DOCUMENT RESUME

ED 055 665 PS 005 100

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TITLE Demonstration Program in Infant Care and Education (September 1968 - June 1971). Final Report.
INSTITUTION Ontario Inst. for Studies in Education, Toronto.
PUB DATE Aug 71
NOTE 263p.

EDRS PRICE MF-$0.65 HC-$9.87
DESCRIPTORS *Day Care Programs; *Developmental Programs; Disadvantaged Groups; Family Background; *Infants; Longitudinal Studies; Mental Development; Motor Development; Parents; *Program Descriptions; *Program Evaluation; Research Design; Social Development; Tables (Data); Test Results

ABSTRACT

The Ontario Institute and the Canadian Mothercraft Society report accumulated findings on all phases of their 3-year demonstration infant day care center. Infants enrolled in the center were either advantaged or disadvantaged, had working mothers and ranged in age from 3 to 30 months of age. The center also served as a training facility for infant caretaker-teachers. The program had been designed to facilitate infants' cognitive, personality, and social development through personalized adult-child interaction, guided learning situations, free play and specialized care. Both infants and students-in-training made gains on a variety of measures. Chapter titles include: General Plan of the Investigation, Study of Infant Development, Study of Student Development, Investigation of Parents, Social Implications. References include a bibliography as well as a reprint of a paper titled "A Developmental Learning Approach to Infant Care in a Group Setting" which comprises one-third of the document. (WY)

Demonstration Program in Infant Care and Education

(September 1968 - June 1971)

Final Report

by

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in collaboration with

Canadian Mothercraft Society

August 1971

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Table of Contents

Acknowledgements

I. Introduction ..... 1.

II. Specific Objectives of the Investigation ..... 2.

III. General Plan of Investigation

A. Design Summary ..... 4.

B. Facilities and Staff ..... 8.

C. Overview of Programs (Infants, Students and Parents)..... 10.

IV. Study of Infant Development

A. Sampling and Measurement ..... 11.

B. Infant Care and Education ..... 26.

C. Results and Discussion

Mental, Motor and Socioemotional Development

- Appendix A (Pp. 31-59)

Specific Developmental Learning Projects

- Appendix A (Pp. 22-31)

Additional Measures of Infant Development

- Main Document ..... 34.

V. Study of Student Development

A. Student Characteristics ..... 73.

B. Measurement ..... 76.

C. Student Education ..... 79.

D. Results ..... 81.

E. Summary - Discussion ..... 88.

VI. Investigation of Parents

A. Description of Families 92

B. Measurement ..... 97.

C. Parent Guidance ..... 99.

D. Results .....102.

E. Summary - Discussion ..... 116.

VII. General Summary-Discussion of Infant Development

A. Effects of Specialized Day Care on Advantaged Infants .... 121.

Sex Differences ..... 139.

B. Effects of Specialized Day Care on Disadvantaged Infants 149.

VIII. Social Implications ..... 161.

References - Appendix A

Supplementary References ..... 171.

Acknowledgements

The investigation was supported by generous grants from the Atkinson Charitable Foundation, from the Development Review Board and the Department of Applied Psychology of the Ontario Institute for Studies in Education, and by support from Commissioner John G. Anderson of the Metropolitan Department of Social Services.

There are many persons whose efforts and skills made the completion of the investigation possible. I would like to thank, especially, Mrs. Audrey Burger, President, and Members of the Board of Canadian Mothercraft Society, for their many contributions, the opportunity to collaborate and the use of the facilities at Canadian Mothercraft Day Care Centre; Mr. Orval McKeough for his untiring efforts and counsel; the students and supporting staff at Canadian Mothercraft whose devotion and service to babies are endless; the many community personnel and organizations who shared their time and facilities for parents; Miss Jean Waddell who typed the manuscript with such care and accuracy; and above all the babies and their parents who were the heart of everything.

I. Introduction

Research amassed from a variety of settings in recent years - social advantage-disadvantage, child rearing at home, infants in institutions, longitudinal and cross-sectional developmental studies, a few experimental studies, and studies on controlled deprivation and enrichment in animals - points to the crucial significance of early experience to (human) development - intellectually, socially and emotionally. Historically, child rearing in the early years has in Canada and the United States been left to the traditional culture and resources of the nuclear family in the home, supplemented by advice from pediatricians, clinic services, and popular periodicals. Professionally staffed day care facilities for preschool children are comparatively recent and seldom very educational. Group care for infants under two has only just begun to be established. In Western and Eastern Europe, Israel, the USSR and China, early group care from birth, some educationally oriented, has been prevalent for years.

Yet large populations in contemporary society possess resources economically and psychologically inadequate to rear children in ways optimal for their development. The plight of a growing number of mothers - working for reasons of both necessity and desire for self-development - and of vast strata of families living chronically in poverty and socio-educational disadvantage can no longer be ignored. The early years play a vital role in establishing modes of functioning that determine the child's ability to cope and learn in school, work and daily life throughout development. Infancy is too important a developmental period to be neglected in any population group.

The purpose of this investigation has been to develop methods and operate a quality program of group day care for infants of working mothers and socioeconomically disadvantaged families. The program was both educationally and interpersonally oriented to provide a model and service for the community.

The demonstration program was a three year study designed by the principal investigator and developed in collaboration with a research team from the Department of Applied Psychology of the Ontario Institute for Studies in Education and the Canadian Mothercraft Society, an infant day care center for working mothers and training center for infant caretaker-teachers. This is the final report of the findings accumulated in all phases of the investigation on infant, parent and student development.

II. Specific Objectives of the Investigation

As stated in the original research and development plan (Fowler, 1968) the specific objectives and supporting activities (Section I.B.) of the investigation were as follows:

1. The primary objective of the program would be to study developmental learning in infants over the first two and one half years of life. We are interested in the immediate and cumulative effects of planned programs of stimulation and socioemotional care upon a variety of cognitive, personality and motivational functions of infant development.

2. There will be a demonstration program in infant education...intended to serve as a model for the community in desirable practices and standards of institutional day care...

3. A third objective will be to study the specialized problems and develop techniques and programs for developmental stimulation of infants from disadvantaged families...

4. The fourth...set of objectives is to develop teaching...(techniques and) methods, curriculum programs and guides, to devise a variety of educational materials...(and toys) and to develop assessment techniques...

5. One of the supporting objectives to further the aims of the first three objectives is to develop and operate a program of training for students... as teachers and infant day care workers...

6. The second supporting objective is to conduct a program of parent education and guidance in infant care and education...

7. This project will also serve as a major source of opportunity for graduate student training...

Plans and progress reports of prior work consist of:

1. Development Proposal for Operation of an Infant Day Care and Educational Program (Fowler, 1968)
2. Year I (September 1968 - June 1969)
   (a) Infant Developmental Learning Demonstration Program: Preliminary Progress Report (Fowler, 1969)
   (b) Progress Report on Demonstration Program in Infant Care and Education (Fowler, et al, 1969)
3. Year II (1969-1970)
   (a) Demonstration Infant Day Care and Education Program: Interim Report (Fowler, et al, 1970)
4. A Developmental Approach to Infant Care and Education in a Group Setting, Merrill-Palmer Qtrly., (Fowler, in press). A major portion of the findings on infant development are reported in this article which is therefore appended as Appendix A.

This final report of the three year investigation covers the following categories of information bearing on the objectives:

1. Development of advantaged (and controls) and disadvantaged infants in cognitive, (including language), social, emotional, motivational and motor functioning cumulatively and in subsamples according to age of entry, time in program and sex.
2. Comparison of student development for each of the three annual program years.
3. Parent characteristics, development and relations to infant development.
4. Development and status of curriculum programs, techniques, educational materials, and program devised measures.
5. Report on special projects on infant development contributing to the development of programs and specialized measures.
6. Discussion and recommendations.

III. General Plan of Investigation

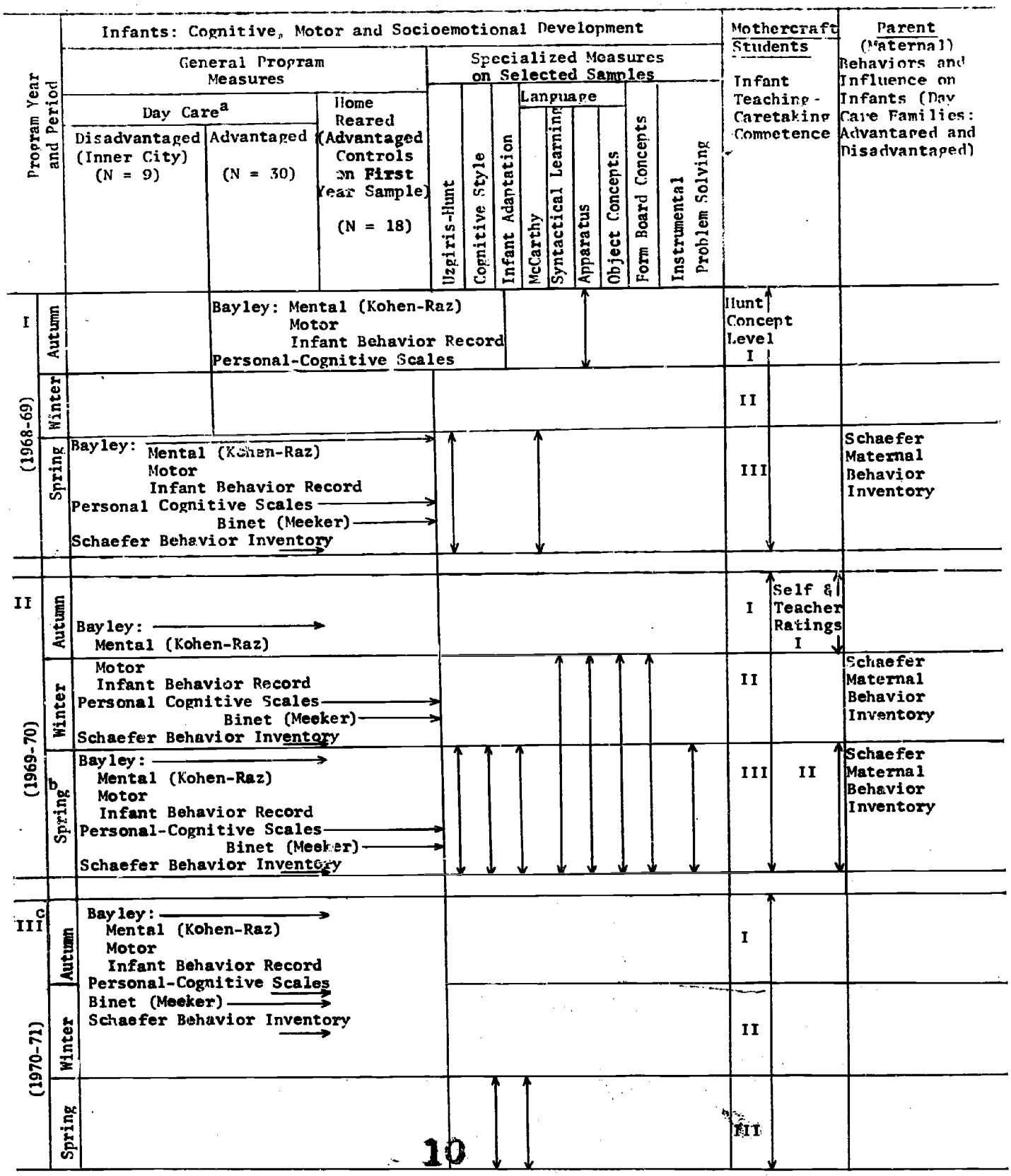
A. Design Summary

The design and schedule of assessments for the three years of the investigation are displayed in Table 1. The subjects of study in the investigation consisted of an accumulating sample of 30 infants of working mothers in attendance at Canadian Mothercraft Society day care center plus an accumulating sample of 9 disadvantaged infants from inner city sections of Toronto, the total ranging from 2 to 30 months in age. Mothercraft teachers in one year training programs and parents were also subjects of study.

The plan of investigation attempted to balance periodic measurement of the infants, students and parents in the program with the program development orientation of the project and the field setting in which the study was

Design and Schedule of Assessments for Demonstration

Program on Infant Care and Education (Cumulative Samples)



[a] Bayley Measures and Personal-Cognitive Scales administered (additionally) within 1-2 months of entry and (on Binet) at time of departure.

[b] Assessments made in late spring - early summer to space measurements.

[c] Only one set of measures generally applied to each infant at either autumn or winter testing.

operating. To accomplish these aims, measurement of all three groups was applied at regular intervals (most generally late fall and late spring as seen in Table 1), for specific needs (e.g., points of entry and departure) and for specific projects when occasion arose. Because of uncertainties with regard to funding during Year III (1970-71), however, a more restricted testing and program development schedule was followed, which limited most children to one testing, either fall or spring according to time of departure and readiness for Binet testing. Year III assessments were therefore based on the demonstration program as developed largely over the first two years of investigation, measuring only the accumulating samples of infants whose families had experienced parent guidance.

The demonstration program was an evolving process following principles and techniques on infant care and developmental stimulation presented to staff, students and parents in part through guides written by the principal investigator (Fowler, 1968 a & b, 1969) and in part through discussion, demonstration and guidance. There was a general treatment program of cognitive developmental learning and socioemotional and physical care and a variety of focused learning programs (e.g., object concepts, language and problem solving) applied selectively for experimental purposes on subsamples of infants at different stages of the investigation.

An annual turnover of students (and some members of the teaching and research staff) meant an annual cycle of fluctuating levels of smoothness of operations and relations. Although the program was under continuous development, each fall the program started partly anew at relatively low levels and worked up to high levels over the year as students and new staff members developed. New measures on selected samples of children were also added (e.g., cognitive

styles, adaptation scales, language) from time to time.

Control and analysis were exercised in several ways, the most general of which was through analysis of gain scores on standardized measures in comparison with normative baselines. The second method was through developmental comparisons of cumulative subsamples of infants grouped according to advantage-disadvantage, age of entry into program, time in program and sex. The third major method of control was through recruitment of a set of home reared infants from the metropolitan community at the beginning of Year I, matched in pairs with the day care group according to age, sex, ability patterns and other criteria as described in the section on sampling. This technique furnished a direct comparison of $Time_1$ (autumn), $Time_2$ (spring), and change scores on selected basic developmental (mental, motor, language and socio-emotional) measures between the demonstration first year day care sample with a sample of exclusively home-reared infants from the same general community. Comparisons were made in the Year I sample over the first year and continued throughout subsequent testings in the autumn and spring of Year II, terminating for each experimental and control child as he reached the Mothercraft "graduation" age of 30 months (or earlier, in the event of premature withdrawal).

Additional analyses on infant development include (1) comparisons between infant measures and (2) assessment of the development of selected samples of infants on specialized measures or of infants in component programs. Parent and student characteristics and development were also analyzed and parent scores related to infant scores. No measures on students were relatable to infant scores because students were assigned multiple infant caretaking roles and regularly rotated among the infant age groups.

B. Facilities and Staff

Despite its proximity to the center of the city, the Mothercraft day care center is located in a spacious old mansion, to which it moved early in the first program year (from slightly less spacious quarters). There is a very large, recently re-designed playground (over 200 square feet per child) divided into asphalt runways for wheel toys and sandbox, grassy areas well-equipped with climbing apparatus, swings, etc., and large trees, plants, etc. for nature observation.

Indoors there are three floors and a basement area that accomodate three major play room and caretaking complexes for the three developmental age groups, together with kitchen, diet kitchen, adult dining room, board and seminar room, library, testing and observation room (including one-way mirrors), student lounge and offices for staff, students and the multiple functions of the program and center. Each of the playroom areas is well lighted (the basement playroom less so) and generously equipped with a wide variety of play materials and equipment as suitable to the age group in order to maximize scheduling flexibility.

The total staff was composed of the principal investigator and research staff, the Director of Mothercraft and teaching and supporting staff plus about 20 students in training each year as infant teacher-caretakers, as well as the Board of Directors of Canadian Mothercraft, whose president, Mrs. Audrey Burger, served as liaison coordinator for the Board and its committees. There were also occasional student-teachers from various nursery school training programs who participated for short periods for field work training.

The Mothercraft staff consisted of four teachers, two for the youngest infant group less than 14 months and one each for two older groups, 13 to 21 and 22 to 30 months, respectively, which, together with student participation, made regular teacher-child ratios of 1:2, 1:3 and 1:4 for each of these age groups. There was a supporting staff for business affairs, diet kitchen, kitchen, maintenance and cleaning. A general custodian and handyman constructed or modified a number of pieces of equipment for the project. There was also a chauffeur who drove the bus for transporting the disadvantaged children from the inner city, accompanied by a rotating member of the research staff and a Mothercraft student.

The research staff, which varied in number from one to four full-time equivalents, consisted of three BA, MA or predoctoral level research assistants, one of whom was project supervisor each of the first two years. Year III was devoted to evaluation of the effects of program without further research on program development (due to funding reductions). One assistant was responsible for parent guidance, which terminated at the end of Year II except for whatever continuing work Mothercraft staff could maintain. Most research assistants worked on all types of project activities - program development, teaching methods (for focused learning projects and teacher training), planning, sampling, testing, student education, and data analysis - in addition to concentrating in one area of responsibility (e.g., parent guidance, project supervision, curriculum or selected specialized projects). Research staff also assisted frequently in infant caretaking. During the final period of Year III a major portion of the comprehensive analysis of data was carried out by Mila Ibe.

C. Overview of Programs (Infants, Students and Parents)[1]

The demonstration program was designed to study and influence the development of advantaged infants of working mothers and disadvantaged (lower working class, inner city, mainly welfare) infants in both group day care and at home in all major aspects of functioning, but especially their cognitive (including language), socioemotional and motor processes. The program, under continuous development and refinement by the OISE research staff and Mothercraft teaching staff for the first two years of the project, is contained in teaching guides and curricula designed and written by the principal investigator (Fowler, 1968 a & b, 1969) following a conceptual model on developmental learning (Fowler, 1965, 1967, 1970, 1971 a & b, in press). When complete the guides will serve as a comprehensive handbook on the care and education of infants and young children in group settings.

Integral to the total program was a one year program of theoretical and practical education for Mothercraft infant caretaker-teachers who, along with and under the guidance of the teaching and research staff, were the major caretakers and teachers of the babies.

There was also an extensive program of parent guidance carried out by a parent guidance worker trained in service and based on a written guide - Cognitive Orientations to Child Rearing (Fowler, 1968). Parent work was aimed at developing and emotionally supporting parents, keeping parents and teachers mutually informed, and relating and harmonizing the children's experience between the home and day care to insure optimal development of the infants.

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[1] In addition to the descriptions of each program in the three separate sections of this document, further description of all three programs, particularly the infant program, is contained in Appendix A.

IV. Study of Infant Development

A. Sampling and Measurement

1. Sample Selection

Socioeconomic characteristics of the families of the infants in day care and definitions of advantage-disadvantage are summarized in a separate section describing the parent aspects of the investigation. There were three sorts of infants studied in this investigation each of which may be defined as follows (upon whom additional details are presented in the results (see specifically Table 3 in Appendix A):

Basic Sample of Mothercraft Infants of Working Mothers (Advantaged Infants)

This, the main and largest group of infants studied, consists of children admitted to the Mothercraft day care center according to the policies set by Canadian Mothercraft Society. Criteria for admission were age (about 2 to 30 months), working mother status (with some priority to single parent families), order of application, and ability to meet the fee schedule and transport their infants.

Upon commencement of the demonstration program, Canadian Mothercraft Society kindly agreed to modify day care policies to give priority to young infants around six months or less as feasible according to age group vacancies, recruit infants likely to remain until graduation (30 months) - both of which were designed to maximize the period of development infants were studied and development influenced during their early years, to maintain a balanced ratio between sexes, and to exclude children with gross emotional or evident organic mental problems.

During Year I, the initial sample consisted of 18 children, 5 to 24 months old who were already enrolled at the time the program began. Nevertheless, there were only two children who were eliminated from the entire cumulative sample of advantaged children (but not the program), one failing to meet emotional criteria and the other for suspected organic deficits. In the course of the first year the day care operation was transferred to larger facilities where enrollment climbed gradually from around 20 to as many as 30 infants. The investigation was essentially a field study aimed at influencing and evaluating the development of an available, accumulating sample of infants in a particular day care center, defined by administrative policies, social need, and limited criteria of age, sex, length of participation, and "normal" range of functioning among more or less advantaged infants. There were no additional sampling procedures, random or otherwise, except for controls described below.

Home Reared Controls of Advantaged First Year Sample

During the fall testing of Year I, a set of infants from the metropolitan area of Toronto, entirely home reared (except for casual baby sitting), were selected and matched in pairs with the sample of children already in day care attendance according to the following criteria:

1. Difference in chronological age should not be greater than 2 months.
2. Sex.
3. Difference in scores on any Kohen-Raz subscale should not be greater than three months. Similar age placement criteria were applied to matching children on the total Bayley Mental Scale (from which the Kohen-Raz Subscales are derived) and the Bayley Motor Scale. Although

matching in most cases was reasonably accurate on the Kohen-Raz Subscales, the spread of items, especially, on the total scales was such that matching was at best approximate, as discussed in the section describing the Bayley Scales.

4. Difference in ratings on any of the three personal-cognitive scales should not be greater than one point regardless of direction (± 1.0).
5. No gross difference in socioemotional or physical health statuses.
6. Differences in educational level of either father or mother should not be greater than one year.

In addition to these formal criteria, gross mismatches between day care and home reared infants were avoided as far as possible on the number of siblings and parent occupational levels, chronological age and marital status (e.g., intact family).

Controls were obtained through two sources, hospital records and birth notices on microfilm in newspaper archives. In both cases limited random and stratified sampling procedures were followed because of restricted access to records filed chronologically and alphabetically. Except for the problem of shifting age placement mental and motor scores, formal criteria (and frequently the peripheral criteria) were met with few exceptions. Restriction of resources and demands for program development and evaluation of the enlarged number of children in day care precluded further control recruitment after Year I.

Inner City (Disadvantaged) Infants in Day Care.

A Cumulative total of 9 infants were enrolled in the day care program, beginning in the spring of Year I. The infants, whose families lived in traditional lower working class sections of the city, were located through the aid of church and community agencies and the community network once an initial point of entry had been gained. Criteria for selection were (1) six months or less in age; (2) absence of signs of gross emotional disturbance or organic mental deficit from any source; (3) family income at level of "needs" test, according to welfare regulations; (4) there should be little evidence of (a) reading material in the home, or (b) of social or cognitive stimulation; (5) English speaking families; and (6) children should perform below or not exceed average in their mental test scores. Only the latter criterion was not met (in 4 children, who scored above average, 110 to 126) because of the earlier lack of availability of deviation IQ test norms. Two additional children had been selected who were not able to attend. Locating matched pair home reared controls proved especially time consuming. Disadvantaged controls are not reported on because the day care matches for two of the three chosen (until control recruitment was abandoned for all children) dropped out prior to a second testing.

2. Description of Instruments

a. Measures of Cognitive (and Motor) Development

Bayley Scales of Mental and Motor Development (1969). The Bayley Mental and Motor Scales are the most commonly employed measures of infant functioning, nationally and internationally. They have recently undergone a comprehensive revision and standardization in the United States on a sample of about 1400 infants aged one to fifteen months (Bayley, 1965). Although the Bayley Scales have been used widely in several countries, for example, recently in Israel (Kohen-Raz, 1968), there are no norms presently available on Canadian populations. (There are no standardized instruments designed specifically to measure Canadian infant populations on cognitive and socioemotional development.) This necessitates comparison with U.S. norms as the closest parallel population group despite cultural differences. Median reliabilities are .90 for the Mental Scale and .89 for the Motor Scale (Bayley, 1965). The Bayley Scales are essentially empirically derived instruments attempting to measure general mental ability (IQ) and general gross motor ability over the entire range of sensory motor-based, cognitive processes (including language) for the infant period.

The final published form of the scales was not available until the second testing of the first year (Year I) of the investigation. Age placement (developmental point) scores, which was the only scoring system available for the fall testing of Year I (with a research kit generously supplied by the Psychological Corporation) on the initial Mothercraft day care sample and controls, were then subsequently converted into the deviation IQ scoring system of the published scales, namely the Mental Development Index and the

Psycho-Motor Development Index. There were a few position shifts in items from the research to the published form making only a slight difference in the final comparisons. The lack of a deviation IQ scoring base for the fall testing, however, is probably responsible for the statistical difference between the day care - home reared Bayley Mental Test means (MDI) in the first year samples. The scales were administered at planned intervals twice yearly, within 1 to 2 months of entry into the program to allow for adaptation, and at the point of departure from the program (Binet after age two years).

Kohen-Raz Subscales of Bayley Mental Scales (1967). These are five scales (and two branching scales) of infant mental development derived through scalogram analysis of the basic Bayley Mental Scale. The scales are termed (1) Eye-Hand, (2) Manipulation, (3) Object Relations, (4) Imitation and Comprehension, and (5) Vocalization-Social Contact-Active Vocabulary Scales. Scales 4 and 5 have branches at the upper end, which we have labeled, "Graphic Imitation" and "Personalized use of Language", following the analysis of Kohen-Raz (1967). These scales embrace 67 out of 163 items of the research version of the Bayley test. These subscales vary in the number of items in the age range covered - ruling out the use of Scales 2 and 3 because of their one year ceiling - but item reversals in Israel as against U.S. populations and non-scalable items were eliminated. Despite obvious reliability and cultural variation problems, problems of skill overlap between scales, some age placement problems (shifts associated with changes from the research to the published form of the total Bayley Mental Scale), and problems of distances between items sometimes as much as 4 1/2 months, the subscales were considered useful to give a more differentiated profile

of infant ability patterns. They also had the virtue of linkage to the only widely used, reliable instrument measuring infant mental development. Experimental and control subjects were matched as closely as possible in age placements scores (within + or - 3 months) on all of the five subscales, where age appropriate, as well as on overall Bayley Mental and Motor age placement scores.

Stanford-Binet Scale (Form LM) (Terman and Merrill, 1960). The Binet scale is historically perhaps the most widely used measure on intellectual development for children past infancy. It was selected as the only available standardized instrument in general use that covers the age period between 24 and 30 months. Although the Bayley Mental Scale extends to 30 months of age, because of the high score levels typical of our children ceiling effects beginning possibly as early as 20 months of age made replacement by the Binet at 24 months essential. In cases where the child was approaching 24 months during a testing period, testing would be delayed a few weeks until he attained the requisite floor age for the Binet.

Meeker Analysis of Binet by Structure of Intellect (1969). The Binet test has recently been analyzed according to dimensions of Guilford's theoretical framework on the structure of the intellect. Using this analytic scheme differential profiles of specific cognitive processes were mapped to determine whether the demonstration program produced cumulative effects in some abilities more than others, much as carried out for the babies at earlier ages with the Kohen-Raz Subscales of the Bayley. Like the Bayley analysis, however, categories are not equally represented at every age because the basic structure under which the Binet was devised is in terms

of age progression at the most generalized (g) level of intellectual functioning. The major categories of cognitive operations used in the Meeker scheme are cognition, memory, evaluation, convergent production and divergent production.

b. Measures of Socioemotional Functioning

The Bayley Infant Behavior Record (1969). This is an auxilliary instrument that accompanies and is administered on the same occasion as the Bayley Mental and Motor Scales. In our investigation it was also employed at Binet testings because of the assumed equivalence of the situation for the expression of behaviors assessed by the IBR. It is based on observations of the infant's patterns of functioning in the course of the testing experience. The measure consists of a set of thirty items upon which the tester rates each infant mainly on 9-point scales (with two 5- and two 2-point scales) including items under such general categories as social orientation, cooperativeness, fearfulness, tension, goal directedness and general emotional tone.

Schaefer Infant Behavior Inventory (Schaefer and Aaronson, 1967). The Schaefer Infant Behavior Inventory is an empirically constructed, non-standardized research instrument developed in conjunction with studies on urban disadvantaged children in the United States. It consists of a set of 23 scales of behavior each based on a cluster of 4 items ranging from high to low possession of the characteristic). The categories generally cover socioemotional processes (e.g., positive social response, contentment, belligerence) but include styles and motivations relative to cognitive activity (e.g., verbal expressiveness, inquisitiveness, concentration, etc.),

appropriate to a demonstration program of this kind. In this study it has been found convenient to group behaviors into two general categories, one positively valued (e.g., enthusiasm) and the other negatively valued (e.g., irritability).

While the scales have been designed principally for children more than 12 months old, the comprehensiveness, face validity and ease of administration of the inventory, together with the fact that a related instrument has recently been extended (with little modification) to younger infant age groups (Weikart, 1969) determined its selection for the present investigation. Moreover, it parallels (to some degree) related categories of an instrument for assessing maternal behaviors that was also employed in this study. The instrument became available for use in this study for the spring testing period of Year I. It was administered at scheduled twice yearly intervals to day care infants in the day care setting. Restrictions on resources and setting did not permit administration on home reared controls.

Personal-Cognitive Scales. This is a scale of three dimensions, autonomy, anxiety-tension level and problem-orientation to assess the behavioral styles of the infant in the mental testing situation, situations common for observations on both experimental and control subjects. The three dimensions are scaled along seven points with the center point assigned the maximum value (optimum adaptation) and the extremes in either direction assigned to represent the lowest (maladaptive) values. The optimal values for the three dimensions are interdependence, moderate tension and adaptive problem solving, respectively, and the 3 pairs of extremes are rigidly independent - totally dependent, apprehensive - placid, and perseverative -

distractable. This is a research instrument devised by the principal investigator and slightly revised by a member of the research staff, Mrs. Darla Grubman, for all assessments after Year I. Revision was limited to small changes in wording to sharpen item definitions. Like the mental and other tests a variety of testers administered the scales at different times making inter-rater reliabilities difficult to compute. The scales were designed to provide selective assessment of characteristics considered most germane to coping and cognitive development.

c. Selected Project Measures on Restricted Samples

There were a number of developmental research measures designed either for the purpose of answering specific questions about infant development or as program related measures for focused learning projects. All of these measures were administered to selected subsamples of infants attending the day care program; some were administered to additional control children (control children other than the first year sample of home reared controls) and some were published or research measures from other sources.

Cognitive Measures: Uzgiris-Hunt Scales of Sensory Motor Development (Uzgiris and Hunt, 1966). This is a preliminary research instrument of 6 scales of infant mental development derived from Piaget's theories and observations on cognitive development. The 6 scales are entitled - I. Visual Pursuit and Permanence of Objects; II. Development of Means for Achieving Desired Environmental Events; III. Development of Schemas in Relation to Objects; IV. Development of Causality; V. Construction of the Object in Space; and VI. Development of Imitation, (A. Vocal Imitation and B. Gestural Imitation). In general the scales attempt to measure developmental

sequences of infants in their understanding of object and spatial relations and the actions of their own sensory motor system in manipulating objects. There are no age bases for the scales other than their 24 month span, but they have been tested on a sample of 84 infants yielding item reliabilities generally from about .50 to 1.00. Scoring was in terms of the number of points accumulated in the series of steps for each of the 6 scales, assigning one point for each "step", similar to recommendations of the designers of the scale.

The points can only very crudely be considered as "scores", however, since there is no basis for determining equality of intervals. The sequential basis for any of these scales must also be considered very tentative and in need of more comprehensive empirical revision in the light of recent investigations which reports reversals and low scale reliability (Miller, Cohen and Hill, 1969). The scales were nevertheless chosen as a supplementary measure because the scales were almost the only instrument available approaching the measurement of mental processes in infants in terms of a combined logical-empirical approach to behavioral assessment in contrast to the traditional empirical derivation of most mental measures. The scales also yield a profile of abilities which may be compared with the other measures.

The scales were administered to two samples of available advantaged and disadvantaged infants, distributed over much of the range of the scales in two spring testings.

McCarthy Assessment of Language Development (1930). Although the McCarthy language measure dates back many years, it remains basically valid because it is not content bound, either in its administration or its

scoring system, and nothing so "natural" and complex for the measurement of language in infancy which may have been devised since could be located. It is a semi-structured method of assessing the language of children 18 months to 54 months in age. Using a set of picture books and toys in any order to stimulate language and minimizing the tester's conversation, the first 50 consecutive verbal responses of the child were tape recorded, regardless of the number of objects in the set needed to generate the requisite number of responses. McCarthy's scoring methods were followed without modification since (1) they provide almost the only norms of complex language analysis on infants and (2) the "naturalness" of the technique and her scoring provides a remarkably sophisticated picture of children's language structure despite its historical antedating of contemporary linguistic concepts. Scoring is based on a number of vocabulary indices, functional analysis, following early Piaget concepts of social and information categories (egocentric speech and socialized speech-adapted information, criticism, emotionally toned responses, etc.), and two methods of structural analysis of syntax according to complexity of sentence and percentages of parts of speech.

The measure was employed on an available sample of 25.5 months (mean) male, day care infants (including one advantaged boy not in the total day care sample) who had participated about a year or more in the program. Not enough girls were available for the age range at the time to include both sexes in the analysis. The aim was to furnish a more detailed profile of the language competence of the day care infants than single test scores yield.

Cognitive Style. An infant level measure of two closely interrelated cognitive styles (analysis and integration) was devised by the principal investigator in collaboration with members of the research staff following concepts developed in prior research (Fowler, 1971a, 1971b, in press). The measure was intended to assess infant competence in cognitive strategies for information processing believed advantageous to problem solving and creative activity; it is now being revised and extended (Fowler, 1970b).

Two arrays of trinkets and miniature objects were presented to each of 13, 16 to 30 month old Mothercraft day care infants (including 3 disadvantaged and one child not in the major advantaged sample) and their 11 controls from another day care center for working mothers (plus 2 children in another part-time, semi-specialized program) of socioeconomic status and educational level comparable to day care families at Mothercraft. The infants were matched by sex and age (±2 months except for one child 3 months older); no matches were available for two children. The arrays were offered individually for exploration and play with no instructions and minimal conversation, 3 minutes and 5 minutes for the 3 object and 5 object arrays in turn. Scoring was computed on the basis of the mean number of different objects and object features responded to (analytic) and the mean number of integrative responses (interrelating objects) of any kind observed. The latter were also weighted for complexity, ranging from contiguity (relating objects without regard to features), through structural (focusing on features or accidental functions) to functional (connecting objects purposively or abstractly).

Infant Adaptation Scales. This is a set of scales devised by the investigator in collaboration with Mr. James Sutherland, a member of the research staff, following procedures adapted from Ainsworth & Bell (1970) and

Rheingold and Eckerman (1970). The scale consists of three categories of dimensions for assessing an infant's adaptation to environments and people: (1) adaptation to an unfamiliar physical environment, (2) to an unfamiliar person, and (3) the quality of a child's attachment relations with a highly familiar adult. The scales were administered by an observer hidden behind a folding screen in a room of a building (neighboring church) totally unfamiliar (interior) to the infants and sparcely furnished except for a few attractive toys (Scale 1) or the presence of a stranger (Scale 2), who appeared after the child had gone through the familiarizing experience with the room. The child was brought to the strange room by one of several highly familiar Mothercraft teachers (day care group) or his mother (home reared controls) and rated on the first two scales on his readiness and emotional ease in separating from the supportive adult (1) to explore the unfamiliar room and play with the toys (Scale 1) and then (2) to respond to the overtures of a stranger who invites the child to listen to a story read from a picture book. The third measure consisted of 5 subscales (physical contact, verbal interaction, tension level, dependence-independence, and complexity-diversity) on which the child was rated in the same setting for the quality of his attachment relations with the familiar adult (teacher or mother). All of the scales are constructed with 5 points in which the center value (3) was defined as optimum adaptation.

Independent assessments on four children by two raters resulted in an inter-rater reliability of .90 (z transformation) between a second rater and the first who did all the ratings.

The scales were administered to a sample of 21 day care infants, embracing both advantaged and disadvantaged infants, and a set of 13 home reared controls (10 advantaged, 3 disadvantaged), matched in age (± 2 months, except for 1 control 2 1/2 months younger), sex, and advantage-disadvantage (parent education > or ≤ 10th grade level). The three disadvantaged infants were drawn from the same inner city areas as the day care disadvantaged sample. The scales were administered at two different periods with slight modification of procedures (time allowed for removal of warm clothing during early spring of second period) and the substitution of a different stranger - judged to be equally responsive to children. All controls were rated during the second period on their adaptation to the same stranger.

Focused Learning Project Measures. Several developmental learning project measures designed specifically for measuring children's progress in a variety of cognitive and language learning tasks were administered to day care samples of children participating in the respective projects. The curriculum programs and attendant learning materials (object concepts, language syntax, language concept learning apparatus, instrumental problem solving, and form board concept apparatus), which are in various stages of development, are described and some results reported in the results section of Appendix A.

B. Infant Care and Education

1. Developmental Objectives

The program of total day care attempted to establish an optimal psycho-social and physical environment of group care to facilitate infant development in all infants, regardless of developmental level and social background. The program made no distinction between advantaged-disadvantaged children as a group, but only according to individual need following general principles of child development and care as we formulated them. There was thus social class integration of children within each of three developmental age groups effected through individualizing relations, care and stimulation, even in small group (2 to 4 or more child) activities. The program was organized in terms of the following developmental areas and objectives.

a. Perceptual-Cognitive Processes

(1) To develop cognitive competence and complexity in perceptual-motor skills, language, problem solving, construction processes and knowledge of the environment.

(2) To develop curiosity, analytic-inquiry and creative-integrative orientations and styles toward and a sense of efficacy and enjoyment in exploration, play, problem solving, learning and achievement in activity and the world.

b. Socioemotional Relations

(1) To develop infants toward interdependent autonomy, cooperation, adaptiveness and complexity in their play and social activities with both peers and adults.

(2) To build feelings of self-worth, positive, warm and flexible orientations toward others (children and adults), and a sense of efficacy in coping in interpersonal relations.

c. Motor Development and Physical Health

(1) To develop strong and healthy physical systems of adaptation, including motor skills, general health and effective attitudes and behavioral patterns in eating, sleeping, physical activity (exercise), elimination (toileting) and related aspects of basic routines of physical development.

2. Organization of Day Care Program

The infant program was organized around three distinct forms of activity distributed throughout the day, each of which served to develop emotional, cognitive, social and physical functions in different ways. The three forms were (1) day care routines necessary for attending to basic needs of the infant (eating, sleeping, toileting, dressing, moving from place to place); (2) free play indoors and out in environments specially designed and equipped with age-appropriate, educational toys and materials; and (3) guided learning in interactive play, individually and in small groups of two or more children.

There were three basic developmental age caretaking groups, determined by characteristics of psychological and physical functioning predominant during each age period in relation to the personal attention and physical care required and thus teacher-child ratios desirable (Table 1 of Appendix A). The developmental spans and associated characteristics defined are, of course, gross approximations marked by overlap and variability among the categories, depending upon teaching methods, group composition, and the developmental experience, styles and learning problems of the child. For example, some children may walk earlier, talk later and/or remain long attached and heavily dependent upon a parent (or particular caretaker)

because of the type of relationship fostered and the lack of prior developmental opportunity for learning or social relations. Under our program conditions and caretaking ratios, however, these developmental patterns were more or less representative.

The organization of and transitions between age groups were generally flexible. Groups (especially the two toddler groups) were regularly mixed in caretaking routines and play, indoors and out, to extend the range of leader-follower modeling, relational and stimulation experiences. Transitions from group to group were gradual and variable according to each infant's needs, readiness for developmental progression and social adaptation to group characteristics and demands. Vacancies in older age groups, which created demands for developmental promotion, could often be accommodated by initially placing a child close to readiness for promotion in the older group for brief periods in selected activities.

Admission to day care was as often as feasible at 3 to 6 months of age, a period we found optimal to developmentally socialize infants in group day care. Health risks from multiple disease exposure appear greater for children under 3 or 4 months since physiological systems are often less stable; by 6 to 8 months children are beginning to respond in terms of stranger anxiety, a phenomenon apparently less prominent in children early exposed to multiple caretaking in day care. Adaptation to day care and developmental progression were generally much smoother and demands upon staff time were less trying for earlier admitted babies.

3. Methods

Methods of infant care and education employed have been developed in the framework of a conceptual orientation to infant and child development for which teaching guides have been developed as indicated earlier (Fowler,). The conceptual approach has been discussed at length in several papers (Fowler, 1965, in press (a) & (b)) as well as detailed in the teaching guides. In this approach development is conceptualized as a gradual emergence of affecto-cognitive-perceptual-motor rule systems through the cumulative effects of child-environmental interaction. Broadly speaking these systems of functioning involve several primary categories of cognitive rules to which affective and motivational components are integral. The latter take the form of affect-value hierarchies of varying organization and intensity determining the direction and persistence of effort. Among major cognitive rule systems are principles bearing on understanding the organization and processes of the physical and social world (how it works), rules for acting on or operating in the world (problem solving and construction). and rules for coding, communicating information, and acting symbolically about the world (language systems - verbal, mathematical, art). At the simplest, most direct level are perceptual-motor rule systems that often include elements of both language and problem-solving.

All of these rule systems evolve and are combined to function through processes of analysis and integration in the person who operates as a unified, though everchanging, problem solving, acting and creating system. Since development begins with infancy when perceptual-motor operations predominate, care and stimulation of the child center on the simplest concepts and

relations about the world in the sensory motor modes. Because of its vital role in organizing thought and because language, especially receptive language, begins during the first year, however, language should accompany most interactions with the baby but be anchored in sensory motor play.

Play is considered critical to the development of the young child, as Piaget (1951) observes and the nursery school movement stresses. Play generates experimentation and (creative) construction to extend, generalize, elaborate, test and consolidate mental processes developing through other experiences (stimulation), as well as providing stimulation of its own. Adequate feelings and motivations come about through the attitudes and style adults use in handling infants: (e.g., trust, warmth, gentleness, excitement, interactive collaboration, etc.). Emotionally sensitive attitudes are needed to develop curiosity, complex interests, self-generating styles of activity (autonomy) for problem solving and creativity, and cooperation in social relations.

In each of the three areas of activity, namely, physical caretaking, free play and guided play learning, techniques were developed based on these general principles of stimulating, relating and caring for the child. Physical care activities, such as changing diapers, were natural settings for repeated opportunity, not only to show affection, but to talk freely to the child in simple language (but not baby talk). The objects and actions he routinely encountered could thus be regularly labeled and described - above all his own body parts to build his self-knowledge, but also the table, diapers, bowel movement, pins, bottles and the actions of lying down, washing, and sitting up that of necessity were so often met in the situation. Drawing

attention in different ways to the many components of a situation, along with good attitudes, combined to make a more pleasant experience and lay some roots of language and cognitive learning in activities that otherwise are often frustrating and boring to the infant. An additional source of motivation and encouragement of autonomy for the babies came through enlisting their own efforts to perform any actions they could to carry out caretaker tasks. Having the infant hold a diaper, then give it to the caretaker, later voluntarily to lie down to be changed, and gradually, as he develops, demonstrating and aiding him to put his arm in a sleeve are a few of the graduated steps leading to the developmental learning of autonomy, cooperation and both cognitive and emotional mastery of the environment. Feeding, going down to sleep, dressing and moving from place to place were all treated with equivalent analysis and handling in our efforts to enrich the infants' developmental experiences.

The main objective in the free play sessions (indoors and out), which occupied much of every child's day, was to design opportunities for experimentation and creative play and for learning social concepts through coordinating play with other children in an environment richly furnished and arranged with "self-stimulating", developmentally sequenced materials. Vigorous physical development and development of both fine and gross perceptual-motor skills were equally important aims. Playrooms were divided and materials distributed in areas (partially defined by physical boundaries), among which children could move about in play with minimum conflict and distraction.

The role of the teacher in free play was subtle if effective - but critical. She had to facilitate traffic flow, mediate social conflict and

problem solving frustration, rotate materials (and children), and guide infants from time to time to stimulate flagging interest and/or foster development in children as and when needed. Without the continuing but unobtru guidance and the language and cognitive concepts of a competent teacher to draw on at critical junctures, concept experimentation is narrower and shallower, and the complexity of play and social interaction do not develop to as imaginative levels over the long run.

Guided learning sessions were interspersed throughout the day to give each child three or more 5 to 15 minute specialized learning activities per day according to interest and level of development. In several projects sequenced curriculum plans were implemented through dramatic play and sensory motor, problem solving and construction activities. There was a diversity of toys introduced as props to support play appropriate to modes characteristic of infant functioning as a method of arousing and sustaining interest and progression in learning. Verbal descriptions and explanations were integral to all instruction, but again channalized in the context of physically manipulating and demonstrating with materials, fitting the infant's need to grasp how language serves as a tool for coding information and coordinating ideas with action.

These sessions were typically carried out tutorially - that is, alone with a child or in small groups of 2 to 5 children, where the advantages of group identification could be combined with continual awareness of individual relations and programming.

Projects on learning information concepts (i.e., the names, characteristics, groupings, etc., of common objects), problem solving (e.g., learning to use objects as tools or learning to get around barriers) and language

syntax (e.g., how subjects and predicates can describe people performing actions) were experimented with in specialized research projects (See Results, Appendix A) that were intrinsic to the regular program. A variety of routine sessions setting up play and guidance with sensory motor toys (e.g., form boards, rings and pegs, puzzles) and teacher-initiated plans on information concepts, similarities and differences, spatial relations, object features and sensory qualities (texture, odors, etc.) were typical of other more or less regular offerings in the program. Much of the activity was organized in terms of analytic and synthesizing operations with part-whole relations, features and functions, relational concepts (between objects and objects and environments), and limited grouping activities. Among our primary objectives were to develop complex mental processes rooted in strong motivations, deep interest and a sense of efficacy and self-worth as a competent child, rather than simply to impart information - though this, too, was an important aim.

C. Results and Discussion

A major portion of the report on the findings and discussion on infant development are contained in Appendix A, which was prepared first to meet a publication deadline. Virtually all of the material on the total cumulative samples of advantaged (plus home reared controls on first year sample) and disadvantaged infants, embracing general mental and gross motor development (Bayley Mental and Motor Scales and Bayley-Binet Scale comparisons), some of the material on specific cognitive competencies (Kohen-Raz Subscales of the Bayley Mental Scale), and some of the material on socioemotional and motivational development (Schaefer and Aaronson Infant Behavior Inventory), is reported and evaluated there in considerable detail. There is in addition coverage of findings on component cognitive learning projects carried out in the course of the three year investigation.

The material to be reported and reviewed in the sections to follow will encompass all the remaining data on infant development, including both additional material on the total sample and findings on selected samples, a report on measures of student characteristics and development, and finally, findings on parent status and development and correlations between maternal characteristics and infant behavior in play and other situations in day care. The results on each of the measures on infant development not covered in Appendix A will be reported and discussed in turn, followed by two comprehensive sections covering the entire student and parent programs and findings, each of which will contain a final summary-discussion section. There will then be a comprehensive summary-discussion, in which all of the separate findings on different measures on infant development will be reviewed in coordinate

fashion in terms of cognitive, motivational and socioemotional development for advantaged and disadvantaged infants and according to sex differences of the advantaged infants. Findings which bear on the role of parent guidance and parent influences will be interrelated with those on infant development where relevant. The concluding section of the document will list a number of conclusions and recommendations that appear to arise from the study.

Meeker Analysis of Binet by Structure of Intellect

An analysis of the Binet records of all children in the investigation who were given the Binet revealed few consistent differences in profiles of cognitive abilities. On the profile chart of five cognitive operations, (cognition, memory, evaluation, convergent production and divergent production), all groups followed a comparatively flat curve with little variation in shape among the total advantaged day care group (N = 19), and the small home reared advantaged control group (N = 5) and disadvantaged group (N = 4). There was, however, a small peak in memory for the advantaged day care infants compared to relatively lower values on memory for the other two groups and on divergent production compared to a lower value for the disadvantaged group. Otherwise, the chief difference between score patterns was simply a generally higher level (in a similar profile) of the advantaged day care group compared to the other two groups.

In further analysis of the advantaged day care group by sex, general (IQ) ability level (110-130 versus $\geq$ 131), age of entry into program ($\bar{X}$ = 8 versus 15 months) and length of time in program ($\bar{X}$ = 10 versus 18 months), all groups again displayed similar profiles on the Meeker charts, with the possible exception of memory (but not divergent production). Infants staying

longer, higher final IQ children, and boys all appeared somewhat higher in memory; otherwise they were much the same in pattern but with differences between levels similar to those reported for general mental scores.

No profiles scores are plotted here because the charts are difficult to reproduce for the amount of data yielded and because the profiles are little more than estimates. The charts are intended for diagnostic analysis of individual children (while we have used group means), the various cognitive operations are unequally represented at different age levels on the Binet (posing large problems of unequal interval scales) and the small distance children of this age (2 to 2 1/2 years) have moved above the floor of the scale - even at their high ability levels - makes profile analysis uncertain.

Summary - Discussion. All three groups (advantaged and disadvantaged day care and home reared infants) showed comparatively flat curves in their profiles of Guilford's five cognitive operations (cognitive, memory, evaluation, convergent and divergent production) except for a somewhat higher level for advantaged day care infants in memory and in divergent thinking compared to disadvantaged but not home reared infants. Boys, higher IQ infants and infants longer in the program also displayed better memory functions than their respective opposites, but otherwise all groups were equal in level. Limitations of the Binet test, sampling and the method of analysis make these trends highly tentative.

No reason for expecting superior mnemonic processes in any of these groups - relative to their mean level in all cognitive functions, or to the patterns of the other groups - was evident. One basis might be the brighter abilities of advantaged boys and of the effects of the greater

program influence upon younger infants who moved to higher IQ levels - coupled with the strong language basis in the program as a mediator of memory. But girls tended to make the greatest general mental test gains and, if anything, to attain final levels at least as high as boys. In the Binet Scale, however, memory is not only heavily dependent on verbal instructions and descriptions but many of the memory test items test memory for language terms. Language and memory may have combined, therefore, to produce higher developments in memory for male, higher IQ infants attending over longer periods, possibly beyond those due to artifacts of the method of analysis.

The possibility that divergent thinking may be greater in the advantaged children (over disadvantaged children) may be jointly a function of their higher ability level and an artifact of the analytic method, in which divergent abilities cannot emerge until certain cognitive developmental levels are attained. There is the problem, on the other hand, that disadvantaged infants, although scoring higher on their final Binet than home reared advantaged infants ($\bar{X}$ = 125 to 110 for controls), were comparatively lower on divergent thinking than either of the other two groups. It is possible that both advantaged groups (in day care and/or in the home) encountered inquiry oriented processes that disadvantaged infants could not utilize as well in the program (despite the stress on flexible thinking) because of too heavy a stress on convergent thinking in their socialization at home.

Bayley Infant Behavior Record (IBR)

Comparison of Advantaged - Disadvantaged and Home Reared (Advantaged - First Year) Controls. A comparison of the mean initial, final and changes in ratings on the Infant Behavior Record for day care advantaged and disadvantaged infants and home reared infants is presented in Table 2. Considering first the general levels at which infants appeared to function, we can see that all three groups were rated at or above the center of the scale (5.00 for all except item 2, which is 3.00) for nearly all items at both initial and final ratings. Initially, only on goal directedness and manipulating (all 3 groups), and attention span (disadvantaged only - as expected), and cooperativeness and activity (home reared only, probably because of relative unfamiliarity with tester and situation) were there mean ratings somewhat below the center level of the scales. Only the home reared group had mean ratings (activity and manipulating) below the center level at final testing - again possibly partly a function of relative unfamiliarity with the tester.

If we compare the modes of day care and home reared infants with the age standardization modes cited in Bayley's tables (1969), it turns out that the advantaged group uniformly equaled or excelled the Bayley norms at all ages, with few exceptions. The controls, on the other hand, tended to rate more unevenly, with more items falling below the Bayley modes. It must be pointed out, however, that for day care infants this type of comparison is somewhat artificial in that to make the age comparisons, infants had to be distributed among the standardization age levels regardless of the point in the program at which the testing occurred. Nevertheless, this method does indicate an apparent general adequacy of the ratings of our day care infants

in comparison with the standardization sample. The few exceptions mentioned concern, especially, fearfulness, tension, and mouthing toys (not among the selected items because the behavior drops out in older infants), in which modes for day care infants tend to be higher (worse except that mouthing is also age-appropriate exploratory activity), and endurance (over the testing period) in which modes tend to be lower than modes for the standardization sample until older ages (12 months or more). Discrepancies were typically small (1 to 2 scale points on a nine point scale), however, means calculated for these items more nearly approximate Bayley values, and the movement toward not only (U.S.) normative, but above modal (optimal) values on these and other (e.g., cooperativeness, goal directedness and attention span) socioemotional and cognitively oriented behaviors with age suggests the positive influence of day care program effects.

The largest number of mean positive changes in ratings, which were substantial (near or greater than 10 per cent) and/or statistically significant is found in the advantaged group (Table 2), of which 7 were substantial and, of these, 6 were significant. Neither of the other two groups made any significant changes but the disadvantaged group made quite substantial improvements on 7 items (the controls on only one), limited statistically (in part) because of the small sample. As may be seen in Table 2, advantaged day care infants advanced significantly in one socioemotionally oriented item (general emotional tone) but mainly in several items concerning purposive cognitive activity, namely, goal directedness and several types of behavior (responsiveness to objects, reactivity, sights-looking, and manipulating) that appear to be concerned with curiosity-exploratory motivations. They

Table 2

Evaluation of Changes in Mean Ratings on Selected Items of the Bayley Infant Behavior Record between Initial and Final Mental Tests for Disadvantaged and Advantaged Day Care and Home Reared Infants

IBR Item		Day Care[a]								Home Reared[a]			
		Disadvantaged (N = 7)				Advantaged (N = 22)				(N = 16)			
No.	Description	Initial	Final	Change	t	Initial	Final	Change	t	Initial	Final	Change	t
1.	Responsiveness to persons	5.86	6.29	.43	.75	5.54	6.36	.82	1.98	5.44	5.19	-.25	-.72
2.	Responsiveness to examiner[b]	3.57	3.57	.00	.00	3.59	4.00	.41	1.62	3.12	3.19	.06	.25
4.	Cooperativeness	5.29	5.43	.14	.17	5.32	5.00	-.32	-.60	4.44	5.19	.75	1.20
5.	Fearfulness	3.14	2.43	-.71	-1.70	3.18	2.59	-.59	-1.44	3.19	3.56	.37	.72
6.	Tension	4.29	4.57	.28	.42	4.23	4.59	.36	1.25	3.94	4.12	.18	.57
7.	General Emotional tone	6.00	5.86	-.14	-.24	5.36	6.27	.91	2.11*	5.69	6.00	.31	.64
8.	Responsiveness to objects	6.00	6.00	.00	.00	5.86	6.54	.68	2.24*	6.25	6.44	.19	.61
11.	Goal Directedness	4.43	5.29	.86	1.55	4.32	5.55	1.23	3.90***	4.75	5.19	.44	1.16
12.	Attention Span	4.57	5.43	.86	.87	5.14	5.64	.50	1.42	5.38	5.81	.43	1.33
13.	Endurance	5.71	5.14	-.57	-.73	5.64	5.45	-.19	.47	6.19	6.38	.19	.40
14.	Activity (gross body)	5.29	6.29	1.00	1.73	4.91	5.23	.32	.85	4.56	4.81	.25	.55
15.	Reactivity (to stimulation)	5.57	6.57	1.00	1.87	5.00	6.32	1.32	3.52**	5.56	5.75	.19	.45
16.	Sights-looking	5.43	6.29	.86	1.87	4.86	5.91	1.05	3.35**	4.94	5.00	.37	.11
20.	Manipulating (exploring)	4.57	6.14	1.57	1.47	4.32	6.05	1.73	5.23***	3.94	4.38	.44	.88

* $p<.05$ ** $p<.01$ *** $p<.001$

[a] Mean Ages (Months) and Ranges at Initial and Final Testings:

		Disadvantaged	Advantaged	Home Reared
Initial	$\bar{X}$	9	9	16
	Range	5 to 13	2 to 18	7 to 24
Final	$\bar{X}$	18	22	23
	Range	11 to 21	13 to 30	15 to 29

[b] Five point scale; all others are nine point scales.

also became more responsive to persons, but not significantly. Disadvantaged children showed large gains in a number of the same items, plus lengthened attention span and decreased fearfulness. Their failure to gain in emotional tone, their rise in (gross body movement) activity (already above the advantaged) and tendency to decline or remain stable on 1-2 items (e.g., endurance), plus a generally slightly lower final level on such items as responsiveness to objects, goal directedness, attention span and endurance, indicate something of the nature of the continuing motivational difficulties of (some of) the disadvantaged compared to the advantaged children. On the other hand, most of their mean final ratings compare favorably with Bayley modes for the age level (18 months) and, as we have already indicated, made as many substantial (though not significant) improvements as the advantaged day care group.

Comparisons of mean changes in ratings between groups are more meaningful than between final ratings because of some variation between the groups initially. There was, nevertheless, only one noteworthy difference between the groups - controls were lower on cooperativeness (for reasons discussed above), but were slightly higher on three cognitive activities (responsiveness to objects, endurance and reactivity to stimulation. It would thus appear that the lack of changes in controls may have some validity as a basis for evaluating day care treatment effects - assuming (as for mental test comparisons) that enhanced familiarity with the test situation in subsequent testings was likely to improve socioemotional and motivational responsiveness relative to initial reactions, at least as much as for the already familiarized (adapted through the day care situation) day care infants. Any differences in the

amount of change favoring day care children should therefore be at least partly attributable to the effects of the demonstration program. (There were, however, other uncontrollable factors such as testers' knowledge of day care - home reared infants' identity.)

Table 3 shows the initial, final and changes in mean IBR ratings of advantaged boys and girls. It will be seen that both sexes advanced significantly on the same set of cognitively oriented behaviors as much as the total sample (Table 2) but girls more consistently (goal directedness, reactivity to stimulation, sights-looking, and manipulating objects) than boys (goal directedness and manipulating), although boys also made important non-significant gains in reactivity to stimulation and sights-looking and, in addition, on attention span (on which girls did not change). Girls, however, also changed more on certain socioemotional characteristics; they gained significantly in their responsiveness to persons and in their general emotional tone (in which boys gained comparatively little), but declined moderately though not significantly in cooperativeness (in which boys did not change), indicating, perhaps increased self-expressiveness or assertiveness (note that gross body activity, a boy type behavior, also tends to rise) of the kind observed on other measures (e.g., personal-cognitive scales).

For the most part, there is a remarkable consistency between boys and girls in mean rating levels, both on initial and final testings, as well as in the pattern of changes (with the few differences we have noted). There was a small tendency, however, for girls to score lower than boys at the first testing both on socioemotional traits (except cooperativeness and fearfulness) and cognitive behaviors (except responsiveness to objects and attention span). Mean gains and losses were not markedly different on any

Table 3

Evaluation of Mean Changes in Ratings of Boys and Girls on Selected Items of the Infant Behavior Record (Advantaged Infants - Cumulative Samples)

IBR Item	Boys (N = 12)[a]				Girls (N = 10)[a]			
No. Description	Initial	Final	Change	t	Initial	Final	Change	t
1. Responsiveness to persons	5.75	6.25	.50	.75	5.30	6.50	1.20	2.71*
2. Responsiveness to examiner	3.75	4.08	.33	.84	3.40	3.90	.50	1.63
4. Cooperativeness	5.25	5.25	.00	.00	5.40	4.70	-.70	-.94
5. Fearfulness	3.42	2.67	-.75	-1.19	2.90	2.50	-.40	-.77
6. Tension	4.17	4.50	.33	.80	4.30	4.70	.40	.94
7. General Emotional tone	5.50	6.08	.58	.86	5.20	6.50	1.30	2.62*
8. Responsiveness to objects	5.58	6.58	1.00	2.10	6.20	6.50	.30	.90
11. Goal directedness	4.42	5.58	1.17	3.39**	4.20	5.50	1.30	2.25*
12. Attention span	4.92	5.83	.92	1.96	5.40	5.40	.00	.00
13. Endurance	6.00	5.50	-.50	-.79	5.20	5.40	.20	.51
14. Activity (gross body)	4.83	4.92	.08	.16	5.00	5.60	.60	1.07
15. Reactivity(to stimulation)	5.33	6.25	.91	1.73	4.60	6.40	1.80	3.52**
16. Sights-looking	5.17	6.00	.83	2.16	4.50	5.80	1.30	2.51*
20. Manipulating (exploring)	4.50	6.08	1.58	4.71***	4.10	6.00	1.90	3.05*

* $p < .05$ ** $p < .01$ *** $p < .001$

[a] Mean Ages and Ranges of Boys and Girls at Initial and Final Testing:

	Boys		Girls	
	Initial	Final	Initial	Final
Mean	10	23	9	20
Range	2 to 18	13 to 30	3 to 14	13 to 30

items and often occurred partly as compensatory changes up or down to converge with the level of the opposite sex (e.g., girls were originally above boys in attention span and cooperativeness and below boys in general emotional tone, reactivity, sights-looking and manipulating, in all of which they made greater changes than boys).

Correlations between IBR Ratings and Mental Test Scores. There were few significant and not a large number of important correlations between the same selected set of IBR items analyzed above and any of the sets of mental test scores (Table 4). At initial testing, IBR items which did correlate significantly with mental scores concerned motivations for cognitive activity (goal directedness, sights-looking and manipulating), but also responsiveness to examiner, suggesting the importance of examiner rapport for the infants' intellectual performance. The fact that responsiveness to examiner apparently plays no further role in subsequent testings (nothing approaching significant correlations), together with the uniform absence of anything except very modest correlations with any other socioemotional factors ($r = -.28$ between tension and mental gain scores is the highest), probably reflects a general adaptiveness of most of our babies to testing from the extensive experience encountered.

The two significant correlations (goal directedness and sights-looking) between final behavioral ratings and final mental test scores again centered on orientation to cognitive activity (as a criterion for effective mental performance), except that sights-looking and manipulating (very close to significant) were negatively correlated! Because (body) activity and stimulation reactivity were also substantially correlated negatively, is there a suggestion that curiosity, exploration and activity can be engaged in to a point of interfering with the task at hand?

Table 4

Correlations between Initial, Final and Changes in Ratings on Selected Items of the Bayley Infant Behavior Record and Initial, Final and Change Mental Test[a] Scores (Advantaged Infants - Cumulative Samples)

IBR Item		Variables Correlated[b]			
No.	Description	Initial IBR vs. Initial Mental (N = 30)[c]	Final IBR vs. Final Mental (N = 22)[d]	IBR Changes vs. Mental Changes (N = 22)[d]	IBR Final vs. Mental Changes (N = 22)[d]
1.	Responsiveness to persons	09	-03	-03	10
2.	Responsiveness to examiner	38*	-11	-07	-23
4.	Cooperativeness	05	07	19	16
5.	Fearfulness	-00	14	-14	05
6.	Tension	-09	-20	-28	-20
7.	General emotional tone	26	-06	18	16
8.	Responsiveness to objects	05	13	22	08
11.	Goal Directedness	47**	48*	49*	20
12.	Attention Span	30	09	53**	27
13.	Endurance	23	31	33	23
14.	Activity (gross body)	-16	-35	-28	-27
15.	Reactivity (to stimulation)	24	-36	01	-25
16.	Sights-looking	45**	-40*	27	-21
20.	Manipulating (exploring)	45**	-39	33	-16

[a] Bayley Mental Scales for initial testing and Bayley or Binet for final testing, depending on age.
[b] Decimal points omitted.
[c] For N = 30: * $r \geq .36$, $p < .05$; ** $r \geq .45$, $p < .01$.
[d] For N = 22: * $r \geq .41$, $p < .05$; ** $r \geq .52$, $p < .01$.

A plausible, partial explanation for this shift may be sought in the different behaviors that define cognitive effectiveness at different ages. In younger and/or less advanced infants a great deal of simple perceptual-motor exploration and manipulating (following, playing with hands, inspecting, orienting to sound, visual patterns, etc.) is integral to the Bayley Mental Scale tasks. In older and/or very bright infants (a number of which were tested on the Binet for their final test), however, tasks on both the Bayley and Binet become more defined in terms of specific verbal and complex means-end performances (form boards, language, building towers, etc.) that demand more sustained, focused behavior. In correlating final ratings with final mental scores, we were dealing with older infants whose mental test performances tended to exceed $130_{\Lambda}^{IQ.}$ In relating changes in IBR ratings and changes in mental test scores, on the other hand, we are concerned with cognitive advancement, in which the larger gains were made by the initially younger infants and low scorers (girls) (Tables 9 to 11, Appendix A).

Reinforcing these differences is the greater magnitude of gains of girls in these particular IBR items relative to boys. Thus boys were initially higher in exploratory behavior (e.g., reactivity to stimulation, sights-looking and manipulating) at the younger ages when they were also higher scorers in the type of cognitive (mental test) performance that demands more explor-atory activity. Since it is girls who gained most (and significantly) in both mental test scores and exploratory behaviors, we still find a positive relationship between changes in exploratory behaviors and changes in mental scores, but a reverse relationship between the two at final testing. In the latter situation girls and boys (as groups) both score cognitively at

about the same high level, but within both groups excessive exploratory behavior does not pay off at the higher cognitive levels and older ages. (In this context, it is interesting to observe the high - perhaps excessive - gains of the disadvantaged in exploratory and movement activity, attaining levels higher than the advantaged that were also coupled with a final mean mental score level fluctuating around 10 points lower than the advantaged group - Tables 3 and 4, Appendix A.)

In sum, increases in goal directedness and attention span were correlated with gains in mental test scores, indicating the importance of purposive cognitive orientation. But that sights-looking and manipulating were also positively correlated (though not significantly) with mental test gains was perhaps more related to the originally lower development levels of the infants involved, since the latter correlations became negative at the final testings with the advanced developmental levels involved. On the other hand, activity (gross body) correlated negatively and endurance correlated positively (but neither significantly) quite appropriately throughout all of the comparisons.

As may be observed in Table 4 there were no significant correlations between final IBR ratings and mental gain scores. The pattern of correlations, however, is more similar to the comparison between final ratings and final test scores than between changes in ratings and changes in mental scores. Those who gained the most in mental test scores - again girls, particularly, and younger infants are those whose final IBR tended to be high in goal directedness, attention span and endurance (purposive cognitive activity) but low in exploratory cognitive activity. Thus high gainers moved toward more organized cognitive orientations appropriate to the higher level demands of the more advanced cognitive developmental status - although trends are small as correlations were generally low.

Summary - Discussion. Putting the pattern together, we may say that boys and girls of the advantaged group generally functioned socioemotionally and motivationally in mental testing situations at least as well or better than the norms of the Bayley IBR standardization sample at all ages, but better at older ages and at the end of their participation program than at the beginning. Initially, advantaged day care infants were slightly below norms on certain emotionally laden items like fearfulness, tension and mouthing of toys (although the latter may also have reflected greater exploratory activity appropriate to the younger ages), and two aspects of cognitive activity (attention span and endurance). Initially, there were few important differences favoring advantaged over disadvantaged infants, with the exception of longer attention span, and if anything the disadvantaged were rated slightly higher in certain, age appropriate exploratory behaviors (i.e., reactivity to stimulation and sights-looking) and gross body activity. Similarly, home reared advantaged controls differed very little, except for being lower in cooperativeness, perhaps as a function of less familiarity to testers and testing than the already adapted day care infants.

Both advantaged and disadvantaged day care infants each made large gains on 7 IBR behaviors, mostly on the same items, but only the gains of the advantaged infants (6 gains) were significant, which in turn were apparently attributable to the fact that advantaged girls gained significantly on more items (5) than advantaged boys (2). Home reared infants made very little change on any behavior except some increased (but non-significant) cooperativeness, presumably indicating adaptiveness to testing. All day care groups made important gains in certain cognitive orientations to activity (goal

directedness, manipulating, reactivity to stimulation and sights-looking), but girls and disadvantaged infants both tended to increase more than advantaged boys on curiosity-exploratory oriented behaviors (reactivity to stimulation, sights-looking and manipulating). In disadvantaged children these increases were accompanied by a decline in endurance and an increase in activity (gross body movement) that in final testing may have reflected slightly excessive amounts of unrelated cognitive and other activity that could interfere with the kind of organized cognitive activity demanded in tests at more advanced developmental levels. These negative considerations were tempered, however, by the increases in purposive cognitive activity (increased goal directedness, and attention span) and enhanced socioemotional behaviors (increased responsiveness to persons and decreased fearfulness).

In advantaged girls, increases in exploratory and activity behaviors, and relatively larger gains of advantaged boys in attention span and responsiveness to objects essentially brought about a convergence of advantaged boys and girls to the same level, since girls had originally (apparently) been insufficiently active and exploratory cognitively (despite longer attention span and greater responsiveness to objects). Similarly, socioemotional improvements in the two sexes (general emotional tone and responsiveness to persons for girls and decreased fearfulness for boys) largely brought them closer together at about the same high final levels. Program participation may have operated directly to benefit socioemotional functioning through the personalized care emphasized or indirectly through cognitive stimulation improving abilities that in turn raised emotional levels by enhancing coping skills. The advancement of girls, especially, and boys to converge at the

same relatively high levels in both cognitive and socioemotional functioning is particularly noticeable.

Correlations between IBR items and mental test scores for advantaged children indicated a consistent pattern of (some significant) correlations between cognitively oriented activity and mental test performance, but on only one aspect of socioemotional behavior (responsiveness to examiner), and this at initial testing, probably indicating the importance of examiner rapport. The absence of significant (or even non-significant moderate) correlations between mental test performance and measures of socioemotional functioning in the testing situation for change scores, but especially for final testing, suggests that after initial testing the general adaptation of most infants diluted the role (or at least the measurement) of socioemotional factors in cognitive competence. It must be stressed that these ratings on socioemotional and cognitive orientations are restricted to behaviors in mental test situations where demands on focused cognitive competence in well-defined verbal and perceptual-motor tasks is primary.

Purposive cognitive activity (goal directedness, endurance, and attention span - except at final testing) tended to correlate positively and consistently with mental test scores and gross body activity negatively, but exploratory behaviors (reactivity to stimulation, sights-looking and manipulating) correlated positively at initial testing and for gain scores, but negatively at final testing. This reversal seems to relate to the greater gains that initially lower level girls (versus boys) made on both mental test scores and exploratory behaviors, indicating a change in the role of exploratory activity at more advanced developmental levels when the sexes

end up performing at the same high cognitive level of activity. Exploratory manipulation is integral and includes much of the range of cognitive performances of younger infants but may diffuse performance if carried to excess in the more complex and organized cognitive operations demanded in later stages of infancy and beyond.

Personal-Cognitive Scales

A comparison of the initial, final and changes in mean rating scores on the three dimensions of the Personal-Cognitive Scales for the cumulative samples of advantaged and disadvantaged day care infants shows essentially good and fairly stable mean levels of functioning and little change under all conditions (Table 5). There were no large nor significant differences between groups or in any of the mean change scores and all ratings were located well within the center area of the scales (±.50) and changed no more than a small amount

Table 5

Stability and Changes in Mean Rating Scores[a] on Personal-Cognitive Scales for Total Cumulative Samples of Advantaged and Disadvantaged Day Care Infants over Total Time in Program[b]

Scales	Rating Period	Advantaged N = 30 CA = 12.2[c]	Disadvantaged N = 9 CA = 5.3[c]	Difference	t (df = 37)
Autonomy (Interdependence)	Initial	-0.22	0.17	0.39	1.36
	Final	-0.32	0.06	-0.37	-1.39
	Change	-0.10	-0.11	-0.01	0.03
	t	0.49	0.37		
Anxiety - Tension Level	Initial	-0.17	0.33	-0.50	-1.96
	Final	-0.20	-0.05	-0.15	-0.54
	Change	-0.03	0.38	0.35	1.02
	t	0.19	1.58		
Problem Orientation (Adaptive Problem Solving)	Initial	0.43	0.11	0.32	1.37
	Final	0.31	0.44	-0.13	-0.44
	Change	-0.12	0.33	0.45	1.42
	t	-0.85	0.92		

* $p < .05$

[a] Negative values represent distance (up to 3) from ideal center (zero) toward independence, apprehensiveness and rigidity, respectively; positive values represent distances in opposite direction from center toward dependence, placidity and distractability, respectively.

[b] Means of 12.6 and 13.7 months between testing for respective advantaged and disadvantaged groups.

[c] Mean chronological ages (months) at time of initial mental testing (when ratings made); initial tests generally given within 1 to 2 months after entry to allow for adaptation.

the first year advantaged day care sample, gained non-significantly around 5 IQ points on the total sample (N = 18) and on nearly all samples analyzed according to age of entry and time paralleling day care group's participation in program. Small samples of home reared girls (N = 7) and/or children measured after 18 months (N = 4), however, both gained about 20 points (samples overlap) compared to about 20 and 36 points for the da, care samples, respectively.[8] Mean mental score levels for advantaged day care infants (compared to U.S. norms) changed generally from high average (110 IQ) to superior levels (130 IQ). Mean gains were generally consistent and very sizeable in nearly half the children (45% $\geq$ 20 points).

There were clear indications that parent guidance in maternal care and cognitive stimulation played a major role in these cognitive developmental gains. There were significant correlations of .60 to .80 between final ratings on 4 of 7 maternal characteristics (verbal expressiveness with child, positive attitude to child, interest in child's education, positively, and hostile detachment from child, negatively) with mental test gain scores. There were few correlations between any maternal ratings and initial mental test scores and mental change scores also correlated less with maternal ratings made earlier in the program.

The greater gains associated with earliness of entry and length of time in program raise the possibility that children regularly exposed to high quality interpersonal care and developmentally sequenced cognitive stimulation from the earliest months (< 6 months) over a period of years might more often develop to cognitive levels equivalent to those of our highest level infants (140 to 160 points).

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[8] See the later discussion on Cognitive Development and Motivations under Sex Differences (Pp. 140-141) and in Appendix A for an account of possible methodological and other factors influencing these partial exceptions to the main findings on mental development.

Cognitive Development: Specific Competencies. The pattern of gains of advantaged day care infants in specific competencies showed generally consistent gains in all areas assessed, but frequently of uncertain magnitude because measures had no standardized baselines or were based on selected (available) day care subsamples.

1. Motor Development. Mean changes in gross motor processes (Bayley Motor Scales) generally averaged less than 5 standardized point, non-significant gains (from average levels of 100), compared to mean home reared (first year sample) non-significant gains of 8 points. Day care infants enrolling earlier ($\bar{X}$ = 12 versus 18 months), however, gained non-significantly about 8 points (compared to significant, mean control gains of 13 points); those staying longer ($\bar{X} \geq 12$ months) gained significantly about 8 points (there were no motor measures on controls over longer periods).

On fine perceptual-motor, instrumental processes (Kohen-Raz Eye-Hand Scale), first year day care samples gained significantly (as expected developmentally) along with but no more than home reared controls. But on another measure of fine perceptual-motor based processes (graphic imitation, Kohen-Raz Branching Scale 4B) gains were significant and slightly, though not significantly greater than control group gains. Mean changes (for selected day care samples) on another set of scales of perceptual-motor development (Uzgiris-Hunt Scales) closely paralleled the magnitude of general cognitive (mental test score) gains. Mean gains were highly consistent on all scales (instrumental concepts, object concepts-schemas, causality, spatial concepts, and both vocal and gestural imitation) - except object permanence, which

was more advanced, by the time infants had attained a mean of 16 months of age. (The pattern for younger, 9 months old infants, in attendance for a somewhat shorter period was slightly more irregular.) The fact that these superior performances of older infants included the Uzgiris-Hunt instrumental scale lends support to the existence of ceiling effects that were suspected on the Kohen-Raz instrumental (Eye-Hand) scale, which may have slightly masked the actual gains of day care infants. The high performance level on the Uzgiris-Hunt object permanence scale (relative to the other scales), on the other hand, may have been because this scale was apparently least subject to ceiling effects.

Overall, there is little evidence to show that all concepts and skills in fine perceptual-motor processes did not improve consistently and to about the same high degree as general cognitive process did. In gross motor development, on the other hand, mean gains were evidently moderate (<10 points) at best and may in some samples have been slightly surpassed by gains of home reared infants, in keeping with less program effectiveness in this sphere. (See Appendix A, P. 52)

2. Language Development. If there was any ability that may have advanced further than others, it was competence in language. On every measure on all samples, language was consistently the area to show important gains that reflected a rich pattern of language development. The language competence of day care infants was shown by their large gains on two Kohen-Raz Scales that involve language, in both of which they significantly exceeded the gains of home reared controls. One of these was receptive language (Scale 4A, Imitation and Comprehension), which parallels a high (possibly above the mean) performance of older infants on the vocal imitation scale of

the Uzgiris-Hunt Scales. (The lower performance of 9 months old infants on vocal imitation may be age appropriate or due to shortness of participation in the program at that age.) The other was a vocabulary, language production scale (Scale 5A) and there was still another (Scale 5B, a branch of 5A) involving personalized use of language, in which advances of the day care group substantially (but not significantly exceeded control gains. Language (verbal expressiveness) was the single scale on the Schaefer and Aaronson Behavior Inventory to indicate significant gains over both short (4-6 months and long (10-11 months) intervals and for both sexes, (although part of these gains may be attributable to failure to judge relative to expected normative developmental advances).

The most comprehensive evaluation of the complexity and cognitive involvement of the language development of advantaged infants is unfortunately restricted to a sample 25.5 months old boys assessed on the McCarthy measures. On a variety of quantitative indices (vocabulary and sentence length) and in complexity of parts of speech (e.g., proportionally more verbs, adjectives, conjunctions and adverbs than nouns), sentence structure (proportionally more structurally complete sentences), and in cognitive complexity of information transmitted, day care boys were generally more advanced in mean levels than interpolated norms for 25.5 months McCarthy boys. There was no reason to believe from qualitative observations that girls were any less advanced in language complexity than boys, as the Schaefer Inventory also indicated. There is the fact however that memory processes, which appear strongly linked to language development (as assessed by the Meeker analysis of the Binet), were slightly more developed in boys than girls. But memory was also generally more advanced in the high IQ and longer enrolled infants and in the advantaged infants as a group compared to controls and disadvantaged infants.

The generally advanced status of language development of advantaged day care infants by the time they reached 18 to 20 months of age can be in part attributed to the regular infusion of language stimulation throughout every child's day in daily caretaking, in supervision of free play and in guided concept learning activities. Language was assigned a priority in student guidance that seemed to show up more and more in the infants' play and social relations as they developed, resulting in a richness and frequency of spontaneous speech, the use of proper names and verbal modes of communication and questioning that seemed to surprise visitors. But a large portion of the language development must also be assigned to the influence of language stimulation from parents, presumably at least in part a consequence of parent guidance. Lack of maternal verbal expressiveness correlated significantly, negatively (-.45) initially (at midprogram), and verbal expressiveness with infant correlated positively with the infants' verbal expressiveness (.36 and .48, both on the edge of significance for the respective sample sizes) for midprogram and final maternal-infant ratings, respectively. Interest in child's education and extensive involvement with child correlated significantly with infant verbal expressiveness for midprogram but not final comparisons (both $\geq$ .40). Moreover, mean mental test gain and final scores of the infants (which have a strong verbal component) correlated significantly with maternal verbal expressiveness with child on both the initial (.55 and .36 for mental gain and final scores) and final (.77 and .51 for gain and final scores) maternal ratings. Initial (midprogram) and final maternal ratings were made a mean of 7 or 8 and 10.5 months, respectively, (on different but overlapping samples) after infants entered the program.

The significantly higher value of home reared over day care infants on one language rating was thought to be due to the socioemotional versus cognitive character of the adaptation situation interacting with sex differences and the fact that home reared were interacting with mother while day care infants were interacting with a teacher.

There were additional indices of language development, both pointing to the possibility of influencing the development of language (and cognition) in specific ways, apart from the effectiveness of a generalized and pervasive developmental program of language and cognitive stimulation as used in our general program. There was evidence on small, selected samples of infants that language syntax (subject-predicate constructions) and language discrimination labeling could be developed in infants in terms of specific planned forms through, respectively, a sequential stimulation program on language syntax, coordinated with corresponding physical activity in play, and the operation of a language-mediated discrimination learning apparatus.

3. Information Processing (Cognitive Styles and Concepts). There were a number of definite indications that modes of cognitive functioning, theoretically related to levels of cognitive competence, were affected positively by the program, some general and some specific to particular, planned forms of stimulation. There was first the fairly consistently high performances on the Uzgiris-Hunt Scales, which although labeled fine perceptual-motor scales of development, properly speaking constitute information processing activities (e.g., object permanence, causality, spatial relations, etc.). There was second the fact that Meeker profiles on the Binet yielded quite flat profiles of the 5 operations (cognition, memory, evaluation and convergent and divergent production) in Guilford's structure of the intellect. Yet there were some differences, for example, the relatively higher gains in memory processes possibly made by infants who were brighter, male, and/or were enrolled longer in the program as already indicated. No specific program sources for this higher relative gain have been identified other than our

emphasis on language stimulation and the integral nature of memory to language on the Binet.

A second process in which advantaged day care infants appeared to gain relative to their own mean and to disadvantaged Ss, but not to advantaged home reared infants (Ns of the latter two groups were small), was on divergent (creative) forms of problem solving. It is encouraging that the kind of intensive cognitive stimulation of which much of the demonstration program was constructed, did not result in a narrow sort of stereotyped form of thinking. (The relatively lower level of disadvantaged infants in this area will be discussed separately.) That the program may have contributed to the development of curiosity motivations and creative orientations is indicated by several measures. In observations of spontaneous language production on the McCarthy, infants displayed persistent curiosity about things and an interest in a broad diversity of information. Inquisitiveness during play (Schaefer Inventory) was correspondingly above average (and monotonous behavior very low) on all ratings for advantaged infants (both boys and girls), reaching almost the highest levels of any ratings in the final assessments. Moreover, infants tended to gain in inquisitiveness over the course of the program (significantly in one comparison), and decline in monotonous behavior, despite positive high ratings made in the first rating period a mean of 6 months after entry into the program.

The somewhat lower mean ratings day care infants were given compared to home reared controls in exploring toys in an unfamiliar room is balanced by their higher mean ratings in adapting to a stranger, but apparently also by the fact of sex differences. Day care girls (including others for whom there were no control matches) scored substantially higher than both day

care boys and the home reared sample (which was overbalanced in boys) on room exploration and complexity-diversity of their interactions with caretaker (day care - home reared infants were equal on this value). (The problem of boys will be discussed under sex differences.) This was in spite of the fact that day care girls (like boys) were also interacting to one of many caretaker students rather than the mother (as for home reared) for whom a greater variety and complexity of interactions might well be expected. More important is the fact that this was a highly specialized situation centering on emotional adaptation to a social situation more than on cognitive motivation and performance, and that all advantaged day care infant mean ratings were uniformly not far from the optimal center area of adaptation.

Advantaged children also showed large and mostly significant gains in several exploratory-curiosity related types of cognitive activity (responsiveness to objects, reactivity to stimulation, sights-looking and manipulating) on the Bayley Infant Behavior Record, compared to little or no gains by home reared controls. It is estimated that the positive correlations (some significant) with initial and gain scores on mental tests, but negative correlations with final test scores, reflects the changing appropriateness of these behaviors to more complex cognitive demands at older age levels (after one year). The large gains in cognitive open-endedness (particularly girls) appeared to have raised advantaged infants to a high but not excessive (as for the disadvantaged) level of divergent functioning.

A sample (N = 13) of mainly advantaged (including three disadvantaged) day care infants (mean age = 23 months) were matched in age, sex and socio-economic background with control infants from two other day care centers, which offered very adequate care but much less specialized cognitive stimulation.

The mean scores for day care infants were much greater on four measures of two cognitive styles (significantly greater on three measures) than their controls. Tentatively, this finding is interpreted as support for the function of these styles in mediating complex cognitive processes, given the high mental test level ($\bar{X}$ = 128) of the day care infants (after many months, $\bar{X}$ = 14.5) in the program compared with the assumed lower ability level of controls. One style, an analytic style, is considered to serve cognitive processing through its role in providing information on specific objects and their features; the second, an integrative style, is viewed as a cognitive strategy complementary to the first, in that it serves to interrelate identified objects and attributes into meaningful patterns and logical structures. Certain forms of integrative style may also be related to divergent cognitive processes to the extent syntheses are original (to the child), complex, and metaphorical (which some of our Ss did show) rather than merely instrumental.

Finally, information (object) concept training with a selected sample (N = 8) of infants (mean age = 23 months; mean IQ = 133) in a content specific category of information (vehicles) over three months of sequential stimulation through play resulted in children making the following achievements: infants could recognize a mean of 76 per cent of 11 object labels, all children could employ object and class concept labels interchangeably, five children could partially sort objects into classes, and one child was able to sort all objects into classes.

The most stable impression of the cognitive development of advantaged infants in the day care program is that of advancement to a complex and

uniform level of general abilities, coupled with diversified forms of development in perceptual-motor, language and information processes. There was, however, relatively less advancement in gross motor processes and relatively greater advancement in language, particularly, and possibly in memory and broad ranging types of logical thinking. The effectiveness of specific, planned and sequenced cognitive learning experiences is supported by results in several projects. These preliminary findings on the value of focue in several projects. These preliminary findings on the value of focused learning do not, however, contradict the apparently more powerful and pervasive effects of general stimulation and care operating throughout the demonstration program (including parent guidance).
displayed average to high levels and many trends toward improvement in their motivations concerning cognitive activity, some of which are closely related to types of information processing styles. These levels and trends are shown by the consistency of moderate to high ratings in both cognitively demanding mental test situations (Bayley Infant Behavior Record and Personal-Cognitive Scales) and behavioral trend ratings on the Schaefer Inventory made from observations in play and other activities in day care.

On the IBR, advantaged infants consistently equaled or exceeded the developmental norms of the standardization sample, except on attention span and endurance at younger ages during their first phases of participation in the program. Otherwise on motivational items they were adequate or better on responsiveness to objects, goal directedness, and several exploratory type behaviors as reported above. From initial to final mental testing, advantaged infants increased significantly in goal directedness, purposive

cognitive orientation, traits that correlated significantly and substantially ($\geq .40$) with mental test scores at initial and final testings and for change scores.

On the personal-cognitive scales, advantaged infants were rated (during testing) close to the optimum on a similar dimension of problem-orientation (slightly toward the distractable side) at initial testing, but improving only very slightly (on this less sensitive scale). Similarly, they tended to become less distractable in play activity (significant for older infants) on the Schaefer, although younger infants became significantly more hyperactive, which was possibly somewhat developmental since the level remained very close to average. The significant rise in rapidity (in play) for the entire group appears related but was presumably more constructive. They also increased markedly and significantly in four exploratory-curiosity behaviors correlating with mental test performance, which paralleled the significant gain in inquisitiveness (especially, younger infants) and the decline in monotonous behavior reported above. Infants tended to increase in attention span, paralleling a similar increase in attentiveness in play activity as rated on the Schaefer Behavior Inventory. (Note that first ratings on the latter came after a mean of around 6 months exposure to the program.) The age rise to norms of the standardization sample in endurance was not paralleled by increases in perseverance in play activity (Schaefer). Home reared controls were slightly more uneven in comparison with modes of the IBR standardization sample and made no significant gains and few gains of any kind except slightly on goal directedness and attention span.

Viewed as a whole the advantaged infants displayed very adequate forms of purposive, logical and exploratory activity in problem solving that generally increased with participation in the program. On final ratings in daily (play) activity (Schaefer Inventory) mean levels for advantaged infants were well above average (≥ 3.00) in all related cognitive motivational behaviors (verbal expressiveness, inquisitiveness, perseverance, concentration, and attentiveness) except rapidity (which has mixed advantages) and, correspondingly, well below average (≤ 2.00) in monotonous behavior and slightly below average in distractability and hyperactivity.

The value of parent guidance in fostering motivations and curiosity appeared in the several significant correlations between maternal behaviors and infant motivational characteristics, especially in their tendency to increase with time in program. Thus,after a mean of 7 months in the program, the mothers' positive attitude toward tutor correlated negatively with the infants' monotonous social behavior. But on a second set of comparisons after 10.5 months maternal verbal expressiveness correlated positively with perseverance and concentration and negatively with distractability (all $\geq .40$, though none significant). Hostile involvement with child correlated positively with distractability (significant, .52) and negatively with perseverance and concentration (both $> .40$). Hostile detachment from child correlated positively with distractability (.37) and verbal expressivity with tutor correlated negatively with distractability (-.45) and positively with concentration (.38).

Socioemotional Development. Aside from motivations governing cognitive activity, there were a variety of broader assessments made on interpersonal and emotional functioning in play, testing, and adaptation situations. In the testing situation advantaged infants were generally at or above IBR Bayley norms for socioemotional items. Fearfulness and tension level, however, were slightly above the IBR modes (but in any case still very low) until older ages (which would be generally equated with the group having been long in attendance). Mean ratings on the IBR and the personal-cognitive scales (autonomy and anxiety tension level) were close to or above the means for the scales for both initial and final ratings, but also improved significantly on the IBR on general emotional tone and somewhat in fearfulness, but not significantly. All final mean ratings were well above (better than) the mean of the scales on IBR socioemotional ratings (i.e., responsiveness to persons and examiner, cooperativeness, fearfulness, tension, and general emotional tone).

Home reared infants were more uneven generally in all ratings, and not significantly different from day care infants on the personal-cognitive scales. They showed a tendency to increase only on cooperativeness in the test situation (IBR), probably indicating adaptation to testing following the first test. Lack of marked changes for day care infants in most socioemotional behaviors (except general emotional tone) or of any correlation with mental test scores and changes (except initially in responsiveness to examiners) may be related to the high values already present at first testing. Day care infants were already quite familiar with and generally well adapted to examiners by the first testing (1-2 months after enrollment), which may have

caused the slightly reduced variance on some of these ratings. But the absence of correlations also suggests the relative independence of cognitive skills from socioemotional processes, once certain threshold values of the latter are reached.

In the unfamiliar situation of adapting to strange physical and social environments, both the selected (available) sample of 19 month old day care infants and their matched controls all clustered near the optimum center values of the scale, except for home reared infants on adaptation to stranger. The groups were equivalent in tension level and slight differences favored day care infants in ability to interact physically with caretaker; on the other hand, verbal modes significantly favored and independence from caretaker slightly favored controls. As discussed above, the situation was complicated by sex differences and the presence of the mother for the controls (versus one of several familiar student caretakers) as the security person from whom to explore and with whom to measure the quality of social interaction. Both of these factors may have favored controls, although in any case both groups displayed uniformly high socioemotional adaptation levels and forms of social interaction, except that control infants were much below average in adapting to the stranger.

Ratings on socioemotional functioning in play and other activity during day care (Schaefer Inventory) presented similarly consistent average to high mean values. There were few (mainly positive) changes from one rating period to the next (again, first ratings came after several months of adaptation) and parallel and polar items were generally significantly intercorrelated, indicating considerably construct validity and rater reliability, despite use

of multiple raters and the extended period basis for the ratings. There were, however, significant declines in fatigue and withdrawal, some increase in gregariousness and enthusiasm (all positive), but significant increases in both belligerence and irritability. The latter were complicated by sex differences to be discussed below and the fact that it was younger children who increased - probably in part due to developmental adaptation. Final mean ratings for advantaged children on socioemotional items were nevertheless all high in desirable directions (negative affect, positive social response, self-consciousness, gregariousness, contentment, passivity, enthusiasm, fatigue, withdrawal, fearful, cheerfulness, and negativism), except belligerence and irritability, which registered only slightly less than high positive values, giving credence to the idea that changes were developmentally adaptive as well as a function of program influences.

That socioemotional as well as cognitive development was partially controlled by maternal styles in turn influenced by the guidance program is evidenced by correlations appearing between ratings on the mothers and ratings on the infants (the two Schaefer Scales). Moderate and significant correlations were obtained in the initial (midprogram) set of comparisons (after a mean of 7-8 months of maternal participation) between 9 of the 17 maternal behaviors and infant withdrawal (a similar pattern obtained for the final comparisons but ratings were only significantly related on maternal verbal expressiveness with tutor, probably because of the much smaller, N = 14, final sample). A sprinkling of other appropriate (positive or negative) correlations were found in the initial (midprogram) socioemotional comparisons, such as between the child's negative affect, positive social response, contentment, and irritability with various maternal

behaviors like hostile, extensive or anxious involvement with child, verbal expressiveness with child and, especially, with the mothers' relations with the parent worker (e.g., cooperativeness, positive attitude, and verbal expressiveness). There were proportionally more correlations between maternal behaviors and infant functioning in the final comparisons.

Conclusions. It would seem that in general advantaged infants got along well emotionally in interpersonal spheres from the first time they were measured (in the initial mental testing) and progressed very adequately throughout their experiences in day care. Mean values on all traits were usually above and rarely below average, whether assessed in formal testing situations, situations requiring adaptation to the unfamiliar or in their regular play and other activities in day care. Generally speaking, adaptation levels tended to equal those of home reared controls, although in a few cases were perhaps slightly better, including their ability to adapt to unfamiliar persons. However, the quality of interpersonal relations between day care infants and familiar caretakers may not have been as high in some ways (especially, in verbal interaction) as similar relations between home reared infants and their own mother, but the sex imbalance of the selected sample (more girls who were better adapted) makes this difficult to assess.

The latter difference on verbal interaction (which is a rating on the infants' spontaneous inclination to verbalize with the adult in a situation of socioemotional demand) may further underline the importance of maternal influences in cognitive as well as socioemotional socialization. The importance of parent guidance seems particularly evident in the light of the increasing correlations between maternal and infant behaviors in final

comparisons. In addition, proportionally more of the correlations between maternal ratings, particularly for final comparisons, were between the mother's relations with the guidance worker and child behavior than between observations on her relations with the child and child behavior. (Some of these differences were also no doubt due to limitations of both the scales - particularly the maternal, which measures somewhat broad categories - and rating conditions.)

The experience of day care itself should also be considered a definite contribution to the infant's socioemotional development, however. All ratings were made in situations intrinsic to and typical of the child's experiences in the day care center. It can be assumed that the positive attitudes and flexible and diversified approach to infant care and education played important roles. But the enhanced and continually developing cognitive competencies may also have contributed to the infant's socioemotional development. Knowledge and competence are extremely potent tools to facilitate coping and hence well-being in all spheres of activity, not just in problem solving with things and words. Two of the component (Kohen-Raz) scales of the Bayley Mental Scales, for instance, (on which day care infants advanced significantly more than home reared controls) are constructed partly in terms of imitative processes, understanding, and social relations that are integral components of social competence. Language itself is one of the most predominant and valuable tools for expressing needs, seeking personal satisfaction and social communication.

That developmental improvements were in the main more evident in cognitive domains, namely in problem solving and reasoning (various mental

test performances), cognitive styles and motivational orientations, was not only because of the strong cognitive stimulation aspects of the program. No less important is probably that cognitive complexity is made up of a large number of both general and specific rules, subject to influences from learning. Personality and social relations, on the other hand, while not without complexity and cognitive components, are more in the nature of broad orientations and styles (e.g., negative affect, gregariousness, contentment, general emotional tone, tension level) unlikely to change very drastically once certain levels of adaptiveness have been reached - as they may already have changed following the 1 to 2 month adaptation period when they were first measured. Moreover, the Schaefer ratings were not made at all until after several months of socialization in day care.

Sex Differences. The effect of sex differences, already discussed at some length in Appendix A, will be summarized here in some detail, to include additional results and because of their great importance in so many areas of this investigation.

1. Cognitive Development and Motivations. Certainly, one of the most outstanding findings in this study is the magnitude of the gains of girls compared to boys. Initially scoring significantly around 10 or more mean IQ points lower (about 104 to 116 for boys) the mean gains of girls ranged around 30 IQ points, compared to mean gains of around 10 points for boys - except for somewhat smaller mean gains in both groups for older ($\bar{X}$ = 19 months) infants or over a shorter period ($\bar{X}$ = 5 months). Of the 13 (45 per cent) of advantaged infants who gained 20 or more points there were nearly twice as many girls as boys (9:5) despite the fact that there were slightly more

boys than girls in the total sample (16:14). In other words, 64 per cent of the girls but only 31 per cent of the boys gained 20 or more points. The final mean scores of the two sexes were on the same level (± 130 IQ), but girls tended to exceed boys in all analyses.

Any evaluation of the outstanding advancement of girls compared to boys in cognitive development must be tempered by a number of considerations (See also Appendix A). In the first place, a paired subsample of home reared girls (N = 7) made mean gains of about the same amount (22 IQ points) as the seven matched day care infants. It is true that adaptation effects might have favored controls, who were less adapted than day care infants at first testing, but home reared boys (N = 11) gained a mean of only 3 points. A more complete explanation seems to lie in a complex interaction between adaptation and regression effects, which differentially influenced the gains of girls over boys. As the pattern of socioemotional findings to be summarized below suggests, the initially lower mental scores of day care girls may well have been partly due to less adequate (less self-assertive) socioemotional coping, a cultural phonomenon likely to affect equally home reared and day care girls. Thus some of the cognitive gains of both day care and home reared girls may have resulted from adaptation to testing, but likely to affect home reared more than day care girls, since day care girls were already fairly well adapted to testing at the first session.

There were probably other factors at work, however, including the possibility of differential rates of cognitive socialization for boys and girls and especially the great fluctuations of mental test scores in the early years due to the difficulties of controlling infant motivations and the fact that somewhat different abilities were being measured at different ages.

There is the fact, however, that the larger total sample (N = 14) of day care girls registered mean gains of 28 points over a longer period, and that when only initially younger infant girls are included (N = 11, $\bar{X}$ = 8 months) the mean gain amounted to 33 IQ points. Presumably in the gains of the control sample of girls we are also dealing at least partly with actual cognitive gains, perhaps of an unusual sample where parents were influenced to provide more cognitive stimulation (from the testing experience and/or from knowledge of the investigation through diffusion effects). On the other hand, the gains of day care girls were nearly 50% greater and on a larger sample. Moreover, as an additional basis of comparison, day care boys (N = 11) gained a mean of 10 points to only 3 points for the same number of home reared boys, making combined mean gains of 14 and 7 points, respectively, for first year day care and home reared samples.

In gross motor development mean score changes for both groups were all minimal, non-significant gains of around five standard score (motor quotient) points, starting from the same average level (about 102). Even over a longer period ($\bar{X}$ = 13 months) in the program there was virtually no difference in the small respective mean gains of 7 and 6 points for girls and boys.

Among other cognitive measures, which gave evidence of differences in specific competencies, was the Meeker analysis of final Binet tests. In this analysis, boys appeared somewhat higher in memory processes than girls, but otherwise the two sexes had virtually identical rather flat profiles on the five Guilford cognitive operations (cognition, evaluation, memory, convergent and divergent production), both being slightly higher in divergent (creative) production types of thinking.

Girls tended to gain more than boys in verbal expressiveness on mean ratings made during play (Schaefer), but both sexes gained significantly over a mid to late program segment and the gains of girls resulted in a convergence with boys who were initially slightly higher. On the other hand, the sample of girls in the adaptation setting were higher than boys in the quality of both verbal interaction and complexity-diversity of their interaction with a caretaker. Although no systematic analyses of sex differences on other measures were feasible, observations (and mental test scores) would suggest that girls were at least as complex and diversified in their functioning in language, perceptual-motor reasoning, concept learning and other areas.

There were, however, more differences evident in cognitive orientations and motivations. The two girls in the information concept learning project on vehicles, for example, learned as well but did not enjoy the content as much, possibly because of being outnumbered by boys as well as because of the boy-related culture content. More general is the evidence from the Schaefer Inventory of Behavior during play and general activity, in which girls, initially (but after several months in the program) slightly lower than boys, increased more than boys on most categories of cognitive motivations (especially, inquisitiveness, perseverence and slightly on concentration) to result in a final high level very close for both sexes on all motivational categories. Part of this convergence was produced by slightly greater gains by boys on certain items (e.g., increase in attentiveness).

On the Bayley Infant Behavior Record (during testing), we find much the same pattern of differences and changes. Thus at the first mental testing advantaged girls were rated lower than boys on several exploratory-curiosity

motivational aspects of functioning, (reactivity to stimulation, sights-looking and manipulating), though more responsive to objects and longer in attention span. But they gained more in cognitive orientation processes (including endurance) than boys (significantly on three compared to one for boys), while boys gained much (but not significantly) in responsiveness to objects and attention span (to little or no change for girls), bringing the sexes very close together in mean ratings at the same final high level in all cognitive motivational activity. (Thus, girls did not come to exceed levels functional for the more organized activities required of older infant developmental levels unlike disadvantaged infants.) Both sexes gained significantly about the same amount in purposive cognitive activity (goal directedness). Boys and girls were also very similar in their adaptiveness to problem solving, but in this case fluctuating inconsistently around the optimum center area of the scale.

It is interesting to note the parallels between the measures taken in separate situations, one mental testing, the other play and caretaking situations - (despite differences in timing of the assessments) - the relatively greater increases for girls in inquisitiveness and for boys in attentiveness in play (Schaefer) corresponding to the relative gains of girls in curiosity behaviors and of boys in attention span in the mental testing situation (IBR). Paralleling these greater gains of girls on curiosity-exploratory behavior are the higher mean final ratings of girls than boys on interest in exploring a strange room (significantly higher) and a strange person, as well as their significantly greater independence of the caretaker in the emotionally loaded adaptation situation.

2. Socioemotional Development. Some of the same pattern of convergences at moderately high levels is seen in socioemotional ratings, both in mental testing situations and in free play and other day care activities. Thus, in testing situations on the IBR ratings, girls increased significantly and considerably more than boys in their general emotional tone and responsiveness to persons, while boys decreased somewhat more than girls in fearfulness, bringing boys and girls to equivalent high levels of functioning. Both sexes increased slightly (girls a very little more than boys) in responsiveness to examiner and tension (which remained below the scale mean, however). But girls also declined in cooperativeness and increased in the amount of gross body movement, on both of which they were originally close to boys, to become somewhat less cooperative but more physically active. These changes reversed slightly the traditional sex role definitions of patriarchal cultures, but both sexes remained safely removed from extremes. Following this latter pattern was the movement of girls from an earlier, more dependent style than boys (significant on one sample) to a final more assertively independent style (significantly greater over both 6 and 12 months periods), as rated on the personal-cognitive scales. Girls also tended to become relatively more tense than boys, while boys remained more placid - though differences remained small near the optimum center area as on the IBR tension scale.

This pattern was more or less repeated on ratings both on adapting to strange environments and the children's play and other activity in day care. On the selected adaptation study sample (well toward the end of their stay in program), girls were rated significantly higher than boys in independence (of caretaker) and in adapting to an unfamiliar room, and somewhat higher

in adapting to an unfamiliar person (as mentioned above). All of these changes would point toward more development in girls of a kind of assertive adaptation similar to that observed for girls in the testing situations.

Although boys were rated much (significantly) higher in physical (but lower in verbal) interaction, a typically traditional cultural trend for boys, they were also significantly higher in tension level, both items reversing patterns reported in the testing situation. Presumably sampling differences as well as differences in the kind of emotional demand between adapting to strange situations and mental testing may be responsible for this partial reversal. Conceivably, the socioemotional framework of the adaptation situation was more in line with the culturally prevalent interpersonal orientations of girls than the demands of mental testing. In both instances, girls were able to advance relatively more than boys toward self-assertive autonomous modes; but the effort in the testing situation (where they had seemingly skyrocketed from much lower cognitive processing levels than boys), may have cost more in emotional tension (partly expressed in greater amounts of physical activity) not needed in the more familiar types of social adaption situation. On the other hand, boys found more difficulty in the socially oriented adaptation situation, where the greater emotional demands not only reduced their level of verbal functioning, but also raised their levels of tension and physical interaction (the latter more traditional levels). Moreover, the emotional demands also apparently reduced their independence levels below the optimum levels observed in the testing situation.

In ratings on play (Schaefer), what little changes on mean socioemotional ratings occurred, from initially (midprogram) average to high levels, were mostly small gains for boys and girls on different items to produce finally, generally well above average functioning. Thus both sexes became more belligerent (girls significantly), irritable, rapid (girls significantly), and hyperactive, but less passive. In each case the change was greater for girls. Boys, on

the other hand, though changes were relatively smaller, became relatively more positive in social response, enthusiastic, cheerful and self-conscious. But what is significant is that these respective clusters of changes not only work to make boys and girls meet at a uniformly, relatively high state of psychological adequacy. The first cluster also moves the girls closer to the boys in traditional forms of culturally prescribed active, assertive styles and speeds of behavior, while the second cluster serves to move boys a bit in the direction of girls in culturally predominant modes of social sensitivity and personal expressivity. The overall pattern of changes is similar to those found in the testing situation, including the slightly greater irritability, belligerence, negativism and negative affect, as perhaps the closest items paralleling the slightly increased tension in testing.

Conclusions. The difference between advantaged girls and boys in the amound and type of cognitive, motivational and socioemotional changes is one of the most significant features of the investigation. Essentially what seems to have happened is that girls, who were at first somewhat less adequate than boys socioemotionally, became more independent, assertive, active, less emotionally controlled (less repressed) and more like the cultural definitions traditionally assigned boys. Boys, on the other hand, developed more or less normatively in these ways, but became possibly more interpersonally oriented according to the sex role definitions usually reserved for girls. In some ways, however, boys showed themselves as possibly slightly less adaptive than girls in their ability to cope with the normal but particular social stresses of exploring a strange room, responding to a strange person or interacting with a familiar teacher in an unfamiliar environment. Cognitively, the girls in our sample, who at the beginning were significantly lower than advantaged boys and more like the disadvantaged sample, advanced twice as much as boys to

end up with the same superior abilities as boys and possibly slightly higher, particularly in verbal abilities (judging by limited evidence), although not in memory. Otherwise, in most aspects, including creative, divergent mental processes, purposive cognitive activity, and concept learning both groups progressed to about the same high levels. Nevertheless, the several indications that girls may have developed more adequately in social relations and brighter intellectually could mean that the combined effects of a (virtually) all female caretaking environment and the responsiveness of the working parents of infant girls to guidance was more beneficial to girls. Carried further it could also mean that boys could have advanced considerably more intellectually and adapted better socioemotionally than they did and continued to surpass the girls, since they started at higher levels. The comparatively small differences separating boys and girls on their final common high plane around 2 to 2 1/2 years of age would soften this point, however. There are moreover, presumably ability ceilings that served to equalize the sexes.

Thus, the fact that both sexes, starting at different levels, would rise to similar, unusually high mean ability levels has many implications for early cognitive development and education (see Discussion in Appendix A). Among other things, it would suggest that the basic intellectual potential of both sexes, but particularly of girls, is not being ordinarily realized, even among supposedly advantaged families in the urban Canadian middle class. Girls, it would also seem (if our samples are at all representative - we cannot compare initial levels of home reared controls who were of course selected to match day care children), are relatively more deprived than boys, both in cognitive and socioemotional development, in part probably because

the sexes are prepared for different roles, a difference that is in actuality a form of cognitive and social discrimination against girls. The lower level of exploratory behaviors and assertiveness found in our girls (compared to boys) early in their period of attendance has been reported for girls elsewhere. But the common level both attained would also support the concept that there is a mean normative level of cognitive functioning considerably higher than past norms (110 to 120 for middle class groups) to which biological potential can perhaps modally rise. This finding, together with the convergence in their styles of interpersonal and emotional functioning, tends also to indicate that sex differences - both in cognitive and personality processes are to an important degree culturally rather than biologically prescribed and limiting phenomena.

Despite the apparent effectiveness of the intensive day care program in cognitively and emotionally oriented developmental stimulation, it is nevertheless premature to assume too much about norms, given the wide range of sampling, measurement, and program implementation problems built into the investigation. It can, however, be assumed with some confidence that parent guidance made as much of a major contribution to the socialization of girls as of boys. Although no analyses by sex were made on maternal styles because of sampling limitations, informed observations on the mothers of girls regularly pointed to a pattern of high interest and attention to their infant girls' development, cognitively and socially. In light of the fact that the mothers of the advantaged infants were all working, many working out of perference as well as financial necessity, it is not surprising that the two functions of (1) role modeling for active goal seeking in complex,

(semi) professional occupations and (2) cognitively-interpersonally oriented child rearing would find themselves in harmony, once the methods and objectives of the parent guidance program became available. The slight edge of girls over boys in most emotional and mental functions in the final assessments would seem to bear this out.

B. Effects of Specialized Day Care on Disadvantaged Infants

Cognitive Development: General. The development of general abilities of inner city children, as measured by infant IQ tests, progressed from an initial mean average level (100 IQ) to a terminal high average level (116 IQ) over the course of a mean of nearly 14 months in the program. Gains were close to the magnitude of the gains of advantaged infants over an equivalent period, although not significant (partly because of sample size, N = 9) and disadvantaged infants started considerably younger ($\bar{X}$ = 5 compared to 12 months for advantaged). When compared with subsamples of advantaged infants matched for age of entry and time in program, mean gains (from an average level on all samples) were significant over a six months interval, no group differences were significant for any interval, and mean gains of as many as 23 IQ points were made by a small sample (N = 4) over 18 months compared to 21 points by the advantaged group.

Cognitive Development: Specific Competencies. The development of specific abilities, while difficult to evaluate because of the lack of standardization and limited number of additional measures[7], appeared to be even across the few areas assessed with the exception of motor development.

[7] The Kohen-Raz Subscales of the Bayley Mental Scale in particular could not be utilized because nearly all Ss fell outside of the younger age ranges of the scales at initial testing or were given the Binet as their final measure.

1. Motor Development. The total sample of disadvantaged infants gained a mean of 12 points on the Bayley Motor Scale over a mean of 10 months, again not significant partly because of sample size. There were no greater mean changes in gross motor development for a subsample of infants measured after 12.5 months in the program. Disadvantaged infants thus appeared to make moderate improvements in gross motor development from average (99) to high average (111), gains more substantial than the typical mean gains of about 5 points made by advantaged infants.

The pattern of near terminal competencies of disadvantaged infants on fine perceptual motor processes was consistent at a high average developmental level (equivalent to Bayley Mental Scale IQ of 116). As measured by the Uzgiris-Hunt Scales (object permanence, instrumental concepts, object concepts, causality, spatial concepts and gestural imitation) the level of functioning was generally even on all perceptual motor scales, indicating a rather uniform level of cognitive competence in component fine perceptual motor, cognitive activities that collectively (plus language) make up general cognitive competence (IQ) in infancy.

2. Language Development. Their competence in language was below their competence in other cognitive processes and below the language competence of advantaged infants, but nevertheless improved over the course of the program. On two measures, the mean for samples of disadvantaged infants after about 6 to 8 months in day care were below average. On the Uzgiris-Hunt Scale of vocal imitation, they scored 16 percentage points below their own mean score for the entire set of Piaget type scales. Mean ratings on their behavior in play and other activity in day care (Schaefer) similarly placed their language

ability (verbal expressiveness) at average to below average scale levels (for different, overlapping samples). Following participation in the program for a year or more at about age 18 months and over, disadvantaged infants were found to have moved from low to high average levels (significant on one comparison) that compared favorably with ratings on other cognitive motivational activities. Their mean rating was, as to be expected, still below the rating accorded to advantaged infants. A corrollary of their tendency to lag in verbal development is reflected in the initially (midprogram) and continuing slightly below average (Schaefer) ratings on maternal verbal expressiveness with her child, the small decline of disadvantaged mothers in their verbal behavior with the parent guidance worker, and some increase in their lack of verbal expressiveness with child. Nevertheless, most of these and other maternal characteristics remained generally average or above.

A small subsample (N = 3) of disadvantaged infants was also rated below the scale average on the quality of verbal interaction (with student day care teacher) in the social adaptation (to strange environments) situation, the same mean rating assigned to a matched set of home reared controls. Because of the emotional demands inherent in this situation, however, cognitive performance would not be expected to be optimum under these circumstances.

3. Information Processing Concepts. We have already mentioned their high average scores - except for language - on the Uzgiris-Hunt Scales (object permanence, instrumental concepts, causality, spatial relations, etc.), which we have discussed as fine perceptual motor, information processing activities, following the practice of the authors. There were in addition

two other cognitive processing measures, both of which further indicated a pattern of relative evenness in cognitive functioning among specific abilities. Mean ratings on the complexity-diversity of interaction with a student teacher in the social adaptation situation (near the end of their stay in program) were no more than average, although greater (not significantly) than for home reared controls - but again this was more oriented to social relations than cognitive performance.

On the Meeker analysis of final Binet test patterns, the disadvantaged displayed a rather flat profile (at a high average 125 IQ level) on Guilford's five cognitive operations (cognition, evaluation, memory, convergent and divergent production) - like advantaged infants - but memory and divergent (creative) thinking were slightly depressed. The former may relate to their lower trends in language processes, given the intimacy with which language is tied up with memory on the Binet, and the latter perhaps parallels their average performance on complexity-diversity, despite the social character of the adaptation situation.

The cognitive <u>styles</u> of disadvantaged infants appeared more diverse, however, on ratings in other situations more comparable to their generally advanced <u>levels</u> of cognitive functioning, but not always productive. On ratings in play (Schaefer), disadvantaged infants were rated about average on <u>inquisitiveness</u> part way through the program compared to above average levels for advantaged infants. Toward the end of their time in the program, however, they had moved (one gain significant) to high average mean ratings, comparable to those of the advantaged infants. In monotonous behavior, something of a polar opposite of inquisitiveness, disadvantaged infants

in midprogram were rated very low (positive), close to or slightly better than the advantaged. Toward the end of the program, on the other hand, their mean rating on monotonous behavior rose (worsened) significantly to become average, (but only slightly worse than the advantaged), suggesting either inconsistency in the ratings or a high proportion of both inquisitive and stereotypic activity - though not very different from the pattern for advantaged infants.

In some ways similar, in the admittedly uncertain setting of an unfamiliar environment, a small sample (N = 3) of disadvantaged infants (two were girls) were rated at the same mean level in willingness to explore the room as the mean for advantaged infants, better than their matched home reared controls, although considerably less than advantaged girls. In adapting to a stranger, disadvantaged infants were at the same low level as home reared, disadvantaged controls, well below advantaged boys or girls.

In the same manner, mean ratings on the flexibility and coherence of their problem solving styles (problem orientation) on the personal-cognitive scales in the mental testing situation were all well within the ideal, center area of the scale, little different from those of advantaged infants, but with a slight tendency toward increasing distractability with development. Mean ratings on related dimensions of the Bayley IBR scales also revealed a picture that may be related. At initial testing, disadvantaged infants were a bit higher than advantaged infants in age-appropriate, cognitive manipulative-exploratory activities (reactivity to stimulation, sights-looking, manipulating, and responsiveness to objects). Since they also gained substantially (although not significantly) on most of these behaviors, they ended up at

their last testing in the program with ratings still higher than the advantaged but at an age when such levels of exploratory activity may have been excessive (non-productive) for the kind of complex and organized cognitive tasks demanded. It will be recalled that these behaviors had tended to correlate positively with initial cognitive test scores (with younger advantaged infants) and with change scores (the younger infants were the bigger gainers) but negatively with the final, high level scores at older ages.

Cognitive Orientations and Motivations. The apparent contradiction between the relatively lower creative processes (divergent production) in cognitive tests and greater stereotypic behavior in play (monotonous behavior) contrasting with improved inquisitiveness in play and high exploratory behaviors in testing may find some resolution in the quality of directedness and persistence of their cognitive orientations, in both testing and play. Mean IBR ratings on their cognitive activity in testing indicated important gains from initial to final testing in purposive cognitive activity (goal directedness) and in ability to focus (attention span), but a decline in their ability to persist (endurance) in cognitive testing; in all of these they continued to function somewhat less well than advantaged infants, although at a good average level.

These gains seemed to follow a similar pattern of changes in functioning in their play (Schaefer) over the course of the program. During the period from a few months ($\bar{X}$ = 7) after entry to near the end of their stay in day care, disadvantaged infants increased substantially from about average to above average levels of motivation in attentiveness, concentration and perseverance. They were close to or not far below the levels of the advantaged infants on their terminal ratings for these behaviors, but failed to improve in distractability while the advantaged infants did. On motivational behaviors more

directly concerned with the pace and intensity of activity and energy expression (hyperactivity and rapidity), they either remained unchanged or became more active in play, becoming definitely more active at above average (dysfunctional) levels than advantaged infants in the final period. These changes in turn seemed to correspond to large mean gains in gross body movement in the testing situation (IBR) and to the apparently excessive amounts of exploratory activity observed.

Trying to summarize these trends, disadvantaged infants made certain gains in their capacity to orient and persist in goal-directed cognitive activity, but tended also to persist in or develop further certain disorganized forms and intensities of energy expression that appeared dysfunctional for organized cognitive activity. Their motivations for purposive cognitive tasks ranged at all times, but possibly more at the end than the beginning of the program, consistently below those of advantaged infants, though still within average levels of functioning. It is worth emphasizing, on the other hand, the decline in endurance in the presumably more demanding mental testing situation, compared with the large (though non-significant) gain in perseverence observed in the probably less demanding conditions of play. The nature of the conflict may be further epitomized by also noting the rise in ability to concentrate (plus attentiveness) in play, which however is contrasted with no change in distractability in play. This contradiction suggests a disposition to orient cognitively, but a fragile one, still too readily disrupted by irrelevant stimuli and inclined to lose focus under pressure; thus also the decline in endurance (staying power) for the whole testing sutuation, along with other indices of increased hyperactivity and excessive exploratory

responsiveness to stimuli (in both testing and play), but the increases in goal directedness and attention span to each individual (short) task.

Socioemotional Development. The pattern of socioemotional functioning for disadvantaged infants fluctuated around average to above average levels, compared to somewhat higher ratings for advantaged infants on most observations, during initial mental testing and after a mean of 7 months in day care in play and other day care activities. Changes from early to later in the program were small to large, both positively and negatively, and greater than those for the advantaged, leaving disadvantaged infants still about average in most socioemotional characteristics, but both better and worse off than they were earlier in some aspects of coping.

In mean ratings on play (Schaefer), disadvantaged infants made marked gains in their social orientation (positive social response and gregariousness) and expression of positive feelings (enthusiasm and cheerfulness). But they also became much more belligerent and irritable, the only socioemotional traits to change significantly and to fall below average levels in final ratings. They were also rated as much more emotionally negative (negative affect and negativistic) and lower in contentment. But they changed little in passivity, fatigue, withdrawal, and fearfulness.

These evaluations find some parallel with ratings made during mental testing, but less with ratings on social adaptation in a strange environment, towards the end of their stay in program. Thus, on the IBR, they improved in their responsiveness to persons (similar to the improved social orientation in play) but became somewhat more tense (on both the IBR and personal-cognitive scales), similar to the increases in negative socioemotional

processes in play. They also became more assertively independent (over the whole program, but gains were significant only over the first six months in the program) and less fearful, which seems to parallel the rise in belligerence during play. Fearfulness, however, remained basically unchanged at a very low (positive) level during day care and play activities.

Mean ratings on social adaptation (small sample, N = 3), on the other hand, showed an adaquate tension level, better than home reared controls and similar to the moderate levels (with slight change) shown during final mental testing, but different from the high levels (e.g., irritability, if this can be equated) shown in routine activities. Since ratings on other related traits made during activity (except belligerence) were average (negativism and negative affect) or above average (positive social response, enthusiasm and cheerfulness), not much below the final levels of advantaged infants (as on all ratings), socioemotional affect and functioning were on the whole reasonably adaptive at the end of the program. Aside from heightened aggressivity (belligerence and irritability), relatively low (but still within an average range) adaptation to the stranger, at the same level as home reared disadvantaged infants, was the only other sign of adaptation problems near program termination.

Although sample sizes precluded correlational comparisons with ratings on maternal behaviors, signs of the role of parent activity in influencing the development of disadvantaged infants can be found in the (Schaefer) maternal ratings. Mean ratings tended to be lower (especially on maternal verbal expressiveness and involvement with child) than for advantaged mothers (assuming we can discount potential rater middle class bias), presumably in

line with the prevailing lower initial and final scores of disadvantaged infants in all areas except gross motor processes. The effect of parent guidance in producing the infants' cognitive gains and enhanced social orientation, on the other hand, may be identified by the high ratings (higher than advantaged mothers), generally assigned well into the program, to positive relations with the parent guidance worker. These superior ratings also appear to underscore the greater efforts of the parent worker with the disadvantaged than advantaged mothers. Although these relations were not entirely sustained, since later ratings tended to be lower than for advantaged mothers, most of these and the other ratings on maternal relations with their child remained above average. Some improvement in the character of their involvement with their child was indicated by a significant decline in the disadvantaged mothers' hostile detachment from their children.

Conclusion. It would appear that, on the whole, the developmental consequences of the educational and personalized day care in the demonstration program were positive for disadvantaged infants. In attendance for a mean of nearly 14 months, from age 5 to 19 months, they changed from an initially average level (100 IQ) to a high average level (116 IQ) and higher in general cognitive functioning. Four infants who attended from mean ages of 4 to 25 months gained a mean of 123 points (102 to 125 IQ). These gains were apparently consistent across several areas of specific, perceptual-motor types of cognitive competencies, but possibly not so great in language, memory, divergent (creative) types of thinking and gross motor development. Mean levels were generally below those of advantaged infants, although mean gains were nearly as great, except in language and other specific competencies (which were less), and in gross motor development (where disadvantaged infants gained more and

ended up higher). Mean levels in cognitive functioning were similar to advantaged girls when they first entered the program, but the latter gained enormously in all respects to equal advantaged boys and surpass the disadvantaged by final testing.

These children seemed to be developing definitely constructive orientations toward intellectual pursuits of the kind valued in school related activities by the time they were departing from the program as well as more adequate forms of socioemotional functioning. They were comparatively attentive to task demands, constructive in activity and goal directed, as well as highly socially oriented and high in positive expression of feelings, independent and possessed of little fear or anxiety, not very different from the general patterns developing in our advantaged infants. Moreover, there were some indications day care disadvantaged infants had advanced developmentally more than home reared infants in expressing less tension, less orientation to physical activity, and more independence and complexity-diversity of their social interaction with adults and ease in exploring a strange environment.

Where they seemed to be developing less functionally in their coping modes, however, was in contradictory tendencies toward excessive physical activity, aggressivity in social relations, and curiosity and exploratory behavior that passed beyond the point of constructive play and problem solving activity. Although generally interested in, oriented toward and capable of complex and rational forms of cognitive activity, these capabilities and interests seemed less formed and less resistent to irrelevant or diverting stimulation. The definite trends toward constructive cognitive styles were in conflict, in other words, with their concerns for social and physical interaction and over-strong assertiveness. These same styles were not equally similar or strong in all children; some were more reflective, gentle, and/or passive, for example, but the trends for the group were nonetheless present and some of the infants more extreme in their nonconstructive orientations than others.

Without exaggerating the extent of these negative trends, we know that some of the disadvantaged infants, like some of the advantaged infants, progressed less well than others. Inevitably we could trace some of the sources of these developing styles to such things as inadequate teacher understanding, skill or individualization during day care. Some of the difficulty was no doubt due to the long and confining daily bus ride to and from the center. But some problems could also be attributed to the too often socioeconomically limiting conditions of home life, as we have reported in the section on parents. Maternal ratings, in particular, while generally indicating positive orientations toward cognitive and interpersonal relations both with their infants and the guidance worker, showed mothers more often than not as less adequate than the way mothers of advantaged infants were perceived.

The effectiveness of our results on this too small sample, nevertheless, is more evident when it is appreciated that cognitive advances (performance and motivational) well above developmental norms, equal to those of solid middle class populations, occurred over a developmental period when <u>downward deviance</u> from the developmental norms of advantaged children usually begins to emerge (Bayley, 1965). Deprivation and disadvantage, cognitively and socio-emotionally, can apparently be <u>compensated for through intensive, early</u> starting quality day care, one may observe. Early enriched care can even develop infants from disadvantaged communities by age two to levels that (cognitively) compare favorably or even exceed those of home reared infants from advantaged communities. But early enriched day care combined with parent guidance was not so effective as it was in drastically reversing the possibly

early starting deprivation of our middle class girls. And we do not know how long this better than usual foundation will endure developmentally for any of our children, above all for the disadvantaged infants who still face development in the same old inner city environment of urban poverty and hardship.

VIII. Social Implications

Many implications of the investigation are discussed in concluding sections of the General Summary-Discussion of Infant Development, in Summary-Discussions on both Student and Parent Development, and in the Discussion and Implications incorporated in Appendix A (Pp. 44-59). This final section will therefore be devoted to listing a few recommendations perhaps socially and practically significant for the fields of infant day care, child development and early education. Although the implications are logical outgrowths of the pattern of findings of the study, it must be recognized that the findings have been derived from a demonstration study on comparatively small samples of children (particularly the inner city children), with all of the methodological ambiguities and uncertainties this implies. In particular, it is expected that there may be numerous alternative forms that could satisfy the various points.

A. There are many indications in this study that support and few that contraindicate the value of group day care for infants. From the point of view of community need and infant welfare and education, infant and child care centers can and should be established in every community throughout the province, with adequate levels of trained staff and suitable space and play materials made available. Quality infant day care would enable mothers who,

for economic and/or psychological reasons, wish to work, and all mothers who need supplementary day care and guidance to get the support they require along with the assurance that their infant is receiving adequate care and education.

B. In light of the promising results of this investigation with respect to multiple aspects of infant development, facilities should be made available to non-working mothers of all social classes, as well as the more obviously needful working mothers and socioeconomically disadvantaged families. Without widespread provision for adequate educationally and emotionally oriented infant care to all families in every community, it appears likely large numbers of infants, particularly poor children and girls, will continue to not be furnished with a foundation of intellectual competencies and coping skills that match their actual basic potential.

C. Parent guidance on child rearing is a universal family requirement. The increasingly strong associations we found between maternal styles (with both their infants and the parent guidance worker) and infant development, particularly cognitive development, over the course of the families' participation in the demonstration program, compared to the few associations at the beginning, would suggest that many otherwise ordinary, well educated parents could benefit from specialized guidance on child rearing. There is, moreover, much reason to suspect that improved parent effectiveness derived in part from the social and psychological support they received from day care as well as the knowledge imparted through guidance and demonstrations.

D. It is clear that many families, more proportionally from the poorer, less educated sections of the lower working classes, require more than

all day care and parent guidance can contribute to family modes of successful community and family living that are in turn adequate to rear children optimally. Although such families and their infants appear to benefit from the combined experience of day care and guidance, marked and (probably) long term developmental benefits seem to need a larger scale marshalling of community resources to resolve conflicts and meet their socioeconomic needs.

Multipurpose community based and controlled centers that would provide a variety of intensive transformational experiences for entire communities and families would appear to be one means of reaching these families. It is essential to coordinate community efforts and resources to re-educate by insuring opportunity for self and community participation and determination. There are a whole host of interrelated problems in the areas of child rearing, community and family living, occupational skills, interpersonal conflict, and general education that can only be resolved with massive but personally focused community effort.

We would stress the manifold burdens of child rearing, family management and alienation that the atomized, isolated family confront in the intricate stresses of contemporary urban life. That many advantaged families from the relatively affluent and educated middle classes, even single women, cope as well as they do in no way denies the pressing need for community integrated alternatives. Serious involvment of fathers, (difficult to achieve on a single family basis), sharing and distributing burdens in some coordinated fashion, closer relations between home, day care and cultural-recreational activities would all have gone far to improve the lot and relations, and probably the children's development in our advantaged as well as our disadvantaged families. There was a hunger in many of our urban parents for social

activity and communication around all of the facets of their lives, which a day care center alone could not fulfill; a well supported, community operated, multipurpose center might have some chance to improve the quality of life and child rearing styles of even many of the more malfunctioning families from all types of backgrounds.

E. There is a great deal of current concern over the future of the family. Can it survive? Whatever its ultimate role in society and value for socialization of the child (as it has proved itself for many families in this study) at the very least it needs modification in form through better communication and mutual support among families and integration of community life - or the needs of early (and later) child development, to say nothing of adult needs, will continue not to be met. Certainly the pulls on our single parent families - among them child rearing, family chores and management, and the high cost of day care, all of which somehow need broader male, community and government support - fall unequally upon women. We wonder, for example, whether the exceptional number of single child families in our advantaged sample (93%) is not related to the high cost of care which doubles for a two child family to become $160 to $200 per month at currently available rates.

F. There were at least four major types of infants in this study who were identified as very different in their general forms and rates of development, advantaged and disadvantaged infants and boys and girls. Sex differences no doubt vary within both of the first two groups but because of sampling restrictions, could only be studied in the advantaged group. Infant day care programs and research and development projects should attend systematically

to the pattern of differences that distinguish these and various other types, as such cultural, ethnic and personality (e.g., passive versus hyperactive) types.

The solution is not of course to direct efforts to grouping and stereotyping infants, but to be sensitive to predisposing circumstances in family and community life that tend to retard or facilitate development in certain children. The best efforts at diagnostic monitoring and individualized developmental programming of intellectual stimulation and relationships must, to be successful, take an inventory of the child's characteristics in relation to cultural and other background influences that have had and continue to have a formative influence on his development. It is quite evident from our study that there are pervasive background factors that work to differentially shape boys and girls as much as between children from different socioeconomic conditions and classes. Unless these effects from differences because of sex roles, ethnic, racial, cultural and other conditions are specifically attended to with respect to program methods, content and values, as was done to some degree in this demonstration program, sometimes initially unnoticed or poorly understood personality and cognitive styles harmful for children's development will take root and persist. The foundation of these styles and systems of coping are established in infancy - as the sex, social class differences in this and other investigations show. Both boys and girls, but especially the latter are apparently ordinarily socially deprived in their opportunities for development, if not so much as socioeconomically disadvantaged children.

G. Infant Day Care Centers should be prepared to address themselves to multiple functions of the child's development. Although the results of this study do not prove the merits of this method over any others, the fact that the principles and techniques applied embraced all major aspects of child's development - cognitive, language, perceptual-motor, and socioemotional (and health although this was not formally measured) - and that development of the infants was shown to have progressed evenly and outstandingly in most areas underscores the significance of the principle if not the methods. Any other course is likely to bring about a failure to develop in some critical process or area - as the shortcomings of our work on gross motor development in the demonstration program indicate.

H. In the same way, it seems probably that it is the process of individualizing and correlating attention to the several major human functions with respect to each child as a unitary developing system that (1) insured few functions got neglected and (2) minimized the neglect of any child as an integrated person. A comprehensive program of day care must in other words be both general in its coverage, yet specific to the individual in its focus and inclusion of functions.

Preliminary work on diagnostic developmental monitoring points to this method as a valuable tool for systematically monitoring the development of each individual as a total system. Had this approach been further developed in our investigation some of the infants who failed to progress much during the program might well have done so. As it was the specific nature of their developmental learning problems was not adequately identified. Whenever possible some mechanism of this type should be employed to assess regularly

each child's development in all major processes, informally at least, to insure continuing input to teachers in what ways the child is and is not progressing optimally - with a view toward modifying approaches to each child according to his needs and styles.

I. The economics of community group care for some time to come is likely to require teacher-caretaker/infant ratios of something more like 1 to 4 or 5 than the 1 to 2 frequent in our demonstration program. Research, directly focused on optimum and feasible ratios under the demands of different caretaking and learning situations needs to be carried out.

Small group processes of handling even infants (in pairs or small groups up to 5 or 6) is one way of coping, which permits individualization of teaching and social relations, while providing the benefits of group processes and identification. This strategy is a viable alternative to relying on large group control, where the individual child is psychologically drowned. It also avoids relying exclusively on one-to-one caretaking, which is feasible in only certain situations, and if used too often leads to attention to some infants at the expense of others, and loses the advantages of combining tutorial and group dynamics that small groups provide. Notwithstanding our often near ideal ratios, the small group strategy proved quite workable for both teachers and infants, particularly in guided play, planned or spontaneous.

J. Attention to multiple functions also means attention to the variety of situations and activities in which infants need to engage. A diversity of situations - the physical caretaking in daily developmentally appropriate routines, free play of all kinds, indoors and out, specific instruction in learning tasks through play, and excursions to the broader community - define

the character of quality infant care. The infant's daily life is necessarily constructed of these many activities, which serve as the contexts in which the stuff of his developing feelings and understandings about people and things emerge. There are not some situations in which the infants learns and others where he loves and is loved. While techniques suitable to the context must be applied, love, cooperation, learning and imaginative play in the context of daily living in all its forms establish the unity of a complex and personalized individual.

K. Not the least of the potential social consequences of this investigation are the changes to be anticipated in educational and other social institutions. Should effective infant day care programs be widely established, a much larger proportion of more cognitively complex and self-reliant children would be expected to populate the elementary schools in a few years. This would seem to need a series of shifts in the programs, expectations and modes of teaching and handling children that would ripple all the way up the developmental scale as the children progressed. The roles of children in the community at large, now already broadening through urbanization, educational up-grading, and the continuing revolution in technology, communication and transportation, would unquestionably face further transformations. Greater responsibility for personal decision making and planning and preparing their own educational and developmental courses and involvement in community planning and activities would naturally be expected much earlier.

This three year investigation has sketched out some major bases for developmental expectations of this kind. The size of our samples, particularly for inner city babies, however, together with the methodological limitations

inherent in a field study, dictate the importance of designing further studies on infant education and care to verify and refine the information emerging in the present study. Many other avenues, untouched or only barely touched on - the nature and role of cognitive styles and language - are both apparently critical for cognitive development; the process of and techniques for facilitating creative activity; the role of memory; how interpersonal orientation toward autonomy and cooperation can be better and specifically fostered; detailed study of variation in the number and intensity of relations with adult caretakers and their relation to developmental timing and attachment relations with the mother; careful assessment of the relations between program and other environmental influences and developmental timing and sequencing - how much of what kind of gains are realized by starting N months earlier in relation to what has gone before; development of a much greater variety of well designed, age-appropriate infant toys and learning materials that are still rather scarce; the development of more diversified and logically based measures of cognitive, motivational, emotional and social processes at all ages and that are standardized on Canadian populations; study of the relations between methods of care and education best adapted to different cultural and subcultural groups and family systems; and many other problems call for continuing, intensive investigation.

Without doubt the most urgently needed research and development strategies are also the most expensive, methodologically complex, time consuming and difficult to undertake. Our investigation studied infants as early as the first few months of life but was truncated at 2 1/2 years of age. It is essential that longitudinal studies be undertaken, monitoring development

and in some instances designing programs to influence the long term development of these and other, larger samples of children, starting early and continuing well into school age and ultimately adulthood. There is no more socially and scientifically significant measure of the effects of infant experiences than its assessment in relation to long term and cumulative developmental consequences.

Supplementary References

Ainsworth, M. & Bell, S. Attachment, exploration, and separation: illustrated by the behavior of one-year-olds in a strange situation. Child Develpmt., 1970, 41, No. 1, 49-68.

Bayley, N. Bayley scales of infant development (with Infant Behavior Record). New York: The Psychological Corporation, 1969.

Blishen, B. R. A socio-economic index for occupations in Canada. Canad. Rev. Sociol. & Anthropol., 1967, 4, 41-53.

Caldwell, B., Wright, C., Honig, A., & Tannenbaum, J. Infant day care and attachment. Presented at the 46th Annual Meeting of the American Orthopsychiatric Association, April, 1969.

Fowler, W. Analytic-integrative forms of cognitive style in infancy and early childhood. Research and Developmental Proposal, Toronto: Ontario Institute for Studies, in Education, 1970. (b)

Hunt, D. A conceptual level matching model for coordinating learner characteristics with educational approaches. Interchange (Ontario Institute for Studies in Education Research Journal, 1970, 1.

McCarthy, D. A. The language development of the preschool child. Minneapolis: Univ. of Minnesota Press, 1930.

Meeker, M. N. The structure of intellect. Columbus, Ohio: Charles E. Merrill, 1969.

Miller, D. J., Cohen, L. B., & Hill, K. T. A methodological investigation of Piaget's theory of object concept development in the sensory-motor period. Presented at the biennial meetings of the Society for Research in Child Development, Santa Monica, Calif., March, 1969.

Rheingold, H. & Eckerman, C. The infant separates himself from his mother. Science, 1970, 168, No. 3927, 78-83.

Terman, L. & Merrill, M. Stanford-Binet intelligence scale. Boston: Houghton Mifflin, 1960.

Weikart, D. Revision of E. S. Schaefer and M. Aaronson Infant Education Research Inventory: Mother's Behavior with Teacher and Child during Teaching Sessions. High Scope Educational Research Foundation, Ypsilanti, Michigan, 1969.

Appendix A

A Developmental Learning Approach to Infant Care in a Group Setting

by

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Presented at the Merrill-Palmer Conference on Research and Teaching of Infant Development, February 11-13, 1971. Revised for publication in the Merrill-Palmer Quarterly.

A Developmental Learning Approach to Infant Care in a Group Setting[1]

Infancy is the most malleable, rapidly changing and least organized period of human development. Never again will there be the same potential for establishing basic forms of understanding, style and feeling in all domains of experience. Early experience is the primary matrix from which all of later development is generated.

This is the concept that governed the design of our program of total care and education for infants. All of the child's relations with the physical and social environment were the subject of attention. The program followed a developmental learning approach: the methods of care and stimulation were developmentally adapted and sequenced to the processes and understanding of the age period.

The investigation was a three year joint effort between a research group of the Ontario Institute for Studies in Education and the teaching staff and student teachers of Canadian Mothercraft Society, designed and based on program guides written by the principal investigator (Fowler, 1968 (a) & (b), 1969). The program was set in the day care facilities (an old mansion) of Canadian Mothercraft in Toronto. There is accommodation for around thirty babies for all-day care; there are spacious and well-equipped

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[1] This investigation was made possible through generous grants of the Atkinson Charitable Foundation, the Ontario Institute for Studies in Education and Commissioner of the Metropolitan Department of Social Services, John G. Anderson. The investigator wishes to express his appreciation of the generosity of the President, Mrs. Audrey Burger, and Board of Directors of Canadian Mothercraft Society for sponsoring the collaboration and making available their staff and facilities. Many other people have contributed to this project at various stages, especially, Mrs. Norma McDiarmid, the Director of Canadian Mothercraft Society, Mrs. Bernice Laufer and Mrs. Darla Grubman, project directors, Miss Sandra Fecht, for parent guidance, researchers, Mrs. Mila Ibe, Muriel Lo, Mari Peterson, Ann Rotstein, James Sutherland, Sue Tanzer, and Sonya Ward, past directors of Canadian Mothercraft Society, Miss Helen Boothe and Miss Patricia Calkins, the Mothercraft teaching staff, Mothercraft and OISE students, and, above all, the infants and their families.

playrooms (for both fine and gross perceptual-motor activities), sleeping, eating, and toileting facilities, kitchen and dining facilities for adults, infant diet kitchen, office space, library and meeting rooms, research laboratory and a very ample shaded playground.

Objectives

In the broadest sense, the two core objectives of the investigation were: (1) to probe the significance of early experience as a foundation period for developmental learning, through (2) establishing a quality program of group day care and education for infants to serve as a model to foster infant day care in Ontario and elsewhere in Canada. The program was aimed at two types of families in particular need of infant day care, working mothers and families in poverty. Both groups of families, for different reasons, are often confronted with conditions for rearing young children lacking in the psychological and socioeconomic resources necessary for optimal development of infants. Integral to this comprehensive effort, was a host of research and development activities embracing infant program development (methods, materials and teacher guides); guidance and education programs for infants, students and parents; evaluation; exploratory research projects on subsamples of children; and development of program-related measures.

In this paper I would like to summarize briefly the major characteristics of the design, the families, the program and the evaluation in order to devote more attention to program dimensions intended directly or indirectly to facilitate infant development. I will also discuss many of the findings on infant development. Additional findings on infant development and results on students and parents are available in a final report on the investigation.

Research Design, Sampling and Program Overview

The general design for treatment and evaluation was comparatively simple, depending in some part upon the policy and characteristics of the Mothercraft center and the limited research resources. There was a regularly evolving group of 25 to 30 babies, of middle class, working mothers from 3 to 30 months old, assessed twice each year on a set of cognitive and socioemotional developmental measures. Replacing part of this basic population at any time were seven babies from economically disadvantaged families, the number determined by the capacity of the single microbus affordable to transport these children to the center. Middle class babies were deposited and called for by their parents.

Except for age (under 6 months whenever feasible), sex and absence of organic and gross emotional disturbance, sampling criteria were determined by admissions policies aimed at service for working mothers according to order of application and need, with priority to single parent families. The developmental learning progressions of a slowly accumulating (over 3 years) sample pool of infants were studied over periods of 5 to as long as 28 of their first 30 months. Attrition was comparatively low: the mean length of stay (of children who attained graduation age or dropped out) was close to 15 months both for the advantaged and disadvantaged. Criteria for disadvantaged infants were age (3 to 6 months), sex, parents with no more than tenth grade education and English speaking, and constraints on emotional disturbance and organicity similar but broader than those applied to advantaged infants. Children from both advantaged and disadvantaged groups were ethnically diverse, very few from either group being black.

Control children were initially selected for the first year sample of 18 working mother (advantaged) infants, until cost factors precluded further recruitment of controls. These exclusively home-reared controls were matched in pairs with day care infants (who were of course partially home-reared) on the basis of age (within 2 months), sex, age placement scores of the Bayley Mental Scale (including Kohen-Raz (1967) subscale derivatives) and the Bayley Motor Scale, and years of parent schooling (neither parent differing generally more than one year from his opposite member in the other group). Family characteristics like occupational level, number of siblings, parent age and marital status were considered in gross terms. The omission of developmental IQ norms from the research version of the Bayley Scales used the first year and the slight modification of the published version employed for the second and third program years (the order of a few items was altered) unfortunately weakened the original matchings. Selected assessments of the original controls have continued until graduation of their day care sample mates.

The program was developed in three spheres, all of which converged in a central purpose of enhancing infant development and learning. Most important was the management of influences operating directly on the infants; two other spheres of student teacher education and parent guidance were both additional levers to maximize the range of influence exercised on the infants' development; they also yielded long-term benefits of their own. The infant program itself divided the child's day into three major categories of activity: (1) developmental routines of physical care that occupied the child inversely according to age; (2) an abundance of self-regulated

free play in well stocked and arranged environments (indoors and out); (3) and guided learning of infants individually (singly or in small groups) in planned play activity. There were also neighborhood walks and excursions as an occasional fourth activity. The program followed a set of general principles of cognitively defined and emotionally oriented care and stimulation and specialized methods appropriate for each type of activity, to be outlined presently in detail. Th principles are set forth in a number of conceptual papers (Fowler, 1965, 1967, 1970, 1971,(a) & (b), in press; Fowler and Leithwood, 1971) as well as in the program guides (Fowler, 1968 (a) & (b), 1969).

There were two components to the one year program of student education, an academic program and a training practicuum. The academic courses covered child development, infant education, health and care, and mental health. The practicuum consisted of training in specific techniques and problems of infant care and education imparted through tutorial demonstrations (live and on videotape), small group discussions, and guidance during actual care-taking and teaching routines.

Parent education and guidance was implemented primarily through an inservice trained parent worker using a parent manual written for this project (Fowler, 1968(a)). Working mothers were visited mainly in the evening or on weekends but occasionally at lunch hour; communication was supplemented by telephone contact and daily encounters with staff and students when the baby was delivered and called for. Visits were scheduled three or more times per year (plus a few parent nights), depending upon need, but during some periods as often as several times a week with a few disadvantaged families.

The aims of the parent program centered on educating parents in play methods of infant care and stimulation through home demonstrations and discussions. Disadvantaged parents were supplied with extensive practical information (coordinated with community agencies) to meet chronic needs for coping in family and community living beyond the discussions on infant care and education furnished all parents. There was a circulating book and toy library set up for disadvantaged babies, and their parents observed and discussed methods at the day care center from time to time.

There were semi-annual infant developmental evaluations using the Bayley Mental and Motor Scales and Behavior Profile, the Binet Scale, and the Schaefer and Aaronson Infant Behavior Inventory (unpublished) for assessing socioemotional development. Mental tests were also scheduled within 1 to 2 months after entry into and just before departure from the program. The Uzgiris and Hunt (1964) sensory motor scales were also employed on subsamples of children, as well as selected measures of language, object concepts, social adaptation, cognitive style, and other cognitive functions, usually related to focused developmental learning projects. Parents were evaluated through the Schaefer and Aaronson inventory of mothers' responses to guidance on infant education (unpublished). Each annual class of students was assessed three times on a paragraph completion test of general concept level by Hunt et al (1967). The scale measures development of relativism, abstraction and generality in social rules and correlates with teaching competence. There were also self- and teacher ratings on student development.

Dimensions of Infant Program

Domains and Developmental Organization of Experience

The conceptual framework, from which the principal investigator derived the program principles and methods, came from many sources. In my view the infant is a perceiving, thinking, learning, feeling and acting creature whose developmental progress evolves through learning and working out mental constructs of environmental relations and of the relation of his own actions (problem solving strategies and skills) to environmental patternings. Emotions are aspects of his reactions to acquired values about and his pleasures and dissatisfactions in coping with the environment. As the infant learns developmentally, he moves from a relatively reflexive state, knowing little and responding semi-automatically in discrete and uncoordinated ways to specific stimuli, to a relatively organized and self-regulated state of competence around two to three years of age. By then the infant has acquired relative physical mobility, a good foundation of language comprehension and syntactical rules for language production, and rudimentary generalizations about and cognitive strategies for acting in the physical and social world. He has a firm idea of the existence of objects, some knowledge of causality and of spatial and temporal relations generally. He can see himself as relatively autonomous and is able to interact concretely with both peers and adults.

Several dimensions of infant development appear particularly relevant to the design of infant developmental learning programs. First, cognitive development may be defined as the acquisition of hierarchies and networks of rules that can be logically programmed to facilitate cognitive developmental learning. There are general rules about how the world is structured (general dimensions and processes), rules for problem solving strategies, language system rules for generalized and abstract information processing, and rules for types of knowledge, including information (or object) concepts of common categories like household objects, vehicles of transportation, archeology, plant forms, and so on. It is the acquisition and organization of mental processes in terms of rule systems that enables the child to deal cognitively rather than associatively on a rote basis in his encounters with the world.

Two, development proceeds sequentially from the simple to the complex, a step or two at a time. Developmental leraning tasks for infants, should, therefore, consist of laying, bit by bit at each child's level and pace, the foundation rules for knowledge, language and problem solving strategies.

Third, the mechanisms of mental development are composed of interweaving processes of analytic and integrative operations within the framework of the level of rule understanding the child has acquired. Stimulus tasks should be designed, therefore, to induce, at increasingly complex levels, cognitive modes of identifying stimulus elements and relations of rules (analytic processes) and mentally constructing and reconstructing environmental relations into larger groupings of rules (integrative processes). In this way the child gradually acquires an increasingly differentiated but continually reorganized rule picture of the world.

Fourth, the amount and forms of stimulation cumulatively experienced determine the level and type of mental organization infants develop. The long-range strategies of developmental stimulation for all types of knowledge are accordingly as important to consider as the tactics employed in any learning situation.

Fifth, the form and emotional climate of interpersonal attitudes and relations are basic to the development of cognitive and social competence. The skill, sensitivity and emotional support of adults in their teaching and ordinary caretaking activities, as well as their effectiveness in encouraging autonomy and mediating peer relations, are essential aspects of quality emotional orientations.

These general propositions determined a great deal of our approach to infant care and education. We used every oppertunity for contact with the babies as a means of facilitating understanding and generating emotionally satisfying relations with people and things.

Emotional Sensitivity and Cognitive Stimulation in Methods of Physical Care

The value of applying these principles of developmental education to the developmental routines of physical care is directly proportional to the prominence routines occupy in the life of dependent infants. The importance of cuddling and fondling infants in the feeding situation has been widely emphasized, without equivalent attention being applied to the significance of cognitive interaction. Students were trained to be gentle, express warmth, fondle the baby, and be sensitive and flexible with respect to his needs at all times. But great stress was also placed on expanding the infant's ability to participate in his own caretaking procedures.

A cognitive orientation to infant caretaking is a necessary complement to an emotional orientation to lay a foundation for autonomy and problem solving strategies needed for environmental mastery.

For instance, self-feeding was encouraged as early as possible, first through familiarizing then guiding the child in handling the tools. In the earliest periods, the child's efforts were engaged in handling the nipple, soon succeeded by helping him to hold the bottle; later a similar progression was followed for eating solids with spoons. In the same way, the infant's energies were gradually enlisted to cooperate in the control of his postures and movements in dressing and undressing. It is not enough to wait until a baby seems to be ready. Effective caretaking strategies anticipate the development of sensory motor skills and understandings, by first drawing the child's attention to past processes in caretaking procedures to prepare the ground for smoother and more rapid learning of coping skills.

Key to this process is an extensive use of language in simple, clear form. Baby talk, except for a few diminutives to facilitate rapport, was discouraged because it blurs the language forms babies need to imitate. Long before speech itself can develop, using language to label and describe objects and events in a caretaking routine is a powerful agent for developing the infant's receptive language and cognitive comprehension of the world about him.

The repetitious, somewhat ritualized character of these daily caretaking routines make them ideal situations for learning about a variety of everyday objects (items of cooking, clothing, bathroom fixtures, types of

food, eating utensils, furniture, parts of the body, etc.) and relations and functions (eating, sitting, on, under, beside, holding, etc.).

Another of the natural advantages of these routines for facilitating learning is the ease with which they permit coordination of language description with environmental events. Piaget has stressed the importance of sensory motor operations for the infant level (1952). While I feel it is essential to anchor all stimulation for infants and young children in concrete activity, language is early significant as a cognitive organizing and abstracting tool as Vygotsky (1962), Luria (1961) and many psycholinguists (Chomsky, 1957) have underscored. For this reason the use of language by teachers and students was almost everywhere encouraged. It is interesting, parenthetically, how many young adults became self-conscious, finding it difficult to use language freely with young infants, apparently because the latter can give no feedback in verbal form. Only after a period of training and experience with infants, perceiving the richness with which language eventually developed in our toddlers, did students become convinced of the importance of early, extensive language stimulation.

The Organization of Physical and Social Environments

Both the physical and social environments in the day care center, and to some extent in the home, were the subject of continuing analysis and organization. Our aim was to develop arrangements best suited for the child's productive exploration and enjoyment of activity to facilitate his development. With respect to social environments, the presence of a teacher education program supported teacher-child ratios enviable to those of almost any other

center. From our experience, I have drafted what appear to be optimal teacher-child ratios relating to the development of autonomy, control, and social and cognitive functions for three different age groups - 0 to 12, 13 to 21, and 22 to 30 months - as shown in Table 1. These ratios, it should be

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Insert Table 1 about here

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emphasized, were developed in a context of highly enriched care and stimulation, which of course these high ratios were designed to ensure.

Actually, the economics of day care seldom permit teacher-child ratios of better than one to four or five in most programs even at the infant level. For this reason and because of our role as a community model, considerable attention was devoted to the organization of room environments and group processes. A detailed description of these processes and accompanying techniques are contained in several guides (Fowler, 1969). These and other processes will be sketched in discussions to follow on our organization of free play environments and the structure of guided learning situations.

At least as important as the ratios were the attitudes, understandings, and organization of social relations in the center. Actually, our problem was in part that of programming adults in space so they did not intrude too much upon the infants' psychic sphere (some private play is considered essential for the development of self-propelled personality and cognitive systems), nor interfere with one another by occupying too much of the social and physical space.

Children crawling freely in the halls and spontaneous cuddling alternated with guided inquiry into processes and problems. Intimacy and play along with learning and cognitive orientations toward activity pervaded the atmosphere. Both orientations were reflected in the formal and informal interactions that succeeded one another many times in the cycle of physical care, free play and guided learning activities followed throughout the day.

For purposes of training, students were regularly rotated among the three infant age groups every few weeks and, in addition, spent several weeks of their training year in field work experience in other infant day care and nursery school age centers. This means that the continuity of individual attachment relations between infant and child was maintained more with the permanent teaching staff than with students. From informal observations and incomplete data on measures of social adaptation, however, we seemed to find that except during initial periods of adaptation for some infants (usually during the stranger anxiety period from 8 to 12 months or so), it was the quality of relations and the casual play-oriented atmosphere in the center that was far more important for the psychic welfare of babies than the fate of specific attachment relations. The large majority of our babies adapted socioemotionally very well within a few days. Most of them showed moderate to high responsiveness to the many strangers who visited the center, readily leaving a familiar caretaker in response to physical and verbal overatures by a stranger. Probably because of the dearth of male caretakers, however, our infants showed some preference for adult females over males. They were generally inquisitive in play and curious to explore unfamiliar physical objects and environments.

The good social adaptiveness of our babies suggests much in favor of

the kind of intensive, multiple relations that resemble the "distributive relations" with which Margaret Mead early characterized attachment life in the extended family and folk community.

The Design and Regulation of Play Environments

Each playroom (as well as the outdoor playground) was richly equipped with a variety of play materials and equipment. Materials were distributed according to function in zones of activity. Each playroom was divided into several zones partially separated by toy shelves and partitions to regulate traffic flow, social density, and visual and auditory interferences to concentration and perseverance in play. The area divisions were more operative for the two older age groups (from 12 months on) as a function of their developing mobility. Specialized toys were rotated at intervals of a few days or weeks to maintain stimulus novelty and to limit the options available in order to develop depth in mastering the concepts intrinsic to each toy.

A basic activity repertoire of the several zones consisted of a book and story area; a floor play area equipped with unit building blocks, miniature replicas of people, animals and vehicles and other appropriate props; an area for sociodramatic play; a table play area for fine perceptual-motor activity in concept learning, with puzzles, form boards and other sensory motor and construction toys; a music area; and an area for art activity. There was also an area for the observation of plants and animals like guinea pigs, gerbils, and so on. Not all of the activity zones were in every room; for example, periods of gross motor activity indoors in bad weather were usually scheduled in playrooms equipped with climbing equipment and wheel toys for this purpose.

The value of play rests upon the opportunities it offers for self- or peer-regulated mental activity in sensory motor exploration, problem solving, and sociodramatic activity. Play is a relatively open-ended activity encouraging the use of fantasy, the discovery of new relationships, and the mastery of half-formed concepts (assimilation in Piaget's scheme of things). Play materials are designed in structures whose manipulations intrinsically foster the learning of cognitive rules. Experimentation and construction activity in these rule operations (e.g., object relations, object permanence, causality and processes of analysis, integration and creation) complements the concept learning stimulated by adults in planned programs.

There is nonetheless a significant though complex role for teachers to guide and develop children in free play. By periodically slipping in and out of play situations, a teacher can introduce or reinforce a concept through timely demonstrations combined with brief verbal comments. She can, for example, demonstrate a linear concept by placing blocks in a row, the concept of enclosure by completing a wall, the distinction between a sailboat and a motor boat by drawing attention to salient features, (e.g., sail versus motor) or stimulate social role play by recalling the activities of a truck driver or carpenter the children have recently seen. She can draw attention to alternative materials when too many problems arise or interest flags. She can widen horizons and foster collaboration through suggesting alternative social roles and tasks for various children in group activity. At the infant level, sociodramatic and other play activities are necessarily quite limited. But the role of the adult in stimulating children's play is significant

in proportion to her skill in minimizing her intrusiveness, in her sense of timing, and in her conceptual focus in selecting concepts closely related to the ongoing play. Apart from other sources of developmental progression, the persistence, autonomy, collaborativeness, and complexity of children's play is very much a function of a teacher's competence in this subtle sphere.

Developmental Principles for Guided Learning.

The same general principles of emotional flexibility and cognitive orientation were applied to the structure of guided learning situations as were applied to all other types of activity. The distinguishing features of guided learning were the initiative of the teacher in setting up and regulating activities and the implementation of a teacher plan. Materials and learning tasks were selected, organized, and sequenced over time, extending through several weeks or months of daily sessions. Planned play sessions were interspersed with quiet and vigorous periods of free play and with physical care routines to balance complex learning and attentional demands with alternating attention to other psychological and physical needs. Each child typically experienced daily from 4 to 8 guided learning sessions of different degrees of organization. Day care is a very long day, typically from 7:30 or 8:00 to 5:00 or 6:00 in the evening. Children need a definite plan of well conceived and adult stimulated activities to sustain their enjoyment and comfort at the center throughout the long day. Systematic planning need not, indeed did not mean rigid organization and scheduling. The type of planning required for flexible scheduling of principle-oriented teaching activities, while perhaps more complicated than rote schedules and learning plans, is within the developmental competence of high school students, as we repeatedly found with most Mothercraft students.

The principles that governed the organization of a guided learning session centered on (1) simplifying the presentation of learning materials and (2) introducing them through play and problem solving activities to arouse and sustain the child's motivations. Language explanations were used extensively but selectively in direct relation to the manipulation of objects. Teacher interest, praise, and task remodeling and re-explaining were encouraged more than verbal correction (negative reinforcement) as a combined means of illuminating relations and motivating children. Guided learning in small groups required the teacher to shift her attention regularly from child to child to ensure that interest and learning progression were individualized. Group contexts were assumed to motivate children to develop through their identification and desire to participate with others.

Collaboration between pairs of children was also fostered through setting up joint tasks as, for example, suggesting two children search for alternative pieces in the same puzzle or form board. Upon occasion toddlers were encouraged to interact in teacher-pupil roles like demonstrating a task (e.g., placing a ring on a peg or locating the steering wheel of a car) for another child. Play activity props such as blocks, miniature animals, and a variety of containers for developing interesting targeting, inserting, hiding, and other instrumental activities were useful for maintaining and diversifying the play. In this way, learning concepts was at times incidental to the major line of the play.

Teaching babies can be difficult because the size of their learning steps, the rules they can learn, is relatively so small to our adult eye, that it is often weeks before substantial changes in object recognition,

language, or mastery of a sensory motor task become visible. The world the infant has to learn is composed of fine-grained patternings of the environment; to the adult, these have long been "perceptual givens" of the world, hard for him to realize they were not always part of his understanding.

But given this apparent lag between input and developmental outcome, how did we design complexity sequences for stimulus presentation and task guidance? For stimulation in physical care, as well as in planned projects, we had little alternative than to rely on our experience with the levels of functioning we observed for babies at different ages, together with the information base provided by developmental norms, test data, and Piaget's observations. The approach is not so crude as it might at first seem. The range of skills and understanding that characterize three, eight and eighteen month olds produce strikingly different behavior patterns at the respective levels. It is clear, for example, that an eighteen month old can survey, label, and handle an array of several objects. A six month old can rarely coordinate hand and eye with more than a single object at a time except briefly in passing. There are, in other words, general developmental levels of complexity that determine the number and kind of units and intricacy of relations that can be handled. These levels served as guidelines for teachers in their daily teaching and caretaking roles with babies.

There was also the useful, though insufficient mechanism of feedback, the cue that a teacher uses to tell her how well she is tuned in to an infant's understanding. Useful because it compels the teacher to change her method of presentation or lower the level of stimulus complexity in the face of

inattention or resistance on the part of a child; insufficient since errors of omission can also occur. Teachers may fail to adjust the complexity or novelty of stimulation to the outer reaches of the child's intellectual schema, as Berlyne (1960), Dember (1965), Hunt (1969) and the work on preference for stimulus complexity (Thomas, 1965) and novelty (Hutt, 1970) suggest. The child may well adapt and enjoy himself but not learn if he is stimulated at a lower level or at a slower pace than he is capable, or not stimulated at all in an area of activity for which he has potential.

Diagnostic Monitoring of Developmental Learning

It should be clear from everything said that our approach to handling and developing children was individualized wherever possible. The highly favorable teacher-child ratios our teacher education program permitted and the techniques we employed were all directed to this end in caring for the infants' needs, in arranging for productive play, and in guiding them in specific learning activities. Small group settings were used for both free play and guided learning activities precisely because miniature groups offer the advantages of group relations without sacrificing focus on individual styles and learning processes.

Sequencing project learning and using sensitive care and tutoring methods are not sufficient in themselves, however, to take account of all aspects needed to individualize developmental learning. Infants moved across a variety of play and activity situations from day to day and were exposed to multiple caretaking in the day care center and different experiences at home. Unless there is some concern for tracking and coordinating this myriad of experiences and their combined and cumulative effects upon the

child's development, optimizing each child's development remains at best an irregular affair. Operating on this assumption, our staff worked on a process that I call diagnostic developmental monitoring. The gist of the process is the maintenance of a continuing record of the major events occurring to each child and periodic assessment of each child's developmental progress in critical functions. The total record is regularly assembled in a profile of developing competencies to give some systematic picture of how a child functions sequentially and at any given point in time. The changing images of each child should not be left to fade in the laboratory, however, but are valuable as a feed-back control system for staff (and, where feasible, parents) to design learning activities and select techniques and styles for tutoring and relating to individual children.

The mechanisms as I have outlined them were not implemented in this project on a comprehensive basis. In our investigation we devised a few assessments to be fed into a comprehensive profile monitoring system, such as ratings on cognitive (e.g., analytic and integrative styles) behaviors in play and social relations, test score components, (including specific ability indices like the Kohen-Raz Subscales (1967) of the Bayley Mental Scale) and language samplings from natural situations. This complex instrument is now undergoing further development, soon to be more systematically evaluated in another longitudinal investigation on children from infancy to kindergarten age.

In our pilot work we tried out forms for students to use on a daily or, alternately, weekly basis to record three things: the major activities in which the child participated each day, observations on the child's progress, and motivational patterns. The core problem was maintaining

a balance between complexity and practicality. It is not easy to design an assessment system, sufficiently complex to be valid, yet simple enough for students and teachers to employ with ease and understanding. Theoretical awareness of the inner complexity of developmental processes is ultimately of little value unless concepts can be distilled to functional terms for teachers to use in the day-to-day decisions about children's development that everywhere have to be made. Unless the staff and parent who work with the child can understand and perceive the benefits, they will not willingly and reflectively employ the scheme. It then descends into a mockery of empty forms.

Still one of the most functional if imprecise devices for monitoring and influencing children's development were periodic "case discussions" we held on individual children. These were designed for training students, for evaluating testing sessions, or because staff member(s) were concerned over some child's problems. Discussions took place in seminars and meetings, sometimes following observations (through a one-way vision mirror or on videotape) of demonstration teaching or testing sessions. Information from several sources was usually available at these sessions, including records and staff comments on testing, playroom behavior and the home situation from the parent guidance worker. "Magical" improvements in a child's behavior occasionally occurred following a discussion, presumably traceable to students and staff gaining a more differentiated picture of the child's characteristics and reacting accordingly. The technique has been found useful when extended at random to any of the children, at times supplying needed attention for those colorless children who are nobody's favorite or nobody's scapegoat.

Preliminary Results and Discussion

I. Focused Developmental Learning Projects

There are four categories of specific rule learning in which a series of developmental learning projects were undertaken, namely, common information (object) concepts, language rules, instrumental problem solving, and dimensional concepts. Focused learning projects served a number of purposes. They provided basic research information; they furnished a research base for general curriculum programs, and they supplemented our general program of cognitive developmental learning to enrich the infants' experience in specific ways. It is in the nature of a service-oriented day care framework that sampling procedures and controls are necessarily limited. They are determined largely by the finite membership of the age-play group. Children's needs and playroom organization seldom permit division of a membership group into criterion subsamples, which would in any case simply further reduce an already minuscule sample size and present problems of contamination.

Experimentation progressed furthest in object concept learning, the culmination of which was a project on learning concepts of types of vehicles. After discussing this in some detail, I shall summarize briefly the developmental work in each of the other areas.

Object (Information) Concept Learning

This was a project designed to teach information concepts about two classes of objects, automobiles and trucks. Children, ranging in age from 20 to 27.5 months (mean, 22.9 months) were instructed for 20 to 30 minutes daily over a period approaching 3 months. The project was carried out

initially in a laboratory room, later in a regular playroom environment, sometimes outdoors. The aims of the project were to teach both object concept and class concept labels for each member of the two sets of vehicles. Salient features of each vehicle were defined to distinguish each vehicle as an object concept (e.g., crane of tow truck and removable top of convertible) and the appropriate vehicles as members of the class "car" (i.e., carries people) from others of the class "truck" (i.e., cab in front and carrier in rear). The chief questions that concerned us were (1) could two year olds be systematically taught as many as ten object concept labels in two sets of comparatively similar objects? (2) could they learn to employ "pseudo-class" concept labels and object concept labels interchangeably? and (3) could they acquire some rudiments of classificatory concepts as reflected in ability to sort the two sets of vehicles reliably into categories on the basis of verbalized requests using class concept labels?

In the learning situation several toddlers were grouped around a table. They were guided in play with miniature replicas (dinky toy types) of cars and trucks, together with a variety of blocks, miniature figures, boxes, and so on, as supporting materials for play. Learning was programmed. The stimulus objects were introduced only one or two at a time, attempting to ensure mastery of each step along the way before proceeding to each subsequent step. The series of complexity levels identified was (1) use of psyeudo-concept label and perhaps some distinctive features of cars and trucks with every exemplar; (2) learning the correct object concept label and distinctive features

for each of the exemplars of each set in turn (first cars then trucks); (3) comparing cars and trucks according to class labels and distinctive features; (4) repeating focus on object labels; (5) then alternating focus on class and object labels; finally, (6) sorting activities with both sets in combination. Although the sequence was not followed by the teacher quite as faithfully as described here, deviations were not marked and simplification, constant review, and the play orientation seemed to contribute to continuing progress and high interest throughout the project. Incidentally, as might be expected, the content of the project (vehicles) elicited consistently more enthusiasm from boys than the two girls - although both groups learned about equally well.

The results for the project were as follows: typically, at pretesting children could employ the class labels of car and truck appropriately to most (a mean of 10.13 discriminated[2] of the 11 object total) of the members of each set as shown in Table 2. They were unable to sort vehicles into

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Insert Table 2 about here

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groups according to the class labels, however, and they knew few of the labels for specific vehicles. The mean number of specific labels for all children for both categories was only 2.01 of the total of 11. There was little difference in scores between cars and trucks but some difference in scores between younger (.50) and older (3.25) children.

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[2] To simplify reporting, scores for the more difficult recognition process of identification, which run generally lower, will not be regularly cited in the text.

At posttesting all children made perfect scores in using both class labels and the total group of children applied a mean of 8.41 object labels correctly (or 75 per cent), a jump of 6.5 points. There were greater mean score gains in labeling trucks (4.0) than cars (2.5) and, generally, for younger (8.25) more than older (5.0) subjects, in both instances because of the lower starting base. Younger children attained a final level equivalent to that of the older subset (when both Identification and Discrimination scores are considered). With respect to classificatory operations, only one of the eight children sorted all 11 vehicles into two classes without error; but five other infants demonstrated some idea of classification through partial sorting, and all children could respond to and make use of the class and object concept labels interchangeably.

Several points can be made in interpreting these findings. It is first perhaps not too surprising that children around 20 to 27 months could learn a set of new labels for objects, some of which were no doubt familiar in this automobile culture of ours. By this age object-word generation should be a well-established rule in the repertoire of children manifestly bright and linguistically competent from participating in a highly enriched program of general cognitive stimulation. Mallitskaya (Slobin, 1966, p.139) succeeded in object-word training 9 to 18 month old infants, though not without difficulty. Lyamina (Slobin, 1966, p. 138) found children under 18 months hard to teach but that culturally familiar objects were no easier to teach than unfamiliar objects. In an early study Strayer (1930) accelerated single word vocabulary development in each member of a pair of identical twins, although many of the object labels learned may have been highly familiar ones the children were on the verge of learning.

In our study children acquired two labels for each of eleven objects, which they learned to employ interchangeably, along with the beginnings of superordinate relations. Welch (1940) reports a few first order hierarchical concepts in common domains like food and household items present in some bright children, but was unable over a six month period to impart genus-species concepts to 12 to 20 month old children (Welch, 1939). The slightly older age and advantaged stimulation of our infants are presumably responsible for their apparent progress. But the significance of this progress lies in the fact that it is one thing for a child to acquire concepts through repeated exposure to culturally valued phenomena in daily experience; it is quite another to set up task sequences that will teach selected concepts according to plan.

How great was this progress? At pretesting the children's use of class labels may be termed pseudo-concepts since the labels appeared to operate merely as undifferentiated object labels, often used instead of (but rarely interchangeably with) the more specific object label for a given car or truck. One may question, however, how generalized or stable the object labels, the dual labeling and certainly the developing genus-species relations were at the end of training. No formal transfer measures were possible at the time. Labeling and sorting miniature replicas, while indicative of a certain form of representational competence, tells us little of generalized concept competence in the real world. We do have evidence, however, from teachers that children occasionally labeled real cars and trucks appropriately, though not of course sorting them into groups.

Is this true classification? Probably not since the mental manipulation of concepts in verbal form in the face of engineered conflict à la Piaget was not even attempted. Yet, clearly, concept learning starts somewhere; the ability of the children to grasp some part of an idea of abstract grouping operations and inclusion-exclusion seemed evident in their partially (and in one case completely) successful sorting activities. Undoubtedly, the focus on criterion features aided learning, along with the play activity and choice of content. Parenthetically, the guided play and problem solving operations, which served as an activity context to motivate the learning, apparently generated much additional concept learning that would be useful to measure (e.g., spatial relations of on, in, under, etc.). The individualized sequential approach probably contributed to the fact that every child in the training group made substantial progress, regardless of age and general ability. There is evidence, however, that sequences proceeded too rapidly at certain points by moving from object labeling to interchangeable object-class labeling and sorting before all object labels had been mastered.

Language Learning

The entire general program was permeated with language to guide and illuminate the infants' activity but there were, in addition, two projects concerned with exploring language learning in more specific ways. One of these was designed to program the operations of language in concept learning in a highly controlled manner through the medium of a language-mediated, discrimination learning apparatus. The other was a program for teaching beginning syntactical rules for making language statements. In the latter project sentence presentation was closely coordinated with the physical operations the sentences represented.

The language-mediated, discrimination learning apparatus presents a two-choice visual stimulus display of miniature animal (or other) replicas, which are attached as handles to doors in a panel. When an infant pulls the correct animal in response to a language instruction (e.g., "Pull the cat"), the door opens to reveal a concrete reward (a trinket or bit of dry cereal). Several sorts of motivational systems are considered to be involved - social, intrinsic sensory motor, and extrinsic concrete reinforcement. By varying systematically the language statements and stimulus materials, it is possible to program learning in complexity, for example, in terms of functions or classes (e.g., "Pull the animal that gives milk", or "Pull the amphibian"). Among other things, the apparatus is designed to compare the developmental effects on children of (apparatus) controlled versus flexible, play activity forms of learning.

Over a series of pilot studies, 10 to 18 month old children have regularly developed correct object choice behavior to one of two stimuli, on a criterion of 13 of 15 trials, but seldom when stimulus choices are alternated randomly and position responses controlled. Problems of attentional distraction and motivational drop have led to the design of a relatively precise and automatic tape programmed, prototype model, now under construction. One of our first objectives will be to ascertain what proportion of these attentional problems have been due to the inefficiency of manual control and how much is intrinsic to a paradigm that may be inappropriate to the characteristics of infant-human cognitive processing systems.

The program on language rule learning is designed to teach a sequence of levels of beginning language rules in conjunction with the manipulation

of miniature doll figures and other toys in play. The levels consist of object labeling (nouns), action labeling (verbs), combining these descriptions into subject-predicate phrases and later adding qualifiers (adjectives), noun objects and prepositional relations. The final level in the beginning series is illustrated by the statement, "(The) red cow walks to (the) barn". The method attempts to induce rule understanding by relating language structures closely to the concrete sensory motor processes to which they apply. Operations are developed as general rules by showing the equivalence of "modular" forms across specific operations as, for example, in "the boy stands, walks, runs, sits", and "the boy runs", "the girl runs", and "the dog runs".

In an exploratory project on language rule play, seven infants from our general program participated in a sequenced series, three times weekly over a period of two to four months. The infants ranged in age from 15 to 20 months, a period when readiness to learn syntactical forms might be expected though none had been observed in these infants. In the course of language guided manipulation of toy human figures in play, several children reached a level of verbalizing noun phrases like "boy walks" and "daddy lie down", three in imitation, two in answer to the question, "What does this one do?" (elicited response), and one child spontaneously. All children readily learned new noun and verb labels that they sometimes applied spontaneously. Further investigation is planned to define and evaluate the utility of these sequences. It is important to determine whether programmed language stimulation will develop generative rule processes across situations beyond what may be expected through cultural norms or even the broad gauge stimulation of our demonstration program.

Problem solving activities of an instrumental character have been explored in two ways. One of my students developed a series of perceptual variations on a drawer opening problem which she taught infants for her Master's thesis (Henninger,1968). Six 16 to 20 month old infants of average IQ were, after two months of twice-weekly teaching sessions, able to open both criterion and two of three transfer boxes to obtain a lure significantly more often than four controls. Successful infants displayed signs of cognitive processing in their analytic and integrative manner of orienting to boxes varying in shape, size, materials and position. They also tended to be more oriented to tasks than to social approval of the teacher.

More recently, I have begun to design a series of instrumental sequences for retrieval and placement of objects. The sequences range from object retrieval (by hand) in the infant's immediate perceptual-motor field at six months to multiple choice and/or tool assembly with two or more tools to reach objects across barriers by 18 months. Trial use of these sequences by teachers in the playroom has pointed up the need for more carefully designed, problem appropriate instruments.

A sensory motor form board apparatus is also under development. The apparatus consists of a set of 48 4" x 4" form boards (in a cabinet), graded in complexity according to shape, area, number and other concepts. Perceptual contrast between two values of each concept (e.g., circle and square or large and small area) is provided to induce concept awareness by juxtaposing two form boards (each with one value) contiguously in a tray designed for the purpose. The perceptual contrast operations with variables can be controlled sequentially, one variable or more at a time to develop concept

generalization. The amount of language and cognitive guidance can also be varied to study the role of adult (and language) guided versus self-guided (non-language) activity in concept development.

II. Effects of General Program upon Infant Development

All of the analyses of program effects presented here combine treatment effects from all sources, both direct influences of the general care and cognitive stimulation program in day care and indirect program influences operating through changes in both parents and day care staff and students from training and guidance programs. No separate analysis of student influences is possible because of the multiple infant caretaking responsibilities of students (and staff), but an analysis of relations between parent characteristics and infant development and of student development will be available in our final report on the investigation. The data on infant development represents the results of cumulative samples of all children who participated in the day care program long enough to be tested at least twice (>3 months) during some segment of the three year period of program development and research on infant development.

Insert Table 3 about here

Mental Development

Total Sample: Advantaged-Disadvantaged. The pattern of test means and standard deviations for mental (and motor) development of the total advantaged and disadvantaged samples are shown in Table 3. It will be

observed that the disadvantaged children, despite their initially higher mean IQ level (110.63 versus 100.00), made highly significant and slightly larger gains (19.17) than the non-significant, though still apparently substantial gains (16.11) of the disadvantaged. There is little change in standard deviation for either group. Differences in sample size and variations in time in program, age of entry and sex differences are, however, all confounded in this analysis. The final mean scores include both Binet and Bayley Mental tests, depending on age.

Insert Table 4 about here

A more exact comparison, (though on a reduced sample) of changes in mean mental scores between advantaged and disadvantaged infants appears to support the overall trend (Table 4). Tracing the course of development of a subsample of 9 advantaged children who entered the program within the same age period ($\bar{X}$ = 4 months) as the disadvantaged, we find significant mean gains for both groups between the first and second testing ($\bar{X}$ = 6 months period) close to those reported above for the entire mean maximum tine in program. The comparison for the longer ($\bar{X}$ = 12.5 months) period in the program, which again shows inconsequential differences in the amount of mean gain between the groups (14.88 versus 16.33 points), is based on fewer cases. Yet, as shown at the bottom of Table 4, if we compare gain scores over a mean interval of 18.5 months for all early entering infants of both groups who attained the age of Binet testing, the mean gains are larger and comparable for both groups at the 20 point level. Largely because of obvious limitations of the disadvantaged

in sample size only the gains of the advantaged group are significant. It will be noted that initial mean score differences between the two groups vary between 5 and 12 points.

Advantaged Infants: Day Care Versus Home Reared Controls. Comparisons between first year samples of advantaged children in day care and their home reared (matched pair) counterparts (Tables 5 and 6) show generally high mean

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Insert Tables 5 and 6 about here

IQ gains of 10 to 20 or more points favoring day care samples over their control samples, but significantly in only one comparison (partly due to the vagaries of small samples) and with some notable exceptions. Gains were large and favorable for the total sample (Table 5) despite the day care group starting from a significantly higher level and, especially, for children who started the program early (2 to 13 months) or stayed in the program 8 months or more (Table 6). The latter comparison shows the only significant difference in the amount of gain between day care and home reared groups, but half of the mean gain scores of the day care group are significant, while only one of the home reared group is. The very large day care mean gain of 36.50 points compared to a control gain of 18 points is based on only 4 pairs. Boys (Table 5) and children participating a mean of only 6 months in the program (Table 6) both made mean gains of about 10 points compared with control gains of about 3 or 4 points. Children who were enrolled at the age of 17 months or more registered relatively little gain, about the same or less than their controls (Table 6).

The most notable exception to the general trend favoring the day care group is the equivalence of the large gain scores (for girls) of both day care and home reared children (about 22 points) - of which only control gains are significant. Boys, it can be seen, did much less well than girls in both groups.

Advantaged Infants: Kohen-Raz Subscales of Bayley Mental Scales - Day Care Versus Home Reared Controls. As shown in Table 7, first year samples of day care infants tended to improve in their mean age placement scores on

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Insert Table 7 about here

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all of the Kohen-Raz Subscales (those within the age range of our samples) of the Bayley Mental Scale, compared to their home reared controls, except in Eye-Hand Control (Scale 1). Differences between the two groups were small at initial testing, again except for the significant difference for Scale 1. Both groups made significant advances in all scales, as might be expected for developmental age scales, but the gains of the day care samples were significantly greater for the basic scales of Imitation and Comprehension (Scale 4A) and Vocalization-Social Contact-Action Vocabulary (Scale 5A). Differences between groups were small and large, respectively (but in neither case significant), for the two branching scales, one, graphic imitation (Scale 4B) and the other, personalized use of language (Scale 5B).

Advantaged Day Care Total Sample: Analysis by Time in Program, Age of Entry and Sex[3]. Each of the variables analysed in Tables 8 through 11 show important differences in the amount of mean IQ gains for different conditions,

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Insert Tables 8 to 11 about here

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although the mean gains are often from 10 to 20 or more points in the several conditions, similar to the day care gains in the day care-control comparisons on first year samples. Thus, regardless of the length of time children participated in the program (Table 8) every group made significant mean gains of 10 to 20 points. However, when children participated 8 months or more (up to 20 months), their gains were generally approaching 20 points compared to about 10 points when they had participated 7 months or less.

The analysis by age of entry (Table 9) again shows mean gains of about 10 and 20 points for the total sample, but the larger and significant gains (22.00) are made by children who entered at 13 months or less, compared with the smaller (9.86) and non-significant gains of children who entered at 17 to 22 months. When age of entry and time in program are assessed together (Table 9), we see significant mean gains of 10 to 20 points continue for the initially younger infants (though again less for the shorter period), while the initially older infants gain only a mean of 8.20 points even after a mean of 13 months in the program.

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[3] No analysis by conditions was done for disadvantaged children because of the smallness of the sample and the fact that all entered early ($\bar{X}$ = 4 months).

Girls gained more than twice as much as boys (27.79 to 11.62 points) considering the total sample (Table 10), and consistently better in relation to other variables, but they also started initially at lower levels, sometimes significantly. Their mean gains are generally significant and substantially greater than those of boys, regardless of length of program participation (Table 11), though significantly so only on the Stanford Binet after a mean of 13 months in the program. Boys do make significant mean gains, however, when considered as a whole (Table 10) and after a mean of 10 months in the program when measured by the Bayley Mental Scale (Table 11). Both boys and girls who entered after 17 months made non-significant gains of about 10 points (Table 10), the only group where girls did not surpass boys in mean gain points including the day care-home reared control comparisons.

groups in

Motor Development

Total Sample: Advantaged-Disadvantaged. The test pattern of means and standard deviations displayed above (Table 3) show very little (advantaged group) to moderate (disadvantaged group) gains in motor scores compared to the substantial gains children of both groups appeared to make in mental test scores. Motor scores were measured over shorter testing intervals, however (about 9 to 10 compared to 12 to 14 months). Only the gain of the disadvantaged group is close to significant. Unlike the mental test scores, both groups are near the same average level in their initial motor scores, bringing the disadvantaged group apparently slightly in advance of the advantaged group at final testing. Changes in standard deviations from initial to final testings are small much as for the mental test changes.

When the mean changes of a sample of 9 advantaged infants, matched (as a group) in age of entry with the 9 disadvantaged children, are compared with the disadvantaged group's motor scores (Table 12), again neither group

Insert Table 12 about here

is seen to gain very much, nor are differences between gains significant. Moreover, after a mean of 12.5 months in the program the remaining six pairs still show no marked nor significant mean gains. The disadvantaged group gained a mean of 8.17 points, however, (to virtually no gain for the advantaged) indicating, as for the total sample (Table 3), the possible effects of longer program participation on the disadvantaged.

Advantaged Infants: Day Care Versus Home Reared Controls. Comparisons shown in Table 13 between mean motor score changes of day care and home reared

Insert Table 13 about here

children reveal the same trend of small to moderate changes reported for the total cumulative samples of advantaged and disadvantaged children. But here control mean gains fluctuate around 10 points to minimal experimental group gains. Of the former group, the total sample and initially younger infants (13 months or less) gained significantly (especially the latter, 13.33 points) and both home reared boys and girls gained moderately (nearly 10 points), although not significantly. In the day care group, the total sample gained little, girls and initially older infants lost slightly (if anything) and

initially younger infants and boys gained about 8 points, the gain for boys being significant.

In sum, boys and initially younger infants showed moderate gains for both day care and home reared groups. Both the total sample and girls of the home reared group gained moderately but the corresponding day care groups did not. There were virtually no changes for either day care or home reared infants at the older age levels. None of the differences between groups for initial or final testings nor for change scores were significant. (No comparisons between groups according to the time day care infants spent in program is possible because of discontinuation of motor testing of controls after the first year.)

Advantaged Day Care Sample: Analysis by Time in Program, Age of Entry and Sex. None of the analyses of motor score changes for the cumulative samples of advantaged day care infants (Tables 14-17) show more than moderate gains,

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Insert Tables 14-17 about here

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thus following the pattern for the total cumulative sample. Of these changes there is a significant gain for the 10 infants (Table 14) who gained a mean of 8.70 points over a mean period of 12 months in the program (discounting the 1-2 month adaptation period before initial testing). The mean gain is similar (though not significant) over a mean of 15 months in the program.

The effects of earliness of entry (Table 15) are slight (approximately 5 point gains for the younger samples), though significant over a 5 months period. The significant difference in final mean test scores between the younger and older samples seems partly due to the

slight loss of the older sample coupled with their initially (though not significantly) lower mean scores.

Overall mean differences between boys and girls in initial and change scores are minimal (Table 16). Both boys and girls, moreover, showed equivalent initial and moderate (but non-significant) change scores if they entered early ($\bar{X}$ = 8 months) or stayed longer ($\bar{X}$ = 13 months) in the program (Tables 16 and 17). Older girls (Table 16) registered a moderate (but non-significant) mean loss of 8.66 points, compared to virtually no change for older boys.

Socioemotional Development

Total Sample: Advantaged-Disadvantaged. In Table 18 is a comparison of

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Insert Table 18 about here

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cumulative samples of advantaged and disadvantaged infants on ratings on the Schaefer and Aaronson Infant Behavior Inventory over several testings. It is evident that, overall, mean item ratings, as well as means for positively and negatively valued items for both groups range typically from average to well above average levels of socioemotional functioning at every testing. There are in fact no more than three items at any testing for any sample that fall more than very slightly below the mean (2.50) for positive items or above the mean for negative items. And only a total of 5 fall outside the lower average range (below 2.0 for positive or above 3.0 for negative items). All of the general means are at or above average levels.

Because initial testings were all administered at a minimum mean of 7 months after entry, all ratings were expected to and do represent fairly constant adaptation values varying relatively little from testing to testing, as seen in Table 18. Correlations between testings varied generally between .50 and .90, indicating considerable stability of both ratings and subjects, once the latter were adapted. The small number of significant mean changes further bears this out.

At initial testing(s) there were no significant differences between the advantaged and disadvantaged infants for the major total sample comparison (first column of Table 18). Nevertheless, differences of about 10 or more percentage (.30 rating) points on verbal expressiveness and self-consciousness favored the advantaged on this comparison and on all of the other positive items for both of the other two initial testing comparisons, except contentment and rapidity in both and verbal expressiveness in the T_1 of the T_1-T_2 samples. Similar differences favored the advantaged on the negatively valued items of self-consciousness, distractibility, passivity and withdrawal for the initial testing of the T_1-T_3 comparison, but favored the disadvantaged on belligerence (less for the T_1 of the T_1-T_2 comparison. All combined mean differences between the groups for each T_1 comparison were minimal, but favored the advantaged for all three comparisons for positive items and the final comparison for negative items.

Changes in mean ratings on items between testings were generally small, non-significant improvements for both groups, but there were many more moderate mean changes, mostly gains for the disadvantaged. In mean ratings for positive and negative items, the advantaged remained stable over both intervals, except for a moderate improvement on positive items between T_1 and T_3. The disadvantaged,

in contrast, gained substantially on positive items and worsened on negative items over both time periods.

As shown in Table 18, over the shorter (4 to 6 months) interval each group made 6 significant changes, distributed about equally for each group over the positive and negative items. Four items increased in negative value for both groups, in one case the same item (belligerence). Over the longer (11-12 month) interval, the advantaged improved significantly on three positive items and the disadvantaged worsened significantly on three negatively valued items.

Aside from significant changes, on items that changed as much as 10 or more percentage points, the advantaged worsened on irritability over both time intervals, worsened on hyperactivity (T_1-T_2) and belligerence (T_1-T_3), but improved on both perseverance and attentiveness (T_1-T_3). The disadvantaged, on the other hand, gained generally more on all positive item ratings except attentiveness (T_1-T_2), and verbal expressiveness and contentment (T_1-T_3); they declined in contentment. They generally worsened in negative affect, hyperactivity and negativism over both time intervals and became possibly more fearful but less passive between T_1 and T_2.

In intermediate (T_2) and final (T_3) status, advantaged infants were about equal to or only very slightly higher than the disadvantaged in mean ratings of both positive and negative items for both sample comparisons at T_2 and for positive items at T_3, but they scored substantially better than the disadvantaged for the mean of negatively valued items at T_3. These patterns are reflected in the few mean item differences (2 positive, 1 favoring each group and 4 negative favoring the advantaged) emerging at either T_2 comparison, and only 4 positively valued item differences at T_3 favoring the advantaged

and one (rapidity) favoring the disadvantaged. On the other hand, all except two of the negative items at T_3 favored the advantaged. The overall means are above average for both groups for positive items and for negative items for the disadvantaged.

In sum, it is evident that nearly all socioemotional ratings ranged from average to high and that generally larger gains of the disadvantaged infants on positively valued items tended to equalize the status of the two groups on subsequent testings. On the other hand, larger disadvantaged group increases on negatively valued items (meaning worsening) apparently resulted in a greater comparative advantage for the advantaged infants at T_3. Only the disadvantaged sample did not rate above average in socioemotional level at final testing for both positive and negative categories - though they were still at the mean (2.54) for negative items.

Total Sample - Advantaged Children: Analysis by Age at Initial Testing and Sex. Mean score levels for all ratings on the Schaefer and Aaronson Infant Behavior Inventory were similar for younger and older infants and boys and girls (Table 19) as reported for the advantaged children as a whole (Table 18). Mean

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Insert Table 19 about here

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ratings ranged from average to high for all items and for means of both positively and negatively valued items at initial testing (T_1) and at a testing 6 months later (T_2). The only rating to fall below average was rapidity for younger infants and girls at T_1. As with the advantaged-disadvantaged comparison, ratings are in terms of socioemotional patterns after whatever adaptation expected to program was effected and thus were comparatively stable from T_1 to T_2.

At the first testing, older infants tended to exceed younger infants on the mean and most of the positive items but to rate lower on the mean and half of the negative items (except for passivity). Boys and girls, however, were about equal in both positive and negative item means. Boys exceeded girls on only two (positive) items (verbal expressiveness and rapidity) and girls scored better than boys on only two (negative) items (lack of belligerence and lack of withdrawal).

Changes for all groups between testings were very minimal. The means for positive and negative categories for older infants and boys remained essentially unchanged, while younger infants and girls gained on means for positive items, but younger infants lost on the mean for negative items, resulting in closely equivalent levels for all groups at T_2. All groups gained significantly on verbal expressiveness, and substantially (but only younger infants significantly) on belligerence (thus 'worsening' - probably developmentally). Younger infants and girls improved on four other items (both groups significantly on rapidity) and declined on three others (younger infants significantly on two). Older infants gained on three, two significantly, and boys gained on two and lost on one, none significantly.

At the second testing (the final testing, T_3, lacked enough cases for further analysis), the older infants exceeded the younger on 6 items and the younger exceeded in only two. Girls exceeded boys in two and girls exceeded boys in only one.

Discussion and Implications

There are several consistent findings in this three year investigation that have considerable significance for child development and infant care and education. At the most general level is the definite progress associated with program participation in infant mental development, found more consistently under certain conditions than others, and the generally satisfactory socioemotional and motivational adaptation of the children.

General Mental Development. Nearly all day care samples made mean mental test gains of about 10 IQ points or more, regardless of whether assessed on the Bayley or Binet Scale, except for some subsample assessments of boys and children entering the program at 17 to 22 months. The mean gains of advantaged and disadvantaged children were consistently similar (about 15 to 20 or more points), especially when age of entry and time in program were comparable, although the latter group started from an initially average level compared to slightly above average levels for the advantaged. It is clear that girls, infants entering the program within their first year, and infants remaining at least 8 months do substantially better (around 20 or more points) than boys, older entries and short-timers (10 or less points). For the most part, all advantaged day care first year samples advance consistently more than their home reared counterparts. (There are none for subsequent years, nor for the disadvantaged), except for girls (both groups gain more than 20 points) and older entries (both gain little more than 5 points).

In interpreting the general cognitive developmental gains, a number of considerations, some cautionary, some supportive, should be kept in mind. In the first place samples were small and the context was a field situation,

not the laboratory. The sources of environmental variation were manifold, constantly changing through multiple caretaking, staff turnover and staff and program development, the changing social composition of the peer groups, and many other factors. Control group comparisons lost some value because of the changes reported above in some items from the original matching on the research to the published version of the Bayley Scales. There was some possibility of ceiling effects in a few of the later Bayley mental scale testings, although none were manifest, would have operated in few cases, were limited to the Mental Scale and, if anything, differentially penalized high scorers - and therefore day care advantaged infants (especially girls) against their home reared controls and the disadvantaged. There were no measurable differences between comparisons based on changes from Bayley-Binet testings and Bayley-Bayley testings - unless in the form of slight (but not evident) ceiling effects on the Bayley or other unknown factors.

Overall, the consistency of mental score gains of nearly 20 points through cumulative samples totaling 39 infants (advantaged and disadvantaged together) suggests that something in the way of more than normative cognitive progression was occurring. Perhaps the best expression of the extent of these effects is shown (Figure 1) in the distributions of frequency values and cumulative percentages

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Insert Figure 1 about here

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in which over 45% of the infants from both groups gained from 20 to 50 points and 60% gained more than 10.

Infant testing is at best a fluctuating proposition, of course, predicting uncertainly to later intellectual performances (Bayley, 1933, 1949; Honzik, MacFarlane, & Allen, 1948). (Follow-up studies are planned to evaluate long-term developmental effects.) But the initial testing of almost every day care infant was delayed for one to two months, until he appeared to have adapted well to the staff and program. Moreover, the intimate acquaintance of testers with every day care child and the regularity of 20 point general gains and gains of girls, younger infants and longer participators, well beyond the 10 point gain level Zigler and Butterfield (1968) report from motivational adaptation (although for pre-school children), indicate that at least some part of the gains were cognitive rather than adaptational. It is girls more than boys who gain, however, and the first year sample of home reared girls gain as much (20 points) as the day care girls. But no adaptation experience was provided for control children, making adaptation effects likely to contribute to control gains between initial and subsequent testings. This comparison sample is small, covering only first year children, some for short periods, and countered by large and consistent gains of day care girls. On the other hand, the latter may be partly explicable because girls started at an initially lower level than boys, making final scores tend to converge (regression effects).

The effect of using instruments standardized on U.S. populations with Canadian infants remains an unknown influence. The tendency of scores to fall in "reasonable" ranges (all samples except advantaged boys fall at a mean of about 100) and to follow expected patterns of changes according to age, sex and length of participation, the experience (despite limitations) of other studies on Canadian children (Fowler, in press), the proximity of Canada to U.S. influences,

and the fact that item content at infant levels is apparently less susceptible to cultural differences (Bayley, 1965; Kohen-Raz, 1968) combine to rule out large systematic errors.

Development of Specific Cognitive Abilities (Kohen-Raz Scales). Within the methodological limitations of small (first year) sample sizes and other restrictions similar to those defined above, advantaged day care infants exceeded home reared children in their advances in all areas of mental competence measured - except fine motor, eye-hand skills (Scale 1). In particular, the gains were substantially and (sometimes) significantly greater on language, imitation-comprehension, and social communication skills. The comparatively limited age range of these scales, it should be added, reduced the Ns and/or scores because of ceiling effects more than on the the Bayley Mental Scale as a whole, which extends to 30 months (compared to 19 to 28 months for the component Kohen-Raz Scales used).

Motor Development. Gains in motor development for all infants, even under favorable conditions (i.e., early age of entry and length of time in program) were apparently moderate at best, though better for disadvantaged than advantaged infants and for boys than girls. The magnitude of the gains (generally around 10 points or less), and the possible tendency of home reared infants to do as well or better than day care infants indicate less program effects on motor development. As in the case of mental score changes, the (moderate) motor score improvements of the home reared children may be (in part) more apparent than real, in the light of probable adaptation effects between initial and subsequent testings.

Socioemotional Development. The general level of socioemotional development for both advantaged and disadvantaged children was generally above average throughout their participation in the program. What few initial differences there were between the groups were small and non-significant, though possibly favoring the advantaged on most positive items and four of the negative items except for belligerence which favored the disadvantaged (lower scores).

Most changes for both short (4-6 months) and long (11-12 months) intervals were small to moderate mean improvements for both groups, with few statistically significant changes. At least some of the changes (e.g., verbal expressiveness, perseverance, rapidity and belligerence) are probably in part age-linked, culturally normative developmental changes, as further supported by the comparisons of younger and older infants in Table 19. Changes were generally greater for the disadvantaged, who tended to gain more positively on nearly all positively valued items but also to decline more on most negatively valued items.

Changes of possible psychological as well as (sometimes) statistical significance may be observed in the clusters of gains and losses of each group. Both groups seemed to improve on verbal expressiveness, inquisitiveness, perseverance and attentiveness, items that reflect positive motivational aspects of cognitive activity, but also on the negatively valued characteristic of hyperactivity. They gained in the socially oriented traits of gregariousness and enthusiasm, but also increased in the socially negative items of belligerence and irritability.

Disadvantaged infants appeared to increase in most of the negative social traits (belligerence, irritability, negative affect, negativism) declined in contentment, but also gained in some positive social traits (positive social

response, gregariousness, enthusiasm and cheerfulness) - a finding reminiscent of Murphy's (1937) report of children scoring high in aggression also scoring high in sympathy. (This contradictory trend was less pronounced in the advantaged.) Their increase in hyperactivity, matched with a decline in passivity, and an increase in fearfulness all leave them still close to or above the mean and are balanced by the gains in motivational items like inquisitiveness and perseverance noted above for both groups.

It is to be noted that, at final testing, the advantaged infants scored at a high level on all items except rapidity and monotonous behavior, irritability and belligerence, for which they were average. The disadvantaged were high socioemotionally in all positive items except gregariousness, contentment and rapidity (for which they were average), but average for all items except irritability and belligerence, where they were high and thus below average (the only two low ratings for either group). All of these (possible) changes, it should be re-emphasized, left both groups still functioning generally at average to high levels, but the small disadvantaged sample somewhat more poorly than the advantaged on negative items.

Comparisons between the sexes and between younger and older advantaged infants followed much the same pattern of levels and changes (though only measured over the shorter 6 months mean intertesting interval). Socioemotional levels were uniformly moderate to high on nearly all items at both testings; all group means fell about equally above average at the second testing with few individual items slipping below this level. Older infants and boys remained fairly constant in mean levels and in the fewness of items changing, but younger infants and girls gained and lost on some items to further equalize their levels among all groups.

Changes and comparisons of possible psychological (and some in) statistical significance, partly developmental and partly due to program influence, include the apparently significant rise of all groups in verbal expressiveness, but also an increase in belligerence (significant for younger infants). Girls and younger infants tended to improve in certain cognitive motivations, both in inquisitiveness and girls (and older Ss) in perseverance. Both increased in socioemotional traits of irritability (younger infants significantly) along with belligerence and younger infants in distractability. Both increased in their activity rates as reflected in increased rapidity (both significant) and hyperactivity (significant for younger), and decreased passivity and less evidence of fatigue. Older infants and boys withdrew less (older infants significantly) and boys became more self-conscious and older infants more distractable (significantly).

Differences possibly favoring older infants at T_2 in cognitively motivating variables (verbal expressiveness, perseverance and concentration) are probably partly developmental (they similarly favored older infants at T_1), but other differences between the younger and older infants (older>younger in irritability, distractability and hyperactivity, and younger>older in contentment, rapidity and self-consciousness) do not seem readily explicable, particularly in the light of reversals from earlier (T_1) differences. Similarly, the two differences favoring girls (rapidity and lack of self-consciousness) and the single difference favoring boys (irritability) offer no ready explanations.

Methodologically, these ratings are subject to a number of limitations. There were no control comparisons. Different ratings were given by different staff members and students because of personnel turnover, although there were trial ratings and guidance by

research staff. The ratings nearly all apply to periods well after the child was well adapted to the center and therefore reflect minimum levels of socialization and socioemotional adaptation, as well as changes over time. There were almost no ratings made at time of entry because they were applied periodically at planned intervals regardless of age or time in program. Nevertheless, correlations between many of the ratings of the same subjects (advantaged, .73 and disadvantaged, .47) over the longer 10-11 month period suggest considerable stability of both ratings and subjects. Finally, the scale was originally designed for use with infants more than 12 months in age, but has proved useful with younger infants.

Implications

Among the more significant implications of our findings are what they augur for the value of infant group care. Quality programs - it is perhaps not surprising - can apparently insure adequate to high level development for all types of children in all areas - cognitive, motor and socioemotional. With few exceptions, all forms of functioning assessed show definite improvements or good adaptation. Cognitive gains were high generally and for all components (language, comprehension and social competence) except (possibly) where fine motor skills were involved - and these were at least adequate. General gross motor development was adequate and socioemotional development moderate to high in adaptation level. There remain, nevertheless, certain problems and differential effects.

On the one hand, it is evident that a program engaging general principles of cognitive stimulation (and supportive emotional care) produces general changes in intellectual development (g), much as Starr (1971) reports for several current

projects in infant education. On the other hand, gains were neither as great nor consistent in motor development, which, if we can trust the restricted evidence of the Kohen-Raz Scale on Eye-Hand Control (it had the lowest ceiling effect), applied to fine as well as gross motor development (most Bayley Motor Scale items and all after 10 months are gross motor functions). Competence, in other words, breaks down into some specific abilities, some of which may be overlooked in a general program. Staff was aware, for example, that developmentally mobile infants were too often carried by students (because of multiple caretaking demands) at the expense of the exercise of motor skill. Motor skills were everywhere fostered but not so systematically nor consciously as language, cognition and socioemotional competence. This differential emphasis not unnaturally shows up in the Kohen-Raz Scales and the overall Bayley Mental and Binet Scales (both of which encompass a high proportion of verbal items and cognitive processing in their motor tasks - the Bayley more at the upper end. Simple as compared to complex motor skills that are not measured in these tests may also be more governed by maturation (Fowler and Leithwood, 1971). The high, generally consistent and increasing socioemotional scores for all groups in the Behavior Inventory, but particularly on verbal expressiveness, cognitive motivational items (especially inquisitiveness) and positive social response further complete this picture. Of the few increases in negatively valued items (e.g., belligerence and irritability, which may have been partly a function of the permissively oriented program, only the disadvantaged attained high scores; all other groups remained around average or better in socioemotional functioning on these and other items.

Earliness of entry and length of participation both exercised important luences upon the extent of cognitive development realized. It would appear t quality stimulation programs with infants should begin at or before one r of age and that longer (>8 months) participation is likely to produce ater effects than shorter (<8 months) periods. There is some (but consistent) evidence that cumulative effects may operate over long periods resumably within limits at least for general competence) in that the longer e period the greater the cognitive gains - although initially higher boys ined less than girls. Even assuming there are ultimately maxima, however, e cognitive gains produced in our advantaged groups have brought both boys d girls to IQ levels of 130 or more, mean levels well beyond those normatively pected in all except highly selected populations. It would appear that our inking and developmental educational objectives for middle class as well as wer working class populations may have to be greatly revised in light of ese results - if confirmed elsewhere and sustained even longer developmental ans.

Earliness of entry may be important in several ways: (1) merely allowing nger participation; necessarily, only early entering infants participated for rkedly longer periods (since graduation came at 30 months). (2) The first ear may be potent (if not critical) for establishing more effective cognitive tyles for learning and information processing, paving the way for later, larger evelopmental gains. (3) The teachers report that children entering before to 8 months socialize and adapt more easily, although there were few consistent ifferences in socioemotional scores between younger and older infants. Interest- ng confirmation that children adapt more easily before 6 months comes from the

director of an infant creche in Paris (Voice, 1971). The period from 7 to 9 months or more has been found to be the peak period of stranger anxiety (Freedman, Loring & Martin, 1967) but (observed) difficulties of older children in adapting could be accounted for on the basis of learned preferences for home environments.

There are many implications here for prevalent middle class child-rearing myths about the value of home and mother as the emotionally significant figure for caretaking. Under conditions of multiple caretaking, complex stimulation, and emotionally sensitive care, but a general context of stable physical and social characteristics (buildings, equipment, many staff and of course parents were more or less permanent, while students remained a year) most of the children thrived - cognitively and

emotionally[4]. Many of them appeared unusually responsive to strangers and unfamiliar physical environments (as the many visitors regularly observed).

The issue really appears to rest more on the quality of care and education, which can probably be adequate in either the home or group care. It has long been generally assumed - but not always demonstrated (viz., infant emotional disturbance and social disadvantage) - that home and family are the best place to rear baby. The evidence we have assembled suggests that all day group care can be as salutary a setting as the home and (given a well-designed and implemented program, both emotionally oriented and intellectually stimulating) special additional benefits of social adaptation and intellectual development may accrue. Similar findings are reported on rearing infants in Kibbutzim in Israel (Kohen-Raz, 1968) - although mental gains were not nearly so great and, correspondingly, the program was oriented more toward play and socioemotional relations without stress on intellectual stimulation (Kohen-Raz, 1968; Smilansky and Smilansky, 1968). Home and group day care need not be seen as competitors, but as natural and necessary complementary community resources for rearing infants, especially, for working mothers and disadvantaged families as our findings show. After all, day care children remain under the care and guidance of parents many hours of every day and all weekend, with different effects as we shall indicate below.

At first glance, advantaged and disadvantaged infants seemed to derive about equal and positive benefits from the program in mental development. The disadvantaged gained greater but still small benefits (relative gains) in motor

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[4] We can report at least one very well progressing (Final IQ=122) disadvantaged child whose survival (and potentially his 10 months younger sister) early seemed in doubt and one middle class, borderline infant (not reported in the cumulative samples because he failed to meet entry emotional criteria) who gradually developed more and more adaptively under careful nurturance to later adapt adequately when he entered an ordinary nursery school (despite being young for the age group).

and generally favorable but slightly mixed benefits in socioemotional development. The problem is complicated, however, by sex differences. Although advantaged boys and girls adapted about equally well socioemotionally, and both developed little motorily, advantaged girls improved cognitively much more than boys in all comparisons except among initially older infants. While the disadvantaged sample was too small and the sex composition imbalanced (6 girls to 3 boys) for formal comparisons, the difference in mental test gain scores, if any, between initial and final testing were means of 24 and 15 IQ points in favor of boys. Thus when we compare the relative gains of the two groups by sex, advantaged girls and disadvantaged boys are found to have made comparable high advances (means of 27.79 and 24 points, respectively) and advantaged boys and disadvantaged girls comparable, more moderate gains (means of 11.62 and 15 points, respectively). Why this pattern of difference (assuming due caution because of sampling limitations, particularly for the disadvantaged)?

If we can assume that some reasons for gains and losses of individual children represent trends related to sex differences, the following factors can be considered. In the first place, of the four subgroups, three started with initial mean scores right around 100; only advantaged boys started at a substantially above average level ($\bar{X}$ = 116.38). We may have an unusual sample of advantaged boys; Bayley (1965) found no class or sex differences in children under 15 months, an age younger than all except our small, older sample. It is also possible that traditionalist patriarchal values result in a differential child rearing bias of middle class parents in favor of intellectually stimulating boys more than girls. That our findings on middle class girls do not conform to some previous investigations in cognitive (especially language) sex

differences in infancy, which show girls scoring at the same level as boys (Bayley, 1965) or in some cases exceeding boys in language (Kagan, 1969) and other specific cognitive tasks (Reppucci, 1971), may be a difference in child-rearing modes in (some) Canadian compared with U.S. and British populations.

In the second place, the consistently higher mental score gains of advantaged girls (if not entirely due to regression phenomena) compared with boys may involve two things. When exposed to a value system and methods that stressed the equal importance of intellectually stimulating girls as much as boys, middle class parents of girls responded strongly and effectively to compensate for the lower level they may have been earlier supporting. Even without assuming greater efforts of girl parents than boy parents, the new methods might well have less effect upon boys than girls because they were (1) already being moderately well stimulated and (2) were already nearer their upper intellectual potential. There was more room for cognitive stimulation to have an effect upon girls.

The second thing is the possibility of (an almost uniformly) all women teaching staff producing a differential bias fostering development of girls over boys. Some limit on this source is indicated by the fact it apparently did not operate on disadvantaged boys to the same extent - although again the sample of the latter is minuscule. There were also few systematic sex differences in socioemotional adaptation and the significant and greater increases of the girls in belligerence and similar trends in others (hyperactivity, irritability and passivity - a decline) are probably better seen as a general response of girls (initially culturally stereotyped at low levels) to a permissive, problem-centered program, raising them to (or

slightly above) the level of boys. Both groups remain well within optimal ranges on these socially negative characteristics - unlike the disadvantaged.

The problem is nevertheless a serious one, in which privileged access to the complex workings of the world is reserved mainly for men, while early education and child-rearing suffer because women are in some sense exiled to these fields, a condition that deprives both women and children from broader concepts of the larger world - even as men are deprived

of greater opportunities for interpersonal intimacy. It is here that our findings have implications for the role and status of women in society. If society and women can feel assured that infants very early can be adequately reared in group day care settings, as our study suggests, then day care can be a major agent permitting women to seek as many options for continuous career development as men. When this factor is considered in combination with the effect traditional parental values may be exercising on the cognitive development of supposedly advantaged infant girls, early day care in combination with parent guidance seems essential.

Although starting at the same level as advantaged girls, disadvantaged children, as a group, did not make the same magnitude of cognitive advances, though starting earlier and continuing about as long. Actually, like our advantaged girls and some earlier studies of the 1930's (Anastasi, 1958; Wellman, 1945), the initially lower disadvantaged IQ scorers (<90) did make the greatest gains (> 40 points). The apparent conflict is to be found in the four children who reduced the mean group cognitive and socioemotional gains because they lost (or gained very little) - to say nothing of the families who dropped out entirely, making a total of more than 50 percent of the total cumulative sample of 11 disadvantaged children originally recruited. It would seem that the gap between scoioeconomic classes as between sexes can be made up in many - but not all cases and, just as serious, the effort needed to sustain optimal levels of development (100 IQ is not considered optimal) cannot be sustained by more than half the disadvantaged families without some other form of support.

In many cases, despite obvious high interest in the program and more intensive guidance (than for advantaged families), disadvantaged parents lacked

the socioeconomic and psychological resources to implement the methods as systematically as the advantaged families obviously did. At least as important, disadvantaged children were bussed in every day, resulting in two to four hours less program participation each day[5]. Despite individualized care middle class staff bias was also a definite possibility (although some of the staff and students themselves originated in simple family circumstances). Despite the fact that four children (two of them boys) made very large gains of 21 to 56 points, two (including the other boy) made moderate advances around 10 points, a half dozen children failed to gain, declined markedly and/or dropped out because the family could not sustain the effort to participate.

Our experience points to a great need for locating day care facilities in the poor community itself to facilitate participation of parents and to much greater provision, not just of education and guidance, but of large scale socioeconomic resources to improve the socioeconomic and psychological conditions of life. Day care and guidance are essential - but not enough. The positive social values inherent and the advantages accruing in this program of (social class) integrated infant education would in Toronto at least, not be altered by establishing multi-purpose infant centers in or close to working class neighborhoods. Nearly all of our advantaged families now transport their babies considerable distances to and from the center and there are known waiting lists at other centers - without special methods of care and education.

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[5] Efforts to maintain an active and varied program on the bus route were hampered by numbers of personnel available, caretaking conditions and the inevitable fatigue of children on a long bus ride.

Table 1

Developmental Age Groups and Teacher-Child Ratios

Developmental Age Groups	Approximate Age Range (Months)	Predominant Developmental Characteristics						"On the Floor" Teacher-Child Ratios
		Physical Mobility	Infant's Participation in Physical Care	Scheduling	Language	Sensori-Motor Play	Socioemtional Relations: Adults	Socioemtional Relations: Peers	
Younger Infants	0 - 12	Minimal: None to crawling	Minimal development of interest in comfort and attention to routines	Highly individualized and flexible. High ratio of sleep, eating and other routines to waking and play	Comprehension; babbling but no speech	Highly circumscribed and focused in direction, distance, number of objects and relations. Interest in objects as ends in themselves rather than tools for a purpose (except hands as instruments)	Close and relative dependency on and interaction with one adult at a time	Responds to single infants for brief periods but largely through contiguity alone	1:2

Younger Toddlers	13 - 21	Moderate Walking to beginning running	Beginning participation in single acts and attention to details of eating, dressing, toileting, etc.	Moderate stabilization in routines; long periods of play and wakefulness	Single words and holophrases; extended comprehension	Extension of area of focus beyond immediate environment; relating two (or more objects)--objects as instruments to other purposes. (e.g.,simple puzzles, form boards)	Relative autonomy in a familiar and friendly environment. Some adaptation to care and (individualized) guided learning in groups of 2 to 4 children but limited peer interaction	Some initiating of contact but interaction limited in quality and duration.	1:3

Older Toddlers	22 - 30+	<u>Mastery</u>: Walking, running, stair climbing, beginning wheel toys	Relative autonomy in certain routines--eating, toileting, stair climbing, getting into cot, etc.; some participation in all others--e.g. dressing.	Good adaptation to flexible routines of a group. Typically one nap per day.	Syntax and more elaborate comprehension	Interest in multiple patterns, object relations and sustains (brief) chains of means-end activities.	Multiple adaptation, some cooperative interaction and considerable autonomy in relations in (small) groups of all types and of both adults and peers.	Initiates and interacts socially with others functionally with some persistence	1:4

Table 2

Mean Scores of Information Concept Training Group in Identifying[a] and Discriminating[b] Objects by Object and Class Labels at Pre- and Posttesting

	Age Group[c]	Concept Categories											
		Cars (N = 5)				Trucks (N = 6)				Combined (N = 11)			
		Object Label		Class Label		Object Label		Class Label		Object Label		Class Label	
		I	D	I	D	I	D	I	D	I	D	I	D
Pretest	Younger	.50	.50	3.75	5.0	0.0	0.0	2.75	4.5	.50	.50	6.50	9.50
	Older	1.25	1.50	4.75	5.0	1.50	1.75	5.75	5.75	2.75	3.25	10.50	10.75
	Total	.88	1.13	4.25	5.0	.75	.88	4.25	5.13	1.63	2.01	8.50	10.13
Posttest	Younger	2.0	3.75	5.0	5.0	2.0	5.0	6.0	6.0	4.0	8.75	11.0	11.0
	Older	3.0	3.50	5.0	5.0	3.0	4.75	6.0	6.0	6.0	8.25	11.0	11.0
	Total	2.50	3.63	5.0	5.0	2.50	4.88	6.0	6.0	5.0	8.41	11.0	11.0
Change	Younger	1.50	3.25	1.25	0.0	2.0	5.0	3.25	1.50	3.50	8.25	4.50	1.50
	Older	1.75	2.0	.25	0.0	1.50	3.0	.25	.25	3.25	5.0	.50	.25
	Total	1.62	2.50	.75	0.0	1.75	4.0	1.75	.87	3.37	6.50	2.50	.87

[a] Identification of objects without verbal cue in answer to question "What is this?"

[b] Discrimination of objects with verbal cue in answer to guestion "Where is the ___?"

[c] Mean ages of Younger (N = 4) and Older (N = 4) groups were 21.6 and 26.8 months, respectively. Mean IQs were 127.25 and 139, of which some were Bayley and some were Binet tests.

Table 3

Changes in Mean Ages and Mental and Motor Test Mean Scores and Standard Deviations for Total Cumulative Samples of Advantaged and Disadvantaged Day Care Infants

	Mean Age[a] & Mental[b] Test Scores				Mean Age[a] & Motor[c] Test Scores			
	Initial	Final	Change	t	Initial	Final	Change	t
Advantaged N = 30								
Age	12.2	24.3	12.6		12.7	21.8	9.1	
Mean Score	110.63	129.80	19.17	5.09**	102.60	106.33	3.73	1.45
SD	15.15	14.44	-.71[d]		12.08	14.68	2.60[d]	
Disadvantaged N = 9								
Age	5.3	19.0	13.7		6.2	15.8	9.6	
Mean Score	100.00	116.11	16.11	1.99	99.22	111.33	12.11	2.19
SD	16.52	14.72	-1.80[d]		11.60	13.48	1.88[d]	

* $p < .05$ ** $p < .01$

[a] Initial age refers to age at first testing; tests generally given 1-2 months after entry to allow for adaptation.

[b] Initial mental test scores are all Bayley Mental scores; final mental test scores are either Bayley Mental or Binet scores, depending on age of child.

[c] Bayley Motor Scale.

[d] Changes in standard deviations are for differences between standard deviations at initial and final testing (not for the standard deviations of the change scores).

Table 4

Comparison of Mean Mental Changes Scores of Samples of Advantaged and Disadvantaged Infants Matched for Age of Entry Over Mean Periods of 6, 12.5 and 18.5 Months

Testing	Group		Difference	t
	Advantaged	Disadvantaged		
6 Months Period				
	CA = 4[a] N = 9	CA = 4[a] N = 9		(df = 16)
Initial Mean	104.56	100.00	4.56	0.68
Final Mean[b]	124.67	116.33	8.34	1.11
Mean Change	20.11	16.33	3.78	0.39
t	2.48*	3.19**		
12.5 Months Period				
	CA = 4[a] N = 8	CA = 4[a] N = 6		(df = 12)
Initial Mean	107.62	103.00	4.62	0.66
Final Mean[b]	122.50	119.33	3.17	0.56
Mean Change	14.88	16.33	1.45	0.16
t	4.25**	1.71		
18.5 Months[c] Period				
	CA = 9[a] N = 14	CA = 4[a] N = 4		(df = 16)
Initial Mean	115.07	102.50	12.57	1.43
Final Mean[d]	135.93	125.00	10.93	1.28
Mean Change	20.86	22.50	1.64	0.12
t	3.63**	1.34		

* $p < .05$ ** $p < .01$

[a] Mean chronological age (months) of entry into program.

[b] Bayley Mental Scale.

[c] Mean testing intervals: advantaged = 17 months; disadvantaged = 20 months.

[d] Binet Scale.

Table 5

Comparison of Changes in Mean Mental[a] Scores of Day Care and Home Reared Infants for Total Sample and by Age of Entry into Program and Sex (Advantaged Group - First Year Samples)

		Testing	Day Care N = 18, CA = 13[b]	Home Reared	Difference	t
Total Sample		Initial	112.22	103.06	9.16	2.81*
		Final	126.61	109.67	16.94	2.64*
		Mean Change	14.39	6.61	7.78	1.21
		t	2.55*	1.48		
Age of Entry	17 to 22 months		N = 7, CA = 19[b]			
		Initial	113.14	102.14	11.00	3.21*
		Final	118.71	109.14	9.57	0.90
		Mean Change	5.57	7.00	1.43	0.14
		t	0.97	0.92		
	2 to 13 months		N = 11, CA = 10[b]			
		Initial	111.64	103.91	7.73	1.53
		Final	131.64	108.91	22.73	2.81*
		Mean Change	20.00	5.00	15.00	1.87
		t	2.43*	0.83		
Sex	Boys		N = 11, CA = 13[b]			
		Initial	117.91	106.09	11.82	2.50*
		Final	127.64	102.91	24.73	3.59**
		Mean Change	9.73	3.18	12.91	1.61
		t	1.82	.71		
	Girls		N = 7, CA = 14[b]			
		Initial	103.29	98.29	5.00	1.32
		Final	125.00	120.29	4.71	.40
		Mean Change	21.71	22.00	.29	.03
		t	1.82	4.09**		

* $p < .05$ ** $p < .01$

[a] Initial testing based on Bayley Mental Scale; final testing includes some Bayley and some Binet Scales, depending on age.

[b] Mean chronological age (months) at age of entry; day care and home reared groups matched for age and sex.

Table 6

Comparison of Mean Mental Score Changes Between Day Care and Home Reared Infants According to Length of Time in Program (Advantaged Group - Cumulative Samples)

Time in Program	Testing	Day Care	Home Reared	Difference	t
		(CA = 13)[d]			
5 to 7 Months ($\bar{X}$ = 6) N = 18[a]	Initial Mean	112.22	103.06	9.16	2.81*
	Final Mean	123.00	107.50	15.50	2.68*
	Mean Change	10.78	4.44	6.33	1.03
	t	2.21*	1.05		
		(CA = 9)[d]			
8 to 16 Months ($\bar{X}$ = 15) N = 8[b]	Initial	114.62	101.12	13.50	2.43*
	Final	137.25	104.75	32.50	5.85**
	Change	22.62	3.62	19.00	2.26*
	t	2.64*	.62		
		(CA = 8)[d]			
15 to 20 Months ($\bar{X}$ = 18) N = 4[c]	Initial	110.50	96.25	14.25	2.64
	Final	147.00	114.25	32.75	2.00
	Change	36.50	18.00	18.50	1.29
	t	2.46*	1.54		

* $p<.05$ ** $p<.01$

[a] All scores are on Bayley Mental Scales; includes 8 day care and 2 controls with suspected slight ceiling effects.

[b] Half of final test scores are Binet and half are Bayley Mental Scales; no suspected ceiling effects.

[c] All scores are on Binet Scale.

[d] Mean chronological age (months) at age of entry; controls matched with day care in terms of age.

Table 7

Comparison of Mean Age Placement and Change Scores for Day Care and Home Reared Infants on Five[a] Kohen-Raz Subscales of the Bayley Mental Scale (Advantaged - First Year Samples)

		Day Care	Home Reared	Difference	t
Initial Group Means on the Five Kohen-Raz Subscales					
	N				
Scale I	16	14.02	12.99	1.03	.65
4A	13	15.62	14.64	.98	.56
4B	17	14.55	13.63	.92	.63
5A	17	14.30	13.03	1.27	.75
5B	14	13.27	12.69	.58	.36
Scale 1: Eye Hand					
Testing		N = 10[b]	N = 10[b]		
Initial Mean		11.43	9.92	1.51	2.20*
Final Mean		17.80	16.33	1.47	1.87
Mean Change		6.37	6.41	-.04	.06
t		7.32**	12.70**		
Scale 4A: Imitation and Comprehension					
		N = 12[b]	N = 12[b]		
Initial Mean		12.46	12.11	.35	1.00
Final Mean		21.53	18.44	3.08	2.34*
Mean Change		9.07	6.33	2.73	2.38*
t		9.47**	7.90**		
Scale 4B: (Branch: Graphic Imitation)					
		N = 12[b]	N = 12[b]		
Initial Mean		12.78	12.29	.49	.78
Final Mean		19.18	17.87	1.32	1.18
Mean Change		6.40	5.58	.82	.77
t		7.01**	4.24**		
Scale 5A: Vocalization-Social Contact-Active Vocabulary					
		N = 11[b]	N = 11[b]		
Initial Mean		11.30	10.21	1.09	1.75
Final Mean		20.56	16.84	3.72	3.92**
Mean Change		9.26	6.64	2.63	2.32*
t		8.89**	11.64**		
Scale 5B: (Branch: Personal Use of Language)					
		N = 4[b]	N = 4[b]		
Initial Mean		8.48	8.40	.08	.05
Final Mean		18.88	15.78	3.10	2.56*
Mean Change		10.40	7.38	3.02	1.33
t		9.12**	5.19**		

* $p < .05$ ** $p < .01$

[a] Kohen-Raz defines a total of five scales of which two (Scale 2, Manipulation and Scale 3, Object Relations) could not be used because of their low ceilings (12 months) and two (Scales 4 and 5) have branches as we have indicated and labeled (following his concepts) in the table.

[b] All change score comparisons for the scales are based on group comparisons; pair matching was no longer possible after the initial testing due to attrition and ceiling effects (of which the latter tends to penalize high scorers - the day care samples).

Table 8

Changes in Mean Mental Scores for Day Care Infants According to Time in Program and Age at Entry into Program (Advantaged Group - Cumulative Samples)

Testing	Time in Program			
	2 to 7 months ($\bar{X}$ = 5) Bayley Scale N = 29[a]	8 to 16 months		17 to 20 months ($\bar{X}$ = 18) Bayley - Binet[b] N = 9
		($\bar{X}$ = 10) Bayley Scale N = 11[a]	($\bar{X}$ = 13) Bayley - Binet[b] N = 14	
Initial	111.83	106.27	116.50	112.00
Final	121.35	126.18	133.79	130.11
Change	9.52	19.91	17.29	18.11
t	2.69*	3.42**	2.95*	2.42*

* $p < .05$ ** $p < .01$

[a] Includes 9 children for first period and 4 children for second period whose final Bayley Test may be subject to slight ceiling effects.

[b] Bayley Scale used for initial testing and Binet Scale used for final testing because of ceiling on Bayley.

Changes in Mental Scores for Day Care Infants According to Age of Entry and Length of Time in Program (Advantaged Infants - Cumulative Samples)

Time in Program	Testing	Age of Entry: 2 to 13 Months ($\bar{X}$ = 9) N = 23	Age of Entry: 17 to 22 Months ($\bar{X}$ = 19) N = 7	Difference	t
Total Sample[a] 4 to 20 Mo. ($\bar{X}$ = 11)	Initial Mean	109.87	113.14	-3.27	.49
	Final Mean	131.87	123.00	8.87	1.45
	Mean Change	22.00	9.86	12.14	1.38
	t	4.92**	1.67		
		2 to 13 Months ($\bar{X}$ = 9) N = 22	17 to 22 Months ($\bar{X}$ = 19) N = 7		
2 to 7 Mo. ($\bar{X}$ = 5)[a] Bayley Scale	Initial Mean	111.41	113.14	1.73	0.28
	Final Mean	122.18	118.71	3.47	0.56
	Mean Change	10.77	5.57	5.20	0.62
	t	2.49*	0.97		
		2 to 10 Months ($\bar{X}$ = 7) N = 11	c		
8 to 16 Months ($\bar{X}$ = 10)[a] Bayley Scale	Initial Mean	106.27			
	Final Mean	126.18			
	Mean Change	19.91			
	t	3.42**			
		8 to 13 Months ($\bar{X}$ = 10) N = 9	17 to 22 Months ($\bar{X}$ = 19) N = 5		
($\bar{X}$ = 13) Bayley-Binet[b]	Initial Mean	117.33	115.00	2.33	0.23
	Final Mean	139.67	123.20	16.47	2.11
	Mean Change	22.33	8.20	14.13	1.17
	t	2.78*	1.18		
		5 to 13 Months ($\bar{X}$ = 9) N = 9	d		
17 to 20 Mo. ($\bar{X}$ = 18) Bayley-Binet[b]	Initial Mean	112.00			
	Final Mean	130.11			
	Mean Change	18.11			
	t	2.42*			

* $p < .05$ ** $p < .01$

[a] Includes 9 children for first period and 4 children for second period (Bayley group only) whose final Bayley may be subject to slight ceiling effects.

[b] Bayley Scale used for initial testing and Binet Scale used for final testing because of age ceiling on Bayley.

[c] Only younger members remain in this sample; older members given Binet.

[d] Only younger members of sample still remaining in center after 16 months.

Table 10

Changes in Mental[a] Scores of Day Care Infants for Total Sample and by Sex and Age of Entry into Program (Advantaged Group - Cumulative Samples)

		Testing	Sex: Girls	Sex: Boys	Difference	t
			N = 14 CA = 11[b]	N = 16[b] CA = 11		
Total Sample		Initial Mean	104.07	116.38	12.31	2.39*
		Final Mean	131.86	128.00	3.86	.72
		Mean Change	27.79	11.62	16.16	2.29*
		t	4.48**	3.10**		
Age of Entry	17 to 22 Mo. $\bar{X}$ = 19		N = 3	N = 3		
		Initial Mean	108.00	117.00	9.00	.63
		Final Mean	118.00	126.75	8.75	1.20
		Mean Change	10.00	9.75	-.25	.02
		t	1.10	1.09		
	2 to 13 Mo. $\bar{X}$ = 8		N = 11	N = 12		
		Initial Mean	103.00	116.17	13.17	2.37*
		Final Mean	135.64	128.42	7.22	1.15
		Mean Change	32.64	12.25	20.39	2.55*
		t	4.70**	2.87*		

* $p < .05$ ** $p < .01$

[a] Initial test means based on Bayley Mental Scale; final test means include some Ss with Bayley Mental Scale and some with Binets, depending on age.

[b] Mean chronological age (months) at age of entry into program.

Table 11

Changes in Mean Mental Scores for Day Care Infants

According to Sex and Time in Program

(Advantaged Group - Cumulative Samples)

Time in Program		Testing	Sex		Difference	t
			Girls	Boys		
			N = 13 (CA = 11)[a]	N = 16 (CA = 11)[a]		
2 to 7 Mo.	($\bar{X}$ = 5) Bayley Scale	Initial Mean	105.92	116.62	10.72	2.14*
		Final Mean	121.92	120.87	1.05	.20
		Change	16.00	4.25	11.75	1.71
		t	2.69*	1.09		
			N = 6 (CA = 6)[a]	N = 5 (CA = 6)[a]		
8 to 16 Months	($\bar{X}$ = 10) Bayley Scale	Initial Mean	101.67	111.80	10.13	1.61
		Final Mean	127.00	125.20	1.80	.23
		Change	25.33	13.40	11.93	1.02
		t	2.42	8.72**		
			N = 6 (CA = 13)[a]	N = 8 (CA = 14)[a]		
	($\bar{X}$ = 13) Bayley - Binet[b]	Initial Mean	108.67	122.38	13.71	1.56
		Final Mean	140.33	128.88	11.46	1.39
		Change	31.66	6.50	25.17	2.53*
		t	3.84*	1.08		

* $p < .05$ ** $p < .01$

[a] Mean chronological age (months) at age of entry.

[b] Bayley Mental Scale used for initial testing and Binet Scale used for final testing.

Table 12

Comparison of Mean Bayley Motor Scale Change Scores of Samples of Advantaged and Disadvantaged Infants Matched for Age of Entry over Mean Periods of 6 and 12.5 Months

Testing	Advantaged	Disadvantaged	Difference	t
6 Months Period				
	CA = 4[a] N = 9	CA = 4[a] N = 9		
Initial Mean	106.67	99.22	7.45	1.41
Final Mean	111.33	99.33	12.00	2.03
Mean Change	4.66	.11	4.55	0.78
t	1.49	.02		
12.5 Months Period				
	CA = 4[a] N = 6	CA = 4[a] N = 6		
Initial Mean	109.67	103.83	5.84	0.93
Final Mean	109.00	112.00	3.00	0.31
Mean Change	0.67	8.17	8.84	0.76
t	.08	.97		

* $p < .05$
[a] Mean chronological age (months) of entry into program.

Table 13

Comparison of Mean Changes in Bayley Motor Scores Between Day Care and Home Reared Infants over the First Six Months[a] for Total Sample, and by Age of Entry and Sex (Advantaged Group - First Year Samples)

		Testing	Day Care	Home Reared	Difference	t
			N = 15[b] CA = 13[b]			
Total Sample		Initial Mean	101.47	102.20	-.73	0.15
		Final Mean	105.33	110.80	-5.47	1.09
		Mean Change	3.86	8.60	-4.74	1.03
		t	1.08	2.28*		
			N = 6[b] CA = 18[b]			
Age of Entry	17 to 22 Months	Initial Mean	100.00	97.83	2.17	.25
		Final Mean	97.67	99.33	-1.66	.25
		Mean Change	-2.33	1.50	-3.83	.39
		t	-.53	.22		
			N = 9 CA = 12[b]			
	2 to 13 Months	Initial Mean	102.44	105.11	-2.67	.44
		Final Mean	110.44	118.44	-8.00	1.10
		Mean Change	8.00	13.33	-5.33	1.19
		t	1.63	3.40**		
			N = 9 CA = 12[b]			
Sex	Boys	Initial Mean	100.11	107.00	-6.89	1.20
		Final Mean	108.77	115.11	-6.33	.86
		Mean Change	8.66	8.11	.56	.13
		t	2.77*	1.49		
			N = 6 CA = 13[b]			
	Girls	Initial Mean	103.50	95.00	8.50	1.14
		Final Mean	100.17	104.33	4.17	.61
		Mean Change	-3.33	9.33	12.67	1.38
		t	.48	1.74		

* $p < .05$ ** $p < .01$

[a] Bayley Motor Scale not administered to Home Reared after first year of investigati

[b] Mean chronological age (months) at age of entry.

Table 14

Mean Changes in Bayley Motor Scores of Day Care Infants According to Time in Program (Advantaged Group - Cumulative Samples)

Testing	Time in Program		
	2 to 8 Months ($\bar{X}$ = 5) N = 29	9 to 13 Months ($\bar{X}$ = 12) N = 10	14 to 19 Months ($\bar{X}$ = 15) N = 8
Initial Mean	102.79	100.90	103.62
Final Mean	105.79	109.60	111.62
Mean Change	3.00	8.70	8.00
t	1.51	2.65*	1.16

* $p < .05$

Table 15

Mean Changes in Bayley Motor Scores of Day Care Infants According to Age of Entry and Time in Program (Advantaged Infants - Cumulative Samples)

Time in Program	Testing	Age of Entry: 2 to 13 Months N = 23 (CA = 9)[a]	Age of Entry: 17 to 22 Months N = 7 (CA = 19)[a]	Difference	t
Total Sample 2 to 19 Months ($\bar{X}$ = 13)	Initial Mean	104.57	96.14	8.42	1.66
	Final Mean	110.30	93.29	17.02	3.04**
	Mean Change	5.73	-2.85	8.59	1.44
	t	1.85	.86		
		N = 22[a] (CA = 9)	N = 7 (CA = 19)[a]		
2 to 8 Months[b] ($\bar{X}$ = 5)	Initial Mean	104.91	96.14	8.77	1.71
	Final Mean	109.77	93.29	16.49	3.09**
	Mean Change	4.86	-2.86	7.72	1.72
	t	2.13*	.86		

* $p < .05$ ** $p < .01$

[a] Mean chronological age (months) at age of entry.

[b] No comparisons for longer periods in program were possible because of graduation of infants entering between 17 and 22 months.

Table 16

Changes in Motor Scores of Day Care Infants for Total Sample and by Sex and Age of Entry into Program (Advantaged Group - Cumulative Samples)

		Testing	Sex: Girls	Sex: Boys	Difference	t
			N = 14 CA = 11[a]	N = 16 CA = 11[a]		
Total Sample		Initial Mean	102.79	102.44	.35	.07
		Final Mean	106.14	106.50	.36	.07
		Mean Change	3.36	4.06	.70	.13
		t	0.71	1.76		
			N = 11 CA = 8[a]	N = 12 CA = 8[a]		
Age of Entry	2 to 13 Months	Initial Mean	102.64	106.33	3.69	.81
		Final Mean	109.27	111.25	1.98	.35
		Mean Change	6.64	4.92	-1.72	.27
		t	1.20	1.45		
			N = 3 CA = 18[a]	N = 4 CA = 19[a]		
	17 to 22 Months	Initial Mean	103.33	90.75	-12.58	1.18
		Final Mean	94.67	92.25	-2.42	0.26
		Mean Change	-8.66	1.50	10.16	-1.75
		t	-1.47	.58		

[a] Mean chronological age (months) at age of entry into program.

Table 17

Mean Changes in Bayley Motor Scores of Day Care Infants According to Sex and Length of Time in Program (Advantaged Infants - Cumulative Samples)

Time in Program	Testing	Sex		Difference	t
		Girls	Boys		
		N = 13 (CA = 11)[a]	N = 16 (CA = 11)[a]		
2 to 7 Months ($\bar{X}$ = 5)	Initial Mean	103.23	102.44	.79	0.17
	Final Mean	104.92	106.50	-1.58	-0.30
	Mean Change	1.69	4.06	2.37	0.59
	t	.49	1.76		
		N = 7 (CA = 6)[a]	N = 9 (CA = 9)[a]		
9 to 15 Months ($\bar{X}$ = 13)	Initial Mean	101.00	105.78	4.78	0.81
	Final Mean	108.00	111.78	3.78	0.54
	Mean Change	7.00	6.00	-1.00	0.13
	t	.98	1.67		

[a] Mean chronological age (months) at age of entry.

Stability and Change in Mean Scores on Schaefer and Aaronson

Infant Behavior Inventory for Advantaged and Disadvantaged

Day Care Infants (Cumulative Samples)

Item[a] Description	Time$_1$[b] Adv. N=29	Time$_1$[b] Disadv. N=7[c]	Time$_1$-Time$_2$[b] (4-6 Months) Advantaged N=18		Time$_1$-Time$_2$[b] (4-6 Months) Disadvantaged N=7[c]		Time$_1$-Time$_2$-Time$_3$[b] (10-11 Months) Advantaged N=12			Time$_1$-Time$_2$-Time$_3$[b] (10-11 Months) Disadvantaged N=5		
	T_1		T_1	T_2	T_1	T_2	T_1	T_2	T_3[d]	T_1	T_2	T_3[d]
Positively Valued												
1. Verbal Expressiveness	2.94	2.49	2.74 **	3.32	1.97 **	2.64	2.72	3.22 **	3.60	2.04	2.70	3.28
4. Positive Social Response	3.14	3.06	3.38	3.51	2.89	3.34	3.46	3.49	3.67	2.76	3.32	3.52
6. Inquisitiveness	3.07	3.01	3.00 *	3.29	2.59 *	3.34	3.08	3.12	3.32	2.46	3.40	3.16
8. Perseverance	2.90	2.76	2.59	2.85	2.30	2.93	2.69	2.92	3.02	2.30	3.14	3.00
9. Gregariousness	2.75	2.53	2.88	3.02	2.36	2.83	2.83	3.01	*3.23	2.26	2.84	2.80
11. Contentment	2.97	3.06	3.23	3.26	3.17 *	3.00	3.34	3.16	3.19	3.20	2.96	2.76
12. Rapidity	2.56	2.31	2.12 *	2.52	1.89 *	2.59	1.96	2.32	1.96	2.08	2.46	2.76
14. Enthusiasm	2.97	2.94	2.98	3.20	2.60	3.04	3.06	3.12	*3.46	2.48	3.06	3.00
17. Concentration	2.83	2.56	2.71	2.83	2.41	2.81	2.87	2.91	3.13	2.34	3.02	3.00
21. Cheerfulness	3.06	3.03	3.21	3.34	2.66	3.10	3.22	3.25	3.47	2.60	3.06	3.28
23. Attentiveness	3.09	3.04	3.23	3.38	2.90	3.11	3.30	3.34	3.58	2.82	3.08	3.16
Mean	2.93	2.80	2.92	3.05	2.52	2.97	2.96	3.08	3.24	2.49	3.00	3.07
Negatively Valued												
2. Negative Affect	2.07	2.21	1.81	1.83	1.70	2.11	1.73	1.83	1.80	1.54	2.04	2.52
3. Monotonous Behavior	2.01	1.77	1.91	1.72	1.83	1.86	1.94	1.92	2.12	1.88	1.80	*2.36
5. Self-consciousness	2.21	2.49	1.59	1.81	1.77 *	2.03	1.60	2.07	1.68	2.00	2.04	2.20
7. Irritability	2.68	2.90	2.30	2.64	2.30	2.79	2.27	2.44	2.64	2.30	2.78	*3.48
10. Distractability	2.34	2.60	2.39	2.30	2.37	2.33	2.19	2.24	1.98	2.52	2.18	2.48
13. Passivity	1.86	1.77	1.87	1.64	2.09	1.74	1.77	1.78	1.68	2.16	1.80	2.12
15. Hyperactivity	2.45	2.33	2.08	2.37	1.96	2.44	1.92	2.15	1.80	1.98	2.26	2.80
16. Belligerence	2.39	2.14	1.85 *	2.30	1.43 *	2.03	1.78	2.03	2.07	1.68	1.82	*3.28
18. Fatigue	1.88	1.67	1.85 *	1.52	1.96	1.80	1.85	1.75	1.66	2.10	1.84	2.24
19. Withdrawal	2.21	2.23	2.02 *	1.80	2.20	2.23	1.93	1.86	1.79	2.32	2.24	2.32
20. Fearful	2.09	1.83	1.91	1.80	1.70	1.98	1.84	1.96	1.90	1.84	1.94	1.96
22. Negativism	2.06	2.11	1.79	1.96	1.80	2.18	1.72	1.95	1.78	1.72	2.14	2.76
Mean	2.19	2.17	1.95	1.97	1.93	2.12	1.88	1.86	1.91	2.00	2.00	2.54

Mean Change Score significant at:
* $p < .05$ ** $p < .01$

[a] Four point scales: four and one are maximum values for positive and negative items, respectively.

[c] Sample composition varies because of differing restrictions for comparisons with Schaeffer and Aaronson Maternal Behavior Inventory and T_1-T_2 comparisons.

[d] Significance values refer to T_1-T_3 comparisons.

[b] Inventory first employed at end of first program year. Ns reduced for T_1-T_2 and T_1-T_2-T_3 comparisons due to attrition and graduation.

Mean and Range of Ages and Time in Program (from date of entry to final testing) for Different Samples at T_1

		T_1 Samples		T_1-T_2 Samples		T_1-T_2-T_3 Samples	
		Adv.	Disadv.	Adv.	Disadv.	Adv.	Disadv.
Ages at Prog. Testing	Mean	18	11	14	11	14	12
	Range	4 to 31	5 to 15	7 to 23	5 to 15	7 to 21	8 to 15
Time in Prog.	Mean	9	7	6	7	7	8
	Range	1 to 10[1]	1 to 11	1 to 10	1 to 11	1 to 10	1 to 11

[1] One S was 16 months old

Table 15

Stability and Change in Mean Scores on Schaefer and Aaronson Infant Behavior Inventory for Day Care Infants Between Time 1 and Time 2 by Age at Initial Testing (T_1) and Sex (Advantaged Group - Cumulative Samples)

Item[a] Description	Age at T_1				Sex[b]			
					Girls		Boys	
	4 to 12 Months ($\bar{X}$ = 7) N = 7		13 to 24 Months ($\bar{X}$ = 17) N = 11		5 to 17 Months ($\bar{X}$ = 12) N = 8		4 to 24 Months ($\bar{X}$ = 15) N = 10	
	T_1	T_2	T_1	T_2	T_1	T_2	T_1	T_2
Positively Valued								
1. Verbal Expressiveness	2.31	* 3.03	3.01	** 3.51	2.56	* 3.28	2.88	* 3.36
4. Positive Social Response	3.51	3.64	3.29	3.42	3.44	3.51	3.33	3.50
6. Inquisitiveness	2.69	3.29	3.20	3.30	3.01	3.32	3.09	3.27
8. Perseverance	2.26	2.43	2.80	3.12	2.62	2.92	2.56	2.79
9. Gregariousness	2.91	3.00	2.85	3.02	2.91	3.04	2.85	3.00
11. Contentment	3.34	3.55	3.15	3.06	3.22	3.30	3.23	3.22
12. Rapidity	1.74	* 2.74	2.35	2.38	1.92	* 2.70	2.27	2.38
14. Enthusiasm	2.80	3.04	3.10	3.30	2.99	3.15	2.98	3.24
17. Concentration	2.51	2.44	2.83	3.08	2.68	2.89	2.73	2.78
21. Cheerfulness	3.17	3.43	3.24	3.29	3.28	3.26	3.16	3.31
23. Attentiveness	3.29	3.47	3.20	3.32	3.26	3.34	3.21	3.41
Mean	2.78	3.10	3.00	3.16	2.89	3.17	2.94	3.11
Negatively Valued								
2. Negative Affect	1.69	1.90	1.90	1.80	1.80	1.90	1.83	1.79
3. Monotonous Behavior	1.80	1.57	1.97	1.81	1.88	1.72	1.93	1.71
5. Self-consciousness	1.43	1.64	1.69	1.92	1.46	1.60	1.69	1.98
7. Irritability	2.14	* 2.91	2.41	2.47	2.20	2.80	2.39	2.52
10. Distractability	2.49	2.69	2.34	* 2.06	2.44	2.30	2.36	2.30
13. Passivity	2.11	1.71	1.71	1.59	1.95	1.65	1.80	1.63
15. Hyperactivity	1.77	* 2.66	2.27	2.19	1.92	2.45	2.20	2.31
16. Belligerence	1.14	* 2.26	2.15	2.42	1.48	* 2.48	1.98	2.26
18. Fatigue	2.00	1.47	1.76	1.55	1.88	1.50	1.84	1.54
19. Withdrawal	1.83	1.77	2.14	* 1.76	1.86	1.71	2.15	1.81
20. Fearful	1.72	1.92	2.00	1.75	1.99	1.91	1.89	1.65
22. Negativism	1.48	1.84	1.94	2.02	1.82	1.92	1.79	1.88
Mean	1.80	2.03	2.02	1.94	1.89	1.99	1.98	1.93

* Mean Change Score significant at $p < .05$

** Mean Change Score significant at $p < .01$

[a] Four point scales: four and one are maximum values for positive and negative items respectively.

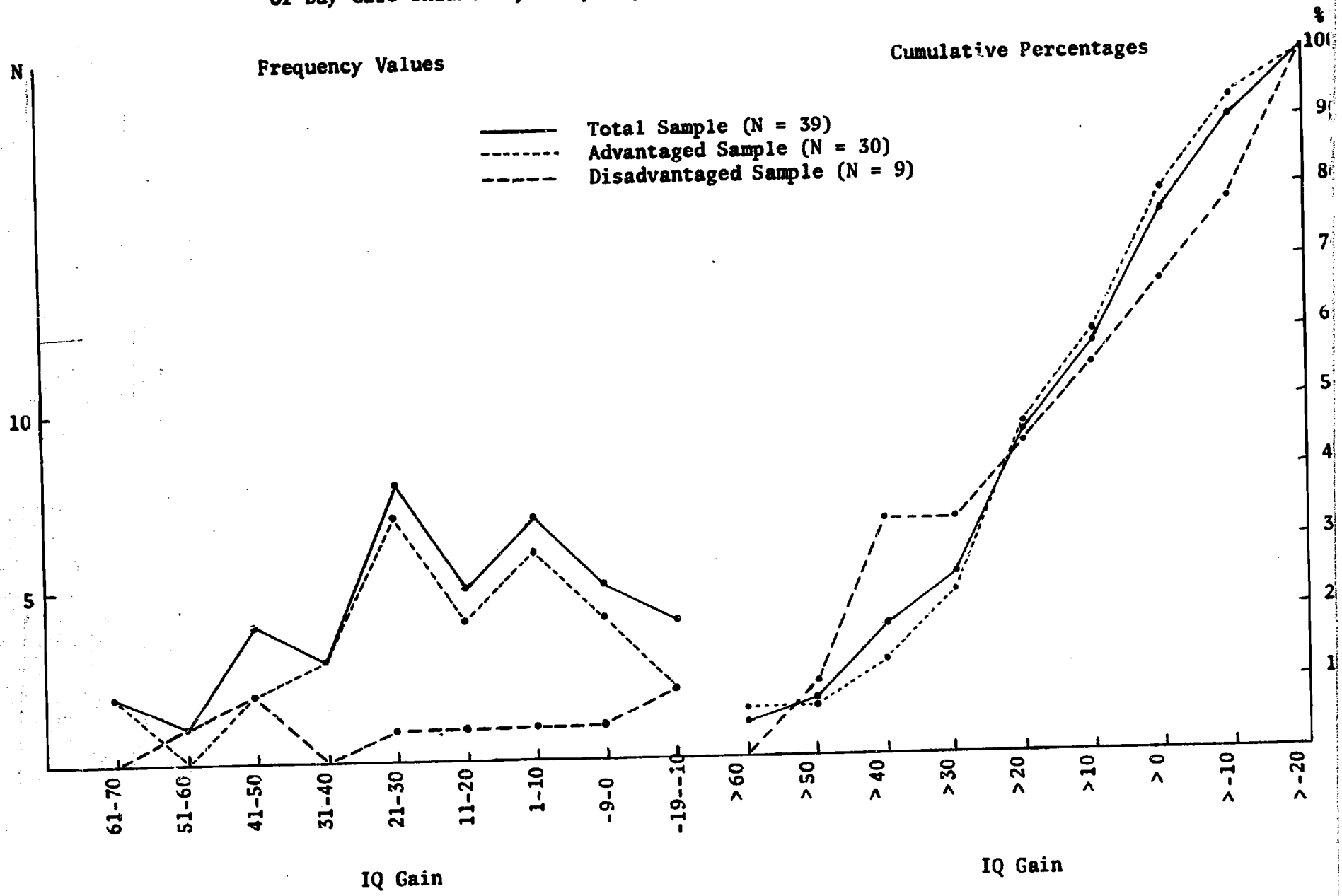
[b] Inventory first employed at end of first program year.

Mean and Range for Ages and Testing Interval in Months

			Age at T_1		T_1 to T_2 (Interval)
			Younger	Older	
Sex	Girls	Mean	7	16	6 mo.
		Range	5-8	15-17	2-9 mo.
	Boys	Mean	7	19	6 mo.
		Range	4-11	12-24	2-8 mo.

Figure 1

Distribution of Mental Test Initial-Final Change Scores for Cumulative Samples of Day Care Infants by Frequency and Cumulative Percentage Values



References

Anastasi, A. Differential psychology. (3rd Ed.) New York: Macmillan, 1958.

Bayley, N. Mental growth during the first three years. A developmental study of sixty-one children by repeated tests. Genet. Psychol. Monogr., 1933, 14, 1-92.

Bayley, N. Consistency and variability in the growth of intelligence from birth to eighteen years. J. gen. Psychol., 1949, 75, 165-196.

Bayley, N. Comparisons of mental and motor test scores for ages 1-15 months by sex, birth order, race, geographical location, and education of parents. Child Develpm., 1965, 36, 379-411.

Berlyne, D. E. Conflict, arousal and curiosity. New York: McGraw-Hill, 1960.

Chomsky, N. Syntactic structures. The Hague: Mouton, 1957.

Dember, W. N. The new look in motivation. Amer. Scient., 1965, 53, 409-427.

Fowler, W. Concept learning in early childhood. Young Childr., 1965, 21, 81-91.

Fowler, W. The design of early developmental learning programs for disadvantaged young children. Supp. to IRCD Bull., 1967, 3, 1A.

Fowler, W. Cognitive orientations toward child-rearing. Ontario Institute for Studies in Education, 1968.(a) (Mimeographed)

Fowler, W. Principles of infant developmental stimulation. Teachers guide. Ontario Institute for Studies in Education, 1968.(b) (Mimeographed)

Fowler, W. Group techniques and processes for the supervision and instruction of young children: general considerations. Ontario Institute for Studies in Education, 1969. (Mimeographed)

Fowler, W. The patterning of developmental learning processes in the nursery school. In A.J. Biemiller (Ed.) Problems in the teaching of young children. Monogr. Series No. 9, Ontario Institute for Studies in Education, Toronto, 1970, 27-46.

Fowler, W. Infant stimulation and the etiology of cognitive processes. Univ. of Illinois at Urbana-Champaign: Educational Resources Information Center/ Early Childhood Education, 1971.(a)

Fowler, W. Cognitive baselines in early childhood: developmental learning and differentiation of competence rule systems. In Jerome Hellmuth (Ed.) Cognitive Studies: Cognitive Deficits, Vol. 2, New York: Brunner/Mazel, 1971, 231-279.(b)

Fowler, W. The differential development of competence and deficit and some perspectives for Canada. In T. J. Ryan (Ed.) Poverty and Young Children. Economic Council of Canada and Vanier Institute of the Family. (In press)

Fowler, W. & Leithwood, K. Cognition and movement: theoretical, pedagogical and measurement considerations. Perceptual and Motor Skills, 1971, 32, 523-532.

Freedman, D. G., Loring, C. B., & Martin, R. M. Emotional behavior and personality development. In Y. Brackbill (Ed.) Infancy and early childhood. New York: The Free Press, 1967, 427-502.

Henninger, P. Infant problem solving. Unpublished MA Thesis, University of Toronto, 1968.

Honzik, M. P., MacFarland, J. W., & Allen, L. The stability of mental test performance between two and eighteen years. J. exp. Educ., 1948, 17, 309-324.

Hunt, D. E., Kingsley, R. C., Massari, D. J., Shore, R. E., & Sweet, J. S. Conceptual level scoring from paragraph completions in adolescents. Syracuse University, September, 1967.

Hunt, J. McV. The epigenesis of intrinsic motivation and the fostering of early cognitive development. In J. McV. Hunt (Ed.) The challenge of incompetence and poverty. Urbana, Illinois: University of Illinois Press, 1969, 94-111.

Hutt, C. Specific and diversive exploration. In H. W. Reese & L. P. Lipsitt (Eds.) Advances in child development and behavior, Vol. 5, New York: Academic Press, 1970, 1-181.

Kagan, J. Continuity in cognitive development during the first year. Merrill-Palmer Qrtly., 1969, 15, No. 1, 101-119.

Kohen-Raz, R. Scalogram analysis of some developmental sequences of infant behavior as measured by the Bayley Infant Scale of Mental Development. Genet. Psychol. Monogr., 1967, 76, 3-21.

Kohen-Raz, R. Mental and motor development of Kibbutz, institutionalized, and home-reared infants in Israel. Child Develpm., 1968, 39, 489-504.

Luria, A. R. The role of speech in the regulation of normal and abnormal behavior. New York: Liveright, 1961.

Murphy, L. B. Social behavior and child personality: an exploratory study of some roots of sympathy. New York: Columbia Univ. Press, 1937.

Piaget, J. The origins of intelligence in children. New York: Internat. Univ. Press, 1952.

Reppucci, N. D. Parental education, sex differences, and performance on cognitive tasks among two-year-old children. Develpmtl. Psychol., 1971, 4, No. 2, 248-253.

Schaefer, E. S. & Aaronson, M. Infant behavior inventory. Laboratory of Psychology, National Institute of Mental Health, U.S. Depart. HEW, (Unpublished) 1967

Schaefer, E. S. & Aaronson, M. Mother's behavior with tutor and child during tutoring sessions. Laboratory of Psychology, National Institute of Mental Health, U.S. Dept. HEW, (Unpublished) 1967

Slobin, D. I. Soviet psycholinguistics. In N. O'Connor (Ed.) Present-day Russian psychology. Oxford: Pergamon Press, 1966, 109-151.

Smilansky, M. & Smilansky, S. The intellectual development of Kibbutz-born children of "Oriental" (Middle Eastern and North African) origin. Res. Rep. No. 120, Ruth Bressler Center for Education Research, Kiryat Menachem, Jerusalem, Israel, 1968.

Starr, R. H. Jr. Cognitive development in infancy: assessment, acceleration, and actualization. Merrill-Palmer Qtrly., 1971, 17, No. 2, 153-186.

Strayer, L. C. Language and growth: the relation efficacy of early and deferred vocabulary training, studied by the method of co-twin control. Genet. Psychol. Monogr., 1930, 8, 215-317.

Thomas, H. Visual-fixation responses of infants to stimuli of varying complexity. Child Develpm., 1965, 36, 629-638.

Uzgiris, I. C. & Hunt, J. McV. A scale of infant psychological development. Univ. of Illinois, 1964. (Mimeographed)

Voice. Day Care and Child Development Council of America, Inc., Washington, D.C., 1970, 3, No. 1.

Vygotsky, L. S. Thought and language. Cambridge, Mass: MIT Press, 1962.

Welch, L. The span of generalization below the two-year age level. J. Genet. Psychol., 1939, 55, 269-297.

Welch. L. The genetic development of the associational structures of abstract thinking. J. Genet. Psychol., 1940, 56, 175-206.

Wellman, B. L., & McCandless, B. R. Factors associated with Binet IQ changes of preschool children. Psychol. Monogr., 1946, 60, (2, Whole No. 278).

Zigler, E., & Butterfield, E.CC. Motivational aspects of changes in IQ test performance of culturally deprived nursery school children. Child Develpm., 1968, 39, 1-14.