LONGITUDINAL FOLLOW-UP OF PREMATURELY BORN CHILDREN: OUTCOMES OF HOME STIMULATION PROGRAMME TO AGE FOUR — A PRELIMINARY ANALYSIS

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This paper presents the initial findings from an ongoing project which examines the development of a group of prematurely born children at selected times during each of the first four years of life. Some of these children participated in a home stimulation programme. As the reader will appreciate, in reporting on research in process one faces the frustration of the unknown both in the data yet to be collected and in the data collected but still in the process of analysis.

CONTEXT OF THE PROBLEM

The incidence of preterm birth has changed very little since the turn of the century. The phenomenon of regionalized health care since 1960, however, has created strategically placed neonatal intensive care units, where the mortality rates for the preterm infant have declined markedly. In the same 20 years, research has been mounted to provide planned stimulation regimes for the increasing numbers of surviving preterm infants.

The philosophy directing the care provided to preterm infants in nurseries has altered markedly over the same two decades. In 1981 it was reported that supplemental stimulation in the nurseries of university teaching hospitals has no discernable effect at discharge on the preterm infant's development beyond that of the usual standard of care (Chapman, Note 1).

Most of the 20-odd intervention programmes to date have been conducted during the preterm infant's initial hospital stay and were evaluated immediately upon the study's conclusion (Chapman, 1980). Six of these hospital intervention projects have reported follow-up data on their subjects during the first year; one project reported outcomes at one year; and one project reported outcomes at three years.

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STATEMENT OF THE PROBLEM

The immediate and short-term effects of some stimulation programmes provided for the preterm infant were found to be beneficial but long-term outcomes were never evaluated. Whether or not there are sleeper effects that will appear later is unknown.

There is no study which has follow-up data beyond age 3 on preterm subjects who have participated in planned stimulation studies. In addition, follow-up data beyond the age of 3 on any preterm infant born subsequent to 1970, when changing patterns and philosophies of children's neonatal care were occurring, are scarce.

REVIEW OF THE LITERATURE

One reason there may be few longitudinal studies of preterm infants is that so many variables must be addressed. Over the first five years of life, developmental measures are known to be affected by a multiplicity of variables. In the first year of life the quality of the home environment (Wachs, Uzgiris, & Hunt, 1971) and caretaker-infant relationship (Yarrow, Rubinstein, Pedersen, & Jankowski, 1972) affect cognitive development.

A 1979 report from the Department of Health, Education and Welfare demonstrated that the quality of stimulation provided in the home and the related parent-child interaction continue to demonstrate strong associations with the child's developmental status between the ages of 2 and 4.

In addition, by age 2, socioeconomic status (Caputo, Goldstein, & Taub, 1981; Sigman & Parmelee, 1979) and language background (Sigman & Parmelee, 1979) are significantly associated with developmental test scores. At this age, birth order has a significant effect on preterm infants' developmental scores independent of the infant's language or socioeconomic background (SES) (Sigman, Cohen, Beckwith, & Parmalee, 1981). First-borns score significantly higher than later born preterms in both the first 2 years.

Sigman and colleagues' (1981) preliminary data indicate that Spanish speaking preterm children continue to do poorly at ages 3 and 5 on the Stanford-Binet intelligence test. Whether this finding is related to an actual lower SES or inappropriate use of an English-based, culturally influenced measure to assess ability in non-English speaking children,or both, requires delineation.

A key issue in long-term study of preterm infants is: What is the earliest age at which valid prediction of actual intelligence to be attained can be identified? Grant review committees appropriating limited funds take an additional look at a project, however meritorious it may be, that has the potential to commit scarce governmental funds to a seven-year project. Questions will be raised concerning (a) the attrition rate, (b) whether, when a large battery of tests is used over the years, statistical significance will be found sometimes by chance alone, and (c) whether the number of intervening variables over such a time period allows a reasonable interpretation of any results.

Some authors (Sigman et al., 1981) contend developmental measures made on preterm subjects at as early as 4 months corrected age can be correlated with intelligence tests at 5 years; others (White, 1975) believe test scores near the end of the second year can be predictive of later school success. There are also those who, because they believe sensorimotor intelligence is biologically determined and only influenced by major environmental influences, would not see a follow-up study on subjects exposed to intervention as necessary (Scarr-Salapatek, 1976, pp. 179-180; Wilson, 1972).

The studies conducted in the 1960s frequently contended that the stature of prematurely born children — in terms of height and weight — remained below the norms (Dann, Levine, & New, 1964; Lubchenco, Horner, Reed, Hix, Metcalf, Cohig, Elliot, & Bourg, 1963; Robinson & Robinson, 1965). In the 1970s, two studies did not find subjects to be undersized (Fisch, Bilek, Miller, & Engel, 1975; Fitzhardinge and Ramsay, 1973), whereas one did (Holstrum, 1979).

The use of standardized graphs (for example Reed & Stuart, 1959) may not be appropriate as the cohort of preterm children may include different proportions of ethnic groups than the standardized populations for such graphs.

Children born prematurely in the 1960s had fewer overt neurological sequelae but behavioural and academic problems remained (Fitzhardinge & Ramsey, 1973; Neligan, Kolvin, Scott, & Garside, 1976). Earlier it had been noted that prematures had more behavioural problems that their siblings (Mohr & Barthelme, 1930) or their full-term controls (Drillien, 1964).

Maladjustment had been found in 25% of Beskow's (1949) school-age premature sample and in the majority of Howard and Worrell's (1952) school-age sample. Hence "the behavior syndrome of prematurity" Shirley (1938, 1939) described for the premature's first two years of life persisted.

School problems on entrance were attributed to lack of readiness (Howard & Worrell, 1952; Jansky, 1975), but continued in spite of normal IQs and seemed related to deficits in underlying integration of neurological development (Beskow, 1949; Blegen, 1953; DeHirsch, Jansky, & Langford, 1966; Weiner, Rider, Oppel, & Harper, 1968).

To summarize, it is evident that multiple variables influence the preterm infant's development. Whether or not the long-term development of the preterm infant can be facilitated by manipulation of some of these variables is the focus of this project.

THE RESEARCH FRAMEWORK FOR LONGITUDINAL STUDY OF PRETERM INFANTS

Figure 1 illustrates the model proposed for longitudinal study of the preterm infant. It is an interactive model in which the preterm infant's potential for development is seen as dependent upon three major factors — his/her human interactors; the environmental context in which those interactions occur; and the uniqueness the individual preterm contributes. The model provides for interventions to be directed at any one of the three factors. It evaluates sequentially along the life process successive developmental outcomes in the anthropometric, motor, social/behavioural, cognitive, and academic performance domains.

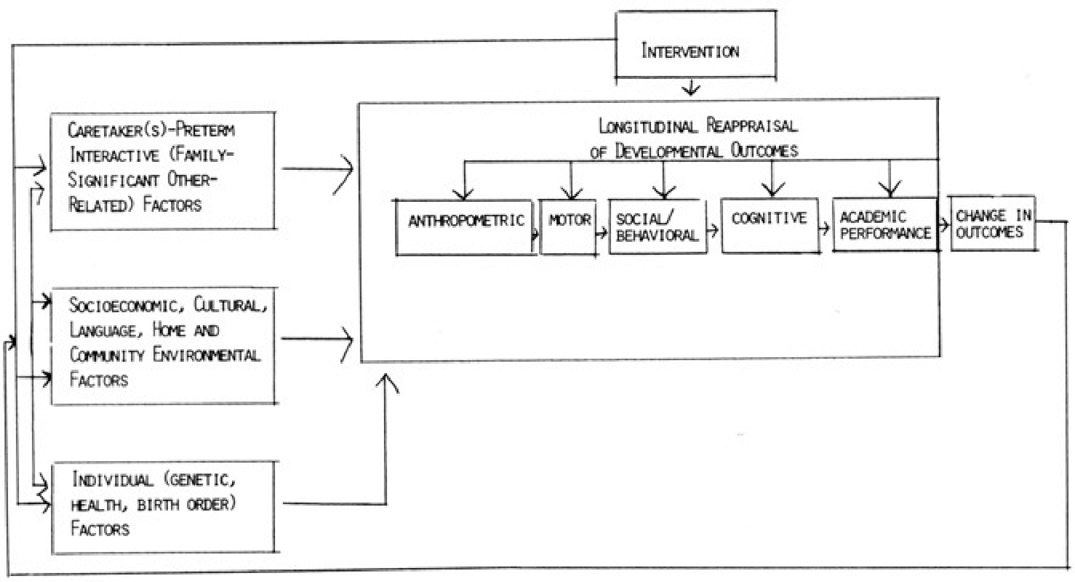

Figure 1: Model of research framework of longitudinal study of preterm infants (adapted from *Conceptual Framework for Nursing* of the Faculty of Nursing, University of Toronto, *1981*).

Purpose

The purpose of this study is twofold; (a) to determine long-term developmental outcomes of preterm infants born during or after 1975; and (b) to determine if home intervention programs for preterm infants/children affect long-term developmental outcomes of preterm infants born during or after 1975.

Specific Research Questions

1. Do preterm infants/children born during or after 1975 demonstrate comparable developmental outcomes with the standardized populations on the measurement tools for assessment at ages 9 and 18 months from their mother's expected date of confinement and/or at 3 and subsequent years of age?
2. Do preterm infants/children exposed to home stimulation programs demonstrate different developmental outcomes from preterm children not exposed to such programs on the measurement tools used for assessment at ages 9 and 18 months from their mother's expected date of confinement and/or at 3 and subsequent years of age?

Research Hypotheses

1. Preterm children born during or after 1975 will demonstrate comparable developmental outcomes to standardized populations at some time between 18 months and 5 years of age.
2. Preterm children exposed to home stimulation programs in the first 3 years of life will demonstrate superior developmental outcomes to preterm children not exposed to such programs.

Definition of Terms

Preterm children refers to 259 children who (a) were born in one of three university teaching hospitals in Ontario between November 1, 1975 and October 31, 1979; (b) had a mean birth weight of 1,551 ± 317 grams; and (c) had a mean gestational age of 226 ± 16 days.

Developmental outcomes in this paper will refer to subjects' (a) mental and motor scores on The Bayley Scales of Infant Development (Bayley, 1969) for 9 and 18 month olds; (b) IQ scores on the Stanford-Binet Intelligence Scale (Form L-M) (1972 Norms) for 3 and 4 year olds (Terman and Merrill, 1973); (c) social competence scores on the Vineland Social Maturity Scale (Doll, 1953); and (d) anthropometric measures of height and weight.

Home control group refers to subjects who received no home program.

Early home stimulation refers to subjects who following discharge had 10 monthly visits of one-hour duration for a tutor to provide a prescribed module of parental education and designated toys.

Late home stimulation refers to subjects who following their Bayley assessment at 9 months from EDC had an individualized program consisting of tutoring and toys provided monthly until age 2 and bimonthly to age 3.

Continual home stimulation refers to subjects who had both early and late home stimulation.

METHODOLOGY

Design

A posttest-only control group design was used (Campbell & Stanley, 1963). At discharge from the hospital, by a stratified (by sex) random method, subjects were assigned to one of three posthospital intervention groups or to a group who had comparable time spent with them as the experimental group.

Procedure

All four groups had a monthly home visit from the public health nurse for the first 10 months after discharge to deal with health promotion and problem alleviation. Although methodologically the addition of a "pure" control group, without any visits, would have improved the project from a design standpoint, such a group was rejected on ethical grounds. In addition to the monthly visits of the Home Control Group, the Early Home and Continual Home Stimulation groups had (during the same hourly visits) a specified teaching module presented to the caretaker and age-appropriate toys left for the intervening month. Hence all subjects received the attention provided in ten one-hour visits to control the Hawthorne effect but in two of the intervention groups planned tutoring and provision of toys occurred. The Bayley Scales of Infant Development were administered in the home by a qualified psychometrist, who did not know the group assignment of the child, after the conclusion of the ten visits. The time selected for the first Bayley assessment was when the child was 9 months from the mother's date of confinement (EDC) so that the variable of biological maturation would be controlled.

Following the first Bayley assessment, the latter half of the control group admitted to the sample was designated the Late Stimulation Group. They, together with the latter half of the Early Stimulation Group admitted to the sample (who became the Continual Stimulation Group), received, based on the results of the Bayley assessment, an individualized monthly program of tutoring and toys until age 2, and then a bimonthly program until age 3.

All subjects were reappraised 18 months from their mothers' EDC on the Bayley Scales of Infant Development. At ages 3 and 4 cognitive assessment was appraised on the Stanford-Binet (Terman & Merrill, 1973), social maturity on the Vineland (Doll, 1953), and the anthropometric measures were recorded. The validity and reliability of these measurement tools is documented in the literature.

Sample

The original sample had 259 subjects. Attrition rates over the period 1975-1981 are illustrated in Table 1.

Table 1
Attrition Rate by Year

Variable	Year						
	75-76	76-77	77-78	78-79	79-80	80-81	Total
Subject intake (I)	65	64	80	52	0	0	261
Total remaining subjects from previous year (TRS)	0	62	123	192	237	236	236
I + TRS	65	126	203	244	237	236	
Lost during year/ study	3	3	11	7	1	4	29
Remaining/start of year sample	62/65	123/126	192/203	235/244	236/237	232/236	232/261
Attrition rate of sample/year/to date	4.6%	2.4%	5.4%	2.9%	0.4%	1.7%	11.2%

Losses were due to death (2), emigration (12), inability to trace (7), and refusals (8; 2 after cerebral palsy diagnosed). Tilford (1976) warns results may be equivocal if children with major neurological deficit are left in the main sample. Hence, 7 children with cerebral palsy (incidence 2.7%) were removed from the main sample and will be analyzed separately.

In addition, it was decided that a subject would be placed in a special group designated Developmental Delay if on either Bayley Scale he/she did not attain a score of 50, or if on the Stanford-Binet he/she did not attain the basal score at the year 2 level. Based on these criteria, seven subjects were assigned to the Developmental Delay Group and removed from the main sample. The attrition from the sample due to cerebral palsy was distributed across all four treatment groups; the attrition due to developmental delay was distributed across all groups except the Continual Stimulation Group. Up to the time of the 18-month assessment, 86% (223/259) of the original sample remained in the main sample, another 4.6% (seven with developmental delay and five with cerebral palsy) were still members of special follow-up groups, so over 90% of the original cohort were followed to 2 years of age.

FINDINGS AND DISCUSSION

Cognitive and Motor Developmental Outcomes in the First Two Years

There were no significant differences found at 9 months from EDC on either the mental or motor development Bayley Scale corrected-age scores between the subjects who had a home stimulation programme and those who did not (see Tables 2 and 3).

Table 2

Ranges, Means, Standard Deviations of Age-Corrected Bayley Mental Development Indices at 9 Months from Mother's Expected Date of Confinement for Premature Infants Exposed and Not Exposed to an Infant Stimulation Programme[a]

Exposure to programme		n	Range	Mean	Standard deviation
No	Male	56	65-136	102.26	15.91
	Female	55	60-146	109.20	16.91
Yes	Male	55	72-150	111.10	16.58
	Female	56	69-150	115.16	14.03
Total	Male	111	65-150	107.04	15.80
	Female	111	60-150	112.38	15.64

[a] F — Value n.s. for treatment, sex, and treatment × sex.

Table 3

Ranges, Means, Standard Deviations of Age-Corrected Bayley Motor Development Indices at 9 Months from Mother's Expected Date of Confinement for Premature Infants Exposed and Not Exposed to an Infant Stimulation Programme[a]

Exposure to programme		n	Range	Mean	Standard deviation
No	Male	56	66-139	97.31	15.56
	Female	55	72-150	104.16	17.07
Yes	Male	55	69-134	102.19	12.99
	Female	56	75-143	103.73	11.28
Total	Male	111	66-139	99.41	14.87
	Female	111	72-150	102.76	15.16

[a] F — Value n.s. for treatment, sex, and treatment × sex.

Females consistently scored higher than males but not significantly so. Mental development outpaced motor development in the first year. Overall group means for both sexes demonstrated these corrected scores to be comparable to the means and standard deviations of the test's standardized population for motor development and better than the standardized means for mental development. Other authors have noted that use of corrected scores on the Bayley Mental Development Indices probably inflates the score during the first year of life (Hunt & Rhodes, 1977).

However, if one follows Lubchenco's (Note 2) suggestion and uses corrected age scores during the first year, the following observation can be made concerning the proportion of the sample with IQs under 90 at 9 months from the subject's mother's expected date of confinement: 21 of the 111 children who had no planned program had IQs under 90 (18%); whereas 10 of the 111 children who had exposure to a stimulation program were found to have IQs under 90 (9%).

At 18 months from the subject's mother's expected date of confinement, again there were no statistically significant differences found among the treatment groups on either the Bayley unadjusted mental or motor scores (see Tables 4 and 5). At this age again females scored higher than males in mental development but not significantly so. Motor and mental development appeared to parallel each other better at 18 months than they had at 9 months. Although the mean unadjusted scores for both mental and motor development fell within a standard deviation of the mean, this sample of prematures had not attained the mean score of their full-term counterparts in the standardization population by the time they reached 18 months from their mother's expected date of confinement. Forty per cent of the sample (113/223) would have IQs under 90 with the use of unadjusted Bayley Mental Indices. With age-corrected scores 13% (31-223) of the sample have IQs less than 90 at this age. The percentage varied by group from 9% to 18%, with the lowest incidence (9%) occurring in the group who had been exposed to continual stimulation.

Table 4

Ranges, Means, Standard Deviations of Unadjusted Bayley Mental Development Indices at 18 Months from Mother's Expected Date of Confinement for Premature Infants Exposed to Different Timing of Stimulation Programmes[a]

Timing of programme		n	Range	Mean	Standard deviation
None	Male	23	62-118	88.00	15.90
	Female	26	73-124	95.85	12.09
Early	Male	27	62-116	89.30	16.08
	Female	26	75-137	101.08	14.66
Late	Male	33	54-129	85.39	16.22
	Female	29	56-135	91.34	16.83
Continual	Male	29	72-112	88.79	11.11
	Female	30	58-131	94.80	16.71
Total	Male	112	54-129	87.75	
	Female	111	56-137	95.61	

[a] F — Value n.s. for treatment, sex, and treatment × sex.

Table 5

Ranges, Means, Standard Deviations of Unadjusted Bayley Motor Development Indices at 18 Months from Mother's Expected Date of Confinement for Premature Infants Exposed to Different Timing of Stimulation Programmes[a]

Timing of programme		n	Range	Mean	Standard deviation
None	Male	23	64-119	94.52	17.83
	Female	26	64-124	101.96	15.58
Early	Male	27	64-137	98.93	15.41
	Female	26	70-137	104.12	14.22
Late	Male	33	50-116	90.28	18.20
	Female	29	60-112	90.28	17.25
Continual	Male	29	50-115	97.86	13.92
	Female	30	54-124	96.53	16.77
Total	Male	112	50-137	95.20	
	Female	111	54-137	98.73	

[a] F — Value n.s. for treatment, sex, and treatment × sex.

Cognitive Developmental Outcomes at Ages 3 and 4

At the completion of the stimulation regimes at 3 years of age there were no significant differences found among the groups on their scores on the Stanford-Binet (see Table 6).

Table 6

Ranges, Means, Standard Deviations of IQ at Ages 3 and 4 Years of Age for Premature Children Exposed to Different Timing of Stimulation Programmes[a]

Timing of programme		n	Range	Mean	Standard deviation
None	3 Years	48	57-127	93.19	16.48
	4 Years	45	72-132	100.91	15.41
Early	3 Years	53	62-134	95.91	19.33
	4 Years	46	70-134	101.56	16.97
Late	3 Years[b]	27	62-129	95.78	21.47
Continual	3 Years[b]	25	73-132	98.76	17.05
Total	3 Years	153	57-134	95.50	18.53
	4 Years	91	70-134	101.21	16.22

[a] F — Value n.s. at both ages 3 and 4.

[b] Subjects have not yet attained 4 years of age.

The overall mean IQ score of 95.50 ± 18.53 demonstrated that this sample of prematurely born 3-year-olds had not, by this age, attained the standardized population mean of 100. Bakeman and Brown (1980) compared 21 preterm infants with 22 full-term infants who were born in 1975 when these children were 3 years of age. No intervention was provided. The preterm's mean score on the Stanford-Binet was 83.5 ± 10.7; the full-term's mean score was 94.6 ± 14.2. The current preterm sample has a mean comparable to their full-term group. Even so, 40% of the sample (62/153) who have already attained the age of 3 have IQs under 90 at this age.

Ninety-one subjects have reached their 4th birthday. Due to the nature of the design, 45 of these subjects are in the control group; 46 in the early stimulation group. There was no significant difference between the IQ score on the Stanford-Binet for these two groups (see Table 6). The mean IQ for the entire group of 4-year-olds was 101.21 ± 16.22. Therefore, by 4 years of age these premature children born in university teaching hospitals during 1975 or 1976 have comparable means and standard deviations on the Stanford-Binet to this test's standardized 4-year-old population; 29% (26/91) have IQs less than 90.

Social/Behavioural Outcomes at Ages 3 and 4

There was no significant difference among the treatment groups' scores on the Vineland Social Maturity Scale at either age 3 or age 4 (see Table 7).

Table 7

Ranges, Means, Standard Deviations of Social Quotients at Ages 3 and 4 Years of Age for Premature Children Exposed to Different Timing of Stimulation Programmes[a]

Timing of programme		n	Range	Mean	Standard deviation
None	3 Years	48	87-167	124.00	22.99
	4 Years	45	80-158	118.87	19.59
Early	3 Years	53	87-173	122.64	19.43
	4 Years	45	80-180	118.98	17.90
Late	3 Years[b]	27	87-160	116.19	19.83
Continual	3 Years[b]	25	87-173	114.56	21.91
Total	3 Years	153	87-173	120.61	21.08
	4 Years	90	80-180	118.92	18.77

[a] F — Values n.s. at both ages 3 and 4.

[b] Subjects have not yet attained 4 years of age.

It is recognized that, in general, 1983 children are much more sophisticated than the 1953 children on whom this test was standardized. The means of the overall sample at both ages 3 and 4 exceed plus one standard deviation of the standardized population's mean. Most of these premature children perform the life skills involved in self-care at the table, in toileting, in dressing, in locomotion, in reciprocal play, in communication, in assuming responsibility for household tasks and in hand manipulation skills exceptionally well. Only 14% (22/153) and 11% (10/90) at ages 3 and 4 respectively fall below the standardized mean. Bakeman and Brown (1980) data support the finding that preterm cohorts have adequate social competence by age 3.

Anthropometric Developmental Outcomes at Ages 3 and 4

The heights of the sample at 3 and 4 years of age are shown in Table 8.

Table 8

Ranges, Means, Standard Deviations of Height (cm) at Ages 3 and 4 Years of Age for Premature Children Exposed to Different Timing of Stimulation Programmes[a]

Timing of programme		n	Range	Mean	Standard deviation
None	3 Year	47	85-102	94.34	3.42
	4 Year	44	91-109	101.45	4.04
Early	3 Year	53	84-108	94.13	5.04
	4 Year	45	90-115	101.33	5.50
Late	3 Year[b]	27	88-101	94.30	4.07
Continual	3 Year[b]	24	85-103	94.04	4.15
Total	3 Year	151	84-108	94.21	4.28
	4 Year	89	90-115	101.39	4.58

[a] F — Value n.s. at both ages 3 and 4.

[b] Subjects have not yet attained 4 years of age.

The weights of the sample at ages 3 and 4 are shown in Table 9.

Table 9

Ranges, Means, Standard Deviations of Weight (kg) at Ages 3 and 4 Years of Age for Premature Children Exposed to Different Timing of Stimulation Programmes[a]

Timing of programme		n	Range	Mean	Standard deviation
None	3 Year	48	11.10-18.10	13.80	1.51
	4 Year	45	11.40-20.00	15.78	1.83
Early	3 Year	53	10.00-20.00	13.90	1.91
	4 Year	44	11.80-24.90	15.85	2.46
Late	3 Year[b]	27	9.90-16.80	13.36	1.62
Continual	3 Year[b]	25	9.50-25.9	13.06	3.00
Total	3 Year	153	9.50-25.9	13.63	1.98
	4 Year	89	11.40-24.90	15.81	2.16

[a] F — Value n.s. at both ages 3 and 4.

[b] Subjects have not yet attained 4 years of age.

There are no significant differences among the treatment groups at ages 3 or 4 in either height or weight. This sample of premature children is approximately 2 centimeters shorter and 1 kilogram lighter at both 3 and 4 years of age than the average measurements reported (Reed & Stuart, 1959; Watson & Lowry, 1967). Hence their growth increment in height (7 cm) and in weight (2 kg) between 3 and 4 is comparable to the growth increment of the average child between 3 and 4 but the premature child started at a lower baseline.

SUMMARY AND CONCLUSION

The findings of this project to date indicate that preterm children in this sample (a) do not attain comparable anthropometric measurements to standardized growth curves up to age 4, (b) do attain social maturity comparable to standardized populations by age 3, and (c) do attain comparable IQ scores to standardized populations by age 4. There is no evidence that provision of stimulation programs at different times during the first 3 years affects overall outcomes.

In conclusion, a quotation from Koenig (1950) seems appropriate:

> The first chapter in the life of the premature infant is by all odds the most dramatic one. In it, he utilizes the best talents of the medical and nursing professions and by the mere act of remaining alive achieves that so desirable result — the lowering of the infant mortality rate. His brief moment of triumph over, he usually disappears into oblivion. (p. 803)

It is hoped that the model for longitudinal study of the preterm infant offered here will provide understanding of the health of premature children in the 1980s and bring them out of oblivion.

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RÉSUMÉ

Suivi longitudinal d'enfants prématurés: résultats du programme de stimulation à la maison jusqu'à l'âge de quatre ans — analyse préliminaire

Les résultats à long terme des programmes d'intervention destinés aux enfants prématurés n'ont pas fait l'objet d'écrits. Une seule étude (N = 5-6/groupe) a été faite auprès d'enfants âgés de 3 ans; aucune recherche n'a porté sur les observations au delà de cet âge. La présente étude avait pour objectif de mesurer le développement à long terme des prématurés afin de déterminer si les programmes d'intervention ont une influence sur leur développement. Dans un échantillon de 223 sujets, les résultats relatifs au développement cognitif et moteur au cours des deux premières années ne pouvaient se comparer aux normes. A 9 mois et à 18 mois, les filles et les sujets exposés au programme de stimulation tendaient à présenter un Q.I. plus élevé que les garçons et les sujets témoins. A 3 ans et à 4 ans, aucune différence au niveau du Q.I. n'a pu être établie entre les groupes d'enfants stimulés et non stimulés. A 4 ans, mais non à 3 ans, le Q.I. était comparable aux données normatives. On n'a constaté aucune différence entre les groupes de stimulation quant au développement social et de comportement chez les enfants de 3 et 4 ans. Parallèlement, aucune différence sur le plan de la taille ou du poids n'a été observée entre les groupes à 3 ans ou à 4 ans; le taux de croissance observé à 3 ans et à 4 ans était normal mais les sujets avaient quand même une taille et un poids inférieurs à ceux d'enfants du même âge.