Zero to Six
The Basis for School Readiness

by
Gillian Doherty
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Abstract

This paper presents the results of an extensive review of the current literature on school readiness. The purposes of the paper are to identify and discuss the components of school readiness; to explain the importance of the very early years of a child's life (from conception to age six) in laying the foundation for scholastic achievement and adult success in all aspects of life, including the labour market; and to present a brief discussion of the impact of the availability of various family and community resources on a child's school readiness.

The paper presents five components of school readiness:

- physical well-being and appropriate motor development;
- emotional health and a positive approach to new experiences;
- age-appropriate social knowledge and competence;
- age-appropriate language skills; and
- age-appropriate general knowledge and cognitive skills.

The determinants of each component of school readiness are discussed, followed by a chapter on the importance of critical periods of development. These critical periods are relevant for certain types of development, such as language fluency and social competence with peers, and reflect time periods when a child is biologically primed to develop more advanced neural structures and/or skills provided the appropriate stimulation is available. The discussion of resources available to the child includes the family's income, other family resources such as parental time and parenting practices, and community resources such as quality non-parental child care and family support programs.

The paper concludes that the life situation of many parents in the late 1990s makes it difficult for them to provide the support their children need to be ready for school at age six. In the author's judgement, preparing children to be school-ready must be a collaborative effort involving the family, the community in which the child lives and the broader society.

Résumé

Ce texte présente les résultats d'une recension exhaustive des textes actuels sur la préparation à l'école. Il vise à dégager et traiter les composantes de la préparation à l'école; à expliquer l'importance des toutes premières années de la vie d'un enfant (de la conception à six ans) lorsqu'il s'agit de jeter les bases des succès à l'école et dans tous les aspects de la vie d'adulte, notamment sur le marché du travail; et à présenter une brève analyse de l'effet que les diverses ressources que la famille et la collectivité mettent à la portée de l'enfant peuvent avoir sur la préparation à l'école.

Le document présente cinq éléments de la préparation à l'école :

- le bien-être physique et le développement moteur approprié;
- la santé émotive et une approche positive des expériences nouvelles;
- la connaissance et la compétence sociales appropriées selon l'âge;
- les habiletés linguistiques appropriées selon l'âge; et
- les connaissances générales et aptitudes cognitives appropriées selon l'âge.

Les déterminants de chaque composante de la préparation à l'école sont traités, et sont suivis d'un chapitre sur l'importance des périodes critiques du développement. Ces périodes critiques sont pertinentes pour certains types de développement, comme la maîtrise des langues et la compétence sociale avec les pairs, et reflètent les périodes où l'enfant est biologiquement le mieux disposé à acquérir des structures neurales ou des aptitudes plus avancées, à la condition que les stimulus nécessaires soient présents. L'analyse des ressources à la portée de l'enfant rejoint le revenu familial, les autres ressources familiales, comme le temps des parents et les pratiques pédagogiques, et les ressources communautaires comme les programmes de qualité en matière de garde non parentale et de soutien à la famille.

Le document conclut que, du fait de leur situation de vie, de nombreux parents de la fin des années 90 trouvent difficile d'assurer à leurs enfants l'appui dont ils ont besoin pour être prêts à l'école à l'âge de six ans. De l'avis de l'auteur, la préparation à l'école doit être un effort de collaboration entre la famille, la collectivité où vit l'enfant et la grande société.

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Chapter 1 — Context

The Parameters of this Paper

This paper has two main purposes:

- to identify the physical, emotional, social, language, and cognitive skills required within a child so that the child, at age six, is ready to take advantage of the learning opportunities offered by the formal school system (see Chapter 2); and
- to explain why and how the period from conception to age six is so important for laying the foundation for academic achievement and later adult success in the labour force and in life in general (see Chapters 3 and 4).

Children develop within the broader context of their family, the community in which they live, and society as a whole. Chapter 5 discusses some of the contemporary realities of family life that impact on child development. It also provides a preliminary exploration of how the community and society can support child development by supporting parents in their parenting role.

While the focus is on the first six years of life, there is no intention to dismiss children's experiences after age six as unimportant determinants of their eventual ability to handle change, think critically, problem solve, communicate, work independently or as part of a team, and become caring, contributing members of society.

The Importance of School Readiness for the Individual

"School readiness" refers to a child's ability to meet the task demands of school, such as sitting quietly, and to assimilate the curriculum content at the time of entry into the formal school system.[1]

School readiness and later childhood

Canadian[2] and American[3] research demonstrates that school readiness at age six predicts children's ability to benefit from academic instruction in the early grades of elementary school. Academic performance in the early grades, in turn, is a significant predictor of

whether the child completes high school.[4] This is not surprising. Because of the cumulative nature of subjects in the early curriculum, such as mathematics, children who fail to master the basics have gaps in understanding that may hinder their ability to grasp more advanced concepts. As early as grade three, children who eventually leave school before graduation are exhibiting academic difficulties and low achievement test scores.[5] By grade nine, children's general receptiveness to schooling is already well established and future school leavers often have a pattern of high rates of absenteeism.[6] As a result, they fall further and further behind and become increasingly likely to leave school without a diploma.

Lack of school readiness also has other negative effects on children. For example, the behavioural demands of the classroom and the playground require the ability to cooperate with others and to communicate feelings and wishes in an appropriate verbal fashion. Children who lack these skills at school entry resort to behaviours such as physical aggression, bullying, and interruption of other children's activities. Research has shown that such behaviours are associated with peer rejection and lead to children being excluded from group activities by the other children.[7] Peer rejection is thought to contribute to low self-esteem and lack of engagement in the school culture and process. Canadian[8] and American[9] follow-up studies have found that the lack of appropriate social skills at the time of school entry is one of the best predictors of delinquent behaviour in early adolescence.

Being school ready at school entry gives children the opportunity to benefit from all that school has to offer, both academically and socially. This allows them to develop self-respect and self-esteem as they tackle the challenges of learning and growing up.

The extent and nature of school leaving in Canada

As already mentioned, the path to leaving school before high school graduation can start early in a child's school career. Two important pathways are:

- failure to master the academic basics as a result of deficient language or cognitive skills at school entry, and/or poor classroom skills, and/or frequent absences in the early grades due to illness. Repeated difficulty performing at average classroom levels is believed to result in low self-esteem, reluctance to try new things, and further achievement difficulties;[10] and

- peer rejection associated with disruptive, uncooperative, and aggressive tendencies towards peers and eventual alienation not only from peers but also from teachers and school in general.[11]

The rate of young adults no longer enrolled in school and lacking a high school diploma can be estimated on the basis of the administrative records of each provincial and territorial ministry or department of education, or through surveys. There are some statistical inconsistencies in the reported findings between the two approaches. Since the survey approach is considered to be the more accurate,[12] survey findings are used in this report.

Three recent national surveys completed by the federal government report school leaver rates for twenty-year-olds as ranging between 18% to 21%.[13] All three estimates were based on the assumption that most youth should have completed their basic education (high school) by age 20. However, a later follow-up with the respondents to one of the surveys found that this may not be the case. One out of every four young people who had left high school without graduating in 1991 had returned and obtained their high school diploma by 1995. [14] As a result, in 1995, the school leaver rate was 14.2% of the total population age 22 to 24, not the 18% found when the respondents were age 18 to 20. These findings suggest that a substantial proportion of school leavers are motivated to return and complete their high school education after experiencing difficulty in obtaining a job because they do not have a diploma.

The estimated 14% school leaver rate is still significant. It represents an estimated 160,000 people. In addition, it is higher than rates in other countries. For example, in Japan, fewer than 2% of students do not complete high school.[15]

The skill level of Canadian school leavers is also pertinent. The 1991 federal School Leavers' Survey, based on interviews with 9,460 youths aged 18 to 20, found that:

- 16% of male drop-outs and 17% of female drop-outs reported having difficulty understanding and completing an employment application. In contrast, only 6% of male and 5% of female high school graduates reported having difficulties with this task; and

- 19% of male drop-outs and 29% of female drop-outs expressed the opinion that their mathematical skills limited their job opportunities. In contrast, only 4% of male and 11% of female high school graduates expressed this opinion.[16]

The labour force prospects for a young person who has difficulty understanding and completing an employment application are dim given the skill requirements of today's and tomorrow's jobs.

High school completion and later employability

Adults' level of formal education predicts their ability to compete successfully in the job market, that is, their employability. Canadian research has found that:

- in 1995, the unemployment rate for people age 22 to 24 who had not completed high school was 17% for men and 30% for women.[17] In contrast, it was 11% for male and 10% for female high school graduates who had completed further education or training beyond high school;[18]
- a male with less than high school graduation has, on average, 5.8 years of unemployment during his 40 year work life in contrast to 3.6 years among males with grade 12 and 1.3 years for males with a degree;[19] and
- between 1990 and the first half of 1996, jobs held by people with a post secondary school certificate or diploma increased by 26%. There was almost no change for people who were high school graduates. However, jobs for those with less than a high school diploma *decreased* by 25%.[20]

The ability to obtain and retain employment is important not only for the individual's ability to be self-supporting, but also for the individual's self-esteem. Ours is a society in which adult success is at least partly related to being in the paid labour force. A prolonged period of involuntary unemployment is frustrating and may lead to feelings of incompetence and powerlessness. These feelings may result in alienation from a society which appears to have no place for the individual, and alienation from its norms and goals.

The importance of high school completion for employability is not likely to diminish in the future. Success in an international market place dominated by new knowledge and new technology is dependent on having a workforce with high literacy and numerical skills, good problem-solving ability, and adaptability. A 1995 estimate produced by Human Resources

Development Canada indicates that 55% of all new jobs created between 1995 and 2000 will require a minimum of 12 years of formal education. [21]

The Importance of School Readiness for Society

Being school ready increases the likelihood that children will complete high school, find employment and be able to contribute to society in many ways, including as caring citizens and parents and as tax payers.

Lack of school readiness, and the resultant increased likelihood of repeating a grade, and/or having to receive special education services, and/or leaving before completing high school, costs the whole society through:

- lost government revenue;
- increased government expenditures;
- decreased ability to be competitive in the global market; and
- decreased ability to provide functions that are essential for the smooth functioning of the society as a whole.

Lost government revenue

Leaving school without obtaining a diploma increases the probability of being unemployed. Unemployed people do not contribute employment insurance (previously known as unemployment insurance) premiums, pay little or no income tax, and tend to pay lower consumption taxes than employed people because they purchase less.

The Conference Board of Canada has calculated that the nearly 137,000 youths who left school instead of graduating with the class of 1987 will cost society $1.7 billion in 1992 dollars as a result of lost taxes.[22] It should be noted that this figure pertains to the people who left school before obtaining a diploma in only *one year*, and does not include lost employment insurance premiums.

Table 1 compares lifetime tax and premium contributions over a 40-year working life time for people with different educational levels. It illustrates the direct correlation between higher contributions to the public purse and higher levels of formal education.

Table 1: Estimates of individual lifetime tax and premium contributions made between the ages of 25 and 65 years, by education and gender, 1990 dollars

Taxes and premiums	0 - 8 years education	12 years education	degree
Males:			
federal income tax	$133,000	$220,000	$447,000
federal consumption taxes	$56,000	$66,000	$93,000
provincial income tax	$92,000	$134,000	$281,000
provincial consumption taxes	$56,000	$64,000	$91,000
U.I. contributions	$14,000	$19,000	$22,000
Females:			
federal income tax	$26,000	$72,000	$195,000
federal consumption taxes	$20,000	$28,000	$48,000
provincial income tax	$18,000	$45,000	$134,000
provincial consumption taxes	$19,000	$28,000	$48,000
U.I. contributions	$4,000	$10,000	$17,000

Source: Ross & Shillington (1990). *Child poverty and poor educational achievement: The economic costs and implications for society*, page 70.

Based on Statistics Canada's Social Policy Simulation Database/Model, SPSD/M.

Notes: U.I. contributions refers to employees' contributions to unemployment insurance (now known as employment insurance).

Women have a lower average wage than men and spend more time out of the workforce for child bearing and rearing. As a result, their average lifetime salary and U.I. contributions are lower than those of men at each educational level.

Increased government expenditures

Increased government expenditures related to lack of school readiness are incurred while the child is in school each time the child has to receive special education services or repeats a grade. Grade repetition means that society has to pay twice to teach the child the skills and knowledge that should be attained in the grade that was repeated. The data from parents interviewed for the National Longitudinal Survey of Children and Youth in 1994-95 indicate that approximately 5.5% of all children between the ages of six and eleven who were surveyed had repeated at least one grade.[23]

Costs to society are also incurred when an unemployed person is supported by public monies. Table 2 illustrates that among both males and females, people without a high school diploma are likely to receive more social assistance during their lifetime than people with grade 12 or a university degree.

Table 2: Estimates of individual lifetime income security payments received between the ages of 25 and 65 years, by education and gender, 1990 dollars

Taxes and premiums	0 - 8 years education	12 years education	degree
Males:			
social assistance	$47,000	$19,000	$15,000
U.I. benefits	$60,000	$30,000	$14,000
Females:			
social assistance	$41,000	$13,000	$12,000
U.I. benefits	$21,000	$21,000	$20,000

Source: Ross & Shillington, 1990, page 71.

Based on Statistics Canada's Social Policy Simulation Database/Model SPSD/M.

Notes: U.I. benefits refers to the person's unemployment insurance (now known as employment insurance) benefits.

Education level has little impact on the lifetime level of U.I. benefits received by women. This is mainly explained by the fact that women with lower educational levels are almost four times as likely as men to be out of the paid labour force and, therefore, to have not contributed to U.I.

Decreased ability to be competitive in the global market place

Competitiveness requires both:

- a sufficiently large pool of workers; and
- workers with the appropriate level of knowledge and skills.

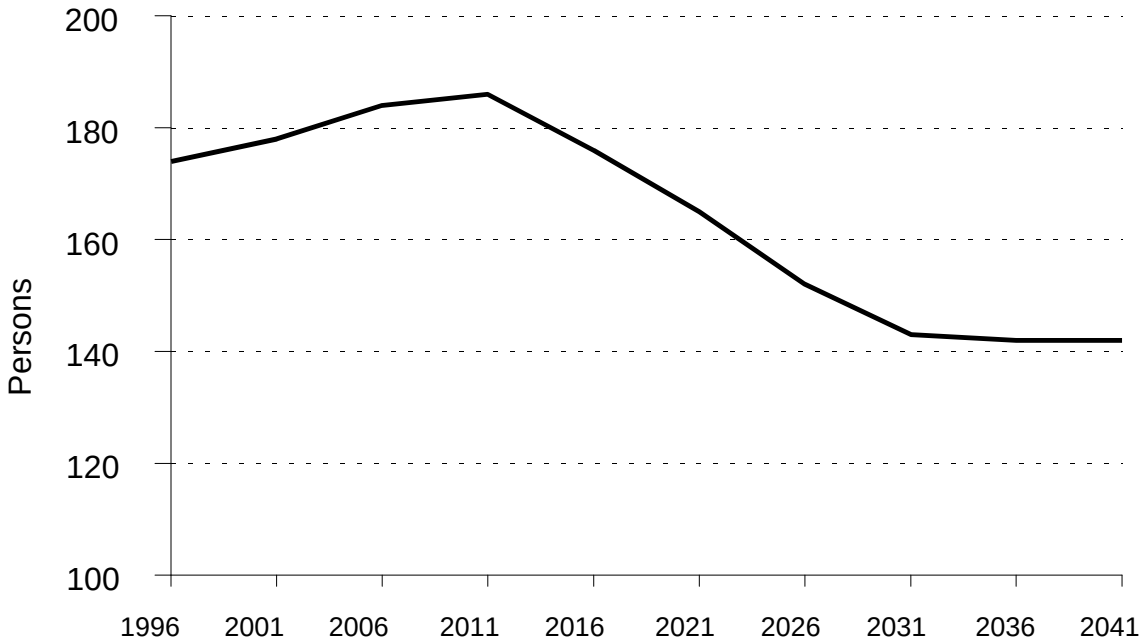
Canada's birthrate dropped below what is required to replace the population in the late 1970s and has remained well below replacement level ever since.[24] At the same time, the elderly are living longer as a result of improvements in medical technology and nutrition. Using current birth, immigration, and death rates, Statistics Canada projects that:

- the population aged 65 and older will expand from around 12% in 1993, to roughly 16% in 2016, and 25% in 2041. The most rapidly growing group would be those over age 85, more than doubling in size to about 800,000 in 2016, and to 1.6 million in 2041; and
- the proportion of young people in the population will drop from 25% in 1993, to 19% by 2041.[25]

As a result of these demographic changes, Canada may not have a sufficiently large pool of workers to compete successfully unless every potential worker is productive.

Graph 1

Projected number of working age persons for every 100 "dependent age" persons (age 0 - 17 plus age 65 and older), 1996 to 2041



Source: Statistics Canada (1994). *Population projections for Canada, Provinces and Territories, 1993-2016*, Catalogue 91-520, Table 19, page 73.

Note: Assumes current levels of births, immigration, and deaths.

Workforce skill is also required to compete in the global workplace. Canada will not have an adequately skilled workforce if it has higher school leaving rates than other industrial countries. Harvard economist Robert Reich has been quoted as saying "Every factor of production other than workforce skills can be duplicated anywhere around the world. Capital

now sloshes freely across international boundaries, so much so that the cost of capital in different countries is rapidly converging. State-of-the-art factories can be erected anywhere. The latest technologies flow from computers in one nation to computers in another nation. It is all interchangeable … all except for one thing, the most critical part, the one element that is unique about a nation: its workforce."[26]

Decreased ability to provide functions essential for society as a whole

The availability of a sufficient number of people to provide essential functions — as healers, teachers, builders, engineers, traders, and so on — is a key determinant of the overall social environment and social stability. These roles require special skills and knowledge gained over childhood and young adulthood. Children who lack school readiness at school entry have difficulty developing or may be unable to develop the requisite skill and knowledge base. Most new jobs will require a minimum of 12 years formal education. In most cases, a high school diploma is necessary for the pursuit of technical or professional training and qualifications.

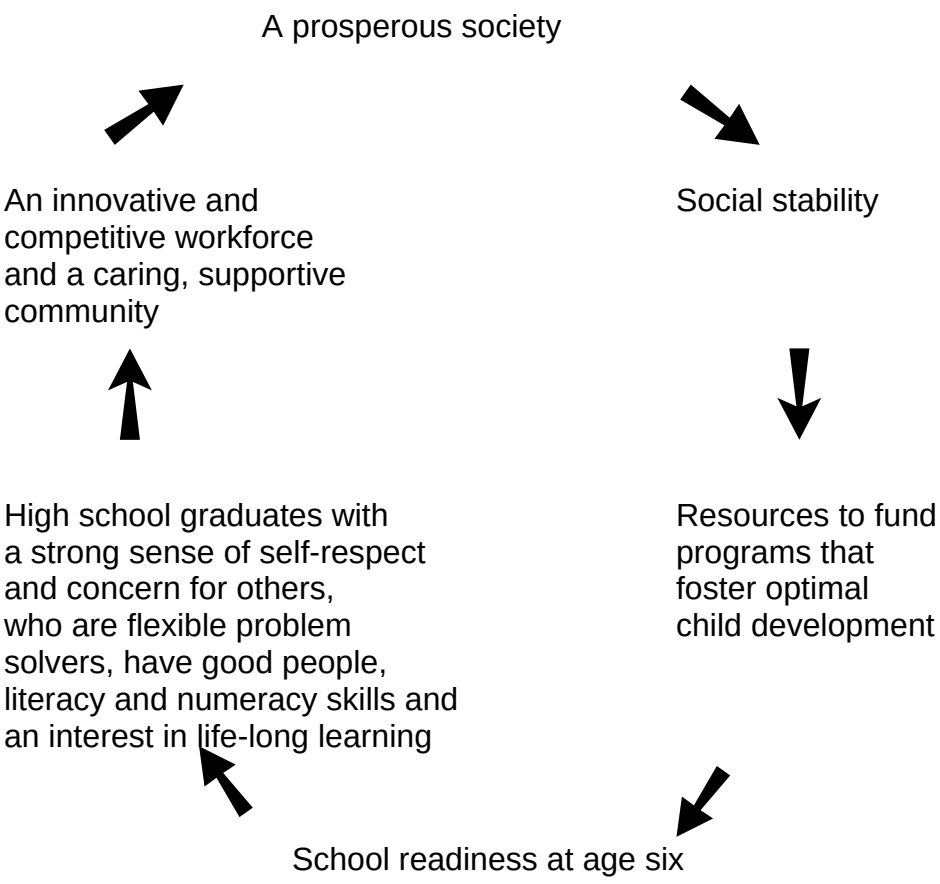
Towards A Prosperous Society

A prosperous society is one in which all citizens have the means to meet their basic needs, where there is social cohesion rather than social division, where the various segments of society cooperate for the common good, and where safe, attractive communities make it relatively easy to attract new citizens and new businesses. This type of society is associated with social stability as well as economic growth. Social stability and economic growth, in turn, provide the societal willingness and the resources to support optimal child development. Children whose development has been supported and encouraged are more likely to be ready for school at age six than children whose developmental needs have not been met. The extent of a child's school readiness predicts the likelihood that the child will develop a strong sense of self-respect and a concern for others, have good people, literacy, numerical skills and problem-solving skills, and an interest in life-long learning. Citizens with these skills provide an innovative and competitive workforce as well as a caring, supportive community. This in turn, encourages economic growth and social stability, both factors which increase the

prosperity of the society. This circular relationship is illustrated by Diagram 1. The diagram also illustrates the crucial importance in the cycle of school readiness at age six. As is discussed in Chapter 5, developing school readiness must be seen as a partnership involving the child, the parents and other primary caregivers, the community in which the child lives, and society as a whole.

Diagram 1

The inter-relationship between economic and social goals



Source: Adapted from a diagram presented by Dr. Dan Offord at the symposium, *Children in a Changing Socioeconomic Environment*, Ottawa, October 1, 1994.

Endnotes

1. Kagan, 1992.

2. PULKKINEN & TREMBLAY, 1992; STENNET, 1988; TREMBLAY, MASSE, PERRON, LEBLANC, LEDINGHAM, 1992.

3. Horn & Packard, 1985; Kontos, 1988; Reynolds, Mavrogenes, Bezruczko & Hagemann, 1996; Stevenson, Parker, Wilkinson, Hegion & Fish, 1976.

4. BARRINGTON & HENDRICKS, 1989; CAIRNS, CAIRNS & NECKERMAN, 1989; ENSMINGE ENTWISLE & HAYDUK, 1988; GILBERT, BARR, CLARK, BLUE & SUNTER, 1993; LLOYD, 1978 MCLEOD, BOYLE, BYRNE & HALL, 1994.

5. Barrington & Hendricks, 1989; Entwisle, Alexander, Cadigan & Palls, 1986.

6. Binkley & Hooper, 1989.

7. Coie & Kupersmidt, 1983; Dodge, 1983; Ladd & Price, 1987.

8. Tremblay, Masse, Perron, Leblanc, Schwartzman & Ledingham, 1992.

9. Ensminger, Kellam, & Rubin, 1983.

10. Rumberger, 1987.

11. Finn, 1989; Radwanski, 1987.

12. The administrative record approach has resulted in reported national drop-out rates as high as 32%. However, this approach has major problems, for example, different definitions and data collection methods across jurisdictions. As a result, the administrative record approach is considered less accurate than the survey approach (Gilbert, Barr, Clark, Blue & Sunter, 1993, pp. 11 & 12).

13. The 18% drop-out rate comes from a random stratified sample of 9,460 youths aged 18 to 20. The 21% estimate is based on the long form of the 1991 census. The long form is completed by 20% of the population. The findings of all three studies are discussed in Gilbert *et al.*, 1993. The survey approach clearly results in a lower rate than the administrative approach. It should be noted that surveys rely on the respondents' self-reporting of their academic achievement. Some respondents may be reluctant to identify themselves as school drop-outs.

14. Statistics Canada, 1996, *School leavers' follow-up survey, 1995*, p. 2.

15. Gilbert, Barr, Clark, Blue & Sunter, 1993, p. 3

16. Ibid., p. 53.

17. Statistics Canada, 1996, *School leavers' follow-up survey, 1995*, p. 3. According to an article published in the *Ottawa Citizen*, October 16, 1996, the analyst who prepared the report noted that many of the women who had dropped out of high school had young children and this may have kept them out of the workforce.

18. Ibid., pp. 2 and 3.

19. Ross & Shillington, 1990, Table 9, p. 68.

20. Little, 1996.

21. Estimate produced by the Applied Research Branch, Human Resources Development Canada.

22. Lafleur, 1992, calculated from Exhibit 4, p. 10.

23. Statistic from the first cycle data of the National Longitudinal Survey of Children and Youth.

24. Vanier Institute of the Family, 1991, p. 54; Wadhera & Millar, 1996, p. 8.

25. Statistics Canada, 1994, *Population Projections for Canada, Provinces and Territories, 1993-2016*, p. vi.

26. *The Financial Post*, April 5, 1990 editorial.

Chapter 2 — The Components of School Readiness

Definition

"Readiness to learn" is a general concept that can be applied to a wide variety of situations. In contrast, "school readiness" refers specifically to the child's ability to meet the task demands of school, such as sitting quietly and listening to the teacher, and to assimilate the curriculum content.[1] As will be discussed in the following chapter, school readiness is based, in part, on the child's level of physiological maturation. However, the child's innate abilities and temperament, and his or her early experiences also exert a strong influence.

Developmental psychologists and early childhood educators agree that understanding the transition-to-school process, and the child's experience in school, requires moving beyond the traditional academic definition of school readiness. It is necessary to include consideration of factors such as motivation and social skills.[2] A study that combined the findings from 58 smaller studies and treated them as one data set found that one of the best predictors of a child's later reading skills was the child's ability to remain focused on a task when in kindergarten.[3] Follow-up studies have found a direct relationship between the child's ability to get along with classmates and the likelihood that the child will or will not leave school before graduation.[4]

A more recent expansion of the traditional definition of school readiness emphasizes the importance of the school being "ready" for the child.[5] This reflects Canadian as well as American concerns about kindergarten and grade one classrooms that fail to address different levels of school readiness among children, employ inappropriate instructional approaches, and/or impose unrealistic academic demands. The readiness of the school, and its resultant ability to foster the child's development, is discussed in Chapter 5.

The Components of School Readiness

The United States' National Education Goals Panel has proposed that school readiness involves the following five components within the child:[6]

- physical well-being and appropriate motor development;
- emotional health and a positive approach to new experiences;
- age-appropriate social knowledge and competence;
- age-appropriate language skills; and
- age-appropriate general knowledge and cognitive skills.

The order in which the components are listed is significant. It reflects the growing recognition of the importance of components other than those obviously related to academic success, for example, the importance of emotional health and of social knowledge and competence.

Physical well-being and appropriate motor development

The term physical well-being goes significantly beyond the concept of freedom from major disease or gross neurological impairment such as cerebral palsy or deafness. It encompasses factors such as the possession of adequate levels of energy to enable the child to concentrate on school activities and the ability to resist common infections. Frequent absences from school in the early grades due to illness may result in failure to learn the basics that are crucial for mastering more advanced academic work.

School readiness also requires sufficient physical coordination to complete common kindergarten and grade one tasks such as controlling a pencil and turning the pages of a book without tearing them. Schools operate on the assumption that all five-year-olds have such skills. A child who lacks age-appropriate motor skills may view him- or herself as incompetent. This negative self-image could result in withdrawal from classroom activities and, as a result, loss of opportunities to practice and learn.

Emotional health and a positive approach to new experiences

School readiness requires self-confidence so that the child does not have to devote energy to defending against fear of failure and is willing to try new tasks. It also requires the emotional maturity to:

- defer immediate gratification, for example, to resist talking with another child instead of doing an assigned task;
- persist in repetitive but necessary exercises, such as sounding out words; and
- cope with momentary failures without an outburst of weeping or intense anger that prevents continued concentration and learning from mistakes.[7]

Dan Keating, at the University of Toronto, has coined the phrase "habits of mind" to categorize a person's habitual response to new settings and experiences.[8] He notes that habits of mind vary along a continuum from highly defensive and overly reflective, as seen in the person who is always very reluctant to try new things, to impulsively rushing into any situation that presents itself. School readiness requires an approach in the middle of this continuum, that is, one characterized by curiosity about the world, an eagerness to try new experiences, along with some ability to reflect before acting. A child who is fearful and reluctant to engage in new activities misses learning opportunities that are seized upon by a child with a positive approach to life. A child who is impulsive may fail to perceive all aspects of a task and, as a result, fail to fully understand it.

Age-appropriate social knowledge and competence

The behavioural demands of the classroom require an awareness of the general standards of acceptable behaviour in a public place, the ability to control one's own behaviour, the ability to cooperate with others in working together on assignments, appropriate respect for adult authority, and the skills to communicate feelings and wants in socially acceptable ways. Children who exhibit appropriate classroom conduct in grades one and two have higher levels of reading and arithmetic performance than do children who lack adequate classroom skills.[9] Disruptive classroom behaviour in elementary school predicts poor grades in high school, even when the children's IQ level is taken into account.[10]

The skills to get along with other children are also important. Children's ability to establish and maintain positive relationships with their classmates during the first few weeks of school is directly related to their success in adjusting to school.[11] Successful peer interaction in grade one depends upon social skills such as the ability to negotiate instead of using aggression to obtain what is desired, and the ability to enter a group that is already engaged in an activity without disrupting it. Children who have not developed the social skills necessary for positive peer interaction by early elementary school have been observed to behave consistently in ways that lead to peer rejection.[12] Furthermore, behaviours such as aggression and lack of cooperation with others persist over time and across settings, resulting in continued peer rejection even if the child changes groups.[13] Three studies report that the incidence of leaving school before graduation among peer-rejected boys is two to three times higher than that among boys who get along well with their peers.[14]

The dynamic through which peer rejection increases the likelihood that the child will leave school without a diploma is less obvious than is the association between lack of classroom skills, such as staying focused on a task, and poor school performance. Early adolescence is a period when a sense of belonging to the peer group and group identity become increasingly important. School leavers are reported as feeling alienated from peers as well as teachers, and to be emotionally withdrawn from the schooling process.[15] Social scientists hypothesize that peer rejection at school leads to a feeling of lack of relatedness, a view of school as unpleasant, and rejection of its goals.[16] Nation-wide research conducted in Canada in 1991 found that school leavers are more likely than high school graduates to report that they did not enjoy school, disliked school rules, had problems with their teachers, and did not participate in extracurricular activities.[17]

Age-appropriate language skills

By school entry, a child should be able to:

- understand adults' and other children's verbal communication; and
- verbally communicate experiences, ideas, wishes, and feelings in a way that can be understood by others.[18]

Being able to understand the teacher and other children, and having the skills to express ideas, wishes, and feelings assists the child to adjust successfully to the school setting. Language skills at school entry are also related to later academic achievement. Research studies from Canada and the United States report that children's oral language level in kindergarten accounts for between 30% and 40% of the child's later reading ability.[19] The ability to name letters, to attend to the component sounds within a word, and vocabulary size appear to be particularly important.[20]

Age-appropriate general knowledge and cognitive skills

While language skills are important for learning to read and write, and being able to count is important for beginning arithmetic, other less specific knowledge is also important. Knowing that a story has a beginning, a middle, and an end, and understanding the ways in which language can be used symbolically to represent remote or even imaginary events, is necessary for reading readiness.[21] Familiarity with board games which involve numbers, such as snakes and ladders, assists the child to master basic adding and subtracting.[22]

The term "cognitive skills" refers to the ways in which children perceive, organize, and analyze the masses of information provided by their social and physical environments. Adequate cognitive skills are essential for both the retention and retrieval of information, and for the effective exploration of new experiences. The skills required at school entry include the ability to understand similarities and differences between groups of objects and the ability to remember and recite back specific pieces of information. There is considerable research indicating that the child's level of cognitive skills prior to school entry predicts later academic success.[23]

Chapter Summary

The components of school readiness within the child go well beyond the traditional identification of cognitive functioning and specific language and number skills. Research suggests that the following five components are all important:

- physical well-being and appropriate motor development;
- emotional health and a positive approach to new experiences;
- age-appropriate social knowledge and competence;
- age-appropriate language skills; and
- age-appropriate general knowledge and cognitive skills.

As illustrated by Table 3, children develop the components required for school readiness in a series of steps. Each succeeding level of competence builds on those that preceded it. (The concept of developmental building blocks is discussed briefly at the end of Chapter 4.) The following chapter presents some of the determinants for the development of competence in each of the five components of school readiness.

Table 3: Some of the developments in the components of school readiness between birth and age five

Age	Motor development	Emotional health/positive approach to new experiences	Social knowledge and competence	Language skills	General knowledge and cognitive skills
Two months	sucking and other survival reflexes, little voluntary control	unable to differentiate self from other	no concept of being able to influence another	reflex crying when nervous system is over stimulated	no understanding of cause-and-effect
One year	independently mobile using non-walking methods, can walk holding onto something, able to grasp items using thumb and forefinger	can differentiate primary caregiver(s) from others, will use caregiver as a secure emotional and physical base for exploration	understands that others can act and be acted upon, engages in games with familiar adults, imitates others	skilled at using gestures, e.g., holds up arms to be picked up. Imitates words, first spontaneous and deliberate word uttered around age one	engages in task variation and deliberate experimentation, has some sense of cause-and-effect in a specific situation
Two years	able to walk and climb stairs, eye-hand coordination sufficiently developed to allow manipulation of large objects	increasing self-confidence, will move a considerable distance from caregiver when exploring	interested in playing along side other children, but not actually with them in a joint activity	can string two or three words together in a simple sentence, e.g., “look truck”	begins to move from reliance on replica objects, e.g, a doll, in pretend play to use of substitute objects, e.g., a pillow for a “baby”
Three years	skilled at climbing and jumping. Fine motor coordination sufficiently developed to permit manipulation of small objects	beginning to regulate own behaviour, tries to handle emotions such as frustration but still needs adult help and guidance	interested in playing with other children. Has difficulty sharing because of difficulty taking the perspective of another	has some basic idea of grammar, e.g., adds “s” for a plural, asks questions, forms multi-word sentences	shows some basic understanding of categorization, e.g.,can sort by colour or by shape, but makes mistakes
Four years	can control a pencil and cut with scissors	can control own emotions, such as anger or frustration, in many situations with minimal adult assistance	plays with other children. Is able to take turns and engage in cooperative activities	can join simple sentences together to describe a past or present action or experience	reliably sorts by colour or shape, but not by both simultaneously
Five years	able to write letters, turn book pages without tearing them	has some ability to stop and think before deciding how to act, is curious about the world outside the home	has basic peer relationships skills, e.g., knows how to enter a group	can hold a prolonged conversation and express ideas	by the end of the year, can sort by both colour and shape simultaneously

Endnotes

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6. Quoted in Kagan, 1992, p. 50.

7. Singer & Singer, 1993.

8. Keating, 1990; 1993.

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10. Feldhusen, Thurston & Benning, 1970; Lambert, 1972.

11. Ladd, 1990.

12. Coie & Kupersmidt, 1983; Dodge, 1983; Dodge, Coie & Brackke, 1982; Ladd & Price, 1987; Putallaz & Gottman, 1981.

13. Coie & Kupersmidt, 1983; Ladd & Price, 1987.

14. Amble, 1967; Barclay, 1966; Gronlund & Holmlund, 1958.

15. Finn, 1989; Radwanski, 1987.

16. Kupersmidt, Coie & Dodge, 1990; Wentzel & Asher, 1995.

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18. The United Way of America, 1993, p. 6.

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20. Adams, 1990; Biemiller & Doxey, 1993; Reynolds, Mavrogenes, Bezruczko & Hagemann, 1996; Yopp, 1988.

21. Rutledge, 1993.

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23. For example: Hess, Holloway, Dickenson & Price, 1984; Reynolds, 1989; Tizard, Blatchford, Burke, Farquhar & Plewis, 1988.

Chapter 3 — The Determinants of School Readiness

Introduction

Between birth and age six, children develop the essential language and cognitive skills required to learn reading and arithmetic. They also develop the ability to manage their emotions, to handle stress without disintegrating into tears or a temper tantrum, and to cooperate with others. Children who enter elementary school with good social skills, the ability to handle frustration and stress, physical well-being and age-appropriate motor skills, and a solid base of language and cognitive skills are able to take advantage of the learning opportunities offered by the school. This chapter will discuss the determinants of each of the five components of school readiness identified in the previous chapter.

How Do We Know What We Know About the Determinants of School Readiness?

Scientists have used a variety of techniques to gain an increasingly precise understanding of how children develop. These techniques include, but are not limited to:

- **observational experiments** in which a large number of children are given precisely the same task at different ages and a careful record is made of the child's responses;[1]
- **the use of EEG** to determine the correlation between a child's age, the relative maturation of various areas of the brain, and cognitive skill level;[2]
- **examination of tissue samples from animals** of different ages or with different experiences.[3] This technique provided the first concrete evidence of increases in the number of axons (that part of the nerve cell that transmits information) in the brain over time. This physiological change parallels changes in the animal's abilities. It demonstrates that developmental stages often involve changes in anatomical structure as well as changes in function;
- **experiments with animals**, for example, examining the effect on the development of vision when one eye is deprived of sight within the first six weeks of life in contrast to being deprived of sight at 12 months of age;[4] and
- **visual imaging of the neural system's structure and function through positron emission tomography (a PET scan).** This technique can be used to observe the brain in action.[5]

Modern neuroscience, such as analysis of tissue samples or data from PET scans, is providing hard, quantifiable evidence to support observational data. Combining the findings from the various techniques tells us how children develop their motor abilities, sensory abilities and their language and cognitive skills. The research also indicates what is required for optimal development in each area.

The Prenatal Period

The period between conception and birth lays the foundation for the child's physical well-being. It is also the period during which basic neural structures begin to be established, for example, the embryonic connections between the eye and that part of the brain responsible for processing visual input. As a result, the prenatal period has a direct impact on the child's later school readiness. This section discusses the determinants of prenatal development in general rather than discussing the determinants of each of the school readiness components individually. Determinants of the five components of school readiness between birth and age six are discussed individually in the following section.

After the egg is fertilized, repeated cell division occurs, followed by migration of cells to their appropriate areas and the development of specialized structures such as eyes and legs. However, these genetically determined activities can be disrupted or prevented by factors such as poor fetal nutrition or the introduction of toxins or infections into the prenatal environment through the placenta. The eventual impact on the components of school readiness is determined by what happens, when it happens, and the subsequent interplay between the resultant biological vulnerability and early life experiences.

Poor fetal nutrition

The nutrition of the fetus is dependent on the mother's current nutritional level. Contrary to popular belief, the fetus cannot take nutritional stores from the mother's body to compensate for deficiencies in her diet, for example, inadequate protein, mineral, or vitamin intake. Poor fetal nutrition is associated with low birth weight. The threshold for categorizing a newborn as a "low birth weight baby" is a birth weight less than 2,500 grams (5.5 pounds). In Canada, the proportion of live births classified as "low birth weight" dropped from 7.2% in 1961 to

5.5% in 1990.[6] In 1994, the latest year for which national statistics are available, it was back up to 5.9%.[7]

In 1994, there were 23,055 low birth weight babies in Canada.[8] Research has found that, in comparison with normal weight newborns, low birth weight babies have:

- higher rates of neurological disabilities such as cerebral palsy;[9]
- a far higher incidence of subtle "minimal brain dysfunctions", for example, poor attention span, language delays, difficulty interpreting and/or processing visual stimuli, and poor visual memory;[10] and
- a higher incidence of difficulty in learning to read.[11]

An American study reports that only 27.2% of its low birth weight sample that had not received special education services was performing at grade level at age eight.[12]

The introduction of toxins

Anything in the mother's blood stream passes to the fetus through the placenta. Maternal smoking is a classic example of the introduction of a toxin in this manner. Smoking during pregnancy is associated with low birth weight babies, and babies with a higher incidence of auditory deficits and higher rates of "idiopathic mental retardation" (that is, developmental delay in the absence of any other disability such as Down Syndrome).[13] The more a pregnant woman smokes, the greater the chance of her baby having idiopathic mental retardation.[14]

Maternal smoking is known to reduce the amount of oxygen reaching the fetus in two ways, first by raising the amount of carbon dioxide in the mother's blood, secondly through the constriction of the blood vessels in the placenta by nicotine.[15] The resultant reduction in oxygen received by the fetus may be the reason for the subtle brain dysfunction found among children whose mothers smoked during pregnancy.

About one-third of babies born to women who regularly have three or more drinks a day during pregnancy are born with fetal alcohol syndrome.[16] This disorder includes developmental handicap (mental retardation) and behavioural problems such as poor attention span. Even babies whose mothers drink only moderately during pregnancy have a

higher incidence of motor problems as preschoolers and difficulty with basic reading and arithmetic at age seven.[17]

The introduction of infection

Rubella (German measles) is the best known example of an infection that can have detrimental effects on fetal development. Babies who were exposed to the rubella virus through the placenta early in pregnancy have a high incidence of blindness, deafness, developmental handicap, and heart defects.[18]

The Period From Birth to Age Six

The remainder of this chapter will discuss children's development related to:

- physical well-being and motor development;
- emotional health and a positive approach to new experiences;
- social knowledge and competence;
- language skills, and
- general knowledge and cognitive skills.

Each of these five components of school readiness was defined in Chapter 2.

Physical well-being and appropriate motor development

Assuming normal birth weight and the absence of any major disability or sensory impairment, children's physical well-being and motor development unfolds as it should as long as the child:

- has adequate nutrition;
- is protected against accidents or the experience of neglect, abuse, or violence;
- is protected against preventable diseases through immunization; and
- has ample opportunity to exercise large muscles through running, jumping and climbing, and to develop fine motor coordination through manipulation of various objects.

Emotional health and a positive approach to new experiences

The child's emotional health and habitual way of reacting to new situations have their basis in the early relationships between the infant/toddler and the people primarily responsible for his or her care.[19]

The development of attachment between child and caregiver

Each young child's repeated experience with his or her caregivers will range from consistently prompt, affectionate, and appropriate responses, through inconsistent care giving where needs are sometimes met sensitively and promptly and sometimes not, to situations where the infant's or toddler's attempts to communicate distress are routinely ignored for long periods of time. Developmental psychologists use the term "attachment" to describe the extent to which the young child develops a trust that the caregiver will respond promptly and appropriately, thereby providing a sense of security. If the level of trust is high, the attachment is described as "secure". An "insecure attachment" refers to a relationship characterized by the child having a low level of trust.

Until fairly recently, it was believed that infants formed only one "attachment" relationship, usually with the mother (the "mother-child attachment"). Research has shown, however, that infants can and often do have attachments (in the sense being used) with mother, father, and other adults who care for the child on a fairly regular basis over a period of time.[20] The extent of the security of the attachment, as measured by standard research procedures, can be predicted by the extent to which the caregiver is alert to the infant's signals, interprets them accurately, and responds to them promptly in a warm and appropriate fashion.[21]

The effect of a secure or insecure attachment

Infants and toddlers with a secure attachment use the emotional and physical security that it provides as a base from which to explore things and people in the environment. Initially such exploration requires assistance from the caregiver. Gradually children begin exploring on their own. They periodically return to the caregiver for reassurance of the caregiver's continued presence, and therefore the continued presence of a secure base, and for comfort if frightened or frustrated. The support provided by the secure attachment provides the self-

confidence needed for early attempts at exploration. Successful attempts at exploration on one's own increase the child's self-confidence and encourage more exploration. Thus the child begins to learn about and master his or her environment and to gain in both competence and self-confidence. Children with an insecure attachment to their caregiver tend to be reluctant to go off exploring because the threatening aspect of moving away from the caregiver is not balanced by a trust in the caregiver's emotional and physical availability if required.[22]

Psychologists have developed well-validated procedures to determine if an infant's or toddler's attachment to a caregiver is secure or insecure. Follow-up studies comparing groups of four- and five-year-olds whose infant/toddler-caregiver attachment was secure with groups whose attachment was insecure, have found that those who had a secure attachment:

- are more positive in their general outlook;
- have higher levels of self-esteem;
- are more independent;
- are more empathetic with other children and have greater social competence;
- show higher levels of curiosity, are more purposeful and focused in their actions, and are better able to persist with tasks; and
- are less rigid in their approach to problem solving.[23]

Teaching children to regulate their emotions

The relationship between infant and primary caregiver(s) also appears to set the stage for the child's later ability to regulate emotions and deal with stress. Sensitive, responsive care giving in infancy gives the child a sense that the caregiver will respond and, as a result, a sense of control over the environment. It has been suggested that it also wires the child's "calm down" switch.[24] Support for this hypothesis comes from research demonstrating an association between a secure attachment in infancy and the ability to tolerate frustration and modify a child's impulsiveness at age four and five.[25] The way the "calm down" switch develops is believed to be as follows. Between ten and eighteen months a cluster of cells is hooked up in the emotion region of the brain (the potential "calm down" switch). If a child is

soothed when hurt or frightened, gently guided in how to control aggression, and can learn to delay gratification, a "calm down" switch develops. This is able to calm agitation by infusing reason into the emotional upheaval. The switch is strengthened each time the toddler is assisted to calm down or delay gratification rather than being yelled at or punished.

Evidence for evolutional roots

The importance given by psychologists to the security of the attachment between infant or toddler and caregiver is sometimes dismissed as an artifact of western culture. However, signs of attachment to the primary caregiver(s) begins to be evident around age six months in widely different life situations and cultures.[26] Use of the primary caregiver as a secure base for exploration has been found for young toddlers in China, Colombia, Germany, Israel, Japan, Norway, and the United States.[27] This suggests that infant/toddler-caregiver attachment is a universal phenomenon that is characteristic of the species. Having an innate tendency to remain close to the primary caregiver heightens the toddler's chances of survival. At the same time, the urge to explore also has survival value as a preparation for having to care for oneself. Psychologists note that the urge to explore is found in all young primates and believe that it is genetically programmed. The infant/toddler-caregiver attachment serves to provide a potential balance between these opposing inclinations.

Social knowledge and competence

Children's effectiveness in dealing with the social world emerges largely from experiences in close relationships with both adults and other children, supplemented by direct guidance and instruction.

Early close relationships with adults

Psychological theory proposes that the nature of the child's early experiences with caregivers will result in expectations and attitudes that will influence his or her later orientation to other adults and children. A child who has a history of caring supportive relationships with caregivers will develop "secure" attachments. Children with secure attachments can be expected to perceive themselves as worthy of love and to approach others, including peers, with positive expectations. This type of approach tends to elicit positive reactions from

others and forms the basis for the development of social competence. However, a child who learned as an infant and toddler to doubt the availability and predictability of caregiver assistance and support will have a general mistrust of others and low self-esteem. Such children can be expected to act towards other children as if they will be negative and rejecting, for example, by being wary and/or aggressive with peers. This behaviour limits the opportunities to learn and practice peer social skills.

Research supports the above hypotheses. When four- and five-year-olds who are known to have had a secure attachment with their mother as infants and toddlers are compared with children whose attachment was insecure, the secure attachment children have been found to:

- be more empathetic and responsive with their peers;[28] and
- have greater social competence with other children, for example, to be more skilled in initiating and responding to contact with peers.[29]

An association has also been found between the security of the infant attachment to his or her *non-parental* caregiver(s) and the child's later social competence. Children whose attachment to their non-parental caregiver was secure have been found to be more sensitive and empathetic with peers, less frequently aggressive with other children, and to initiate contact more frequently with peers when four-year-olds than children whose attachment was insecure.[30]

The child's experience with other children

Children need relationships with similar age peers as well as with adults in order to develop social competence. The relationship between adult (or older sibling) and child is inherently unequal in that one person has more power than the other. In contrast, no child in a peer group has formal authority over others and the individuals perceive themselves, more or less, as equals.[31] The different characteristics of the two types of relationship provide different learning opportunities. Relationships with adults or older children provide a context for instruction and guidance. Relationships with similar age children provide the opportunity for interaction in *equal status* situations. These enable the child to learn and practice the skills

required for social competence in adulthood, for example, negotiation, reciprocity, and handling competition among peers.

By roughly 15 months of age toddlers become very interested in each other and like to play in the same area. However, each child tends to engage in a separate and individual activity. For example, one child plays with some blocks while the other plays with a doll. Interest in playing with, rather than along side, another child emerges towards the end of the second year. At this age children are still very self-centred and their cognitive development is such that they have difficulty taking the perspective of another. As a result, a group of toddlers requires an alert and sensitive adult to intervene when pushing, shoving and hitting occur if, for example, one child tries to take a toy away from another. The guidance provided by the adult in this situation can help the child to learn self-management and the rules that preschoolers expect each other to observe. One such rule that emerges among three-year-olds is the "rule of possession". This is the rule that when one child is firmly in possession of something it is "his" or "hers". Between age three and five, children develop an increasingly strong sense of rules. They repeatedly reinforce and enforce group norms, expectations, and rules with each other. In this way, each child learns what is expected and how to behave in different peer situations. By age five, children will refuse to play with children who do not observe accepted peer group norms, such as "no hitting".

Children who have a pattern of positive interaction with their peers and high levels of cooperative play at age four get along well with and are liked by their classmates when they are five-year-olds in kindergarten. Four-year-olds who spend more time engaging in disruptive and/or aggressive behaviour as preschoolers carry this approach into kindergarten and tend to be disliked and rejected by their classmates.[32] Shy, socially withdrawn kindergarten children tend to be neglected (ignored) by other children. Both "neglected" and "rejected" children lack the social skills to initiate contacts with others or engage their peers appropriately. In both cases the child is much less likely to be included in group activities than are other children. As a result, their opportunities to develop more adaptive social skills are limited. While rejected status is associated with an increased probability of school drop-out, children classified as "neglected" often have good academic achievement.[33] However,

their lack of peer relationship skills may result in lifelong difficulties working in groups or teams.

Guidance or direct instruction from adults

Caregivers both guide children's early interactions with other children and provide direct instruction. In the early toddler period, a caregiver might assist children to learn how to take turns through playing a game in which each child takes a turn at pulling a bead off a string of pop-off beads. Sharing might be encouraged by an adult helping two children to figure out something they could both do with the same toy that each child wants. From a very early age adults teach children verbal social skills and, in so doing, convey socially expected behaviour. "Say hello to Mrs. Jones" is a direct instruction that also gives the message that a person should be greeted. Most adults intervene when they see a toddler hit another toddler. Quite often they will point out to the child that such behaviour is "not nice", and suggest some other way of handling the situation.

Language skills

Language development requires:

- gaining control over the speech apparatus — mouth, lips, tongue, vocal cords — in order to produce specific sounds intentionally;
- being exposed to language; and
- being actively encouraged to use language.

Learning to control the speech apparatus

All infants go through the stages of cooing, babbling, "jargon" (nonsense words), and word mimicry. Around age 12 months, infants all over the world produce their first culturally relevant word.[34] As discussed in the following chapter, cooing, babbling, and jargon appear to be genetically programmed. However, the adult's paying attention, smiling and responding to babbling encourages the child to continue. Encouraging babbling increases the likelihood that, by chance, the child will make a sound that is close to a real word. Caregivers tend to reinforce word-like sounds, thereby encouraging the child to make the same sound intentionally. Attempting to make a specific sound helps the infant to gain

control over the speech apparatus. Later, the adult's encouragement of word mimicry assists the child to learn how to produce real words.

The importance of exposure to language

When children can recognize and produce some words they are ready to learn their meaning. The adult or older child can assist the child in this by bringing objects, persons, or animals to the child's attention, labelling them, and telling the child something about them.

Learning language also involves discerning rules such as how to make words plural and how to form a grammatically correct sentence. Sentences allow an individual to say something that has not been heard, therefore, children cannot develop this ability solely through imitation or instruction. Psychologists note that all languages share certain structural characteristics. As a result, they believe that there is an innate capacity that enables young children to extract the rules of any language that they hear spoken.[35] Experience is still important. Children need to hear a language being used in a variety of ways in order to extract the rules for asking questions, expressing the past tense, and so on. Being read to, asked questions, and encouraged to describe things they have seen also assists children to learn how to construct sentences.

The importance of being encouraged to use language

Ample research attests to the value of adult conversations with toddlers and preschoolers as opposed to adult language used primarily to instruct or guide behaviour.[36] Children's vocabulary increases dramatically between the ages of two and four if they are exposed to language and provided with encouragement and opportunities to use it to describe experiences, seek information, and share feelings and ideas.[37]

Words are symbols. They allow the representation of something that is not present, or may never have existed, as well as indicating something that can be seen or experienced. The ability to use symbols to represent something forms the basis for reading and arithmetic. The report of the Ontario Royal Commission on Learning stresses the importance of the active use of language during the preschool years by noting:

> "Children who are being readied for future learning (and, therefore, for school) are spoken and listened to; have their questions answered; are offered explanations; and are encouraged to try new words and ideas, to imagine, to guess, to estimate, to draw, and to observe…."[38]

General knowledge and cognitive skills

The term "cognitive skills" refers to the ways in which children perceive, organize, and analyze the information provided by their social and physical environment. The ability to classify objects on the basis of a particular characteristic, such as form or colour, is an example of a cognitive skill.

The rate of development and the formation of the cognitive skills required for school readiness depends upon:

- anatomical maturation of the structure of the central nervous system; and
- the child's physical and social experiences.

The level of maturity of the child's cognitive skills exerts a strong influence on specific learning by either facilitating or limiting the acquisition of new knowledge. Specific learning or new experiences also make a strong contribution to the development of the child's cognitive skills. This reciprocal process results in a "process of intellectual snowballing".[39]

Maturation of the structures of the central nervous system

1) Basic development

The development of the brain is determined by a sequence of precisely programmed events similar to the wiring of the circuits of a computer. At birth, neurons (nerve cells) have one of three levels of development:[40]

- some neurons have been hard-wired by the genes to produce the connections (circuits) that control breathing, heart rate, body temperature, and other mechanisms essential for survival;
- some neurons have been genetically programmed to develop rudimentary connections, for example, the connection between the eye's retina and the brain. However, the mature abilities of these rudimentary connections depend on the child's

experience after birth. For example, if a child is born with cataracts and these are not corrected promptly, blindness results;[41] and

- trillions and trillions of neurons are completely unprogrammed and totally dependent on post-natal experience in order to develop circuits.

The basic process of circuit development is the same whether the neuron relates to vision, language, memory, or some other activity. A neuron consists of a cell that receives signals on highly branched extensions of its body known as dendrites and transmits the information along an unbranched extension known as the axon. Neurons exchange information with each other across a junction known as the synapse. Each time information exchange occurs across a given synapse there is a temporary metabolic reaction.[42] Repeated activation of this reaction strengthens the incipient connection between the neurons and increases the likelihood that it will be retained.[43] Thus, each time a baby or toddler is talked to, the synapses along the connections between the ears and the specialized auditory reception area of the brain are strengthened.

Beginning two or three months after birth, and lasting into the second year of life, there is a rapid proliferation of synapses among neurons that have been genetically programmed to receive experience that is species-specific. In humans, these species-specific neurons include those that are associated with language as well as those associated with vision and hearing. Another type of neuron is not programmed by the genes. Synapses between such neurons develop as the result of the unique experience of the individual and proliferate throughout life.[44] These neurons enable the acquisition of new information over the whole lifetime.

2) Maturation

Strengthening of a synapse as a result of repeated use is the first stage in the development of inter-neural connections and is involved in all types of learning and memory storage. Maturation also involves the encasement of the axon (message transmitter) with a thin, fatty sheath called myelin. This facilitates more rapid transmission of messages long the axon. As neural connections mature and become more myelinated, the individual is able to perform more complex tasks. Completion of myelination in different areas of the brain coincides with

observational data indicating changes in the types of skills that a child can master and the types of problems that a child can solve.[45]

3) Behavioural reflection of the anatomical changes in the brain

Observational studies have demonstrated that at age four children can work with one concept at a time, for example, colour, such as red or blue, ***or*** shape, such as circle or square. However, at this age, children usually cannot integrate these two concepts. For example, generally they cannot sort objects into red circles, blue circles, red squares, and blue squares. However, most children can do this task by age six.[46]

Similarly, children at age four can usually count a set of objects, often up to ten. They can also make a non-numerical judgement of a pile of things as being "a little" or "a lot", that is, they can make an estimate of global quantity. However, they cannot combine these two competencies. As a result, they cannot answer the question "which is bigger, four or five?" Instead their responses are random. They act as if the two sets of knowledge are stored in two separate files, as in a computer, and there is no way to "merge" them. Between age four and six, most children become capable of correctly answering questions such as "which is bigger, four or five?"[47] The ability to integrate counting and an estimate of global quantity simultaneously is necessary for children to understand grade one level instruction in adding and subtraction.[48]

The increased cognitive skills noted above that emerge between four and six probably result:

- partly from increased myelination of the connection between the left and right hemispheres of the brain starting around age four; and
- partly from the strong pattern of growth in the fibres between the frontal and posterior portions of the brain. This begins around age four and continues to around age ten. This growth is believed to explain the increase in "working memory" during these years.

The ability to merge the two concepts in the numerical example used above involves integration of sequential and parallel components. The two hemispheres of the brain are believed to play different roles in these two types of activity. As a result, merging sequential

and parallel information requires a certain maturity of the connection between the hemispheres. Working memory grows from the ability to retain one "unit" of information at age four, to being able to retain four units at age ten. One can hypothesize that a working memory of two units might be required to merge two existing concepts (or "files"), such as counting and an estimate of global quantity, because the task requires the two files to be open at the same time. Therefore, until the child has a working memory of two units, generally by age six, this task cannot be accomplished. Thus, the child cannot deal with relative quantity, the idea that something is big or small relative to something else. Higher levels of working memory would permit three or four files to be held open at the same time, thereby enabling more complex activities.[49]

In 1996, a report was published from a ten-year series of observational experiments conducted by a group of researchers using children in Canada, China, Japan, and the United States.[50] The researchers found that children pass through the same stages of cognitive skill development, that is, the ability to manipulate two units, three units, and so on, at approximately the same age in all these four industrialized countries. Furthermore, similar stages to those found for numerical understanding, cited above, were found for children's understanding of spatial concepts, language, and social conventions. The likelihood of a child being able to complete a new task in any of these areas was predicted by the child's age and the resultant probable level of their cognitive maturity.

The child's physical and social experiences

1) Children's actions on their environment[51]

During the first year of life, children's responses to the environment change from single acts based on inborn reflexes to organized sequences of goal-directed behaviour. The newborn's sucking reflex is applied to anything that accidentally touches the child's mouth, including the baby's own thumb or hand. Infants find sucking pleasant, even sucking a thumb, so seek to repeat the initially accidental placing of thumb in mouth. Eventually, by chance, the baby succeeds and has a rudimentary lesson in cause-and-effect. By five or six months of age, children deliberately repeat an action that has produced an interesting consequence. For example, an infant may accidentally knock a spoon off the high-chair tray so that it clatters

onto the floor. After the spoon is replaced on the tray, the infant may deliberately knock it to the floor again to determine if the same sound results. When the same effect occurs, the infant repeats the action, thereby clearly indicating an understanding of his or her ability to make the sound happen. However, at this age, the child's understanding is limited to the specific situation and he or she will only repeat the action with a spoon when in the high chair.

By age 12 months, children will experiment with variations of the same action. For example, a child might drop a toy down some stairs, then throw another toy down the stairs and watch what happens. The child is obviously interested in the different way a toy falls when dropped or thrown. The child may then experiment with dropping and throwing things when sitting in a chair. These variations illustrate that the child has developed a general concept of cause-and-effect relations to replace the earlier limited understanding tied to a specific object in a specific situation. This change represents a major leap in cognitive skills. However, it is still limited to concrete actions and objects because the child has not yet developed the capacity to use symbols (to have one thing represent another).

Once mobile, children's ability to explore increases significantly. If given the opportunity, toddlers explore anything and everything with great enthusiasm. When children are exploring their environment they are actually doing science, mathematics, and social studies, to use school terms. Touching, smelling, and tasting a banana are all part of an experiment to discover its characteristics. Helping to set an extra place at the table because a friend is visiting provides a basic lesson in mathematics.

2) Pretend play

Children also begin to engage in pretend play between 18 and 24 months of age, for example, pretending to feed a doll. With age and experience, pretend play becomes more complex. The child engages in a string of activities, such as pretending to go to the garage to fill the car with gas, and learns how to use substitute objects (such as a block) when a toy replica is not available. Role playing and using an object to represent something else involves the use of

symbols and symbolic thought. This ability to engage in symbolic functioning, in addition to being able to deal with concrete actions and objects, represents another major cognitive leap.

3) Dialogue with adults

Between the ages of 18 and 24 months, the ability to use language begins to emerge. As a result, the child can benefit when adults use words to identify and label situations, point out connections between different events, and call attention to concepts such as "similar" and "different". Experiences such as this assist the child to interpret and organize information from the social and physical environment.

Chapter Summary

The findings from research indicate that:

- children's development, and hence school readiness, unfolds through the interaction of genetic endowment, physiological maturation, and active engagement with the environment (see the diagram at the end of the chapter);
- each developmental stage is dependent on the preceding stage; and
- many of the knowledge bases and skills required for adult competence are laid down during the first six years of life.

Prenatal development is genetically determined. However, the process may be disrupted if the fetus does not receive adequate nutrition or is exposed to infections or toxins through the placenta. Disruption of development during the prenatal period may result in obvious defects, such as blindness, or more subtle brain dysfunction. If there are no problems at birth, children's physical health and motor development unfolds as it should provided the child has adequate nutrition, is protected against illness, accident and injury, and has ample opportunity to exercise large and small muscles.

Infants and toddlers whose caregivers repeatedly respond to their signals in a prompt, affectionate and appropriate manner develop a secure attachment to the caregiver and a positive approach to the world. Children who had a secure attachment to their caregiver(s) as infants and toddlers subsequently show a greater willingness to explore, better task focus and persistence, less rigidity in problem solving, and greater ability to handle frustration than

children whose attachment was less secure. As a result, they approach tasks and problems in positive ways that encourage learning from experience and the development of cognitive skills.

Children's effectiveness in dealing with their social world also has its basis in their early experiences with caregivers. This sets the stage for a general trust or mistrust of others which, in turn, forms the basis of the individual's typical reaction to and approach with others. However, learning how to get along with adults does not teach the child the skills for successful relationships with other children. Peer relationship skill development requires experiences with peers. Preschoolers who are positive in approach and cooperative are well liked in kindergarten and included by other children in group activities. Preschoolers who are disruptive and aggressive are disliked and rejected by other children. Those who are very shy and lack the skills to approach peers are not disliked, they are simply ignored. Children who are either disliked or ignored are not included by other children in group activities. As a result, their opportunities to develop more adaptive peer skills are limited.

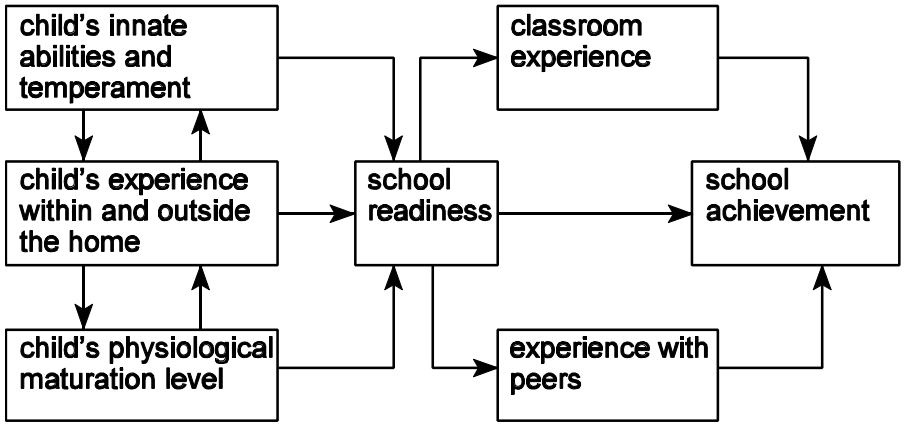
Once the child's anatomical structures are sufficiently mature to produce words, the child's language development is dependent upon exposure to language and the opportunity to use it. Active language use appears to be the key. At school entry, children's ability to understand and use language depends upon the extent to which they have been encouraged to describe experiences and express ideas, and have engaged in two-way dialogue with people who have more advanced language skills.

The development of cognitive skills depends upon a feedback loop between the increasingly mature brain and children's active involvement with their environment. Research has demonstrated actual anatomical changes in the brain that must occur before certain cognitive skills can be mastered. However, the brain also depends on experience for the maturation of its anatomical structures.

Diagram 2 illustrates how children's school readiness unfolds through the interaction of genetic endowment, physiological maturation, and experience.

Diagram 2

The determinants of school readiness and later school achievement



Note: The arrows going in both directions indicate a feedback loop. For example, the child's innate abilities and temperament influence the child's experience within and outside the home. The child's experience influences his or her innate abilities and temperament.

Endnotes

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3. See, for example: Turner & Greenough, 1985.

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35. Chomsky, 1957.
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37. Carew, 1980; McCartney, 1984; Whitebook, Howes & Phillips, 1990.
38. Ontario Royal Commission on Learning, 1994, p. 14.
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40. Begley, 1996; Shatz, 1992.
41. Shatz, 1992.
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Chapter 4 — Critical Periods

Introduction

In the first few years of life there are a number of specific times when the child is at a particular developmental level and is biologically primed to develop more advanced neural structures and/or skills provided that the appropriate stimulation is available. These times are known as "critical periods". They represent a window of opportunity and set the stage for later development. This chapter provides information on the critical period for several components of school readiness and the specific experiences (determinants) required for optimal development at that time. The chapter closes with a brief discussion of how children's development progresses through sequential stages, or building blocks.

Definition of "Critical Period"

The term "critical period" refers to the age range during which the developing child is especially sensitive to the impact of specific types of experience. Critical periods appear to have two stages. The first stage involves an age range during which the child is maximally sensitive to specific experience. This is followed by an age range during which the sensitivity gradually wanes. After the critical period has past, it may be impossible, and at best difficult, for the neural pathway, area of the brain, or skill to develop as it should.

Critical periods occur for those neurons and processes that have been genetically programmed to respond to experiences that are ubiquitous in the life of all members of the species. For humans, these experiences include exposure to input from both eyes simultaneously, speech, the stimuli generated by the child's own motor activities, and close contact with other humans. As discussed in this chapter, there are several important areas in which neural development and/or skill achievement must occur during the critical period in order for the child to achieve more complex development at a later time.

There are not critical periods for those processes that primarily depend upon the unique experience of the individual, for example, memories of specific events.[1] As a result, learning in many areas can continue throughout the lifetime.

A diagram illustrating the critical period for some of the components of school readiness is provided later in this chapter.

The Biological Basis for Critical Periods

The newborn's brain consists of many more neurons and synapses than it will ever need. The adult structure of the brain, and hence its abilities, results from the strengthening of synapses regularly used and the elimination of unused neurons and synapses. This has been likened to wiring the circuits of a computer.

Modern techniques used to study how children develop, such as the use of EEG and visual imaging (PET scans), have confirmed:

- changes in the uptake of glucose (the brain's primary source of energy) that match the process of initial over-production and subsequent elimination of excessive neurons and synapses as each area of the brain matures;[2] and
- changes in the brain's structure that coincide with behavioural and neuro-physiological alterations.[3]

Evidence of genetic programming has been found for some critical periods, for example, the selective "turning on" of certain genes in some brain neurons at a typical age and their "turning off" at a later age when the critical period wanes.[4] However, environmental experience also guides the innate neuro-developmental timetable to a significant degree.

Examples of Critical Periods Before Age Six

The functioning that emerges after a critical period is determined by both the nature and the timing of the relevant experiential input. The following small selection of examples related to the five components of school readiness identified in Chapter 2 illustrates the interplay between critical periods, when the organism is at a maximum state of readiness, and the required specific experiences.

Physical well-being and appropriate motor development

1) Physical well-being

Vision is an example of the physical well-being component of school readiness. The neurons associated with vision are genetically programmed to develop rudimentary connections from the eye's retina to the visual area of the brain before birth. The way in which the brain's visual areas develop after birth depends upon experience. Human infants are born with the ability to discern light and shapes but lack abilities such as depth perception. The older child's ability to assess depth results from cues based on input to the brain from both eyes simultaneously (binocular vision).

Experimental work with cats has shown that normal binocular vision depends upon each eye adopting its own territory in the visual area of the brain. In the cat, this requires appropriate visual signals being received by the brain from about four to twelve weeks of age. If one eye is sutured shut during this period, so that the brain only receives signals from the other eye, a particular territory in the visual area is not assigned for the closed eye. If the cat's eye is opened after twelve weeks of age, the cat's vision remains monocular. Signals from what is a perfectly healthy eye are not "seen" by the brain. This occurs because, at the critical period, there were no visual signals to that part of the brain. Therefore, no neural connections were developed. If a cat's eye is sutured shut after twelve weeks, and the sutures removed later, there is no interference with binocular vision because the required connections had been made before the suturing.[5]

Clinical observation provides confirmation of a similar critical period for the development of binocular vision in children. Infants can be born with strabismus, a visual defect in which one eye cannot focus with the other due to an imbalance in the muscles of the two eyes. As a result, these infants cannot coordinate their eyes in a normal manner. The condition can be corrected by surgery. If this is done in the first year of life, the child's later binocular vision is comparable to that of children born without strabismus. If surgery is performed after age one but before age three, the child has a life-long substantial deficit in binocular vision. Children born with strabismus who do not have the defect corrected until after age five never

develop binocular vision.[6] Clinical observation has confirmed critical periods for other visual processing skills in children. One example is the ability to process lines of different orientation, a skill used to discriminate different letters from each other.

Myelination of the visual system in humans is complete by age two. On the basis of clinical observation, scientists believe that the post-natal critical period for binocular vision begins at birth, is at its strongest between birth and age two, then slowly wanes until age four or five.[7] The critical period for visual acuity is believed to be at its strongest between birth and age five or six and to gradually wane until age eight.[8]

2) Motor development

At birth, babies move their fingers, arms and legs but have little voluntary control over them. Given appropriate experiences at the right age, for example opportunities to reach for things and crawl when an infant, and opportunities to scribble on paper and manipulate blocks when a toddler, the brain progressively refines the motor circuits so that the child develops greater motor control.

Scientists believe that the critical period for gross motor control, for example, walking, climbing and jumping, is at its maximum from birth to age five then gradually wanes until around age eight. The critical period for fine motor control development is believed to start around age two and to begin to wane at about age ten.[9]

Emotional health and a positive approach to new experiences

1) Emotional health

By around two months, the newborn's basic states of distress or contentment begin to evolve into more complex emotions such as joy, sadness, and fear. The relationship between the infant and primary caregiver(s) provides the brain either with emotional stimuli that facilitate healthy emotional development or stimuli that have an adverse effect on emotional health.

Between ten and eighteen months a cluster of cells is hooked up in the emotional region of the brain. This is believed to grow into a control switch, able to calm a child's agitation by infusing reason into the emotional distress. Scientists hypothesize that adult soothing and

comforting when the infant or toddler is distressed strengthens the neural connections of the control switch. The switch is strengthened each time the child is comforted until the child "learns" to calm him- or herself down.[10] This is the beginning of emotional control and sets the stage for the child learning to control frustration and delay gratification.

Stress, for example as a result of repeated threats or physical abuse, also wires the emotion circuits. When faced with a perceived threat the body mounts a defense that includes releasing chemicals and hormones that increase the heart rate and move glucose into the large muscles, the "fight-or-flight response". As long as this stress response remains activated the body directs the majority of its activities to coping with the perceived emergency. When the threat passes, the response should be turned off promptly so that the body can return to normal operations. However, animal research indicates interference with the ability to turn off the stress response after the threat has gone among primates with a history of frequent or prolonged stress.[11] The more often a stress response is triggered in early childhood, the easier it is to trigger again because the circuit keeps being strengthened. The repeated surge of stress hormones during the critical period for developing the ability to switch off the stress response appears to interfere with the development of this ability.[12] A child whose ability to switch off the stress response is impaired is in a constant state of anxiety. The brain concentrates on scanning the environment for impending danger. This reduces its ability to pay attention to stimuli that are not potentially threatening and thus limits opportunities to learn from the environment.

Scientists believe that the critical period for learning emotional control is between birth and age two [13] and the critical period for learning to switch off the stress response is between birth and age four.[14] The critical period associated with emotions then wanes until puberty.[15]

2) Habitual responses to new experiences

Behavioural evidence of the beginning of attachment to the primary caregiver(s) emerges at around age six months in children from very different cultures.[16] Young toddlers in countries as diverse as China, Colombia, Germany, Israel, Japan and the United States have been observed to use the primary caregiver as a secure base for moving out to explore their

environment.[17] Research indicates that the extent of the child's eagerness and willingness to explore new experiences, and the child's general trusting or wary approach to life, is established as early as age two. This is illustrated by a follow-up study conducted in the United States.[18] Whether the children had a secure or insecure attachment to their caregivers was assessed at age 18 months. At age 24 months, each child was observed in four different problem-solving situations. The extent to which a child approached the situations with enthusiasm, and persisted even if having difficulty, was predicted by the extent of the security of the earlier toddler/caregiver attachment. The children who approached problem solving with a positive attitude and persistence as two-year-olds, showed a more positive attitude, greater flexibility, and greater persistence in solving tasks as five-year-olds.

Other research has documented an association between a secure attachment to the caregiver as an infant and toddler and self-confidence, independence, flexible problem solving, and persistence in five-year-olds.[19]

There is not the clear linkage with physiological change in function and structure for the development of habitual ways of responding to new experiences that there is for vision. Therefore, the hypothesis about the timing and duration of the critical period has to rely on observation. The consistency in general approach between age two and age five noted in the follow-up study cited above, supports the hypothesis that the critical period for developing habitual ways of responding is at its height between age six and 24 months. It then may wane for a couple of more years.

Social knowledge and competence

Getting along with peers is an example of social knowledge and competence. The basis for peer social competence appears to be laid down in the first two years of life. Four- and five-year-olds who learned to trust the availability and appropriateness of assistance from their caregivers when they were infants and toddlers (therefore developed secure attachments) are more responsive to their peers and approach them more often in positive ways than do preschoolers whose early caregiver attachment was insecure.[20] As indicated in the previous

chapter, an insecure attachment can be expected to lead to a general mistrust of others and expectation that they will be rejecting.

Research indicates that as early as age four, children are well on the way to establishing their peer contact style. Children who have a pattern of positive interaction with peers as four-year-olds get along well with their kindergarten classmates when they are five-year-olds. Children who have a pattern of disruptive and/or aggressive behaviour with peers as four-year-olds carry this behaviour into kindergarten and tend to be disliked by their classmates.[21] Children who have not developed the social skills necessary for positive peer relationships by early elementary school have been observed to behave consistently in ways that lead peers to reject their overtures and involvement in group activities.[22] Furthermore, a child's ineffectual patterns of peer social interaction persist over time and across settings, resulting in continued rejection even when the child changes groups.[23]

Support for the belief that specific peer contact style develops early and is subsequently maintained comes from a study of seven-year-old boys.[24] Six groups of eight previously unacquainted children were observed over eight free-play sessions. The behavioural patterns of the boys with their peers during the initial sessions predicted the extent to which the other boys would actively seek them to be participants in their activities in the later sessions. Boys who became disliked and were rejected as partners in their activities by their peers had engaged in more disruption of on-going peer activities and more aggression towards others in the early sessions. Boys who were socially withdrawn in early sessions tended to be "neglected", that is, they were rarely asked by the others to be part of a team or to join an activity. Opportunities to interact with other children, and thereby practice positive social skills, are limited for both rejected and neglected children. As a result, they have difficulty learning more effective social strategies for engaging their peers.

Scientists believe that the critical period for peer social competence begins around age three, when a spontaneous interest in playing with other children rather than simply beside them emerges, and probably extends to around age six or seven. As discussed later in this chapter, follow-up studies have shown that it is possible to assist children with deficient peer social

skills to learn more effective skills. However, this requires specific intervention that must be tailored to the particular deficit of the child.

Language skills

All infants go through the stages of cooing, babbling, "jargon" (nonsense words), and word mimicry during the first year of life. Around age 12 months, infants all over the world spontaneously produce their first culturally meaningful word.[25] However, the language(s) spoken fluently in adulthood, the child's language skills at school entry, or in fact whether any language is spoken, depends upon experience in early childhood. Children who are born with a severe hearing-deficit progress through the cooing, babbling and jargon stages. This suggests that these stages reflect neurological maturation that is genetically programmed and does not require sound input. However, infants born with a severe hearing deficit do not progress to word mimicry and the production of culturally relevant words unless their hearing capacity is amplified.[26] If language input is not provided by age five, a child who is born deaf will not learn to speak, or will have a very restricted vocabulary and poor verbal fluency as an adult.[27]

There is other evidence of a period of maximum readiness to learn how to communicate with others starting at about age eight or nine months (the beginning of word mimicry) and continuing to age six or seven. Clinical observation and experimental tests demonstrate that:

- children who are deaf can begin to learn a sign for an object at the same age that hearing infants begin to learn the words (names) for objects. The earlier children who are deaf begin to learn sign language, the greater their eventual grammatical fluency. Eventual fluency in sign language begins to decrease the longer its acquisition is delayed after age six;[28]
- children under age six who have suffered damage to language areas in the brain often quickly regain much of their language capacity, older children recover more slowly and not always completely, adults usually experience some permanent language impairment.[29] These clinical observations indicate that prior to age six, the brain can often compensate for damage to its language area by switching the area to the opposite hemisphere or through some other sort of neural reorganization. Compensation becomes increasingly difficult after age six; and

- native Korean and Japanese speakers whose first exposure to English occurs before age seven can obtain competency in English vocabulary and grammar that is equivalent to that of native English speakers even though English uses sounds and grammatical organization not used in these two languages. As the first exposure to English increases beyond age seven, the final level of competency attained decreases substantially.[30]

Scientists believe that children are especially primed for acquiring language and language skills between nine months and five years of age. This "critical period" begins to gradually wane between ages five and seven.[31] A person's fluency and vocabulary can continue to improve after age seven in languages that the individual has already started to learn. However, if learning a second language does not begin until around puberty, eventual fluency will be much less than it would have been had the learning started earlier.[32]

General knowledge and cognitive skills

The child has two major cognitive skills to master in order to be ready for school at age six. These are:

- the ability to represent something by a symbol and to understand symbolic use. Children who have this ability can use a substitute object to represent something not present during pretend play or demonstrate an understanding that the number "3" represents a group of three objects. The ability to function with symbols is an important prerequisite for later reading, writing, and numerical skills; and
- the ability to understand the concept of relative quantity. For example, that a pile of objects is not simply "a little" or "a lot", it is a little or a lot relative to another pile. Children who understand this concept understand that the numbers one to ten represent two poles of a continuum. Each number between one and ten is equally bigger or smaller than its immediate neighbour in the sequence. As a result, numbers with a higher numeric value have a higher real value (three candies are one more than two and are more desirable to have). Research indicates that this ability is critical for later success in grasping basic adding and subtraction and more complex mathematics.[33]

1) Understanding symbols

Canadian[34] and American[35] researchers report that children born into impoverished families have a decline in language and cognitive skills, relative to other children, over the entire preschool period starting with a sudden decline between age 18 and 24 months. This sudden

decline corresponds to the usual age at which children begin to string two words together to convey meaning and to use substitute objects in pretend play. The sudden decline has been attributed to difficulty switching from a concrete to a symbolic understanding of the world as a result of living in an environment where adults seldom talk or read to their children, and there is little encouragement or opportunity for exploration.[36]

Studies of ***middle-class*** children have found that the more their caregivers talk with them, read to them, and provide a variety of opportunities for exploration and language use when they are toddlers, the more advanced the child's language and cognitive skills are at age three through five.[37] These studies underline the importance of experience during the preschool years for all children.

2) The concept of relative quantity

In both Canada and the United States, children living in low-income families are more likely than other children to fail to make the transition between ages four and six from perceiving things in a polar fashion ("a little" or "a lot") to being able to understand relative quantity (an amount is a little or a lot relative to another amount).[38] Again this developmental deficit appears to reflect lack of appropriate environmental stimulation prior to age six. Lack of ability to understand relative quantity increases the likelihood that the child will approach mathematics as a rote activity and, by adopting this strategy, fail to perceive that it involves relationships. A rote approach limits the child's opportunity to develop higher order mathematical skills.

Research examining the association between cognitive skills and EEG data measuring brain activity reports evidence of a growth spurt in the brain during the second year of life.[39] This may signal the beginning of the height of the critical period for the development of cognitive skills. Measurements taken of the brain's use of glucose (its chief source of energy) at different ages show that children's brains consume twice the adult amount of glucose from age four to puberty.[40] These findings suggest that children's brains between age one and puberty are as primed as they will ever be to process new information. The ability to acquire and store new information continues after puberty, but with some limitations due to lack of

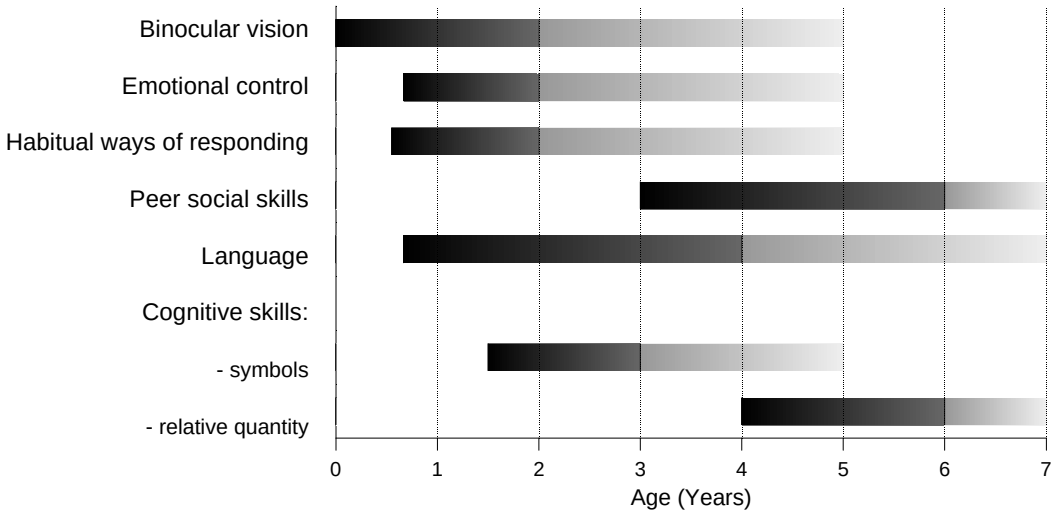
plasticity. After puberty, new knowledge is easiest acquired in areas where expertise has already been established or in areas where there are parallels to existing knowledge.

The Different Critical Periods between Birth and Age Six

As illustrated by Diagram 3, connections between neurons (circuits) in different areas of the brain mature at different times. As a result, different circuits are most sensitive to experience and most receptive to new learning at different ages. As noted earlier, critical periods appear to have two stages. The first stage involves an age range during which the neurons are maximally sensitive to the presence or absence of required stimulation. This is followed by an age range during which the sensitivity gradually wanes.

Diagram 3

Critical periods for some components of school readiness



Source: Adapted from Begley, 1996, pp. 58-59

Note: The dark band represents the maximum sensitivity of the critical period in question, the light band represents the stage during which the critical period wanes. Though not indicated by the above diagram, the critical period wanes gradually as the area of the brain, neural pathway, or skill in question loses plasticity and, hence, its ability to change. For example, the height of the critical period for vision lasts from birth to age 24 months, it wanes until about age five.

Is the Critical Period Really Critical?

The term "critical period" implies that failure to develop a certain neural pathway or skill during a particular time period will result in an irreversible deficit. This is clearly true in some cases, for example, the development of binocular vision. However, is this always true? The following examples explore this question.

Language and cognitive skills

A 1996 review of 19 compensatory programs for impoverished children prior to school entry examines not only their different approaches, but also their long-term outcome, and the association between outcome and each of: age of entry, duration of intervention, and intensity of intervention.[41] This review found that follow-up studies of different programs indicate that almost all well-resourced interventions prior to school entry result in later benefits. These benefits include lower incidence of grade repetition and better academic performance relative to similarly impoverished children who did not receive the intervention. However, the most enduring language and cognitive skill benefits are associated with intensive, long-duration interventions that begin within the first year of the child's life. Interventions begun after age three have less impact, and those started after age five appear to confer little or no benefit.

One study compared twelve-year-old children considered as infants to be at risk for delayed development because of their environmentally deprived homes, the children had been randomly assigned to one of four groups:[42]

- one group received a full-time, five days a week compensatory preschool program beginning at age four months and continuing until kindergarten entry at age five;
- a second group received a full-time, five days a week compensatory preschool program between age four months and kindergarten entry at age five followed by bi-weekly individual tutoring in basic skills such as reading and mathematics until age eight;
- a third group had no compensatory preschool program, but received the bi-weekly individual tutoring between age five and age eight; and

- the fourth group received neither the compensatory preschool program nor the individual tutoring.

At age 12, children who had received the preschool program only, or the preschool program and individual tutoring, did better than children in the other two groups in standard tests of reading, mathematics, written language, and general knowledge. The children who had received only the tutoring between age five and eight performed better than the control group, but not nearly as well as the other two groups. There was very little difference in ability between the group that had only attended the preschool program and the group that attended the preschool program and received the individual tutoring. The incidence of grade repetition was significantly less among both groups of children who received the preschool program in comparison to the two other groups. Rates of grade repetition were almost the same for children receiving only the individual tutoring and those who had not received any intervention.

The results of the above individual study, plus the findings of the review of 19 other compensatory programs cited above, suggest that:

- the most benefit derives from efforts to compensate for an impoverished environment during the height of the critical period for language development (nine to 24 months of age), and the switch from concrete to abstract (symbolic) reasoning (two years to five years); and
- some benefit accrues to compensatory efforts between age five and eight, after the critical period for the development of language and symbolic understanding, but the benefits are much less.

Social competency with peers

The research cited earlier in this chapter indicates that a child's relative level of social competence with peers is fairly well established by age six or seven. After that period, children with poor peer social skills are likely to be rejected or neglected by other children so miss out on further opportunities to develop effective strategies for relating to peers.

Deficient peer social skills in elementary school have been targeted for intervention for over twenty years. Intervention strategies have included specific instruction, role playing in a

laboratory situation with other children whose skills are also deficient, and supervised practice with classroom peers. A review of nine long-term follow-up studies[43] of intervention programs indicates that the results are quite encouraging for that group of children whose deficiencies reflect failure to grasp children's rules and norms for appropriate behaviour. They are less successful for children whose disruptive behaviour stems from an inability to succeed in academic tasks. However, by the time intervention begins in elementary school, children with deficient social skills already have a negative reputation among their peers. As a result, even after they have learned more effective peer relationship skills, other children may continue to reject or neglect them. It appears that behavioural change is necessary, but it is not sufficient. Structured opportunities must be provided for the children to demonstrate their new skills with their peers.

In summary, it appears possible to compensate for deficient peer relationship skills after the critical period. However, successful intervention requires very specific training tailored to the child's particular deficits and the provision of opportunities for the child to demonstrate his or her new competency to peers.

Conclusions

Critical periods are specific times when the child is at a particular developmental level and is biologically primed to develop more advanced neural structures and/or skills provided the appropriate stimulation is available. For some abilities, such as certain aspects of vision, failure to develop neural pathways or specific skills during the critical period results in an irreversible deficit. On the other hand, it is possible to compensate to some extent at a later stage for less than optimal social skill, language, or cognitive development during the critical stage. However, such compensation requires special intervention programs, for example, a highly resourced language and cognitive stimulation program. A large body of research findings has enabled us to pinpoint many of the things that are required to support human development from conception and throughout life. Waiting to provide corrective programs once it is clear that a child has failed to develop necessary basic competencies, rather than supporting children's growth and development from the start, results in great personal cost to the child's self-esteem and self-confidence and often a considerable dollar cost to society.

Building Blocks

Within a critical period, a child's development progresses through sequential stages, or building blocks, that differ in the ***kind*** of abilities the child can exhibit, not simply the amount of ability. If a critical period is missed, later development in that area will still occur in stages.

The qualitative differences between one stage and the next reflect:

- genetically programmed bursts of maturation in the brain's physiological structure and functioning. This is illustrated by research demonstrating an association between different levels of cognitive skills and maturation of different regions within the brain;[44]
- building on previous experience. For example, beginning to learn to count by touching the objects and saying the number out loud gives children active experience of associating a number with touching an object. This experience helps them to progress to counting silently; and
- the existence of more primitive cognitive skills, for example, understanding and being able to use single words, such as the names of objects, is necessary before a child can proceed to using sentences to express ideas.

Each stage is dependent upon the preceding stage. Failure to achieve one stage may make it difficult, and sometimes impossible, to achieve later stages. This concept of building blocks is illustrated by Table 4 which presents the example of a child who had inadequate language skills at school entry. The illustration of some of the developments that occur between birth and age five provided in Table 3, at the end of Chapter 2, also demonstrate how skills build on previous skills.

Table 4: The possible effect of inadequate language skills at school entry

Possible outcome for the child	Possible outcome for society
Difficulty learning to read	Difficulty understanding and communicating effectively with the teacher leading to an increased likelihood of classroom behaviour that is considered disruptive by teacher and peers
Frustration, perception of self as unable to do academic tasks, probability of being turned off school and attempting to learn	Grade repetition, and/or repeated failure in various subjects
Poor academic achievement, perhaps to the extent of being functionally illiterate	Leaving school without a diploma and without adequate reading and mathematical skills
Difficulty obtaining and retaining employment, low standard of living	Fewer skilled workers, undermining of society's economic base and fewer resources to meet increased income maintenance demands

Source: Table concept from Steinhauer, 1996, page 5.

Chapter Summary

There is evidence from both physiology and behaviour to indicate that there are critical periods during which the child is particularly ready to benefit from experience and, as a result, develop new skills. This observation even holds true for social skills. While it is possible, in some areas, to partly compensate for development that failed to occur during a critical period, such compensation is costly to provide and may have limited benefit (as illustrated in regard to language and cognitive skills).

Children develop competence by building on previous physiological changes and on environmental and developmental experiences. Those who miss out on crucial experiences during a critical period will probably never be what they could have been. The first few years

of postnatal life are a key time for child development. Children must be provided with adequate nutrition, and adequate social, language, and cognitive stimulation during this time if they are to develop to their full potential.

The following chapter, chapter 5, discusses the role of the family in supporting child development and how current realities make it more difficult for parents to provide this support than in the past. The chapter also provides a preliminary exploration of how the community in which the child lives can support child development through supporting parents in their parenting role.

Endnotes

1. Greenough, Black & Wallace, 1987.
2. See, for example, Chugani, Phelps & Mazziotta, 1987; Thatcher, Walker & Guidice, 1987.
3. See, for example: Chugani, 1993; Chugani & Phelps, 1986.
4. Prasad & Cynader, 1994.
5. Hubel & Wiesel, 1977; Kalil, 1989; Shatz, 1992.
6. Aslin, 1981; Banks, Aslin & Letson, 1975.
7. Begley, 1996, p. 58,
8. Nash, 1997, p. 52.
9. Ibid., p. 55.
10. Begley, 1996, p. 58.
11. Evans, Hodge & Pless, 1994, pp. 172-174.
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21. Ladd & Price, 1987.
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24. Dodge, 1983.
25. Slobin, 1985.
26. Schiefelbush, Sullivan & Ganz, 1980.

27. Lennenberg, 1967.

28. Newport, 1982; 1988.

29. Hecaen, 1976; Lenneberg, 1967.

30. Johnson & Newport, 1989.

31. Begley, 1996, p. 57.

32. Begley, 1996; Johnson & Newport, 1989.

33. Griffin, Case & Siegler, 1994.

34. Wright, 1983.

35. Belsky & Steinberg, 1978; Etaugh, 1980; Ramey & Haskins, 1981.

36. Wright, 1983.

37. Bradley & Caldwell, 1981; Bradley, Caldwell, Rock, Ramey, Bernard, Gray, Hammond, Mitchell, Gottfried, Siegel & Johnson, 1989; Brooks-Gunn, Klebanov & Duncan, 1996; Lamb, Hwang, Broberg & Bookstein, 1988.

38. Case, Okamoto, Griffin, McKeough, Bleiker, Henderson & Stephenson, 1996; Griffin, Case & Siegler, 1994. Both these reports cover studies conducted in Canada as well as work done in the United States.

39. Thatcher, Walker & Guidice, 1987.

40. Harry Chugani, Wayne State University Children's Hospital of Michigan, quoted in Begley, 1996, p.5.

41. Campbell & Taylor, 1996.

42. Campbell & Ramey, 1994.

43. Burton, 1987.

44. Thatcher, Walker & Guidice, 1987.

Chapter 5 — Resources Available to Children in the Late 1990s

Introduction

As discussed in Chapter 3, the determinants that affect the five components of school readiness at age six range from adequate nutrition through the quality of the child-caregiver(s) relationship to social experiences with other children. Children derive resources to assist their development from two primary sources, their family and the community in which they live. Familial resources can be divided into income and other resources such as the amount of parental time available to be spent with the child and parental approaches to guidance and socialization. Community resources can include services such as reliable, quality non-parental child care, child-ready kindergarten programs and family support programs, for example, mother/child drop-in centres.

This chapter will discuss the extent to which family income, other family resources, and community resources are available to support children's development and hence their school readiness at age six. In some cases the available data have limitations. For example, it is difficult to measure the amount of parental time available for children; as a result, the proxy of parental involvement in paid employment is used. In other cases the way(s) in which available resources impact on the determinants of school readiness is (are) not clear due to the state of our current knowledge. In recognition of this fact, each of the discussions on income, other family resources, and community resources ends with the identification of some of the important questions for which we do not yet have answers.

Family Income

Introduction

Over the past decade changes in the labour market have been associated with lay-offs from full-time jobs and increased use of part-time, casual, and contract workers. In 1993, one in five workers had at least one period of unemployment during the year, and one in 10 held a temporary job. The percentage of families with at least one parent unemployed for more than six months was 12.2% in 1994.[1]

Employment insurance is intended to be a safety net for people who are unemployed. However, there have been four cuts in the program's expenditures since 1990 in spite of continued high rates of unemployment.[2] Not only has the number of hours a person must have worked in order to qualify been increased, the maximum number of weeks a person may collect benefits has decreased.[3] An unemployed individual whose employment insurance has run out and who still requires income support has to turn to social assistance (welfare). In 1994, depending on the province, couples on welfare with two children received between 46% and 72% of a poverty-line income.[4]

Family income is linked directly to meeting children's needs, whether they be the basic physical needs for food and shelter, or developmental needs such as access to children's books. Income limitations make it harder for parents to provide good nutrition, a safe place to live, and intellectual stimulation through exposure to a variety of activities. Canadian research has found that children living in poverty are at greater risk than other children for:

- nutrition-related diseases such as anaemia, and chronic ear and other infections.[5] This may result in frequent school absences with a resultant failure to learn the basics crucial for later school success;
- delayed language development. 1994-95 data from the National Longitudinal Survey of Children and Youth show that 25.3% of the four- and five-year-olds who lived in households with income under $30,000 per year had scores indicating delayed language development on a standard test in comparison to 15.6% of children the same age in middle-income households and 9.2% of four- and five-year olds who lived in higher income households with income over $60,000 per year;[6]
- poor school performance;[7] and
- leaving school before completing high school. In 1993, the school leaving rate among 16 and 17 year-olds living in poverty was 8% in comparison to 5% for their same-aged peers not living in poverty.[8]

Participation in the paid labour force is no guarantee against poverty. According to Statistics Canada data, in 1995, one in five low-income families is headed by a parent who works full-time all year, another 32% are headed by someone who works part-time.[9]

Research suggests that the following six factors are probably important in considering the impact of poverty on child development:

- the incidence of poverty, sometimes referred to as the "poverty rate";
- the depth of the poverty in which the child lives;
- the duration of living in poverty;
- the timing of living in poverty, that is, the child's age when the family is experiencing poverty;
- the concentration of poverty in the low-income family's neighbourhood; and
- the effect of poverty on parents.

Poverty rates

Statistics Canada's Low Income Cut-Offs are generally used as a measure of poverty. They take into account different community sizes and locations and different family sizes. They are set at a level where families with incomes below the cut-offs would usually spend 55% or more of their income on three basic needs: food, shelter, and clothing. The remaining family income may or may not cover other basic needs, such as a telephone and transportation, and allow the family to provide its children with the opportunities for development routinely available to other children in the community.

In 1994, 19.0% of Canadian children under age 18 (1,295,355 children) were living in families where the total family income was below the official Statistics Canada Low Income Cut-Offs.[10] In 1992, the gap between the Low Income Cut-Offs and family income for families in poverty with at least one child under the age of 18 was approximately $9,000.[11] This means that a significant proportion of Canadian families have incomes at a level that makes it difficult for them to provide their children with the resources available to children in the society as a whole.

The poverty rate for all Canadian children under the age of 18 masks the fact that children are more likely to be living in poverty if they are:

- under age seven. In 1994, the poverty rate for this age group was 21.3%, a total of 568,513 children; or

- living in a lone-parent family. In 1994, the poverty rate for this group was 57.4% for children age 0 to 18, and 72.7% for children under age seven. In contrast, the rates for children living in two-parent families were 12.1% and 13.1%, respectively.[12]

Clearly being under age seven and living in a lone-parent family puts children at significant risk of living in poverty.

Although the poverty rate for children less than 18 remained relatively stable from 1975 to 1992 (at about 18%), the rate for young children under age seven increased from 18.8% to 20.9%. The number of children under age seven living in poverty increased by 81,180 over the same time period.[13] The increase in the number of children under age seven is unlikely to change until the last of the "baby boom" generation has moved beyond the prime child-bearing age. This will not occur until around 2005, when the youngest members of this cohort reach age 40.

Table 5 illustrates the higher poverty rate among children under age seven in contrast with children age zero to eighteen, and how the poverty rate for children closely tracks the unemployment rate.

Table 5: Poverty rates, 1988 to 1994 inclusive

Year	Children age 0 to 18	Children under age 7	Unemployment rate
1988	15.2%	17.8%	7.8%
1989	14.3%	15.8%	7.5%
1990	16.6%	19.0%	8.1%
1991	18.2%	21.0%	10.4%
1992	18.0%	20.9%	11.3%
1993	20.8%	24.8%	11.2%
1994	19.0%	21.3%	10.4%

Source: Computations performed by the Applied Research Branch, Human Resources Development Canada, using Statistics Canada's *Survey of Consumer Finances* files for the years in question and the 1986 Low Income Cut-Offs.

The depth of poverty

Children are defined as living in deep poverty if their family's income is less than 75% of the respective Statistics Canada Low Income Cut-Offs.[14] About 336,000 children under age seven were living in deep poverty in 1992.[15]

In 1992, the rate of deep poverty among children in lone parent families living in poverty was:

- 41.6% for children age zero to 18; and
- 58.8% for children under age seven.[16]

The deep poverty rates among children in two-parent families are considerably less. In 1992, the rate of deep poverty for children less than 18 was 5.5%; for children under age seven, it was 6.2%.[17]

These differences in rates of deep poverty indicate that living in a lone parent family puts a child at risk of living in deep poverty.

Living in deep poverty means living in a family facing a constant struggle to meet its basic needs for food, shelter, and clothing. This usually translates into living in a home which needs major repairs and puts children at risk for accidents.[18] It often means having poor nutrition. When necessary expenses occur other than those required to meet basic needs, for example, the purchase of school text books, parents in deep poverty have to cut expenditures on food.[19] High starch foods are filling and relatively inexpensive. However, they lack the nutrition required for optimal child development, and leave the child vulnerable to infections. A very high carbohydrate diet low in other nutrients hinders the child's ability to concentrate while in school.

Data from the first cycle of the National Longitudinal Survey of Children and Youth, collected in 1994-95, indicate that children living in families where the income is below 75% of Statistics Canada's Low Income Cut-Off (LICO) have higher rates of behaviour problems and grade repetitions than do children living in poverty but in families with an income above 75% of the LICO.[20] The difference between the two groups of children living in poverty was

found to be statistically significant, that is, it could not simply occur by chance. These findings collaborate similar findings of behaviour and school problems reported by the Ontario Child Health Study.[21]

The duration of living in poverty

In the United States, family incomes are surprisingly volatile.[22] It is not uncommon for a family to experience a brief period of poverty as a result of temporary unemployment or for a family to move in and out of poverty several times over a decade. There are also some families that remain in poverty year after year. Similar information is not available for Canada. American research has found that the greater the number of years that a child lives in poverty the greater the likelihood that the child will leave school before graduation.[23] Another American study reports that "the effects of persistent poverty were roughly twice as large as the effects of transient poverty" on five-year-olds' IQ level and the extent to which they were reported as having behaviour problems.[24] While the American research suggests that duration is an important aspect of poverty, there is a need for Canadian research on this issue.

The timing of living in poverty

The fact that so many critical periods for child development occur prior to puberty raises the question of whether living in poverty has a greater impact in early childhood or in adolescence. The Ontario Child Health Study found that children age 4 to 11 living in poverty were at greater risk for psychiatric disorder, poor school performance, and difficulty getting along with others than children who lived in poverty who were between the ages of 12 and 16.[25] It should be noted that no children under age four were studied by this research. These findings are similar to findings from England.[26] However, American research has produced contradictory results. One study found that living in a family receiving welfare during early childhood was associated with a greater probability of grade failure and poor literacy at age 19 than was living in such a family as an adolescent.[27] Another study comparing the impact of living in a family on welfare before puberty and during adolescence, found that welfare status between age 12 and 15 was a significant predictor of likelihood to leave school prior to graduation. However, living in such a family receiving welfare at earlier

periods was not associated with increased risk for school leaving.[28] The availability of only one Canadian study that has examined the issue of timing and the contradictory findings of the American studies indicate a need for further exploration of this issue.

The concentration of poverty in the child's neighbourhood

The social science literature suggests that living in a neighbourhood with a high concentration of low income families is detrimental to children's development and their progress in school because of the limited resources in such neighbourhoods.[29] This hypothesis has been used to argue for placing subsidized housing in areas where the majority of families are not living in poverty. An American study found that children living in poverty in a neighbourhood where most families were not poor had higher developmental levels than same-aged poor children living in areas with a high concentration of poverty. In addition, the prevalence of low income neighbours has been found to increase the incidence of acting-out behaviour problems.[30] Evidence from the 1981 and 1991 Canadian Census' indicates that low income is increasingly concentrated in neighbourhoods where the family poverty rate is more than double the national average.[31] This points to the need for Canadian research on this aspect of poverty.

The effect of poverty on parents

As discussed in Chapter 3, young children's development, and hence their school readiness, is enhanced by good nutrition, warm and supportive relationships with their primary caregiver(s), and by having caregivers who talk with them, read to them and provide them with opportunities to master new experiences.

Parents living in poverty tend to be preoccupied with keeping their children sheltered and fed. This immediate concern reduces the psychological energy left for attending to higher order needs such as talking with and reading to their children. The daily nagging worry about whether there will be sufficient money to meet basic needs, and what will happen if an unbudgeted expense occurs, depletes parents' emotional reserves. This depletion has a negative effect on parents' ability to meet life's challenges and may lead to feelings of hopelessness and depression.[32] Parental depression may be further exacerbated by poor

general health and fatigue as a result of chronic poor nutrition. The National Longitudinal Survey of Children and Youth found that, in 1994-95, 17.5% of children living in lower-income families (annual income under $30,000) lived with parents who scored high on the scale measuring depression, compared to 8.3% of children in middle-income families and 4.8% of children who lived in upper-income families (annual income over $60,000).[33] When a parent is depressed, even a simple task like preparing a meal may feel so overwhelming that it is not attempted.

Persistent worries about money, living in dilapidated and overcrowded housing, and lack of hope all contribute to parental stress.[34] This stress may result in ineffective parenting strategies or harsh, inconsistent discipline.[35] There is a considerable body of research linking chronic stress and/or depression among parents living in poverty and behaviour problems among their children. [36]

Conclusion

A significant proportion of children in Canada are living in families where the income level is such that parents have difficulty providing them with the resources available to children in the society in general. The impact of poverty on parents may further reduce parental resources by having a negative effect on parents' psychological ability to cope with every day tasks such as meal preparation and on their approach to parenting.

Areas requiring additional research

Canadian research has established a definite link between poverty and negative effects on child development. However, there is little Canadian research that has examined how poverty impacts on children. Such research is needed to guide policy and program development. For example, there is a need for clarification of the impact of timing on poverty. There are certain policy implications if, as appears possible, poverty has a more detrimental impact on young children than on adolescents. Similarly, research on the impact of the concentration of poor families in the child's neighbourhood would confirm or negate the current belief that poor children benefit from living in a neighbourhood where most families are not poor.

Some children raised in poverty manage to develop competency in all the components of school readiness and go on to do well in school. There is a need to identify the protective factors at work in such situations. American research suggests that differences in the extent to which poor children's parents talk with them and provide them with stimulating activities accounts for half of the observed effect of income on cognitive development.[37] If Canadian research confirmed these findings it would suggest the value of ensuring that parents understand the importance of active language involvement and cognitive stimulation for children's development. Other possible protective mechanisms that need investigation include parental disciplinary practices and the availability of community resources.

Other Family Resources

Introduction

Family resources other than income include the amount of parental time available to spend with the child and parental approaches to guidance and socialization. The amount of parental time available, and the extent to which parenting is supportive, is influenced by factors such as parental employment, whether the family is two-parent or lone-parent, and the amount of stress the parent is experiencing. This section discusses the impact of increased parental workforce participation and increased parental stress on the non-income familial resources available to young children.

The need for parents to work

Lone parents

In 1992, 12.6% of children under age seven lived in lone-parent families, up from 5.8% in 1975.[38] In this situation, the lone parent has three options: a) rely on child support payments, b) enter the paid workforce, or c) go on welfare.

Relying on child support is often not a viable option. Individuals with lower incomes tend to marry individuals also with lower incomes; thus, many ex-spouses do not have sufficient income to contribute towards two households. Furthermore, default rates on child support are as high as 80% in some provinces[39].

In 1992, in Canada overall, after a lone parent with one child on welfare had provided food, shelter, and clothing, only $1,230 would have been left for other expenses, or $1.69 per person per day.[40] The best option for a lone parent in this situation is to enter the paid workforce, provided the salary level is sufficient to enable the purchase of reliable child care and cover the costs associated with going to work. In 1991, the incidence of poverty in families with at least one child under age 12 decreased from 92.9% for families with no earners, to 29.7% for families with one earner.[41]

Two-parent families

In many families, it is an economic necessity for both parents to work. In 1995, the percentage of two-parent families with children under Statistics Canada's Low Income Cut-Offs was 12.8%. It was 27.4% if the family had one earner and 7.3% if the family had two earners.[42] Almost 57% of children age five years or younger living in two-parent families in 1994-95 were living in situations where both parents worked and/or studied.[43]

The impact of increased parental workforce participation

In addressing a potential financial resource deficit, employed parents often end up with a time deficit. In 1994, 57% of women in Canada whose youngest child was under age three, and 59% whose youngest child was between the ages of three and five, were engaged in paid work.[44] In 1991, 68% of women in the paid labour force who had at least one child under age six worked on a full-time basis.[45] Canadian data collected in 1991 indicate that the average white-collar employee works approximately 45 hours a week at the office. On top of this, over a third of the employees surveyed spent several additional hours each week performing job-related work at home. Sixteen percent of the employees reported spending more than 60 hours a week in work-related activities.[46]

As a result of increased parental workforce participation:

- parents have difficulty finding the time let alone the energy to engage their children in joint activities that will enhance the children's development;
- parents often have to rely on people outside the family to care for their children for a substantial number of hours each day. The need for appropriate non-parental child

care, the difficulties obtaining it, and the consequences for children are discussed later in this chapter; and

- significant numbers of Canadian parents report feeling constantly tired, overloaded, and stressed. In a 1992 survey, one out of three full-time employed mothers provided responses to a questionnaire that indicated they were under extreme levels of stress.[47] Research indicates that stress significantly increases the likelihood that parents will be irritable and/or punitive with their children.[48] Negative parent interaction with their children as a result of stress increases the likelihood of child behaviour problems such as aggression.[49]

Parental stress

Reasons for high levels of parental stress in contemporary families include:

- balancing work and family responsibilities; and
- the lack of social support networks.

Balancing work and family responsibilities

The increase in the number of dual-career families has made the old methods of coordinating the demands of employment and family inappropriate for the majority of situations. It is now rare for one parent in a two-parent family to remain at home to provide care for the children and do the housework, shopping, and myriad of other tasks related to daily life. Not surprisingly, a survey of 22,000 Canadian families found that 40% of working mothers and 25% of working fathers reported significant difficulty balancing the demands of their work and their family responsibilities. Fifty percent of mothers and 36% of fathers reported high levels of stress.[50] Parents' difficulty balancing work and family responsibilities is a lose-lose situation. For the families, it is linked to marital problems and an increased incidence of stress-related illness. For employers, it is linked to reduced work performance, increased absenteeism, unscheduled days and emergency hours off, and higher rates of employee turnover.[51]

The time crunch for parents is not just a result of a larger proportion of mothers participating in the paid workforce. Some parents of young children are also providing regular care for elderly relatives. A Canadian survey published in 1993 found that 26% of the more than 5,000 employees who participated had responsibility for both child and elder care.[52]

Lack of social support networks

Social supports for parents, such as emotional support from family or friends, have been shown to provide a buffer to stress and to decrease the likelihood of negative parenting behaviours.[53] The National Longitudinal Survey of Children and Youth found, in 1994-95, that low levels of social support for parents contributed to children's low scores on their overall ability to get along with others.[54]

A number of factors indicate a weakening of traditional social support networks for parents with young children. These include:

- increased numbers of lone-parent families. A parent in a lone-parent family lacks the presence of a second adult with whom child care responsibilities can be shared and from whom emotional support can be obtained;
- higher workforce participation by women of all ages. This decreases the availability of female relatives to assist with child care; and
- increased family mobility. This means young parents may live in a different community, or even different country, from other family members and long-term friends. The result is a reduction in the extent to which extended family members can provide immediate emotional, social, and practical support (such as emergency care for children when a parent is ill).

Non-traditional social supports, such as parent-child drop-in programs to reduce isolation among stay-at-home mothers, are believed to compensate for some of the loss of traditional forms of parent support.

The impact of parental stress

Parental stress affects children through:

- its influence on parenting style and the tone of the interaction between parent and child; and
- its influence on the child's own level of stress.

As noted earlier, over the past decade changes in the labour market have been associated with significant job loss. Concern about possible job loss has been found to be linked with feelings of demoralization, increased marital conflict, and harsh, inconsistent discipline of children.[55] Fathers who have actually lost their job are reported to become irritable,

explosive, and to be punitive and inconsistent with their children.[56] A paper that combined the findings of 47 studies examining the association between parenting style and child behaviour reports that a harsh, authoritarian style predicts undesirable child behaviour such as aggression, hostility, disobedience, and negativism.[57] The authors speculate that this parenting style sets up a reciprocal cycle whereby the parent provokes negative behaviour in the child, and the child's behaviour provokes further disapproval and harshness from the parent. Junior high school students whose families had experienced long-term job lay-offs, or whose parents had recently lost a job, had poorer school adjustment and lower social competence than peers in families with no job loss or rapid re-employment of parents after a lay-off.[58]

Mothers who are engaged in the paid workforce report higher rates of difficulty balancing their work and family responsibilities[59] and greater levels of extreme stress[60] than do fathers or other women. This is not surprising. In Canadian households in which both parents are employed full-time, 52% of the wives retain all the responsibility for daily housework.[61] Employed women spend an average of 23 hours a week engaged in household chores while men devote an average of 14.2 hours to household tasks.[62]

Mothers reporting high levels of stress:

- are less responsive to their infants and provide them with less stimulation than mothers reporting less stress;[63] and
- with older children, are more likely to use authoritarian, harsh, aversive discipline measures.[64]

As discussed in Chapter 3, infants are more likely to develop a secure attachment to a caregiver who is responsive, that is, attends to their signals and addresses their needs promptly and appropriately. A secure attachment during infancy increases the likelihood that the child, when older, will have a positive outlook on life, the ability to regulate his or her emotions, and a high level of social competence.

Living with a stressed parent is, in itself, stressful for the child. One of the body's normal responses to stress is the production of "fight or flight" hormones. Frequent release and high

residual levels of these hormones interfere with the development of synapses (the junctions between neurons), a normal part of learning. The adverse effects of stress on learning may be most pronounced in young children.[65]

Conclusion

The contemporary economic need for the lone parent or both parents to work, job insecurity, stress associated with balancing work and family responsibilities, and the lack of kinship family supports all reduce the family resources available to support children's development.

Areas requiring additional research

Research on the impact of family support programs for parents considered to be at risk for abusing their child has been conducted for over a decade. The research has demonstrated that such programs are beneficial for "at risk" parents such as unmarried teenagers or women living in deep poverty. However, there is a need for similar research with parents who are not considered to be particularly at risk. This includes the need to examine the types of non-familial support services that work best with this population and whether they are more beneficial at certain life stages, for example when the child is an infant.

Community Resources

Introduction

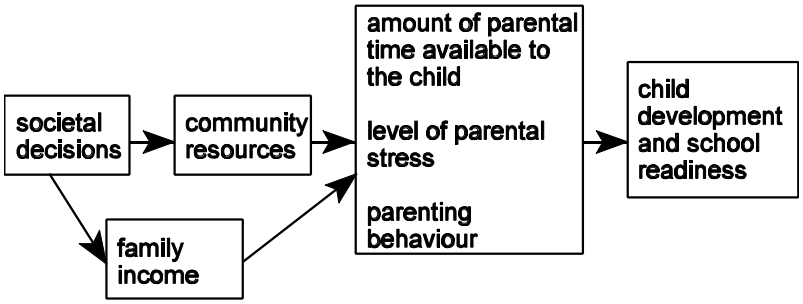
The family has the primary role in supporting child development. However, as already discussed, families in the late 1990s are under considerable stress. Unemployment rates remain stubbornly high, real incomes have declined for much of this decade, and social support through kinship networks is less available. All of these factors make it difficult for many families to provide their children with what they require to foster their skill development and school readiness.

Canada must be concerned about the development of ***all*** its children. A persistent fertility rate below replacement level and an aging population enhances concerns about having a sufficiently large skilled workforce for the future.

The first step is to acknowledge the importance and value of parenting for the whole society. The second step is to acknowledge that parents cannot continue to carry the majority of the burden for preparing children to be productive adults and caring citizens. Preparing children to be school ready must be a collaborative endeavour involving the community in which the family lives, and society as a whole, as well as the family. This concept is illustrated by Diagram 4.

Diagram 4

Pathways by which factors external to the child impact on school readiness



Notes: The pathways between societal decisions and factors within the family, and between community provision of resources and family factors are actually two-way. The parents can influence societal and community decisions.

Societal decisions that impact on the family may be made at either the federal government or the provincial/territorial level. Examples of federal decisions include legislated provisions for maternity leave and income tax provisions such as the Child Care Expense Deduction. Provincial/territorial decisions include whether or not block grants are provided to child care programs in order to cover part of the operating costs, thereby reducing fees.

Tables 7 and 8 at the end of this chapter illustrate some ways in which families, communities, and society can support children's development.

Some of the resources in the community that can support parents in their parenting role are:

- reliable non-parental child care that supports children's well-being and development;
- family-friendly workplace policies and practices;
- family support programs such as mother-child drop-in centres; and
- child-ready kindergarten programs.

Non-parental child care

One of the most important policy questions facing Canada is whether resources should be focused on children whose development is considered to be at risk, or should society invest in *all* children, including those who appear to be living in relatively secure situations. This debate is particularly pertinent to child care. A considerable body of research has consistently documented the value of high quality child care for children from impoverished families.[66] A number of factors need to be considered with regard to the question of whether child care should be targeted to children at risk or made more generally available and affordable. These factors include:

- the number of children receiving regular non-parental care while their parents work or study (thereby obtaining or upgrading workplace skills);
- the impact of regular non-parental care on the development of children who are not considered to be at risk;
- the type of regular non-parental care currently being received by children; and
- the affordability for ordinary parents of child care that will support their children's development.

The number of young children receiving regular non-parental care

In 1994-95, almost 37% of ***all*** Canadian children five years of age or younger were receiving some form of non-parental care on a regular basis while their parent(s) worked or studied. This represents about 850,000 children.[67]

The impact of non-parental care on young children's development

A survey of twenty-one follow-up studies comparing children not considered to be at risk who had or had not received regular non-relative child care prior to school entry[68] found that children with regular (usually centre-based) child care experience:

- had better ability to get along with other children at the time of school entry and in the later elementary school grades;
- were rated by their teachers as having an easier transition to elementary school and better classroom skills both in the first year of school and in subsequent years;
- had a larger vocabulary at the time of school entry and better language skills in subsequent grades;

- had higher levels of cognitive functioning at school entry; and
- performed better on measures of academic readiness at school entry and in school subjects in later grades.

It is essential to note that the above positive outcomes were found for "high quality" child care, that is, child care provided by people who are knowledgeable about children's developmental stages and needs, are not responsible for too many children at one time, talk with the children, and provide them with a variety of stimulating activities. Child care lacking these characteristics has been found to be associated with increased incidence of behaviour problems, poorer social skills with peers, delayed language development, and poorer school skills.[69] It is also important to note that a growing body of research indicates that a middle-class home does not compensate for the negative impact of participating in poor quality child care, at least for young children in full-time attendance.[70] This finding is not surprising, infants and toddlers in full-time child care spend an average of nine hours a day in that situation. This represents a greater percentage of their waking hours per week than is spent with their parents. If the child care environment lacks adequate levels of social, language and cognitive stimulation, the child's development will be put at risk.

The type of non-parental care currently being received by children

Non-parental care in Canada may be provided in the child's own home, the home of a relative or non-relative, or in a child care centre. Centre-based care is always regulated, care provided in a home other than the child's home may or may not be regulated. Being regulated means that the child care provider conforms to the standards required by the province or territory in which the care is provided and is subject to regular monitoring visits by an outside person. Standards relate not only to health and safety provisions, they also limit the number of children that may be cared for by one person at any given time. This limitation is necessary to ensure that the caregiver has sufficient time to provide children with stimulation as well as prompt attention to their physical needs. Regulation in itself provides no guarantee that the care provided will meet children's physical health, safety and developmental needs. However, having to meet standards and being monitored increases the

likelihood of this. Unregulated care does not have to meet even basic standards for health and safety and is not monitored by any outside person other than the parent.

Table 6 illustrates the type of care received by the 850,000 children five years and younger receiving some form of non-parental care on a regular basis in 1994-95 while their parent(s) worked or studied. It shows that just over 400,000 children under age six were receiving non-parental care from a non-relative in a situation that does not have to meet any standards and is not monitored by any outside person. Twenty hours a week or more was spent in non-parental child care by almost 80% of children two years of age or younger and about two-thirds of the older preschoolers.[71]

Table 6: Child care arrangements of preschoolers while their parents worked or studied, 1994-95

Type of arrangement	Child age 2 or under		Child age 3 - 5 years	
	Number	Percent	Number	Percent
Care by a relative	103,500	25.9%	85,300	18.8%
Regulated child care	98,700	24.7%	151,300	33.3%
Unregulated child care	194,500	48.6%	211,200	46.5%
Other, e.g. kindergarten	U	U	6,700 M	1.5% M

U: estimate too unreliable to publish

M: estimate less reliable due to high sampling variability

Source: Lero (1996). *Children's Participation in Child Care Arrangements*, Table 1.

The heavy reliance on non-relative, unregulated child care probably reflects a number of factors, including:

- the shortage of regulated child care spaces; and
- the cost of regulated child care to the parent.

In 1994, the last year for which national statistics are available, there were an estimated 723,070 children under age six whose lone parent or both parents were working on a full-time basis and 288,853 full-time regulated spaces for children in this age range.[72] The issue

of the cost of regulated care, and its lack of affordability for many parents, is discussed in the following section.

Research comparing regulated and unregulated child care is sparse. There are a number of reasons, such as income tax implications, for unregulated care providers to be reluctant to be identified. Three Canadian studies report that the interactions between caregiver and children in regulated homes tends to be more positive in tone than in unregulated homes, and the caregiver provides a greater amount and variety of stimulating activities.[73] One of these studies also examined children's language development. It found that the mean scores on standard language tests were significantly lower for children in unregulated homes than they were for same-aged peers in regulated situations.[74] The Canadian findings that the behaviour of caregivers in regulated settings is more likely to support child development parallels the findings of American studies.[75]

The affordability of regulated child care

In Canada, the majority of a child care program's operating budget comes from parent fees. Some provinces provide regulated programs with small financial grants to assist with operating costs. Other provinces, such as Newfoundland and New Brunswick, do not.[76] Until the replacement of the Canada Assistance Plan by the Canada Health and Social Transfer (CHST), the federal government shared part of the cost of child care for low-income parents with the provinces and territories. It is no longer doing this under the CHST.

The provision of child care that will support and encourage child development is labour intensive because of the regulations limiting the number of children that can be cared for by one person. In 1993, the monthly fee for full-time regulated child care for infants and toddlers ranged between $6,000 to $10,284 a year depending on the province or territory.[77] This is a large amount of money considering that in 1994 the average after-tax income of families with children under age 18 was $43,700.[78] All the provinces and both territories provide fee subsidization for low income families that meet certain criteria, including a ceiling on the family income. However, over the past decade fees have increased in all the

provinces, family incomes have not kept pace with these increases, and the amount and availability of fee subsidization has decreased.[79]

An analysis of the 1992 net annual cost of child care in four different provinces for a two-parent family with one infant and one preschooler found that the cost as a percentage of family income rose steadily until, at an income of $45,000, it ranged between 9.8% to 14.8%, depending on the province. The percentage then began to drop so that with a family income of $100,000 it ranged between 5.0% and 5.6%.[80]

The result of the heavy reliance on parent fees to cover child care operating costs and minimal financial support from governments is that:

- increasing numbers of low income parents cannot afford regulated child care because fee subsidies no longer cover a sufficient proportion of the cost to make the service affordable; and
- many middle-income families that do not qualify for fee subsidy cannot afford regulated child care.

As a result, many parents have to rely on unregulated situations that do not have to meet basic standards and are not monitored by any outside person. This may put their children's development at risk.

Conclusion

In order to participate in the paid workforce, parents need to have reliable, affordable child care. Since children's development is heavily influenced by their daily experiences this care should be high quality, a characteristic more likely to be present in regulated than in non-regulated care. Currently, the number of regulated child care spaces available for young children falls far short of the number of children whose parents work or study on a full-time basis. In addition, regulated care is not affordable for many parents.

Family-friendly workplace policies and practices

A family-friendly workplace is one that is sensitive to the family needs of its employees and is supportive of employees who are combining paid work and family roles.[81] While there appears to be increasing recognition of the problems faced by employees who must balance

work with responsibility for children and/or elderly parents, organizational structures and practices have not kept pace with demographic and workforce changes. For example, two thirds of Canadian employees have no flexibility in the hours that they work.[82] A Canada-wide survey found that only 2.6% of the available regulated child care spaces were in work child care programs (that is, programs established for the employees of an organization and provided with some type of on-going support by the employer, whether it be the provision of free space or an operating grant).[83]

Creative ways of supporting employees in their child rearing role that have already been implemented by some companies in Canada include "cafeteria" style benefit packages that allow employees to chose the combination of benefits most suited to their needs, and flexible work schedules.[84] Other companies allow a certain number of "personal" days off that can be taken whenever an employee needs them, in addition to sick leave.[85] Employee assistance programs are increasingly providing employees with assistance in locating child care, or are actually providing on-site child care programs.[86]

Most work-family research has focused on the ways individuals cope with the need to balance family and work responsibilities rather than on how workplaces can assist parents in this balancing act.[87] However, research with mothers who have preschool age children has found that:

- mothers report lower levels of stress if they perceive their immediate supervisor as understanding and flexible when child-related emergencies arise;[88] and
- the availability and use of family-oriented benefits such as flexible work schedules, "personal" days off, "sick child" days, and employer-sponsored child care is associated with lower levels of perceived strain in balancing work and family responsibilities.[89]

Reduction of parental stress is important for child development. The likelihood of authoritarian discipline and associated child behaviour problems increases when parents are stressed.[90] Family-friendly policies and practices may also have a pay-off for the employer. American employers surveyed about the impact of employer-sponsored child care reported the following benefits: increased ability to recruit employees, lower absenteeism rates, reduced turnover rates, and improved employee attitude toward the company.[91]

Family support programs

High levels of mobility, and the high workforce participation by women of all ages, has significantly decreased the availability of social supports through kinship networks. Some communities are responding to the increased social isolation of young families by providing support programs such as childbirth preparation classes, mutual support/parent education groups for first-time parents, and drop-in recreation programs for children and their parents.

An outcome study on a Quebec home visiting program for low-income new mothers reports that mothers who receive this intervention are more sensitive to their infant's needs and provide higher levels of language stimulation than a matched group of mothers not getting this support.[92] These findings are similar to those from a number of American home visiting programs for mothers considered to be at risk of child neglect or abuse.[93] Research conducted in Ontario to evaluate a number of different family support program approaches found that parent education programs and parent-child drop-in centres are perceived by parents as reducing stress and assisting them in their parenting role by increasing their understanding of what children need to support their development.[94] Ontario's *Better Beginnings: Better Futures Project* is currently conducting research in a number of different communities on the effectiveness of home visiting by a trained lay person and on the effectiveness of parent support groups.[95]

Child-ready kindergarten

The focus of this paper is on preparing children to be ready to take advantage of the learning opportunities provided by the school system. However, it is also important to ensure that the school system is ready for the child. The learning approach children use, and is appropriate to use with them, is strongly influenced by the nature of their cognitive skills at the specific point in time. Children under age six can learn by rote, for example to count up to fifty, but at this age the ability to really understand numbers, to see cause-and-effect relationships, and to succeed in problem-solving comes from concrete manipulation of the physical world. As discussed in Chapter 3, a four- and five-year-olds' reasoning and cognitive skills are different in kind, not just amount, from those of a seven- or eight-year-old. Therefore, a watered-down version of grade one or two curriculum and approaches is not appropriate for kindergarten.

In the United States, the focus on "global competitiveness" and "accountability" by politicians and increasing demands from parents for "more academics" has resulted in many school boards imposing academic drills, rote learning, and formal achievement tests on children in preschool programs.[96] The extent to which this is also occurring in Canada is not clear. However, concern has been expressed that Canadian schools may be coming under similar pressures.[97]

Research indicates that academic drills and rote learning with four- and five-year-olds has little lasting value and actually may be counter-productive. Studies report:

- higher rates of stress behaviours among children in "academic" programs than among peers in more developmentally appropriate kindergarten settings[98] and lower levels of self-esteem and belief in one's ability to succeed;[99]
- poorer language skills, both in terms of understanding language and in communication ability, among children in "academic" programs;[100] and
- short-term gains in school readiness skills, such as recognizing numbers and letters, among children in "academic" kindergarten. However, this is offset by poorer academic functioning in the later elementary school years and higher rates of leaving school before graduation than among children who received less structured academic programs as four- and five-year-olds.[101]

In addition to being appropriate for the child's developmental level, the school also needs to be responsive to the wide range of experiences, backgrounds, and needs found among Canadian children at school entry. Research has found that among children whose native language is English, language skills at age five may differ by a year or more. In other words, in any group of five-year-old native English speakers there may be some children whose skills are at the five-year-old level, others whose skills are at the four-year-old level, and some with the ability of the average six-year-old. Comparable variation can be found in social and fine motor skills.[102] Immigrant and refugee children may speak little or no English or French.

Areas requiring additional research

As noted in Table 6, nearly 50% of children under age six receiving regular non-parental care in 1994-95 were in unregulated situations. There is a need for much more information than is

currently available on differences, if any, in both the process and the child outcome between regulated and non-regulated non-parental child care.

Research has found that employed mothers with preschool children report lower levels of perceived stress if they can take advantage of family-oriented benefits such as "sick child" days. However, the research does not appear to exist that can answer the question of whether family-friendly workplace practices make a difference in parenting approaches and child development.

While concern has been expressed that Canadian kindergartens may be following the American trend towards a more "academic" approach in kindergarten, there is no hard data to support or negate this concern. This is a very important policy and practice issue because of the well-documented adverse effect of drills and rote learning in kindergarten.

Family Support in Other Countries

The availability of family income, other family resources, and community resources is shaped by the broad decisions taken by the society as a whole. Societal decisions include the amount of paid leave mothers receive to encourage them to stay at home with a new baby and whether or not there is a national child care strategy. Other countries have made decisions regarding support to parents in their child-rearing role that are different from Canada's.

The following are four examples.

- France pays women who have at least three prenatal visits a grant of approximately U.S. $150 a month during their pregnancy to encourage them to seek prenatal care;[103]
- Swedish women can take up to 15 months of parental leave, most of which is paid at 75% of earnings.[104] A woman receives 80% of her full salary for ten months in Finland. Norwegian women receive their full salary for five months while staying at home with a new baby. Danish women receive 90% of their salary for six months.[105] These policies have been put in place to increase the likelihood that women will not feel financial pressure to return to work soon after birth. Therefore, they will remain at home with their young infants and, in so doing, provide the prompt, responsive care that leads to a secure infant/mother attachment. In 1996, Canadian legislation provided for maternity benefits calculated at 55% of insurable earnings for a maximum period of 15 weeks;
- workers with children have statutory paid leave for family reasons, such as a child's illness, in Germany and Norway;[106] and

- in Sweden, parent fees cover 11% of the cost of centre-based child care with the remainder of the cost divided between the local municipality (49%) and the state (40%). In Denmark, the local municipality and the parent share the expenses of regulated care on a 65/35 basis. Parent fees in France are set on a sliding scale dependent on income for children under age three, early childhood programs for older preschoolers are free-to-the-user.[107] In Canada, provincial and territorial fee subsidization for regulated child care has decreased in all provinces over the past five years while parent fees have increased in all provinces during the same time period.[108]

Chapter Summary

In the late 1990s a number of factors make it difficult for many parents to provide the support their children need in order to be school ready at age six. These factors include:

- lack of an adequate family income. In 1994, 21.3% of children under age seven were living in a family where the total family income was below the official Statistics Canada Low Income Cut-Offs;
- the economic need for both parents, or the lone parent, to participate in the paid workforce even when their children are very young. Almost 57% of children age five or younger living in two-parent families in 1994-95 were living in situations where both parents worked and/or studied. Approximately 68% of working mothers with at least one child under age six were working full-time;
- lack of access to non-parental care that is of sufficient quality to safeguard the child's health and support the child's development. In 1994, the last year for which national statistics are available, there were an estimated 723,070 children under age six whose lone parent or both parents were working on a full-time basis and 288,853 full-time regulated child care spaces for children in this age range; and
- high levels of stress reported by parents. Sources of stress include income insecurity as a result of changes in the labour market, difficulties balancing work and family responsibilities, and lack of social support networks to assist in the parenting role.

Research studies have consistently found that lack of adequate income is associated with higher levels of parental depression than found among middle-income parents. When a parent is depressed, such basic tasks as preparing a nutritious meal may seem too overwhelming to tackle.

A 1992 survey found that one out of three mothers working full-time reported feeling under extreme levels of stress. This stress was associated with factors such as feeling in a "time crunch" and being unable to spend time doing activities with their children, lack of reliable child care, and difficulties balancing work and family responsibilities. Research indicates

that stress significantly increases the likelihood that parents will be harsh and inconsistent with their children. This type of parenting style often results in children being aggressive and non-compliant.

Parents cannot continue to carry the majority of the burden for preparing children to be productive adults. This must be a collaborative endeavour involving not only the family but also the community in which the family lives and society as a whole. Affordable, regulated child care is perhaps the most important resource that a community can provide to assist parents in their parenting role. Other resources include family-friendly workplace policies, family support programs such as parent-child drop-in centres, and child-ready kindergarten. Society can assist parents through measures such as the provision of adequate income supplementation for low-income families.

Tables 7 and 8 illustrate some of the ways in which families, communities, and society can support children's development. No attempt is made to provide a comprehensive review of all the familial and extra-familial factors associated with optimal child development and school readiness at age six. Instead, a sample of factors has been chosen to highlight significant issues and factors about which there are research data.

Table 7: Working towards freedom from prenatal and perinatal damage

Mother	Family	Community	Society
Pre-conception medical check, treatment of medical risks such as diabetes Avoidance of alcohol, tobacco, and other potentially harmful drugs during pregnancy Good nutrition and adequate exercise during pregnancy Regular prenatal assessment and care beginning as soon as pregnancy is recognized and continuing until delivery	Provision of emotional and physical support to the mother Provision of a physically safe environment Provision of an emotionally safe environment (i.e., freedom from violence)	Promotion of responsible parenthood, e.g., - education about parenthood and its responsibilities starting in elementary school - provision of family planning information Provision of medical and psychosocial supports for the family, e.g., - pre-conception screening - prenatal medical care - childbirth preparation classes - paid time off work for prenatal care Effective mechanisms to address potential barriers to prenatal care, e.g., public education about its need, transportation assistance to clinics, interpreter services	Public awareness campaigns to encourage women thinking of becoming pregnant or already pregnant to eat a balanced diet and avoid substances such as alcohol and tobacco Adequate financing to ensure universal accessibility to the full range of prenatal medical and psychosocial support services Adequate economic support for low-income families and/or other mechanisms to ensure adequate nutrition for all pregnant women and access to medical and other required services Policies and practices to reduce teen pregnancies

Table 8: Supporting optimal child development

Family **	Community	Society
The provision of: - affectionate, prompt, and age-appropriate care giving - a physically and emotionally safe environment - good nutrition - opportunities to be physically active - medical check-ups and dental care - prompt attention to signs of illness or disability - opportunities to explore, e.g., to touch and manipulate things, to go to different places, to ask questions and have them answered - opportunities to hear and use language - opportunities to play with other similar age children Protection against: - diseases that can be prevented through immunization - accidents - exposure to neglect, abuse, or the experience of violence towards others - exposure to substance abuse	The provision of: - a variety of family-based and centre-based regulated child care services that are responsive to parental needs, e.g., evening and weekend care available for shift workers - family-friendly workplace policies, e.g., flexible hours, paid “family responsibility days” - a network of well-publicized free-to-the-user or sliding scale fee family support services, e.g., well-baby clinics, caregiver and child recreational programs, safe play grounds, toy lending libraries - support services for families with children who have special needs, e.g., respite care - kindergarten classes that provide programs appropriate to the child’s developmental level rather than a watered down version of grade one Protection against: - exposure to violence - discrimination or isolation	- acknowledgment of the importance and value of parenting to the whole society - policies and practices that address the current high rates of unemployment - a comprehensive anti-poverty strategy - adequate income supplementation for families with young children when required (direct financial assistance or income tax relief) - development of additional regulated child care spaces - provision of operating grants to regulated child care programs so that fees can be more affordable - legislation to reduce environmental pollutants along with effective monitoring and enforcement of same Protection against: - violence portrayed in the media - unsafe streets

** The family may delegate some of these responsibilities some of the time.

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97. Doherty, 1996b.

98. Burts, Hart, Charlesworth, Fleege, Moseley & Thomasson, 1992; Love, 1993.

99. Katz, 1988.

100. Bryant, Burchinal & Lau, 1994; Bryant, Peisner-Feinberg & Clifford, 1990; Whitebook, Howes & Phillips, 1990.

101. Karnes, Schwedel & Williams, 1983; Miller & Bizzell, 1983.

102. Biemiller & Doxey, 1993.

103. The Canadian Institute of Child Health, 1993, p. 68.

104. Moss, 1997, p. 30.

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