

Reading 8.

Simeonson, RJ, Cooper, DH, Scheiner, AP. (1982) A review and analysis of the effectiveness of early intervention programs. Pediatrics. 69 (50), pp635-641

REVIEW ARTICLE

A Review and Analysis of the Effectiveness of Early Intervention Programs

Rune J. Simeonsson, PhD, David H. Cooper, and
Albert P. Scheiner, MD

From the School of Education and Frank Porter Graham Child Development Center,
The University of North Carolina at Chapel Hill, Chapel Hill; and Department of
Pediatrics, University of Massachusetts Medical Center, Worcester

ABSTRACT. A review was made of 27 studies describing early intervention for biologically impaired infants and young children. Although every study provided some type of documentation of outcome, most studies failed to meet common criteria for scientific research, such as specification of inclusion criteria, documentation of reliability, random assignment, and/or the use of control/contrast groups. Studies were grouped into four classifications on the basis of experimental design as follows: retrospective, prospective-no control group, prospective-control/contrast group, and prospective-random group assignment. A comparative analysis was made of the effectiveness of findings on the basis of statistical evidence and clinical support. Statistical procedures were used in 59% of the studies and statistical support for the effectiveness of early intervention was reported in 48% of the studies. Effectiveness on the basis of subjective, clinical conclusions was reported in 93% of the studies. Implications of the discrepancy between effectiveness based on statistical evidence and clinical conclusions are discussed. *Pediatrics* 69:635-641, 1982; *early intervention, handicapped, infant.*

Does early intervention really work? The effectiveness of early intervention has been questioned during the past decade by professionals concerned

Received for publication Aug 13, 1981; accepted Nov 24, 1981.
An earlier version of this report was presented at a conference "Current Concepts in the Care of the High Risk Infant" at the University of Massachusetts Medical Center, Worcester, MA, June 1981.

The opinions expressed herein do not necessarily reflect the position or policy of the US Office of Education, and no official endorsement by the US Office of Education should be inferred. Reprint requests to (R.J.S.) The University of North Carolina at Chapel Hill, 301 NCNB Plaza 322A, Chapel Hill, NC 27514. PEDIATRICS (ISSN 0031 4005). Copyright © 1982 by the American Academy of Pediatrics.

about cumulative deficits due to handicap or deprivation in infancy.^{1,2} It is likely that the cost effectiveness of human services in the current political and fiscal climate will continue to be questioned. If we are to attempt to answer this question, we must be more specific with regard to: (1) what constitutes early intervention; (2) who is the target population; and, (3) what measurements form the basis for evaluating effectiveness.

"Early intervention" is a term that encompasses a range of stimulation and training activities for a variety of infants and young children. The particular type of program provided has often been a function of the perceived needs of children served and the philosophic orientation of the discipline(s) involved. Interventions have thus included those aimed at motor³ and cognitive development,⁴ and broad-based transdisciplinary therapies.⁵

Most efforts have been directed toward two major groups of children: those at environmental risk, and those who are, or who may be presumed to be, biologically impaired. As Browder⁶ has pointed out, the two groups of children are very different in their needs and characteristics. Intervention for children at risk because of social/cultural deprivation has often taken a psychoeducational approach, focusing on intellectual development and the enhancement of parent-child relationships. Longitudinal studies have shown intervention to be effective in preventing cumulative intellectual deficits due to environmental deprivation.^{7,8} Research on early intervention with environmentally deprived populations has been comprehensively reviewed in the last few years.^{9,10} No comparable review of research with developmentally disabled infants and children had

been carried out. Denhoff,¹¹ however, has recently surveyed some intervention programs from a pediatric perspective, and others^{12,13} have dealt with the problems of documenting the effectiveness of early intervention. Comprehensive review of this topic in the pediatric literature seems relevant, given the significant medical component in the diagnosis, evaluation, and treatment of this population.

The scope of this review will be limited to infants and young children whose impairments are presumed to be biologic in nature. These children are often identified at birth and usually include asphyxiated and low-birth-weight infants, as well as infants with genetic, metabolic, neurologic, or anatomic defects. Specific conditions may include cerebral palsy, mental retardation, disorders of communication, or a combination of these handicapping conditions.

For the purpose of this review, early intervention will be defined as a period of systematic intervention carried out in infancy or early childhood. Duration of intervention may vary from months to years. Furthermore, the definition of intervention will be limited to manipulations that are exclusively experiential in nature. Typically, this involves traditional therapies such as physical, occupational, or speech therapy, and broader combinations of physical or social stimulation. Less traditional therapies, such as vestibular stimulation³ designed to promote motor development, are also included. Pharmacologic or dietary interventions such as 5-hydroxytryptophan for children with Down syndrome¹⁴ and the Feingold diet¹⁵ for hyperactive children will not be considered.

A final issue central to this review deals with the concept of effectiveness. We have previously emphasized the importance of documenting change/progress in children as a function of a specified intervention.¹⁶ As Bricker¹⁷ has pointed out, variability of criteria for success and methodologic difficulties have made the determination of effectiveness problematic. A minimal methodologic requirement is reliable and valid assessment of a child's abilities on two or more occasions. Difficulties associated with assessment of infants in general become exaggerated when biologically impaired infants and young children are considered. Previously we have pointed to limitations concerned with definitional issues, the nature of instruments, characteristics of the child and the examiner, and appropriateness of analysis.¹⁸ Although these limitations have undoubtedly restricted research on early intervention, some studies have been performed in a manner consistent with the goal of documenting progress over time. Each study included in this review possessed data pertaining to documentation of progress of children even though the degree of

experimental control and statistical treatment varied. Although the major purpose of this review is to evaluate the evidence for effectiveness of early intervention, evaluation will also be made of the nature and quality of that evidence. With these qualifications in mind, the major questions we will address are: (1) What are the characteristics of children included in research studies on early intervention? (2) What are the variables of early intervention? (3) What is the evidence for effectiveness of early intervention, given available research?

REVIEW AND ANALYSES OF STUDIES

A review of the literature from 1975 to the present resulted in the identification of 27 research studies that met the qualifications specified previously.^{3,4,12,19-42} Data from these 27 studies were tabulated and summarized in Tables 1 to 3. The multidisciplinary nature of the needs of biologically impaired children is evident from the fact that the research reviewed was equally representative of the biomedical and the psychoeducational literature.

The first question addressed the issue: What are the characteristics of children included in research studies on early intervention? With the low prevalence of seriously impaired children in a given locale and the ethical imperative to provide treatment, it is not surprising that researchers often studied every available child. Limited use of criteria for inclusion resulted in samples heterogenous with respect to diagnostic category, degree of impairment, chronologic age, mental age, etc.

Complete data were not provided by all studies. Treatment group size ranged from two to 75 subjects, and age of subjects ranged from 2½ months to more than 6 years. The reported frequency of sessions ranged from daily sessions to two occasions per week. Duration of individual sessions ranged from as brief as five minutes to as long as a full morning. The duration of the total early intervention programs range from a short four weeks to two years. It is interesting to note that multiply handicapped children were the predominant subjects. Studies that attempted to obtain a homogeneous sample with respect to diagnosis, such as Down syndrome^{12,32} or cerebral palsy,^{38,36} did not specify the criteria on which these diagnoses were determined. In summary, the data provide evidence for the fact that studies of early intervention generally serve small samples of infants or young children with daily sessions of a fairly brief duration. In general, it appears that intervention occurred prior to the second year of the child's life.

The focus of the second question was to define measurements of early intervention: that is, what i

the nature of setting, treatment, and evaluation components. A summary of selected variables is presented in Table 1, which reveals substantial variability in the makeup of interventions in terms of settings and primary emphasis. The importance of the home is evident in that home and home/center programs account for approximately two thirds of reported studies. Other settings, if reported, include clinics and residential facilities. With regard to the primary nature of interventions, half of all studies emphasized an approach combining major domains. Approximately one third of the studies placed primary emphasis on motor development reflected in physical therapy and vestibular stimulation. Most of the studies (81%) provided programming for children based on general concepts of development. Detailed curricula were specified for only five studies, three of which involved vestibular stimulation procedures. The value of parent involvement in studies of early intervention is reinforced by the fact that 70% specified roles for parents and 58% reported some aspect of parent support and/or training by staff.

In the area of evaluation, two types of documentation were reported, with established scales, such as the Bayley, Denver, and Griffiths, used in 70% of the studies, whereas 30% did not include standardized instruments. No single instrument was used with high frequency. These findings illustrate a major factor complicating the comparison of early interventions, namely, the wide variety and type of dependent measures used and the difficulty of drawing inferences from results on nonstandardized tests.³⁴

The unit of analysis by which effectiveness was measured was not consistent. The most common unit, age equivalents, was reported by only ten studies, with other units of analyses, such as IQ scores and behavior frequency measures accounting for lower percentages. In three of the ten studies reporting age equivalents, measures of velocity or efficiency were derived.^{20,24,40}

The last question considered in this review focused on an analysis of evidence for the effectiveness of early intervention. Drawing on reviewed data, all of the studies were evaluated along two dimensions: (1) statistical evidence of effectiveness and (2) conclusions by authors of effectiveness. Authors' conclusions were categorized as supporting effectiveness of intervention if, in the discussion of results, authors cited quantitative evidence for gains, improvement, or accelerated development of subjects. For example "... results demonstrate that early ... intervention ... can accelerate markedly the development of Down's Syndrome ... children. ..." (20, p. 175). The analysis of studies along these dimensions is summarized in Table 2 according to

TABLE 1. Frequency of 27 Studies Reporting Specific Variables of Early Intervention*

Variable	No.	%
Setting		
Home	7	26
Center/clinic	3	11
Residential	2	7
Home and center	12	44
Other	1	4
Not specified	2	7
Primary nature of program		
Motor	7	26
Language	0	0
Cognitive	1	4
Social	0	0
Combined	13	48
Vestibular stimulation	3	11
Other	3	11
Use of curriculum		
Specified	5	19
Not specified	22	81
Role of staff to child		
Direct	10	37
Indirect	8	30
Both	7	26
Not specified	2	7
Role of parents		
Specified	19	70
Not specified	8	30
Measurement scales		
Bayley	5	19
Griffiths	5	19
Cattell	2	7
Gesell	1	4
Stanford-Binet	3	11
Other	4	15
Program specific	8	30
Unit of effectiveness		
Age equivalent	10	37
IQ/DQ	7	26
Criterion reference	4	15
Behavioral frequency	2	7
Other	3	11
Not specified	2	7

* Abbreviation used is: DQ, developmental quotient.

the type of experimental design used.

The four types of experimental designs reflect increasing methodologic and scientific rigor. The four types are defined as follows: retrospective (studies relying on existing data analyzed after the fact); prospective studies without a control group; prospective studies with a control and/or contrast group but without random assignment; and, prospective studies with random assignment to treatment groups. Distribution of studies by type of design reveals proportions ranging from 19% to 33%. In 59% of all studies, statistical treatment of data was used. The proportion of studies using statistical procedures within each type of experimental design varied from 100% of prospective studies with control/contrast groups, to 33% of prospective/no con-

TABLE 2. Analyses of Effectiveness of Early Intervention as Function of Experimental Design

Experimental Design	Frequency		Statistical Results		Statistical Support for Effectiveness		Authors Conclude Intervention Effective	
	No.	%*	No.	%*	No.	%*	No.	%*
	Retrospective	9	33	4	15	4	15	9
Prospective (no control group)	6	22	2	7	2	7	6	22
Prospective (control/contrast group)	7	26	7	26	5	18	6	22
Prospective (random assignment)	5	19	3	11	2	7	4	15
Total	27	100	16	59	13	48	25	93

* Percent of total studies.

control studies. It is interesting to note that the application of statistical analyses was only 60% in studies using the most rigorous experimental design. Of those studies that used statistical procedures, significant support for effectiveness was found for 81%. On an overall basis, objective statistical support for the effectiveness of early intervention was found in slightly less than half of all studies. This is in contrast with the 93% figure for studies in which the authors concluded effectiveness. An analysis of the specific populations involved in the 13 studies reporting significant effects of intervention indicates that the diagnostic groups were a cross section of the groups represented in the 27 studies (ie, five studies, down syndrome; two studies, mental retardation/delayed development; four studies, multi-handicapped; two studies, cerebral palsy).

SUMMARY AND IMPLICATIONS

On the basis of the questions considered in this review, the following conclusions seem tenable. (1) Although sample sizes have typically been small, and detailed criteria for inclusion have often been lacking, subjects in studies of early intervention are in fact infants and young children with significant biologic bases for their handicap. (2) Given the severity of the biologic impairment, intervention efforts have emphasized multidisciplinary therapies and specified roles for parents in comprehensive programs. (3) In spite of limitations from the standpoint of scientific criteria, the research does provide qualified support for the effectiveness of early intervention. Although only 48% of all studies yielded statistical evidence for effectiveness, this figure increases to 81% when the analysis is restricted to those studies that incorporated statistical procedures. Both of these figures, however, are lower than 93%, representative of conclusions for effectiveness drawn by the studies.

The discrepancy between 48% and 93% may be a realistic representation of the status of early inter-

vention research. Which of these values should be used to answer the question, "Does early intervention really work?" To shed some light on this issue, a review of the extent to which early intervention studies met scientific criteria for research is presented in Table 3. The 27 studies were evaluated on the basis of selected criteria pertaining to appropriateness and rigor of experimental procedures and design.

Overall, a limited number of studies met common criteria for scientific research. Inadequate specification of inclusion criteria characterized half of the studies. The lack of adequate descriptions of inclusion criteria places limitations on any generalization of the findings. Random assignment in the use of control or contrast groups is characteristic of less than one fifth of the studies. Further limitations on the scientific merit of the research is evident from the fact that independence of evaluation and documentation of inter-rater reliability are present in only 11% of the studies. A final limitation in this area is that less than one third of the studies used more than one measure of outcome and only one study of 27 included outcome measures that extend beyond the child (ie, family or sibling).

Returning to the discrepancy between the 48% and 93% values of effectiveness, the failure of many of the studies to meet scientific criteria as summarized in Table 3 suggests that the 93% value is an overestimation of effectiveness. Conversely, for many of the same reasons, the figure of 48% may be an underestimation in that many of the limitations and problems inherent in this research, particularly those of small and heterogeneous samples, would also tend to work against statistical support of effectiveness.

As a working hypothesis, it is proposed that although there is empirical evidence for effectiveness of early intervention in 48% of the studies, this is in fact an underestimation. Effectiveness may in fact be closer to the 93% figure derived from the conclusions of contributors to this research area. In sup-

TABLE 3. Review of Studies on Basis of Selected Scientific Criteria

Criterion	% of Studies Reporting (n = 27)	No. of Studies Reporting (n = 27)
Criteria for inclusion of subjects	52	14
Random assignment	22	6
Control group (routine care)	48	13
Contrast group (alternative treatment)	22	6
Outside/independent data collection	11	3
Inter-rater reliability	11	3
Non-child-oriented measures	4	1
Multiple dependent variables	30	8

port of this hypothesis, the following explanations are proposed: (1) Handicapped children made progress but statistical significance was not obtained given limited sample sizes. (2) Children made progress but it occurred in domains not measured by the dependent variables. For example, a child's behavior or style of response may have improved but was not documented. Furthermore, maintenance of a certain level of development, or prevention of regression, may also be reflective of success but not recorded. (3) Children made no discernible progress in developmental domains but improvement was noted in management areas (eg, seizure control, feeding, etc). (4) Children made no discernible progress but improvement occurred in dimensions not specific to the child (eg, family or sibling adjustment).

In order to verify the belief that intervention is in fact effective more frequently than the evidence suggests and to contribute to the improvement of future accountability efforts, two strategies for documentation are proposed. The first is concerned with methodology and the second is conceptual in nature.

From a methodologic point of view, systematic consideration needs to be given to problems of comparing treatment effects. Ethically, control groups are difficult to justify. The use of a contrast treatment also needs to be carefully considered inasmuch as it may in actuality not differ from a control condition if the treatment is minimal, and thus raises the same ethical problem as control groups. On the other hand, if the contrast group is in fact a genuine alternative treatment, generalizations based on comparisons between experimental and contrast groups can be confounded. The lack of significant differences between an experimental and a contrast group may indicate that both groups improved or that neither improved relative to the other over time. Given the nature of documentation

found in the preceding review, such distinctions would be difficult to make. Further methodologic concerns include documentation of inter-rater reliability and details pertaining to subject variables.

The methodologic issues considered above assume that the evaluation of effectiveness should be based on empirical evidence. Although this is an acceptable approach, it is proposed that the effectiveness of early intervention should also be evaluated along conceptual dimensions. Specifically, it is proposed that determination of effectiveness should be based on the expansion of assessment approaches and a distinction should be made between scientific evidence and clinical accountability. To this end, problems contributing to the difficulty of documenting effectiveness raised previously in the four explanations should be addressed.

The expansion of assessment approaches is proposed in order to permit the documentation of progress in domains not measured by traditional tests and measures. In this regard, there should be a broader utilization of measures of child characteristics than traditionally employed. Applicable domains in which handicapped children may demonstrate change over time include communication, temperament, behavior style, rhythmic habit patterns, and affect.⁴³ Related to this is the importance of documenting effectiveness even in the absence of specific developmental progress such as measured changes in pediatric management of medical problems. Improvement of medication status may constitute an important correlate of the effectiveness of early intervention.⁴⁴

This review indicates that measures of family or sibling adjustment in early intervention are limited. Increased measurement should be made in this area as sibling adjustment often is reflective of the handicapped child's status.⁴⁵ Changes in the adjustment and functioning of parents and siblings constitute an appropriate and essential measure of effectiveness, especially as the family unit is frequently a target of intervention efforts.

Finally, in terms of documenting effectiveness, it seems important to distinguish between empirical evidence and clinical accountability. The lack of empirical support for effectiveness should not lead to the inference that a given intervention is not clinically accountable. The lack of empirical support may be a function of the nature of measurement as well as the timing and duration of intervention.³ Quantitative treatment of data and the problems of small sample sizes limiting statistical significance could be addressed by the use of nonparametric statistics, as well as novel applications of single-subject designs.²¹ A procedure that lends itself to empirical as well as clinical accountability is

Goal Attainment Scaling, used extensively in the mental health field and proposed for documentation of progress in young handicapped children.⁴⁶ The Goal Attainment Scaling procedure seems suitable for evaluation of individualized allied health programs for children, such as physical therapy,⁴⁴ and it may also be applicable for assessment of intervention effects on parents, using a system such as the Progress Oriented Family Record.¹⁷ Systematic exploration of alternative strategies and procedures for pediatrics and behavioral science should enhance the effort to document that early intervention is not only humane but effective.

ACKNOWLEDGMENTS

This work was supported in part by the Bureau of Education for the Handicapped, US Office of Education, Department of Health, Education and Welfare, Contract No. 300-77-0309.

REFERENCES

- Clarke A, Clarke A: *Early Experience: Myth and Evidence*. New York, Free Press, 1976
- Bronfenbrenner U: Is early intervention effective?, in Friedlander BZ, Sterritt GM, Kirk GE (eds): *Exceptional Infant, Assessment and Intervention*. New York, Brunner/Mazel, 1975, vol 3
- Kantner RM, Clark D, Allen LC, et al: Effects of vestibular stimulation on nystagmus response and motor performance in the developmentally delayed infant. *Phys Ther* 56:414, 1976
- Brassell W, Dunst D: Fostering the object construct: Large scale intervention with handicapped infants. *Am J Ment Defic* 82:507, 1978
- Harris SR: Transdisciplinary therapy model for the infant with Down's syndrome. *Phys Ther* 60:420, 1980
- Browder JA: The pediatrician's orientation to infant stimulation programs. *Pediatrics* 67:42, 1981
- Heber P, Garber H: The Milwaukee project: A study of the use of family intervention to prevent cultural-familial retardation, in Friedlander B, Sterritt G, Kirk G (eds): *Exceptional Infant, Assessment and Intervention*. New York, Brunner/Mazel, 1975, vol 3
- Ramey C, Collier AM, Sparling JJ, et al: The Carolina Abecedarian Project: A longitudinal and multidisciplinary approach to the prevention of developmental retardation, in Tjossem TD (ed): *Intervention Strategies for High Risk Infants and Young Children*. Baltimore, University Park Press, 1976
- Haskins R, Finkelstein NW, Stedman DJ: Infant stimulation programs and their effects. *Pediatr Ann* 7:99, 1978
- Tjossem TD (ed): *Intervention Strategies for High Risk Infants and Young Children*. Baltimore, University Park Press, 1976
- Denhoff E: Current status of infant stimulation or enrichment programs for children with developmental disabilities. *Pediatrics* 67:32, 1981
- Piper MC, Pless IB: Early intervention for infants with Down syndrome: A controlled trial. *Pediatrics* 65:463, 1980
- Bricker D, Carlson L, Schwarz R: A discussion of early intervention for infants with Down syndrome. *Pediatrics* 67:45, 1981
- Pueschel SM, Reed RB, Cronk CE, et al: 5-Hydroxytryptophan and pyridoxine: Their effects in young children with Down's syndrome. *Am J Dis Child* 134:838, 1980
- Haavik S, Altman K, Woelk C: Effects of Feingold diet on seizures and hyperactivity: A single subject analysis. *J Behav Med* 2:365, 1979
- Simeonsson RJ, Wiegand R: Accountability: A dilemma in infant intervention. *Except Child* 41:474, 1975
- Bricker D: Early intervention: The criteria of success. *Allied Health Behav Sci* 1:567, 1978
- Simeonsson RJ, Huntington GS, Parke SA: Assessment of children with severe handicaps: Multiple problems—multivariate goals. *J Assoc Sev Handicap* 5:55, 1980
- Aronson J, Fällstrom K: Immediate and long-term effects of developmental training in children with Down's syndrome. *Dev Med Child Neurol* 19:489, 1977
- Bagnato SJ Jr, Neisworth JT: The intervention efficiency index: An approach to preschool program accountability. *Except Child* 46:264, 1977
- Barna S, Bidder R, Gray O, et al: The progress of developmentally delayed preschool children in a home-training scheme. *Child Care Health Dev* 6:157, 1980
- Barrera J, Routh D, Parr C, et al: Early intervention with biologically handicapped infants and young children: A preliminary study with each child as his own control, in Tjossem TD (ed): *Intervention Strategies for High Risk Infants and Young Children*. Baltimore, University Park Press, 1976
- Bidder R, Bryant G, Gray O: Benefits to Down's syndrome children through training their mothers. *Arch Dis Child* 50:383, 1975
- Brassell W: Intervention with handicapped infants: Correlates of progress. *Ment Retard* 15:18, 1977
- Bricker D, Dow M: Early intervention with the young severely handicapped child. *J Assoc Sev Handicap* 5:130, 1980
- Carlsen PM: Comparison of the occupational therapy approach for healing the young cerebral-palsied child. *Am J Occup Ther* 29:267, 1975
- Chee FKW, Kreutzberg JR, Clark D: Semicircular canal stimulation in cerebral palsied children. *Phys Ther* 58:1071, 1978
- Clunies-Ross GG: Accelerating the development of Down's syndrome infants and young children. *J Spec Ed* 13:171, 1979
- Connolly B, Morgan W, Russell F, et al: Early intervention with Down syndrome children. *Phys Ther* 60:1405, 1980
- Haavik S, Altman K: Establishing walking by severely retarded children. *Percept Mot Skills* 44:1107, 1977
- Hanson M, Schwarz R: Results of a longitudinal intervention program for Down's syndrome infants and their families. *Educ Train Ment Ret* 13:403, 1978
- Hayden A, Haring N: The acceleration and maintenance of developmental gains in Down's syndrome and school-age children, in Mittler P (ed): *Research to Practice in Mental Retardation: Care and Intervention*. Baltimore, University Park Press, 1977, vol 1
- Ludlow JR, Allen L: The effect of early intervention and pre-school stimulus on the development of the Down's syndrome child. *J Ment Defic Res* 23:29, 1979
- Maloney FP, Mirrett P, Brooks C, et al: Use of the goal attainment scale in treatment and ongoing evaluation of neurologically handicapped children. *Am J Occup Ther* 32:505, 1978
- Sandow S, Clarke A, Cox S, et al: Home intervention with parents of severely subnormal, preschool children: A final report. *Child Care Health Dev* 7:135, 1981
- Scherzer AL, Mike V, Illson J: Physical therapy as a determinant of change in the cerebral palsied infant. *Pediatrics* 58:47, 1976
- Sellick KJ, Over R: Effects of vestibular stimulation on motor development of cerebral-palsied children. *Dev Med Child Neurol* 22:476, 1980
- Shapiro L, Gordon R, Neiditch C: Documenting change in young multiply handicapped children in a rehabilitation center. *J Spec Ed* 11:243, 1977
- Soboloff HR: Early intervention—Fact or fiction? *Dev Med Child Neurol* 23:261, 1980
- Thompson RJ Jr, Garrett DJ, Striffler N, et al: A model interdisciplinary diagnostic and treatment nursery. *Child Psychiatry Hum Dev* 6:224, 1976
- Maisto AA, German ML: Variables related to progress in s

parent-infant training program for high-risk infants. *J Pediatr Psychol* 4:409, 1979

Harris SR: Effects of neurodevelopmental therapy on motor performance of infants with Down's syndrome. *Dev Med Child Neurol* 23:477, 1981

Simeonsson RJ, Huntington GS, Parae SA: Expanding the developmental assessment of young handicapped children. *New Directions Excep Child* 3:51, 1980

44. Simeonsson RJ, Simeonsson NE: Medication effects in handicapped preschool children. *Top Early Child Spec Ed* 1:61, 1981

45. Simeonsson RJ, McHale SM: Sibling relationships of handicapped children. *Child Care Health Dev* 7:153, 1981

46. Simeonsson RJ, Huntington GS, Short RJ: Individual differences and goals: An approach to evaluate child progress. *Top Early Child Spec Ed* 3:51, 1980