowledgeable (PMK)
<i>Politique de la santé et du bien-être</i>	Policy on Health and Well-Being
<i>Service la recherche</i>	Research services
<i>Service de support aux opérations de la Régie de l'assurance-maladie du Québec – RAMQ</i>	Operations Support Section of the Québec Health Insurance Board

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A child's level of motor and social development during infancy is associated with a number of indicators of adjustment later on in life. Although the sequence and the timing of the stages appear to be universal, various factors account for differences in development among infants. The first part of this section examines the motor and social development of infants in Québec. Information provided by mothers allows us to present an overview of the motor and social development of infants who were about 5 months old when data were first collected for the Longitudinal Study of Child Development in Québec (ÉLDEQ 1998-2002). Furthermore, we examine if certain characteristics of the infant's sociodemographic and family context are associated with the fact that he/she has already manifested certain abilities.

The Longitudinal Study of Child Development in Québec (ÉLDEQ 1998-2002) also provides an exceptional opportunity to assess, on an annual basis, early cognitive development in a very large representative sample of five-month-old Québec children. The main objective of this second section is to evaluate the mental capacity of infants at the age of five months. Of specific interest is the developmental pace of mental capacity: 1) Does this pace differ among infants, and 2) Are there links between certain aspects of socioeconomic status and the development pace of mental capacity?



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