Early Intervention Evaluation : Current Issues and Concerns

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Introduction

Early intervention, or early childhood special education, is one of the most recently developed specialised areas of education, coming into widespread existence only in the last 25 years (Kirk & Gallagher, 1983; Wolery, 1993). As economic difficulties continue to place restraints on government funding for education, greater pressure is exerted for accountability in all educational provisions, and demonstrations of program efficacy are rightly demanded by administrators who have increasing calls on limited financial resources. Service providers are also concerned that the type of program they offer is the best available, therefore evaluations of different program types and service deliveries should provide them with the necessary directions. Parents, too, have the right to know which particular programs will best suit their children (Jephson, 1992).

While some writers believe that early intervention operates from a strong theoretical base (see Anastasiow, 1986), others claim that it has evolved largely in an atheoretical manner (Dunst, 1986; 1989; Odom, 1988), and that this has been the fundamental cause of many of the problems inherent in evaluation. The purpose of this paper is to provide an overview of the evaluation problems which have surrounded early intervention research and outline some of the attempts being made to address them.

The Specific Characteristics of Early Intervention Programs

Some understanding of the specific characteristics of early intervention programs must preempt a discussion on evaluation issues, for they contribute strongly to the range of evaluation problems. An examination of factors relating to population definition and program variability will place such a discussion in an appropriate context.

Population Definition

i. Cross-Categorical Grouping

Early intervention programs are usually cross-categorical, serving children with almost any disability at any severity level. Broadly they fall into three groups. The first group include children with identified conditions, such as Down's Syndrome, cerebral palsy, a visual or a hearing impairment. These diagnosable conditions within the child have direct effects on the child's development. The second group are those children who present with a global developmental delay, identified because they do not progress in the communicative, cognitive, social, and physical areas of development at the same rate as their peers. The third group comprise those children who are considered to be "at risk' of learning failure, either because of biological factors such as low birth weight or prenatal exposure to drugs, or because of environmental factors such as child abuse, poor nutrition or lack of stimulation in the home environment (Peterson,

1989).
The combination of such diverse groups in individual programs makes the task of implementing and assessing the effectiveness of programs more difficult than in homogenous programs. The range of subject characteristics also raises the question of external validity and the extent to which the findings of any particular study can be generalised to other groups.

ii. Age Range from Birth to Six

Early intervention programs typically address the needs of children from birth to six years. This is indisputably the most rapid period of human development, with the exception of prenatal development. Determining the specific effects of an intervention program as opposed to normal developmental progress or maturation is extremely difficult.

Program Variability

i. Broad Range of Service Provision

The broad range of service provision that is typically involved in such programs is another essential feature of early intervention programs that increases the difficulty of successful evaluation. McCollom and Hughes (1988) found that, in addition to special educators and regular early childhood workers, professionals from the fields of medicine, social work, speech pathology, occupational therapy, physiotherapy, nursing, and psychology were involved in early intervention programs. In addition to differences in discipline-specific training, there are likely to be differences in the degree to which professionals have been trained to work with infants and toddlers and with their families. There will also be differences in the levels of experience in team membership, in the value placed on collaboration with families and service providers and an enormous range in the personal qualities of each service provider (Rounds, 1992). Variations in training and experience have been found to produce significant differences in service quality, even in similar service delivery models (Bailey and Bricker, 1984).

Apart from differences in the providers, the broad range of actual services present evaluation difficulties. If, for example, speech therapy and physiotherapy are combined with a structured program of small group instruction concentrating on language, fine motor and cognitive development, it becomes almost impossible to determine the particular contribution of each element of the program.

ii. Range of Learning Environments

Some programs are essentially centre-based under the direction of professional service providers while others are home-based programs where the family becomes the chief provider of intervention. The learning environments of children within the one program can also vary. Young children involved in intervention programs also typically attend other preschools which may or may not have special needs workers, and

they spend time with other caregivers. Who is to say that the progress made by the young child is due more to the early intervention program, than to the one-to one teaching that may well be received from a concerned and caring grandmother who minds the child two days a week?

iii. Individualisation of Programs

The curricula and instructional approaches are very likely to vary between programs, but are also likely to vary within individual programs. Newborns, toddlers and five year olds require very different programs, yet all may be part of the same early intervention service. Some programs incorporate teaching objectives into daily routines, whereby target behaviour skills for individual children are weaved into play and other regular activities (Bricker, 1989; Bricker & Veltman, 1992; Browder, 1987; McDonnell & Hardman, 1988; Stephenson, 1990; Warren & Kaiser, 1988). Other programs rely more on the structured teaching approach of direct instruction or precision teaching. Instruction may occur in individual settings, in small or in large groups. Both the frequency and intensity of instruction are likely to vary for individual children, adding further confounding variables. Programming changes are based on the tracking of individual progress, therefore many variations from the original plan may occur. Such highly individualised programs make the level of overall program effectiveness difficult to assess.

iv. Family Support

Early intervention is currently seen as a personalised, relationship-based process which must be family centred if it is to have longterm impact (Bailey, Palsha & Simeonsson, 1991; Bailey & Simeonsson, 1988; Hains, Burton and Hanline, 1992; McGonigel, Kaufmann & Johnson, 1991). The strong emphasis on family involvement and support now included in most early intervention programs (Kirk Bishop, Woll & Arango, 1992), is consistent with recent literature which has emphasised the importance of viewing children in the context of their unique family settings, involving parents in decision making and enhancing formal and informal family support systems. Assessing the impact of a program on different families is an extremely complex task. The families will vary in many ways, with differences in socioeconomic status, race, culture and ethnicity, perceptions of their child's disability, access to financial and other resources, coping strategies and ability to implement and support interventions at home, all of which will add further confusing dimensions to evaluation efforts.

Thus it can be seen that early intervention programs are extremely complex, serving as they do a variety of children and families through a diverse range of programs, and true assessments of their efficacy pose significant problems. Efforts, however, have been made to determine the effectiveness of such programs, and it is to this literature that we briefly turn now.

Brief Overview of Efficacy Studies

Early Evaluation Efforts

In the early years of intervention, evaluation was largely ignored as program planners and service providers concentrated on the development of screening and referral procedures, new curricula and teaching strategies, interagency cooperation and on the implementation of staff training programs (Guralnick, 1989).

Evaluations during the seventies and early eighties were largely of individual programs addressing the needs of children with Down's Syndrome, hearing impairments, mild, moderate and severe intellectual disabilities. Peterson (1987, pp. 40-44) provides a comprehensive summary of many individual program evaluations done during that period, all of which consistently claimed benefits in the areas of cognitive, academic, attitudinal and social growth for children with a range of disabilities and at-risk conditions, in addition to improved functioning for the parents.

The Use of Meta-analysis

It was then acknowledged that in order to make broadly based decisions about effective practice, it was necessary to examine research findings from a large number of studies, rather than rely on information gleaned from individual efficacy studies. During the mid eighties, meta-analysis was used increasingly to integrate and synthesise research evidence from a large number of individual studies (Bailey and Bricker, 1984; White, Bush and Casto, 1985-6; Casto and Mastropieri, 1986; Dunst, 1986; Dunst & Rheingrover, 1981; Dunst, Snyder & Mankinen, 1989; Dunst & Vance, 1983; Guralnick, 1988; Simeonsson, Cooper & Scheiner, 1982; Reynolds, Egan & Lerner, 1983). Meta-analysis involves the collection of all, or a representative sample of, studies in a specified area with results being converted into a common standardised measure (Beauchamp, 1989, p.375). Characteristics that may influence the outcome are coded and statistical techniques are used to examine the relationship between different characteristics and various outcomes. Effect size is the recommended common metric. The reported advantage of meta-analysis is that stronger conclusions may be reached through the examination of a greater number of studies. Meta-analysis has, however, been criticised on the basis that it is almost impossible to obtain logical conclusions from group studies having varying methodologies, populations and measuring instruments.

Recognition of Evaluation Problems

While the reviews using meta-analysis broadly confirmed that early intervention programs have a positive impact on children and families, most reviewers commented on a range of serious methodological problems or "limitations" evident in the evaluations and on the narrow focus of outcome measures. Both design and measurement problems were reported, with an absence of validity measures, a lack of independence between program development and program evaluation, limited followup studies

and a general paucity of empirical evidence (Bailey and Bricker, 1984; Casto and Mastropieri, 1986; Dunst, 1986; Dunst & Rheingrover, 1981; Dunst, Snyder & Mankinen, 1989; Dunst & Vance, 1983; Guralnick, 1988). Results of many studies were reported as "differences" with no indication of the magnitude or statistical significance of the differences. Bailey and Bricker (1984) found in their review, that although child change was usually one of the indicators of program effectiveness, dependent measures ranged from standardised test results to the number of training objectives achieved. In some cases, only one measure was used, in others several measures were used, for example, parent perception and test scores. Some reports of preschool intervention programs, while addressing such issues as identification and referral, duration of enrolment and broad types of programs and services offered, did not address the critical issue of student outcomes. Others reported "program strengths", but no empirically based data on student performance in relation to planned objectives (Radonovich & Houck, 1990). There was also conflicting evidence concerning the significance of family involvement with some reviewers (Casto & Mastropieri, 1986) claiming that they were not essential to the success of a program, while others (Dunst & Snyder, 1986; Strain & Smith, 1986) claiming they were a necessary element

The broad consensus was that most studies were so methodologically flawed that it was impossible to interpret the findings with any degree of confidence and that the studies reviewed did not provide the sort of evidence necessary to support the contention that early intervention worked. This is not to say that any of the reviewers believed that early intervention did not work, but that current evaluations had failed to provide convincing empirically-based evidence to that effect (Dunst & Rheingrover, 1981; Dunst, 1986).

Evaluation Issues

A more complete discussion of the evaluation problems which have arisen throughout two decades of efficacy research and the attempts made to address them, may best be managed by dividing them into four broad groups:

i. threats to internal validity;
ii. the absence of appropriate statistical analyses;
iii. the use of limited outcome measures; and
iv. the lack of a conceptual base to intervention programs.

Threats to Internal Validity

Without control of threats to internal validity, the results of any study become impossible to interpret. Most studies of any scientific value require some form of experimental control. The use of control groups rarely occurs in early intervention research because it would raise serious ethical questions to deny a group of identified children access to a program for the purposes of research. In fact, in the United States, designs incorporating nonintervention control groups are illegal in most states (Bailey & Bricker, 1984). This inability to randomly assign matched groups raises serious validity issues.

Without the inclusion of control groups, gains made could be accounted

for by a range of competing hypotheses. Dunst and Rheingrover (1981) used Campbell and Stanley's (1969) conceptualisation of experimental design to point out a range of threats to internal validity that were evident in many of the studies they reviewed:

- Maturation or normal development provided a particularly strong competing hypothesis in children from birth to six, particularly when a program's duration was six months or more.
- Changes in children could have been due to any other simultaneously occurring events, such as additional therapy programs or time spent with other caregivers, rather than to the intervention program. Campbell and Stanley refer to this as threats due to history.
- Children in programs whose objectives were derived from the initial test instrument could have become test-trained, thereby causing validity threats due to instrumentation. LeLaurin and Wolery (1992) point out that further instrumentation threats arise through the service nature of intervention programs. Services need to respond to the particular needs of the child or family and are therefore very likely to change throughout a program's duration. Maintaining program fidelity or instrument reliability is almost impossible under those conditions.
- The principle of statistical regression would suggest that regression towards the mean could explain the progress recorded by severely delayed children.
- Without random assignment to groups, which rarely occured in the intervention programs reviewed, differing effects could have been the result of pre-existing differences between the groups, resulting in threats due to selection procedures.

In attempts to overcome problems related to the lack of a nonintervention control group, some researchers have compared different intervention programs or services (as reported in Casto & Lewis, 1984; Dunst & Rheingrover, 1981; Simeonsson, Cooper & Scheiner, 1982; White Mastropieri & Casto, 1984). There are, however, substantial design problems when two different intervention programs are compared, not the least of which is the difficulty of forming matched groups due to the heterogenous nature of early intervention groups as discussed previously. With few exceptions (Cole, Mills and Dale, 1989; Cole, Mills, Dale & Jenkins, 1991), the majority of program comparison studies have been retrospective, that is, a comparison group has been located for the purpose of establishing the effects of an intervention after the program has concluded. The comparison group may have had another type of intervention or may have received no intervention at all. A major problem identified by Dunst (1986) when comparison groups have been tested many years previously is that "effects" may be due simply to cohort differences. The IQ levels of children with Down's Syndrome, for example, have increased over the past 50 years due in large part to changing community attitudes which has broadened the experience of many such children. Therefore even without specific

intervention programs, an increase in IQ and some other indicators of progress may be expected.

Lack of Appropriate Statistical Analysis

Further attempts to overcome threats to internal validity have been statistical in nature. Measuring change in children has been expressed as "one of the most enduring statistical problems in research on the efficacy of early intervention problems (Hauser-Cram& Wyngaarden Kraus, 1991, p.288). It is of significance to note that in a number of meta-analyses (Dunst, 1986; Dunst and Rheingrover; 1981), efficacy findings were significantly reduced in studies where appropriate statistical procedures had been used in experimentally designed programs.

One of the most commonly used statistical strategies was the simple change score which is calculated by subtracting a pretest score from a posttest score. There are, however, two problems which have been consistently associated with the use of change scores; their low reliability coefficients, which make discrimination of change difficult to detect from error, and their negative correlation with initial status, which make it difficut to compare changes at different ends of the scale (Hauser-Cram and Wyngaarden Krauss, 1991). Progress is harder to detect at the higher end of the scale and those at the lower end appear to make large increments of progress.

Other statistical approaches, such as indexes of change, have attempted to solve some of the problems associated with the use of change scores. With the use of indexes of change, developmental gain is divided by the months of intervention service in order to calculate a rate of development. Some indexes of change have been constructed to take into account a child's prior development. Wolery (1983) proposed one variation, the Proportional Change Index (PCI) which compares a child's rate of development at pretesting to the rate of development during intervention. Developmental gain is calculated by subtracting the pretest developmental age from the posttest developmental age. The advantages of these indexes is that they are easy to interpret for both groups and individuals with varying levels of disability; they can incorporate change over differing periods of intervention and they can be used to compare development in different domains, such as motor and language domains. They do, however, as pointed out by Hauser-Cram and Krauss (1991) assume that the ratio of developmental age to chronological age would be stable in the absence of the intervention. They are also only useful for measuring change where it is possible to calculate a developmental age; the effect on other family and child outcomes cannot be assessed.

A third statistical procedure (recommended by Hauser-Cram & Kraus, 1991) which could be used to assess individual child progress is the residual change score - the difference between the individual's actual and predicted score. The residual change score identifies individuals who changed more than predicted and those who changed less, within the

sample as a whole. They do not contain the bias demonstrated by simple change scores, are not limited to measures of developmental age but can be used with any interval data. The disadvantages are that residual change scores require reasonably large samples, which are not common in early intervention programs, and they give no precise data on how individuals change, which reduces their usefulness in an educational setting.

Markowitz et al (1991) used a statistical technique called value-added analysis to examine whether children's development in intervention programs was above that which would be expected through maturation alone. Value-added analysis creates what is essentially a statistical control group against which progress can be measured. Cross-sectional data from a pretest is used to approximate the growth rate that children would demonstrate without intervention as they grew older. Program effects are determined by comparing observed growth to expected growth. Value-added analysis does not use the individual child's pretest to estimate a growth rate, but rather uses the relationship of scores to age for a similar group of children measured prior to the introduction of special services, therefore cohort differences could once again reduce the validty of the results.

Thus different statistical approaches are being used to address some of the problems associated with more simplistic assessments of program efficacy, but all have been shown to have their limitations, and difinitive approaches have yet to be devised.

Limited Outcome Measures

There has been some criticism of the limited and/or inappropriate outcome measures used to assess the efficacy of early intervention programs. Many programs have used standardised tests or instruments to document child development (Casto & Lewis, 1986). The value of standardised tests such as the Bayley Scales of Infant Development (Bayley, 1969) are that they have been shown to be excellent predictors of future performance and educational placement which is obviously very useful information. Intervention objectives, however, are highly specific and the use of standardised instruments which have broad application for a normal preschool population, may not be fine enough to discriminate the changes that occur in some young disabled children. Great progress can be made by a young child with Downs Syndrome in an intervention program without these changes necesarily being evident on IQ tests. The use of more idiosyncratic and individualised tests, however, means that generalisation of findings are impossible.

There is limited value in gaining results of high statistical significance through the measurement of specific outcomes if some educational significance is not demonstrated. Data of great statistical significance has been collected on outcomes such as reductions in infant fussiness, eye gaze aversion (as reported by Casto & Lewis, 1986) and behavioural engagement (McWilliam & Dunst, 1986). Yet unless these data can be directly linked to later development, the educational

relevance is questionable. Relevant outcome measures are those which have direct and proven links to further development.

There has been a concentration on assessing program impact on the cognitive, language and motor domains, whereas there has been increasing recognition of the importance of other variables in young children. It is social competence that often determines the success or failure of future integration programs (Guralnick, 1986), therefore the degree to which intervention programs can affect this variable is of great significance. Motivational variables have also been suggested as important indicators of program impact because of their longterm effects on student performance (Zigler & berman, 1983). Emotional development, self efficacy, problem-solving behaviour, adaptive abilities and self-concept are just a few of the child-related variables that could be related to efficacy and which require further investigation.

It is also critical that variables related to the impact of intervention programs on family well-being, competency, relationships, and so on, be included. Our understanding of the significance of the family in early childhood development has expanded greatly in recent years. Any evaluation that concentrates only on child outcomes is ignoring a vital component of the early intervention service, although defining the precise way in which parents are involved is extremely difficult.

This leads directly to the final major criticism of evaluation programs, put forward chiefly by Carl Dunst in a number of papers over the past five years. He, too, raises the question of the limited outcome measures contained in most evaluation studies, but sees this as a direct result of the poorly defined theoretical base for early intervention as a whole.

Lack of Conceptual Base

Dunst (1990) believes that few programs have operated from a strong theoretical base, which has prevented them from making specific predictions and formulating precise hypotheses about the impact of different intervention types. Intervention practices which are the direct outcome of theory and have a strong conceptual base should be able to demonstrate a functional relationship between intervention and outcome. Dunst believes that in most evaluations, specific program effects have not been linked closely enough to specific types of intervention and that generalized positive child performance outcomes have been accepted as evidence of efficacy. This view is supported by Casto and Lewis (1986).

According to Dunst, a major problem with many evaluations is that the emphasis has been overwhelmingly on what the child can or can't do, with no explicit attention paid to the broader-based social systems influences which have an impact on the child's development. If

evaluation procedures can be broadened to include identification of the variables that are responsible for the range of behaviours and

development, the information gathered will have direct bearing on intervention factors that can be used to affect changes in development.

Dunst believes Bronfenbrenner's (1979) ecological model of human development provides an appropriate conceptual base for early intervention programs. Bronfenbrenner developed a systems perspective of the family, in which the infant or child and family are seen as functioning in several environments called microsystems (eg. home, program, community environments like church or neighbood centres, respite and medical centres). Events that occur in any one of the microsystems can influence the others.

Dunst (1986; 1988; 1990) and Dunst and Trivette (1984; 1986; 1987) have used this conceptualisation of early intervention to evaluate programs currently carried out at the Family, Infant and Preschool Program at Morganton, North Carolina. Their research focuses on the description of changes in child, parent and family functioning; the identification of factors associated with these changes, the study of these changes within and across different settings and the translation of causal and mediational factors into specific interventions that promote change in children and families. Independent variables are grouped into five major sets: personal characteristics of the parents, family characteristics, child characteristics, child diagnosis and social support. Both qualitative and quantitative methodologies are utilised. A range of instruments are used to measure social support and different statistical approaches allow them to isolate the types and forms of support that contribute to parent and child functioning. They are not yet completely satisfied with the statistical approaches they are using, but are confident that they are at least measuring with far greater accuracy, the range of variables that really do have an impact in early intervention programs.

Conclusion

It would appear that if we are to continue to make progress in early intervention research, there are a number of areas that require attention. Addressing threats to internal validity would appear to be a priority. Current statistical approaches have addressed some, but not all, of the problems associated with the lack of control groups. LeLaurin and Wolery (1992) believe that more explicit descriptions of intervention strategies, details of actual rather than planned schedules of implementation, the context in which they occur and specific participation rates in replicable terms, would enable the relationship between interventions and their effects to be more readily assessed. There is also a great need for further development of appropriate instrumentation for assessing behavioural change, identification of other outcome variables as indexes of program effictiveness and longitudinal studies to improve the quality of intervention research (Guralnick, 1988, 1989; Jephson, 1992). And finally, predictions of intervention outcomes must emerge from a sound theoretical base so that outcomes can be directly linked to particular strategies (Dunst, 1989, 1990).

We should remember, however, that early intervention research is still

in its infancy. A great deal of progress has been made in the past two decades, not only in program delivery and service provision, but also in evaluation. While not minimising the difficulties ahead, our rapid past progress, our increasing understanding of the variables that affect child and family growth and the ongoing development of more sophisticated research techniques, should give us cause for optimism.

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