THE EFFECTS OF A DEVELOPMENTAL PROGRAM ON THE INTELLECTUAL AND SOCIAL FUNCTIONING OF SEVERELY AND PROFOUNDLY RETARDED CHILDREN AND ADULTS.

Thesis submitted to the Department of Psychology, University of Cape Town, in partial fulfilment of the requirements for the degree of Master of Science in Clinical Psychology.

by

Glynis Disa Child

October, 1976.

The copyright of this thesis is held by the University of Cape Town.
Reproduction of the whole or any part may be made for study purposes only, and not for publication.

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

University of Cape Town

ACKNOWLEDGEMENTS

My appreciation is extended to the following :

Mrs. Myrna Milun, my Supervisor, for her untiring guidance and support.

Dr. Manie van der Spuy, for stimulating my interest in the area, and for help with the planning of the study.

Professor Vera Grover, for her advice and encouragement.

Mr. Lester Gilbert for expert help concerning statistics.

Miss Dot Shamley for aid freely given.

My mother, who typed the manuscript.

I would also like to thank Dr. A. Daneel for his permission to work at the Institution, and Dr. Neil Egnal, the Senior Psychologist, for his helpful suggestions.

A special vote of thanks goes to the staff of the Institution for their cooperation and interest, and to all those who participated in the study as subjects.

Finally, my thanks to the two psychology students, Miss Janine Child and Miss Caron Sepp who so enthusiastically assisted me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES IN APPENDICES

THE EFFECTS OF A DEVELOPMENTAL PROGRAM ON THE INTELLECTUAL AND SOCIAL FUNCTIONING OF SEVERELY AND PROFOUNDLY RETARDED CHILDREN AND ADULTS.

Glynis Disa Child

Following a period of familiarisation with the experimenter to control for the effects of motivational factors on test performance, 42 institutionalised, severely and profoundly retarded children and adults were assessed on the Cattell Infant Intelligence Scale, the OSAIS, and the Vineland Social Maturity Scale. Subjects were then divided into three loosely matched groups : the experimental group received a developmental program over a four-and-a-half month period. Control group 1 received a program of stimulation without training, and Control group 11 no treatment. No significant difference was found between the three groups on post-testing. However, the experimental group showed a significant increase in level of social and intellectual functioning on post-testing, indicating that the program had a positive effect. Increases were not significantly related to initial level of functioning or to chronological age, implying that an individual's level of functioning should not be taken as an indication of his potential for change, and that a wide age range of subjects will benefit from training.

Introduction

During recent years increasing attention has been paid to the problems of the mentally retarded, particularly with regard to the training and education of this group.

A large number of the mentally retarded spend at least a part of their lives in institutions. Numerous studies have now documented the adverse effects of inadequate institutional care on motor, social, language and intellectual development (e.g. Dennis, 1960; Spitz, 1945; Rutter and Martin, 1972; Lyle, 1959). However, subsequent research has shown that these adverse effects can be overcome to some extent by the later provision of stimulating environmental conditions. A major issue in this area is whether a critical period for intervention exists. There is as yet no good evidence to suggest that only one period of intellectual development is sensitive to external intervention, and intervention thus appears justified throughout the recognised period of intellectual development and possibly later. (Stein and Susser, 1971).

In view of the adverse effects of institutionalisation, it is particularly necessary to provide programs of stimulating activities for institutionalised retardates. The mentally retarded form a heterogeneous group in terms of etiology, present condition and prognosis, and consequently mental retardation has been approached from a number of different viewpoints, each of which will have particular implications for the type of training program adopted.

The bulk of research in this area has been conducted with the mildly and moderately retarded, while the severely and profoundly retarded have received less attention. Kirk (in Stevens and Heber, 1964) concluded that up to the time of writing, training programs with the severely retarded showed little positive effect. However, more recent work (e.g. Conover, in Rothstein, 1971) where programs have been carefully designed to provide activities suited to the level of functioning

of the severely and profoundly retarded, has shown promising results.

The aim of the present study is to evaluate the effects of a developmental program designed to provide activities and experiences suitable to the level of functioning of severely and profoundly retarded subjects over a wide age range. Past studies have largely concentrated on work with children, but if a critical period for intervention does not exist, adults too could be expected to benefit from training programs. An attempt will also be made to compare the effects of such a program with one providing stimulation without systematic training of any kind.

Zigler (1967) has suggested that increased familiarity with the experimenter during the course of a program, is one of the major factors leading to IQ change. On pre-test assessment subjects often lack confidence in the presence of the tester and thus fail to perform at their optimum level. In order to control for this, a familiarisation program will be conducted with all subjects prior to initial assessment.

The major hypotheses are that the group receiving the developmental program and the group receiving stimulation without training will both show significant increases in level of social and intellectual functioning on assessment following participation in the programs, and that both these groups will show a significant decrease in level of functioning on follow-up assessment: that a group receiving no treatment will show no increase in level of functioning on post-testing : that there will be a significant difference between the three groups on post-testing; and that there will be no significant relationship between initial level of functioning or chronological age and pre- to post-test changes in level of functioning.

Method.

Following a program of familiarisation with the experimenter, 42 institutionalised, severely and profoundly retarded children and adults (age range 7 years 10 months to 49 years 2 months) were assessed on the Cattell Infant Intelligence Scale, the Old South African Individual Scale, and the Vineland Social Maturity Scale. As only a few subjects scored on the OSAIS, their scores were converted to Cattell scores by means of regression equations, and Cattell and Vineland scores only were used in the statistical analysis.

Subjects were divided into three groups matched as closely as possible for level of social and intellectual functioning. Over a four-and-a-half month period the experimental group received a developmental program providing activities and experiences suitable to their level of functioning. Control Group 1 received a program of unstructured stimulation over the same period of time, which provided activities without systematic training. Control Group 11 received no treatment. At the end of the four-and-a-half month period all subjects were reassessed on the three measures. Follow-up testing was conducted one-and-a-half months' later, during which time no programs were conducted.

Results

Analyses of variance, followed by analyses of Simple main effects and multiple comparisons where appropriate, showed no significant difference between the three groups at the three testing periods. However, as predicted, the experimental group showed a significant increase in mental age, IQ, social age and social

quotient on post-testing. No significant increases were found for Control Groups 1 and 11 on post-testing.

On follow-up testing the experimental group showed a significant decrease in mental age, IQ, social age and social quotient scores.

Correlational analysis showed no significant correlation between initial level of MA, IQ, SA and SQ, and pre- to post-test changes for the experimental. Chronological age was not significantly related to pre- to post-test changes.

Discussion

The results of the present study were seen to give support to continuing work with the severely and profoundly retarded over a wide age range. Although no significant difference was found between the three groups on post-testing, the experimental group did show a significant increase in level of social and intellectual functioning on post-testing, indicating that the program had a positive effect. No significant increases were found for control group 1 on post-testing, implying that unstructured stimulation without training does not lead to improved intellectual and social functioning, but that a structured training program is required.

A significant decrease in experimental group scores was found on follow-up testing, implying that long term work is necessary if improvements are to be maintained.

Changes in the level of social and intellectual functioning from pre- to post-testing were not significantly related to either initial level of functioning or to chronological age. This implies that neither the individual's chronological age, nor his initial

level of functioning should be taken as a criterion of his potential for change.

Implications of the study for practice were discussed.

References.

Conover, J. C. — Community day-care program for severely and profoundly retarded children. In J. H. Rothstein (Ed.) Mental retardation : readings and resources. (2nd ed.) New York : Holt, Rinehart and Winston, 1971.

Dennis, W. — Causes of retardation among institutional children : Iran. Journal of Genetic Psychology, 1960, 96 , pp. 47 - 59.

Lyle, J. — The effect of institutional environment upon verbal development in imbecile children. 1. Verbal intelligence. Journal of Mental Deficiency Research, 1959, 3 , pp. 122 - 228.

Rutter, M. and Martin, J. (Eds.) — The child with delayed speech. London : Spastics International Medical Publications, 1972.

Spitz, R. A. — Hospitalism : an enquiry into the genesis of psychiatric conditions in early childhood. In Psychoanalytic Studies of the Child. Vol. 1. New York. International Universities Press, 1945, pp. 53 - 74.

Stein, Z. and Susser, M. — The mutability of intelligence and the epidemiology of mild mental retardation. In S. Chess and A. Thomas (Eds.) Annual progress in child psychiatry and child development. New York : Brunner and Mazel, 1971.

Stevens, H. A. and Heber, R. (Eds.) — Mental retardation. A review of research. Chicago : University of Chicago Press, 1974.

Zigler, E. — Familial retardation: a continuing dilemma. Science, 1967, 155, pp. 292.

1. INTRODUCTION.

Mental retardation poses a major problem for society. The prevalence of the condition is exceeded by only four other health problems: those of mental illness, heart disease, arthritis and cancer. In the United States it is estimated that approximately 5,4 million individuals are mentally retarded (Scheerenberger, 1969). Directly concerned with them will be parents and a number of relatives, therefore a large proportion of the population will have direct contact with mentally retarded individuals.

The mentally retarded are a heterogeneous group; the condition may have a number of causes, which produce a variety of symptoms and degree of impairment. Rothstein (1971) comments :

> The concept of mental retardation includes such a varying combination of factors and such a lack of uniformity in definition, terminology, classification, treatment and training that its challenge may be considered of equal importance with any known to man. (page 2).

Early efforts in the training and education of the retarded in the 19th century, had as their aim the attainment of normality (Kanner, 1964). This goal was not achieved, and gradually at first, but then more conspicuously, the welfare of society rather than the welfare of the mentally retarded individual became of primary concern. Society had to be protected from the presence of the mentally retarded in the community.

Consequently, by 1900, mental retardation appeared almost entirely as an institutional problem.

From approximately 1950 onwards a resurgence of interest in mental retardation took place (Knott, 1966), accompanied by a growing belief that much could be done to improve the level of functioning and the quality of life of the retarded individual.

Special problems of education and training are presented by the group who are classified as severely and profoundly retarded (IQ below approximately 35). They exhibit a wide range of handicaps, and many show behavior which might be termed autistic. Language development is generally rudimentary or even non-existent, and the group is often considered ineducable. For these reasons the care given to the severely retarded has all too often been of a purely custodial nature, providing them with food, shelter, clothing and nursing aimed only at keeping them clean and healthy. However, with an increasing awareness of the problems of this group over the last few decades, attempts have been made to assess the possibilities of providing them with opportunities for training and education; and to devise programs to meet their specific needs. It is the aim of the present study to examine the effectiveness of such a program.

2. RELATED BACKGROUND

2.1 MENTAL RETARDATION : PROBLEMS OF DEFINITION AND CLASSIFICATION.

Mental retardation has been acknowledged in the writings of man for more than 2 000 years, yet only within the second half of the twentieth century has the magnitude of the problems of this group been fully recognised (Robinson and Robinson, 1965). From the beginning of the twentieth century until World War 11, there existed an almost total lack of concern for the plight of the mentally retarded in the United States (Thompson and Grabowski, 1972). In recent years, however, a great expansion in the provision of services for the mentally retarded has taken place, accompanied by an increasing interest in the training and education of this group.

Mental retardation is a condition which may result from a variety of circumstances which may occur before, during, or after birth. It does not occur in the same form and with the same consequences for all individuals. Clarke (1969) has written : ".....with such a wide group as the subnormal, heterogeneous in aetiology, present conditions and prognosis, low or very low intelligence is perhaps the only thing its members have in common." (page 1).

While intellectual subnormality is generally considered to be the central feature of the condition (Benton,in Stevens and Heber, 1964)., the implications of this subnormality for the individual's functioning in society have received great attention.

Tredgold (1952) maintained that social adaptation should be considered the primary criterion of mental retardation. This view is expressed in the statement that ".....a person with an IQ of 75 or 80 who reveals no significant impairment in adaptive behavior is not labelled mentally retarded." (Scheerenberger, 1969, page 8).

The likelihood of a person being designated retarded may be substantially affected by the culture and society in which he lives. In a highly competitive society inability to cope is more likely to become obvious than in surroundings which are less demanding. The more immediate environment of the family is also of great importance. A mildly handicapped person may often pass unnoticed in a family of low intelligence, whereas his handicap would be more likely to come to attention in a high achieving family. (Shakespeare, 1975).

The major criticism of accepting social incompetence as the primary criterion of mental retardation is that social incompetence is a frequent characteristic of all types of behavioral abnormality and hence cannot adequately serve to distinguish between mental retardation and other conditions. (Benton, in Stevens and Heber op cit). However, it is now generally accepted that before an individual is designated mentally retarded, both his intellectual and social functioning should be taken into consideration.

As a group the mentally retarded are heterogeneous; the condition possesses social, developmental, etiologic, behavioral, neuropathologic and prognostic implications, and has attracted the interest of professionals from a variety of fields. Consequently,

no one definition of mental retardation has ever satisfied all concerned.

Robinson and Robinson (op cit) have summarised the major difficulties in arriving at a definition of mental retardation. They view the problems of definition as having the greatest implications for those individuals whose handicap is relatively mild, as within this group the intellectual handicap is not of so severe a degree to determine their level of adjustment in every sphere. For the severely retarded, on the other hand, they believe that it matters little in what terms retardation is considered, since these children are generally severely retarded in all areas.

Controversy surrounds which abilities should be included in a definition of mental retardation. For example, should the primary consideration be those behaviors which demonstrate the individual's ability to deal with abstract concepts ? Or should the amount of information the individual is able to learn be considered ? Such questions will significantly affect the kinds of measures which are chosen to obtain information regarding the individual's intellectual functioning.

There has been relatively little disagreement concerning whether mental retardation should be defined in practical or theoretical terms. The problem of mental retardation poses practical difficulties for every society, and traditional definitions have consequently emphasised practical

criteria. Most definitions have therefore equated the concept of mental retardation with that of social adaptation.

Some controversy still surrounds the issue of whether a definition of mental retardation should refer to the potential ability or the present functioning ability of an individual. As estimates of potential appear to be subject to serious error, agreement is being reached that a definition of retardation must rest on some estimate of present abilities.

Following the introduction of standardised intelligence tests in the United States (approximately 1910 to 1920), a period of emphasis on IQ was initiated, and definitions of mental retardation began to incorporate the intelligence quotient. Acceptance of such definitions was based largely on the belief that IQ remained constant throughout an individual's lifetime. However, there is now extensive literature to indicate that IQ may change substantially over time (Anastasi, 1969). Gains and decrements in IQ may occur as a result of environmental changes in the child's life and of planned intervention (Scheerenberger, 1969). In reviewing the literature on the mutability of intelligence, Stein and Susser (1971) conclude that IQ scores of children who are either mentally retarded or culturally disadvantaged change in directions which are predictable from certain social experiences or social stimuli.

The fate of mental abilities during adulthood has been subject to great controversy. It was previously believed that mental growth ceased for all practical purposes beyond the age of 16 years. However, more recent work with adults suggests that mental growth may continue on such items as vocabulary and comprehension, which require continuous learning. Detailed studies with the retarded are not yet available but research suggests that they may follow the same pattern as normals, some possibly continuing to mature longer than others (Robinson and Robinson, op cit).

The constancy of IQ should no longer be assumed, nor should it be viewed as a predictor of future performances. There is a danger that the incorrect use of IQ may lead to a self fulfilling prophesy; for example, an individual of low IQ is considered unable to benefit from treatment or training, his subsequent failure to progress then being taken as justification for withholding treatment (Mittler, 1973).

In spite of these issues, the IQ is seen as providing a reasonably accurate reflection of current levels of functioning (Mittler, ibid), and is an extremely useful tool in the early identification of problems, and in the identification of those individuals in need of special training (Robinson and Robinson, op cit).

In 1929, the American Association of Mental Deficiency (AAMD) proposed a new definition of mental retardation (revised in 1961). The AAMD

regards mental retardation as a term descriptive of the individual's present status, and recognised that this status may undergo change. Thus an individual may be considered retarded at one time and not at another, his change in status being dependent on alterations in social standards or conditions, or on a change in the individual's level of intellectual functioning. This view therefore rejects the notion that the individual's IQ remains constant throughout his lifetime.

The AAMD definition is frequently regarded as the most flexible and comprehensive to have been proposed (Scheerenberger, 1969; Robinson and Robinson, 1965). It states that :

> Mental retardation refers to subaverage general intellectual functioning which originates during the developmental period and is associated with impairment in adaptive behavior (Scheerenberger, 1969, page 7).

Each important term in the definition is defined as clearly as possible :

> Subaverage refers to performance which is greater than one Standard Deviation below the population mean of the age group involved on measures of general intellectual functioning. Level of general intellectual functioning may be assessed by performance on one or more of the various objective tests which have been developed for that purpose. Though the upper limit of the developmental period cannot be precisely specified it may be regarded, for practical purposes, as being at approximately sixteen years. (Cited in Robinson and Robinson, op cit, page 34).

The concept of adaptive behavior refers primarily to the individual's effectiveness in adapting to the natural and social demands of his environment. Impaired adaptive behavior may occur in three areas : maturation, learning, and/or social adjustment.

> Rate of maturation refers to the rate of sequential development of self-help skills of infancy and childhood..... In the first few years of life adaptive behavior is assessed almost completely in terms of these and other manifestations of sensory-motor development.
>
> Learning ability refers to the facility with which knowledge is acquired as a function of experience.....Impaired learning ability is.....particularly important as a qualifying condition of mental retardation during the school years.
>
> Social adjustment is particularly important as a qualifying condition of mental retardation at the adult level where it is assessed in terms of the degree to which the individual is able to maintain himself independently in the community and in gainful employment as well as by his ability to meet and conform to other personal and social responsibilities and standards set by the community (Robinson and Robinson, ibid).

The definition includes the dual criteria of intellectual subnormality and social incompetence. Although the definition places reliance on the use of

intelligence tests, it makes it clear that the test score is to be used in conjunction with supplementary evaluations of such factors as present behavior, social maturity and developmental history, and clearly emphasises that the intelligence quotient may change over time.

The AAMD proposes a system of classification based upon the severity of retardation, to accompany this definition. Systems based on the severity of retardation generally assume that intelligence can be plotted quantitatively along a continuum from the highest to lowest measured performance (Scheerenberger, 1964). The AAMD classification system is based upon intellectual functioning as measured by a standard intelligence test such as the Revised Stanford Binet Scale. The system divides the retarded into five groups :

Borderline level	(IQ 68 to 83)
Mild level	(IQ 52 to 67)
Moderate level	(IQ 36 to 51)
Severe level	(IQ 20 to 35)
Profound level	(IQ below 20)

The boundaries for each division, which are based on standard deviations, will vary from test to test.

Thus, when the Wechsler - Bellevue Intelligence Scale is used, the severely retarded are those individuals whose IQ falls below 40.

This system is designed to be used in conjunction with a system based upon adaptive behavior as measured by a standardised test of social functioning such as the Vineland Social Maturity Scale (Doll, 1953). Individuals may be classified into one of four levels ranging from mild inadequacy (1 to 2,25 standard deviations below the population mean) to profound incompetence

(more than 4,75 standard deviations below the population mean). (Benton, in Stevens and Heber, 1964).

Grouping observed phenomena into categories is a practical activity which is determined by current interests and knowledge, and which has as its aim more accurate recognition, advanced understanding and improved knowledge of management and treatment of the condition. Because knowledge increases and interests change over time, classification systems are subject to frequent revision. Heber (1964) views such systems as "arbitrary language systems" which vary according to their intended use. As such, he feels that more than one system may be applied to the same phenomena at one time.

A system frequently adopted by writers in the field of the training and education of the retarded, is that based upon the criterion of educability : this system includes three groups :

The educable mentally retarded (IQ 50 to 80) have the potential for minimal educability in academic subjects, for school adjustment to such a point that independent existence in the community is possible, and for occupational adequacy to a degree that total or partial self-support is attained.

The trainable retarded (IQ 20 to 49) are able to learn self care, adjustment to home and neighbourhood, and economic usefulness in the home or institution.

The uneducable (IQ below 20) are incapable of formal training (Scheerenberger, 1964).

Although this system is based upon the criterion of IQ, Robinson and Robinson (op cit) advocate that it should be used only as a guideline in adjusting training programs to the individual's needs, and recommend

flexibility in transferring individuals from one group to another.

A system of classification which dominated clinical thinking and practice for many years distinguishes between two broad groups: in the first, biological factors are involved in an impairment of the central nervous system, that is, a physiological cause for the retardation is evident; in the second group the etiology of the condition is unknown (Dybward, 1964). The latter group is frequently termed the cultural-familial group; controversy surrounds the etiological factors involved in this condition.

The physiological defective type is almost invariably low IQ (below 40) while the cultural-familial group is generally mildly retarded with IQ of about 50. According to Ullman and Krasner (1969) the majority of the mentally retarded fall within the cultural-familial group; Zigler (1968) estimates that approximately 75 per cent of all the retarded fall within this category.

The diagnostic criteria by which an individual is judged to fall within the cultural-familial group are three-fold : the individual must be mildly retarded, there must be no reasonable indication of a cerebral pathologic condition, and there must be evidence of retarded intellectual functioning in at least one of the parents and in one or more of the sublings (Robinson and Robinson op cit).

Spitz (1963) believes that all retardates are physically defective, and failure to discover such defects in certain retarded individuals is due to inadequate diagnostic techniques. Another view holds that this group may be regarded as representing the

lower portion of the normal distribution of intelligence (Zigler, 1968). However, this view does not exclude the role of environmental factors, such as social deprivation, a high number of failure experiences, and atypical reinforcement hierarchies. Writers such as Braginsky and Braginsky (1971) see the etiology of cultural-familial retardation as lying solely within the social, cultural, economic and psychological realms.

Studies of the cultural-familial retarded present a confusing picture, often showing considerable overlap between the behavior of cultural-familial and normal groups (Giraudeau, 1966). While controversy still surrounds this area, Benton (in Stevens and Heber, 1964) feels that a recession in the importance of the basic distinction between cultural-familial and pathological mental retardation has occurred due largely to the fact that behavioral differences between the two groups have not always been demonstrable.

While classification serves a useful purpose, several writers have pointed to dangers inherent in grouping individuals within broad categories. Clarke and Clarke (1965) believe that all too often classification seeks to rationalise administrative decisions which have already been made, and to invest them with an air of scientific precision which they do not in fact possess. Mittler (1970) emphasises that within each official category of mental retardation is to be found a vastly heterogeneous population. He feels that classification provides a starting point only, and should be followed by a careful analysis of each individual's specific abilities. The procedure of classification may mask more than it reveals and can at least provide no more than probabilistic statements in respect of a single individual. In clinical work each individual must be considered as an individual who may differ fundamentally from the tester's expectations (Mittler, 1970).

2.2 THEORETICAL APPROACHES TO MENTAL RETARDATION.

Blackman (1963) identifies three major theoretical approaches to mental retardation. He feels that each approach has restricted itself to the type of research which is designed to evaluate the tenability of its own theoretical constructs without directly reflecting on the positions held by the other approaches.

The neurophysiological and the environmental deprivation approaches are strongly etiological in orientation. The former conceptualises the mental retardate as an individual with an "inferred, inherent neurological incapacity based on (his) quantitative difference from normals on certain perceptual tasks." (Blackman, ibid, page 602). Perceptual research is emphasised for the purpose of establishing the existence of certain neurochemical brain processes. Mental retardation is seen as linked to the lower level functioning of these processes. Implications of such research for the training and education of the retarded have as yet not been explored.

The environmental deprivation approach maintains that the majority of the mentally retarded suffer no physiological pathology, but as a result of deprivation of appropriate stimuli, experience and information during crucial early years, they have failed to realise their potential. The extreme of such an approach is exemplified in the work of Braginsky and Braginsky (1971, 1972) who approach mental retardation from a socio-political perspective. They believe that the diagnosis and institutionalisation of the retarded takes place not as a function of their intellectual functioning, but as a result of the social sanitation process, whereby society rids itself of unwanted,

unadapted, unsightly surplus persons. They believe that under certain conditions anyone can become mentally retarded. Society's contribution to the process is twofold: it maintains the existence of a surplus population - those persons who are of no use in a productive capacity - and it stigmatises the members of this surplus population by misconstruing the meaning of their behavior. Thus any child born into this population is suspect emotionally, motivationally and intellectually. For the surplus population, the costs of life are so great and the rewards so small that there is a tendency to reject and where possible eject, their children. The disregarded child may be placed either in a foster home, a children's shelter, an orphanage, a mental institution, or a training centre for the retarded. Braginsky and Braginsky believe that the largest number of these children find their way to institutions for the retarded, and are labelled as mentally defective. They consequently reject the concept of mental retardation as a myth perpetuated by the structure of society.

Because the environmental deprivation approach views the cause of retardation as environmental rather than organic, typical hypotheses involve the amelioration of mental retardation through enrichment programs.

The third approach is minimally concerned with the etiology of mental retardation. The learning approach bases its research on the premise that the mental retardate suffers primarily from a learning disability, and that the condition can best be understood by attempting to isolate and identify those aspects of the learning process which are malfunctioning. This will then lead to an evaluation of the most suitable teaching methods for the retarded.

A prominent worker in this area is Bijou (1966, 1968). He advocates an approach to mental retardation which suggests that it be treated in terms of observable, objectively defined stimulus response relationships, without recourse to what he calls 'such hypothetical concepts' as defective intelligence. He holds the view that retarded behavior is a function of observable social, physical and biological conditions, and advocates an objective analysis of the observable conditions which produce retarded behavior. The retarded individual is seen as one who has a limited repertoire of behavior shaped by the events that constitute his history. The focus of attention is the possible patterns of learning that have led to a limited behavioral repertoire. On the basis of such an analysis, testable programs may be developed to determine whether new experiences may lead to the generation of behavior not previously learned.

This approach is directly concerned with the implications of its research work for the training and education of the mentally retarded.

The approaches described up to this point have developed in direct relation to the field of mental retardation. However, the relevance of theories of development which have been formulated outside of the field of retardation, has been increasingly recognised. A developmental approach which has particular implications for mental retardation is that of Piaget.

Piaget believes that cognitive processes emerge through a process of development which consists of a reorganisation of psychological structures resulting from organism - environment interactions; "....cognitive development is to be found neither in the structure

and maturation of the organism nor in the teaching structures of the environment but in the structure of the interaction between organism and environment." (Kohlberg 1968, page 1015). The theory maintains essentially that we learn by doing; that we learn about the world only by actively interacting with it.

Assimilation is the process by which incoming information is transferred so that it can fit into existing forms of knowledge. By the process of accommodation the individual adapts himself to the nature of incoming material. Adaptation is the state at which assimilation and accommodation are in equilibrium, that is, there exists a state of equilibrium in the interaction between the organism and the environment. Mental assimilation then, involves the incorporation of sensory data into existing response patterns and mental accommodation involves the adjustment of these patterns to sensory data. The response patterns which result are known as schemas. Schemas tend to interlock to form increasingly complex higher order schemas.

The concepts of assimilation, accommodation and equilibration occur at all levels of development. However, intelligence is seen as developing in a sequence of stages related to age. Each stage sees the elaboration of new mental abilities which will set the limits and determine the character of what is learned during that period. The order of stages holds true for all children, but the ages at which the stages evolve will depend upon the native endowment of the child and upon the quality of the physical and social environment in which he is reared.

It can thus be seen as both a nature and a nurture theory (Elkind, 1974).

> True cognitive growth refers to the changing, in the direction of increasingly superior ways in which the child perceives, interprets and interacts with the world around him. Cognitive development in this sense depends upon both a maturational process and the child's opportunities for active and meaningful participation with an environment which challenges him and so obliges him gradually to transform existing simple ways of coping into more complex and advanced ways. (Grover, 1971, page 3).

In terms of Piaget's theory, mental retardation can be seen as a result of the individual's failure to progress beyond inferior stages of integration. The greater the degree of retardation, the lower the stage of organisation at which the individual is fixed (Robinson and Robinson, 1965). In work with the mentally retarded, an evaluation of the level of processes of the individual in terms of Piaget's theory, will provide an important guideline as to the abilities of that individual, and will enable the teacher to manipulate conditions to encourage the development of superior ways of dealing with the environment.

Each of the theoretical approaches described here will have implications for the types of training or educational programs which will be developed for the mentally retarded. These implications will be discussed in greater detail in a later section.

2.3 INSTITUTIONAL DEPRIVATION.

A large number of the mentally retarded will spend at least a part of their lives in an institution. For this reason, the quality of care provided by such institutions requires examination.

Robinson and Robinson (1965) describe three broad approaches to institutional care, within each of which variations may occur. Custodial care has as its goal simple containment. It provides the necessities to maintain life without any organised effort towards rehabilitation or training.

The second approach described is custodial care within a therapeutic milieu. In such a setting an attempt is made to train the residents to take care of themselves to as great a degree as they are able within the institution, with or without the goal of returning them to the community.

The third approach is aimed at intensive efforts towards education and rehabilitation. The goal is the provision of services and programs which will enable as many of the residents as possible to lead self sufficient lives, and where this is not possible, to ensure that each individual should fulfil his potential as far as possible.

It is within the framework of custodial care that institutional deprivation is most likely to occur. King, Raynes and Tizard (1971) have attempted to identify some of the institutional practices which contribute to such deprivation. Rigidity of routine exists when management practices are inflexible from one day to the next, and from one inmate to another.

Block treatment involves the regimentation of institutional inmates, treating them as a group rather than as individuals. Depersonalisation exists when there are no opportunities for inmates to have personal privacy or personal possessions. Depersonalisation is also shown where there is an absence of opportunities for self expression, or of situations where the individual may show initiative. Social distance exists when there is a sharp distinction between the worlds of staff and inmates.

These practices coincide with many of Goffman's (1961) characteristics of 'total institutions.' Goffman defines the total institution as "..... a place of residence and work where a large number of like-situated individuals cut off from the wider society for an appreciable period of time, together lead an enclosed, formally administered round of life." (page 11). Within such a setting the individual is likely to lose a sense of personal identity, and to lack the opportunity for the formation of inter-personal relationships.

Clarke (1960) defines deprivation widely as "..... any external event or constellation of events which significantly interferes with the child's normal developmental processes and which thus affects adversely his mental or physical status." (page 27). He lists the main forms of deprivation as social isolation, cruelty and neglect, socio-economic and cultural deprivation, adverse child rearing practices, separation experiences and institutional upbringing.

Over the past few decades there has been a growing interest in the effects of early experience on the individual's subsequent development. Deprivation in early life has received particular attention.

Research has been conducted both with animals and humans, the latter being concerned largely with the effects of deprivation in the setting of the institution.

In the field of animal studies, a wide range of experiments has shown the cognitive and perceptual deficiencies which follow early stimulus deprivation in animals. Riesen (1965) has found that patterned visual stimulation is important in the development of visually guided behavior. Active, as opposed to passive visual experience has been demonstrated to be necessary for perceptual development by Held et al, (1963, 1967). Animals whose visual experience was a result of their own movements showed superior distance and space perception to those whose visual experience was a result of being passively transported. Rutter (1972) stressed the complexity of defects arising from restricted rearing practices, and the difficulties of disentangling which element of restriction leads to which outcome by which mechanism. Studies on the rearing of animals in darkness or in the absence of patterned vision have led to the discovery of such effects as fear of new situations, deficiency in problem solving and other intellectual tasks, perceptual deficits, retinal defects and dysfunction of the visual cortex.

Levine and Broadhurst (1963) have examined the combined effects of early experience and genetic factors on development. They believe that the effects of early experience on emotionality in adult rats are partially determined by genetic or constitutional factors. Stress and handling are believed to stimulate the maturation of the central nervous system, and thus enhance development. Endler and Boulter (1970) compare this view with that of Hebb (1949) who postulates that stimulation facilitates the development of cell assemblies and phase sequences.

According to Hebb, when a particular set of sensations is experienced repeatedly, some of the cortical cells within the brain begin to be organised into a simple corresponding functional unit called a cell assembly. In any single perceptual experience a large number of cell assemblies would be activated. When a particular combination of cell assemblies are simultaneously fixed over and over again, they come to be integrated into increasingly complex functional units called phase sequences. The formation of cell assemblies and phase sequences arises through the individual's interaction with his environment; they serve as mediating processes enabling the organism to process subsequent sensory inputs more readily. An infant thus requires both visual and muscular experience with many objects before he can perceive a given shape as square or round; he must learn that objects vary in weight and colour, but tend to remain the same whether he looks at them or not. The brain requires constant stimulation; when sensory input is lacking, there tends to be a diffusion of electrical impulses through the brain, randomly activating cell assemblies which would not normally be simultaneously excited, and thus weakening old connections and establishing new ones irrelevant to experience.

Clarke (1960) believes that Hebb's work is particularly relevant to an understanding of institutional deprivation. Hebb contends that rich perceptual experience is vital for the healthy development of the central nervous system, and for its continued functioning. The theory suggests that conditions in the institution should be rich and stimulating. The child who is exposed to minimal custodial care at home or in an institution experiences a crippling deprivation of such stimulation.

Numerous studies have revealed the negative effects of institutionalisation (Dennis, 1960; Dennis and Najarian, 1957; Kershner, 1970; Spitz, 1945, 1957; Goldfarb, 1943, 1945 in Mussen, Conger and Kagan, 1969; Kellmer, Pringle and Tanner, 1958; Skeels and Skodak, 1945, in Stein and Susser, 1971; Rutter and Martin, 1972; Lyle, 1959; Tizard, 1960). The effects of such institutionalisation include retardation in the following areas : motor development, the development of social functioning, intellectual functioning and language development.

While the interpretation of early studies such as those of Spitz (1945) and Goldfarb (1943) was in terms of inadequate mother-specific care, later studies implicate the more general variable of adequate stimulation which adequate mothering usually provides (Endler, Boulter and Osser, 1970).

Recognition of the damaging effects of deprivation has led to attempts to alter those patterns of institutional care most likely to provide inadequate stimulation. A guiding principle of many progressive institutions has become that of "normalisation." This refers to :

> .....the provision of a carefully structured and sequentially ordered pattern of activities and real life situations which will progressively face the child with experiences, problems, decision making, responsibilities and innovations parallel to, albeit at a lower developmental level than, those faced by normal children and young people.
>
> (Grover, 1971, page 2).

The aim is to better prepare for normal life demands, to avoid dehumanising conditions, and to provide opportunities for making better use of each individual's available potential. Gunzburg (in Mittler, 1973) points out that normalisation does not imply a slavish apeing of what is considered normal, but rather the provision of experience at a level suitable to that of the level of functioning of the retarded.

While such approaches constitute an attempt to avoid deprivation, the question of whether the effects of deprivation are reversible or not still remains.

2.4 RECOVERY FROM DEPRIVATION.

For many retarded children, a part of their retardation at least is probably largely a result of environmental deprivation (Robinson and Robinson, 1965). Smith (1971) believes that it is of importance to consider the possible cumulative influences on growth and development which might be expected for a young child who is born with a significantly disabling condition and who in addition to this lives in a disadvantaged environment. Such a child may be seen as doubly affected; firstly, because his system is unable to effectively deal with his environment, and secondly, because his environment lacks adequate sensory stimulation.

The crucial question which arises from a knowledge of the negative effects of deprivation is whether or not these effects are reversible by the later provision of environmental stimulation. An issue central to this question is that of critical periods of development.

According to Caldwell (1962) the critical period hypothesis is used in two ways. Firstly, it refers to a critical period beyond which a given phenomenon will not appear (i. e. a point in time which marks the onset of total indifference or resistance to certain patterns of stimulation) and secondly, it refers to what Rutter (1972) calls sensitive periods, that is a period during which the organism is especially sensitive to various developmental modifiers,

which, if introduced at a different time in the cycle, would have little or no effect (i.e. a period of maximum susceptibility).

The issues raised here are whether there are sensitive periods during which the individual is more susceptible to a particular life experience, and whether the effects of early experience will predominate over the effects of experience in later life.

Rutter (1972) notes that sensitive periods have been shown for a wide range of functions in various animal species: the effects of infantile stimulation in rats and mice varies according to the age at which stimulation is administered (Bell and Deneberg, 1963; Henderson, 1964; Levine, 1962); the cortical dysfunction which follows visual restriction in infancy does not occur in adult life following similar restriction (Wiesel and Hubel, 1963); social isolation of older chimpanzees does not have the same negative effects as it does on infants (Davenport, Menzel and Rogers, 1966).

However, there is as yet no strong evidence of the existence of critical or sensitive periods in man. Clarke (1960) cautions that the results of animal research should not too readily be extended to man. Animals have a relatively short period of immaturity, and the part which is played during development by learning may be of correspondingly short duration. For man, however, the situation is different: "....prolonged development implies prolonged flexibility and hence, although deprivation effects in children may be

considerable, there is a greater period for compensatory recovery, sometimes even up to about 30 years of age." (page 26).
While it has often been argued that early years are crucial for subsequent development, Rohwer (1971) has challenged this view, and postulated that early childhood may not be the prime time for education. Instead he believes that early childhood may be an inefficient period in which to try to teach skills that can be relatively quickly learned in adolescence. He maintains that formal schooling prior to adolescence should be abandoned; he feels that research suggests that the longer formal instruction is delayed, up to certain limits, the greater the period of plasticity, and the higher the ultimate level of achievement.

Piaget's theory is of relevance here. The theory does not imply critical periods in intellectual development, insofar as the critical period hypothesis implies sensitivity to stimulation at a definite chronological time span, greater sensitivity to stimulation at earlier than at later periods of development and irreversibility of the effects of early deprivation. The theory does hold that there are developmental phases of sensitivity but these are tied not to the child's chronological age, but to his behavioral level.

> The position does not imply that retarding stimulus deficits at an early point are not reversible by compensating stimulation at a later time point. The stimulation necessary for normal development from one stage to the next

> should be effective in moving a retarded child to the next stage, even if the child has chronologically missed the time at which normal children received this stimulation. (Kohlberg, 1968, page 1 045).

Clarke (1967) argues against the notion that experiences in early life have a crucial influence regardless of later experience. He states that :

> Early experience involving a modification of behavior (learning) will by definition have immediate effects : the size and duration of these will, of course, depend partly upon the length and potency of the experience and the age of the learner, but more particularly on the amount, intensity and duration of subsequent reinforcements....early learning will have effects which, if unreinforced, will fade with time. It will not per se have any long term influence upon adult behavior, other than as an essential link in the developmental chain (pages 1 061 - 1 062).

Stein and Susser (1971) have reviewed work in this area. They conclude that intervention effective in producing IQ change has not been limited to a well defined critical period, and that there is at present no good evidence to suggest that there exists only one period of

intellectual development sensitive to external intervention. They maintain, therefore, that intervention is justified throughout the recognised period of mental development and possibly later. With regard to mental retardation, they conclude on the basis of relevant research, that the IQ scores of children who are mentally retarded change in directions predictable from certain social experiences or social stimuli. "In mentally retarded children, IQ change accompanies change in residential setting, and the direction of change depends on the type of setting," (page 369).

They report a number of studies in support of this conclusion. Skeels and Skodak (1949) carried out a longitudinal study of the intellectual performance of mentally retarded children. In the preliminary stages this study was subject to severe criticism (McNemer, 1940) but the long term follow-up revealed important results. Infants and young children (age range 18 months to 6 years) were removed from an orphanage which was described as 'affectionless' to another that provided the opportunity for more intimate personal contact with adults. These children were tested and retested during a three year period, and a follow-up test was carried out 25 years later. The mean IQ of the experimental children was 64,3 at the beginning of the study. After 18 months the mean IQ had risen to 91,8 points. The contrast group who remained in the orphanage stayed at a low developmental level.

Besides a change in residential setting, Stein and Susser conclude that IQ changes in the mentally retarded also follow specially designed educational, social and medical interventions.

Kirk (1958) showed that pre-school training over a three to five year period, led to significant IQ gains for retarded subjects aged three to six years. (The IQ of subjects at the beginning of the study was between 45 and 80). The IQ gains occurred in children with or without brain damage, but the gains were greater for those without damage.

Kirk reports two studies by Kephart (1939, 1940). In the 1939 study he examined changes in IQ of 50 children admitted to an institution for high grade defectives. While these children had remained in their subcultural homes their IQ's had shown a tendency to decline; but when admitted to the institution training school, IQ's tended to rise slightly. In the second study Kephart reported significant IQ gains over a control group, in a group of 16 adolescent boys in a self-determining program aimed to stimulate activities encouraging thinking ability.

Clarke and Clarke (1953) studied a group of mentally retarded subjects over a number of years. This study is one of the most important and most frequently cited in this area, and will therefore be considered in detail.

The study was carried out at the Manor Hospital, a home for the retarded in Britain. MacMahon (1952) has described conditions at this institution. Training facilities included a school where inmates aged 10 to 12 years were taught the rudiments of reading, writing and arithmetic. Older inmates had the opportunity to learn a variety of crafts and domestic arts, and speech and occupational therapists worked with suitable cases. Scout and guide activities were also provided, and welfare officers were concerned

with placing and supervising patients in wage earning employment in the district.

Clarke and Clarke (op cit) tested 59 moderately retarded subjects in this institution (average age 22 years) on the Wechsler form 1. The same subjects had been routinely tested 27 months previously. Of these 59, 27 subjects showed IQ increases of 8 points or more; 17 of 10 points or more, and 7 of 15 points or more. The remainder showed small increases or decreases. A control group, matched for age and IQ with the original group, was then examined. This group was tested and retested three months later. An average increase of four points was found. The authors concluded that this increase upon retest represented the maximum effect of test practice, errors of measurement and initial underestimates.

The next task,therefore, was to explain the large increases in IQ which had occurred in the original group. This group had not received any special treatment designed to increase IQ, but had participated in the activities provided by the institution for all its inmates. Clarke and Clarke hypothesized that the increase could be explained in terms of a relationship between adverse early home conditions and subsequent IQ increase, and drew up a list of 12 criteria of bad home conditions. The presence of two of these criteria led to a subject being classified as coming from bad home conditions. Subjects in the first part of the study were re-examined using this classification, and it was found that the 'bad home' group and the remainder were significantly different in terms of IQ increase at the ,01 level.

Following this, 20 cases who had been tested two years previously were retested. Six subjects were selected whose records indicated bad home conditions, and five who came from homes which seemed unlikely to have been bad were included. The average increase in the first group was 8,7 points, and in the latter ,6 points.

Clarke, Clarke and Reiman (1958) then followed up 28 subjects who were still available from the original fifty-nine. The IQ's of those from very bad homes had increased about one standard deviation on average, while those from less adverse homes had increased about two-thirds of a standard deviation. Thus, while both groups showed increases in IQ, it was concluded that, "those with the greatest damage due to deprivation made the greatest recovery....and they made it more rapidly (Clarke, Clarke and Reiman, 1958, page 146).

In a second study, 32 subjects admitted in 1951 and still available in 1956, were tested. The purpose of this study was to determine whether IQ changes in this population and age range were a direct function of the time interval between test and retest. Subjects from very bad homes tended on average to make larger increments, but with roughly double the time interval did not increase greatly their average increment compared with the 1953 research. However, members of the residual group from less adverse conditions almost doubled their mean increment in double the time interval.

The authors concluded that this research suggested that the IQ changes resulted as an effect of

removal from very adverse conditions rather than entry into relatively better ones, and consequently attempted to determine whether special environmental conditions would aid this "apparently natural process of recovery." Twenty-one subjects who attended a small rehabilitation unit for high grade patients were selected. Here they were taught industrial skills, and were eventually placed in local industry. During their initial period outside they returned nightly to the hospital. Eleven subjects came from very bad homes, and 10 from less adverse homes. No control group was included, but results were compared with those of the 1951 - 1956 follow-up study, as the average test-retest time was similar. The specially trained subjects did not make significant gains. It was therefore concluded that special environmental conditions did not have a significant effect.

Clarke (1958) offers two possible explanations for this result. Firstly, the difference between the ordinary institutional environment and the one provided by the special unit may not have been as great as was thought, especially as the institution environment provided a fairly intensive program of activities. Secondly, it may be that any environment, other than an adverse one, will stimulate IQ gains, and that the effects of environmental differences are small because all have a positive effect.

The importance of these studies lies in the fact that rather large IQ increases have been demonstrated in adult mental retardates (Mayer-Gross, Slater and Roth, 1974). While the bulk of work in this area has been conducted with children, usually of pre-school age, the study of Clarke, Clarke and Reiman (op cit) demonstrates that increases in IQ are possible in

adulthood. This suggests that intervention is not confined to a critical period, although it would seem obvious that early intervention is preferable to late intervention.

To refer again to the conclusions of Stein and Susser (op cit), IQ change will accompany change in residential setting, with the direction of this change depending on the type of setting. The finding that deprivation effects need not predominate over later experience leads to a more careful evaluation of the effects of special intervention programs designed to raise IQ. For many retarded individuals who live in institutions which provide inadequate care, part of the retardation will be due to deprivation. For such individuals special programs designed to overcome the effects of such deprivation need to be carefully considered.

2.5 APPROACHES TO THE TRAINING AND EDUCATION OF THE MENTALLY RETARDED

In 1968 the International League of Societies for the Mentally Handicapped (Young, 1969) drew up a declaration of general and specific rights of the mentally retarded. Article 11 in this declaration states that :

> The mentally retarded person has a right to proper medical care and physical restoration and such education, training, habilitation and guidance as will enable him to develop his ability and potential to the fullest possible extent, no matter how severe his degree of disability. (page 58).

This statement reflects the growing concern of workers in the field of mental retardation since approximately 1950, with a search for effective techniques aimed at aiding the retarded individual to develop to the best of his ability. The final part of the statement is of particular significance. With a broadening of the meaning of education as an opportunity for growth, rather than an ability to progress in academic subjects, no child need be considered ineducable. (Grover, 1974).

Many attempts have been made to specify the most suitable goals of education for the retarded. Stevens (1958), in reviewing the literature in this area, presents the following goals as representative of thinking in this field : learning to maintain a state of physical well being; learning to live safely ; learning to understand oneself; learning to get along with

others; learning to communicate ideas; learning to use leisure time; learning to travel and move about; learning to earn a living; learning to be a home-maker; learning to enjoy life through an appreciation of art, dance and music; learning to adjust to the forces of nature, and learning to manage one's money.

It is generally accepted, and obvious to those concerned in working with the retarded, that while such broad goals may be held, programs must be designed with a view to the particular needs and abilities of the individuals who will be concerned. Thus, the specific areas to be covered in a program for the educable mentally retarded will differ from those included in a program designed for the trainable mentally retarded.

The Department of Education and Training at the Columbia State School (Ferguson in Rothstein 1971) set up four objectives for its programs: self-realisation, human relationships, economic usefulness, and civic responsibility. To illustrate how these aims may be realistically adapted to the child's level of attainment, they note that under the broad goal of self-realisation, more specific goals may include the development of eye-hand co-ordination and learning simple habits of healthful living.

Mittler (1970) believes that the mentally retarded differ about as much from each other as they do from normal children, so that generalisations about their needs can be dangerous. In many cases the cause of the retardation will be unknown, and while all the retarded will have a learning disability of some kind, no two children will necessarily have the same pattern

of abilities and disabilities. From this point of view, an educational program should not be designed until a close and detailed study of each individual's strengths and weaknesses is carried out. Tyson (in Mittler, 1973) believes that unless this is done, the program may fail because it is aimed at a comparatively less important or even irrelevant aspect of the problem.

The major theoretical approaches to mental retardation have already been discussed. Each of these approaches provides a particular framework for the design of educational programs.

In terms of Piaget's theory of cognitive development, Scheerenberger (1969) believes that the educator should introduce the educational program in such a manner that the child can increase his knowledge, insight, skills, appreciation and attitudes through his own self-activity. In order to maximise the effectiveness of a program, the basic characteristics of the individual's level of functioning in terms of Piaget's stages of cognitive development, should be carefully considered. This will enable the program to be designed to suit that level of development, and to provide suitable educational experiences. For example, the mentally retarded child aged 6 to 8 years will probably be at a level of cognitive development roughly within the 2 to 4 year level. According to Piaget's theory, such a child will be moving from the sensorimotor to the preconceptional stage of development. Understanding no longer depends entirely on the need to carry out a physical reaction in order to comprehend. The child begins to use symbols (words, pictures) to represent objects. Generally, such children will be capable of the type of activities considered suitable for the younger age group in a nursery school for normal children. (Grover, 1971).

Piaget's theory then, makes important contributions to the problems involved in placing specific content areas at appropriate grade levels and in determining the most appropriate ordering of materials within these areas.

According to the learning approach to retardation, while genetic and physiological endowments may set limits on ultimate behavioral repertoires and the speed of their acquisition, the retarded individual is always responsive to his environment, and therefore even the most severe defect does not rule out the alteration of behavior through training. The learning approach involves the application of classical and operant conditioning procedures to the modification of behavior. Ullman and Krasner (1969) describe a behavior modification approach to dressing behavior developed by Minge and Ball (1967), as an example of work in this area. The steps in the program involved attending, coming to the researcher, sitting down, remaining seated, and removing and putting on items of clothing. The average IQ of the six subjects involved in the study was 16; none was toilet trained, and none was able to communicate verbally. Training occurred twice daily for 15 minutes, with food being used as a reinforcing stimulus. At the onset of the program, gestures and other prompts were used in addition to verbal command. Gradually, the subjects were required to respond correctly in order to be reinforced. The program was carried out for a period of two months, at the end of which, progress was noted both in absolute terms of gain, and relative to a matched control group.

Within this approach, the use of token economies which foster skills of retarded children in institutional settings has also been successful.

The composition of the token economy is defined by at least three aspects. Firstly, certain behaviors are designated good and desirable by the institution staff. Secondly, when these behaviors are emitted by an inmate of the institution, he receives a token which serves as a medium of exchange for, thirdly, receiving reinforcement. This reinforcement may consist of any number of things, such as the privilege of watching television, or eating off a china rather than a tin plate. The approach involves the development of behaviors that will lead to reinforcement by others, and that will enhance social skills.

The third theoretical approach to mental retardation which has been discussed is that of environmental deprivation. If retardation is due to deprivation of environmental stimulation, educational procedures should essentially aim to provide environmental enrichment. Enrichment is essentially a broad term which may cover a wide range of educational programs, the essential feature being that they provide stimulation. Blackman (1963) maintains that if enrichment programs are designed for the special class context, then researchers must be prepared to define their terms more clearly, to specify what processes are being enriched, and for what purpose, and by the use of what specific materials. It seems that what Blackman calls for here is the design of structured enrichment programs, rather than the unstructured provision of stimulation without a clear cut set of goals, or a specially chosen set of materials to meet the needs of the individuals concerned. While unstructured stimulation may have a positive effect, it would seem less likely to be effective than a carefully structured program based on an understanding of the strengths and weaknesses of each individual involved.

The increasing acceptance of the importance of social ability and behavior as well as intellectual functioning has resulted in increasing interest in the development of relevant training programs during the last few decades. (Williams, in Mittler 1973). Williams stresses that social interaction is a two-way process, and although social situations in which the mentally retarded can function adequately are limited because they have not acquired the ability to react to others in a variety of situations, it is also true that part of the difficulty lies in the fact that in many situations others have not acquired the ability to meet the expectations and demands of the mentally retarded. She presents three major strategies that may be adopted to overcome lack of social skills :

Accommodation is an attempt to modify or develop the behavior patterns of the individual so as to enable him to cope in the social situations he is likely to encounter.

Locomotion is commonly adopted with the mentally retarded. It involves the removal of the individual from situations where he cannot cope to those in which he can, leading ultimately to the restriction of that individual to a limited range of environments and situations.

Construction involves an attempt to alter the demands and expectations of others in situations which the individual is likely to encounter, so as to enable him to cope despite his social difficulties.

In practice a combination of these strategies may be adopted. First locomotion may be adopted to remove the individual from an environment where he cannot cope to one where he is able to (e.g. an

institution). If such an environment cannot easily be found, a strategy of construction may be used. Finally, accommodation may be adopted, with the aim of restoring the individual to his original environment. It is important to note that within particular restricted environments the mentally retarded often do interact in a competent fashion, and the skills which already exist may be used as a basis for further building.

> It is of immense significance that the child be moved gradually into some small advances in the way he behaves, some slight increase in his ability to care for himself and to make use of community resources, for these can have far reaching effects on the kind of life he can lead, the degree of freedom he can enjoy and consequently the kind of new experience to which he can be exposed and which may help him to develop still further.
>
> (Grover 1971, page 2).

Grover (1971) has pointed out that any program should be conducted within an educational milieu. By this is meant that every activity carried out is planned to assist the child to develop his motor, cognitive, emotional and social skills. Each member of the staff concerned with the program must be fully conversant with the aims of the program if it is to succeed. Too often staff members will engage in activities such as dressing or feeding children whom they feel are too slow to do this themselves. Thus the child never receives the opportunity to learn such skills.

To summarise the main points made by writers in this area : educational programs for the mentally retarded should be based on a thorough understanding of the abilities of the individuals concerned, should have clear cut and detailed goals, and should take a broad view of education, in the sense that it is seen in terms of providing an opportunity for growth and development. Finally, and perhaps most important, no individual should be considered ineducable.

2.6 EDUCATION OF THE SEVERELY AND PROFOUNDLY RETARDED.

According to the AAMD classification system which has been previously discussed, the severely retarded are those individuals whose IQ score falls between 20 and 35 points, as measured on the Revised Stanford-Binet Scale. The profoundly retarded score below 20 points on this scale. The boundaries for this system will vary from scale to scale, so that if the Wechsler-Bellevue scale is used, the severely retarded are those individuals who score anywhere below 40 points on this scale.

The severely retarded present a picture of considerable impairment. The disorder is generally diagnosed early in life (Mayer-Gross, Slater and Roth, 1974), as during the first year the severely retarded child will generally exhibit delays in developmental milestones, such as sitting up, walking and speaking, and all skills such as toilet training, language and adaptive behavior tend to develop late (Philips, 1967, Wright and Tarjan, 1963). In a large number of cases there is considerable damage to the central nervous system as well as organic pathology, and other handicapping conditions including difficulties of ambulation, arm and hand use, and sensory impairment. (Wright and Tarjan ibid). Physical abnormalities and paralysis may exist (Mayer-Gross, Slater and Roth, op cit). The severely retarded individual is often unable to communicate at either a verbal or a gestural level, and may spend much time engaged in stereotyped motor acts.

Norris (1968) reports a study in which 104 parents of severely retarded children were asked to specify what they felt the child's greatest handicap to be. 62% felt that defective speech was the greatest difficulty; 15% mentioned physical defects, 11% emotional defects, 9% lack of concentration and 8% inability to read.

Scheerenberger (1964) presents a table of the levels of adaptive behavior found in the severely retarded at three age levels. The severely retarded child of pre-school age has minimal speech, poor motor development, little or no communication skills, and (he feels) is generally unable to profit from training in self help. At school going age (6 - 21 years) the child can learn to talk or communicate, can be trained in elemental health habits, and profits from systematic habit training. He will not benefit from academic training. The severely retarded adult can contribute partly to self support while under complete supervision, and can develop self-protection skills to a minimum useful level in a controlled environment.

The severely retarded are generally regarded as requiring life-long supervision and care (Kirk and Johnson, 1965; Stevens and Heber, 1964). Many require intensive medical and nursing treatment. For this reason, a large number of the severely retarded will spend at least a part of their life in a residential facility of some kind, although those who do not present a complicated problem of care and control may be adequately cared for in their homes. In the United States in recent years, there has been an increasing movement to delay institutionalization as long as possible (Conover, 1967), and

to provide public school programs or day care centres for the severely retarded. Rothstein (1971) believes that this movement has been the outgrowth of three factors : an awareness on the part of parents that it is psychologically better for the child to remain in the family than to be placed in institutional care; the 'questionable' programs and over-crowded conditions found in many institutions, and the finding that it is more economical financially for society for the retarded child to remain in the community. However, institutional care will be considered a necessity in certain cases. Hannam (1975) believes that if the advice is to keep the child within the family it must be seen to be best for the family as a whole, not just for the retarded child.

Whether the severely retarded child or adult attends a day school, or participates in an institution program, the same problems of developing a program which is effective, and which meets the needs of the individuals concerned, must be considered. There does not exist any one agreed upon approach to the training of the severely retarded. Until fairly recently educational programs and research has been largely concerned with the educable retarded child who has an IQ of approximately 50 to 75. (Kirk, in Stevens and Heber, 1964), and the training of the severely retarded received less attention.

Smith (1971) suggests that the procedures commonly suggested to help the severely retarded child attain those goals which are considered to be suitable for him differ very little from those used in managing the individual who falls within the educable

category. The principles are applicable as long as realistic behavioral objectives are set.

Morgenstern et al (1966) maintain that the first step in any program with the severely retarded must be to develop an efficient means of communicating with the child. Where communication through language is impossible, communication must depend on emotional rapport. They emphasise that no method or material utilised in a program should ever be considered complete; the highest measure of flexibility and adaptability must be maintained.

Hollis and Gorton (1967) discuss the application of behavior modification techniques in the training of the severely retarded; of particular interest is their discussion of social reinforcement, which has the advantage that it can be delivered by a number of persons at any place or time. Conover (op cit) has also stressed the role of social reinforcers, stating that praise, encouragement and acceptance of the retarded individual's efforts plays an important role in fostering independence. Although Shucman (1960) considers social reinforcement in the form of smiling and nodding to be of little use with the severely retarded, more active participation such as clapping, laughing or patting the individual is seen as a most effective method of reinforcement. The importance of this type of reinforcement may be understood in terms of Zigler's (1967) proposal that the behavior of the mentally retarded improves when they are guaranteed experiences in which they achieve success, that is where they are given praise and encouragement.

Comments regarding the trainable mentally retarded are also of relevance here as this group overlaps

with the severely retarded. Lance (1968) presents a number of criteria which should be met before the individual is accepted into a class for the trainable retarded: the individual should be able to see and hear well enough to engage in the class activities, should be ambulatory to the extent that he does not present undue risk to himself or others during the program activities, and should be toilet trained. He should be able to communicate his needs and to understand simple instructions, should not engage in behavior which is physically dangerous, and should be emotionally stable to a degree that he can benefit from the program. Smith (op cit) criticises such stringent entrance criteria which would exclude many of the trainable retarded from acceptance. A more realistic attitude than banning those individuals who are not toilet trained, for example, would be to include toilet training in the program.

Kirk (op cit) summarises the legislative definitions of severely or trainable mentally retarded children in the United States as :

> For school purposes a trainable or severely retarded child is one :
> (1) who is of school age;
> (2) who is developing at the rate of one-third to one-half that of the normal child (IQ's on individual examination roughly between 30 and 50).
> (3) who, because of retarded mental development, is ineligible for classes for the educable mentally retarded who will, however,

probably not be custodial, totally dependent, or requiring nursing care throughout his life;

(4) who has potentialities for self care tasks (such as dressing, eating, toileting), and who can learn to protect himself from common dangers in the home, school or neighbourhood;

(5) who has potentialities for social adjustment in the home or neighbourhood and can learn to share, respect property rights, cooperate in a family unit and with the neighbours, and

(6) who has potentialities for economic usefulness..... (page 63).

The above requirement that the individual's IQ should fall between approximately 30 and 50 points, will exclude a large number of individuals from training programs, including the group who fall within the category of profound mental retardation.

According to Mayer-Gross, Slater and Roth (op cit) there is no clear dividing line between the profoundly retarded, and the lowest grade cases of severe retardation. The lower on the scale the patient is placed mentally, the greater the extent to which anatomical and physiological abnormalities will be combined with the defect. Such abnormalities

will be most common amongst the profoundly retarded : there may be stunted growth, deformities of head and limbs, and congenital aplasia of certain parts of the central nervous system may be found, resulting in severe neurological symptoms such as hemiplegia and diplegia (Mayer-Gross, Slater and Roth, ibid). The profoundly retarded are frequently very restricted in their ability to move about; their movements tend to be poorly coordinated, and many are confined to a wheelchair or to bed. Persistent rhythmic movements, such as rocking the trunk or shaking the head may be indulged in. They may cry out repetitively or make other noises, chew their fingers, or have outbursts like temper tantrums. Incontinence and playing with faeces are common. Speech is very poorly developed, although some learn to articulate monosyllables, or to vocalise a greeting. Some, but not all, can be trained to use the toilet and to feed themselves. (Robinson and Robinson, 1965). A large number suffer from epileptic fits. Total supervision is required, and little learning of any kind will be exhibited, although the individual may come to recognise familiar faces and to obey simple commands. They fall within the group considered ineducable, i.e. incapable of formal training.

A large number of the severely and profoundly retarded have suffered brain damage. Attempts have been made to identify the major symptoms of the brain damaged child, the best known work in this area being that of Strauss and Lethinen (1947). They proposed that the brain injured child is abnormally responsive to stimuli in the environment, reacting unselectively, passively and without conscious intent. They considered the major

symptoms of the brain injured child to be excessive activity, distractability, short-lived aggression and destructive behavior, poor controls, and heightened variability. Based on these views Strauss and Lethinen developed as educational approach to counteract the brain damaged child's general organic disturbance. Research subsequently conducted on the effectiveness of the proposed educational program, did not support its usefulness (Somerville et al 1974). It now appears that not all brain damaged individuals conform to the picture proposed by Strauss, and large individual variations exist, making generalised descriptions of the brain damaged retardate a virtually impossible task (Robinson and Robinson, op cit).

While a number of organised school programmes have been set up for the trainable or severely retarded, particularly in the United States, the profoundly retarded have received much less attention.

Kirk (op cit) has reviewed a number of studies which were initiated in the United States for the purpose of determining the effects of organised school programs on the development of trainable or severely retarded children.

Reynolds and Kiland (in Kirk, ibid) reported a longitudinal study by Lorenz, in which 66 severely retarded children who attended classes in Minnesota were followed up after a period of 20 years. Subjects remained in the special class for five years on average. The mean age on leaving the school was 36 years. On follow-up it was found that 47% of the children were institutionalised immediately

after leaving the special class, 10% were deceased, and approximately 45% were at home. In general the latter came from families of high socio-economic status, while those who were institutionalised came from lower class families. Of the children who had remained at home, two-thirds were well accepted in the community. Ten individuals had some employment history, and two were working full time. Unfortunately, the study did not concern itself with changes in intellectual and social functioning.

Goldstein (in Kirk, ibid) described a two year study of 22 classes for severely retarded children. Twenty-four teachers worked with 173 children during the first year of the study, while 125 children were included in the second year. On psychometric assessment subjects showed no accelleration in mental growth during the two year period. The rate of development of the subjects was evaluated using a detailed check list of behavior traits. Subjects made some gains during the first year, but their progress was not maintained during the second year of the study. Twenty-two children, who tended to have IQ's below 35, were excluded from the program as unsuitable after a trial period of six weeks to two years. Practically all children with an IQ below 25 were excluded as not profiting from the program.

Guenther (in Kirk, ibid) conducted a three year study, the purpose of which was to evaluate two groups: a school for a heterogeneous age group and a program for children between the ages of four and eight. The first group consisted of 15 children ranging in age from five to 17 and IQ 25 to 52. Nine subjects remained in the school for a period of more than two years. Teachers reports and behavior rating scales

revealed that all nine made slight to considerable gains over this time. The school for younger children was less successful, the majority of the children proving to be unmanageable in a group situation.

Johnson and Capobianco (1957) carried out a two year study of 17 classes for the severely retarded, including seven public school classes, two institution classes, eight half-day classes, and two full day classes. With a few exceptions the IQ's of subjects fell between 25 and 50. All subjects had to be capable of some form of communication to express their needs and understand simple instructions. The pre- and post- test measures included the Vineland Social Maturity Scale, a behavior checklist, a language test, articulation tests, and the Fels Child Behavior Rating Scale.

No marked change in overall social quotient was found after training. Subjects whose IQ's were below 30 tended to drop in social quotient, while those above 30 tended to rise slightly. On the behavior checklist, only subjects with an IQ above 31 showed gains. On the language tests, no significant difference between the experimental group and a control group was found after training. In general, the two year program did not lead to significant improvements. Unfortunately, no description is given of the curriculum included in the training programs. A further criticism of the study is that the teachers varied in terms of training. Some had gained full certification as teachers of educable mentally retarded children, while others had little formal training.

Peck (in Kirk, op cit) studied four groups : a class in the public schools, a class in the community, an institution class, and a control group who remained in their homes and did not receive training. The training programs were run over a period of eighteen months. The three experimental groups made significant progress over the control group, although no significant changes in IQ or social quotient occurred in any of the four groups. No significant differences were found between the three experimental groups.

Hottell (in Kirk, ibid) conducted one of the few controlled studies of this sort. Forty-two children were matched in two groups for sex, clinical type, chronological age and mental age. The experimental group (mean age 8, 7 years, mean IQ 41,1) attended day classes, while the subjects in the control group remained in their homes and received no training. No significant differences in change scores between the experimental and control groups were found on measures of mental age, IQ social age, social quotient, and a behavior rating scale. Subjects whose IQ's fell between 40 and 50 gained significantly over the group of IQ between 30 and 40, but similar results were not obtained for measures of social maturity.

Cain and Levine (in Kirk, ibid) examined the development of social competence of 182 trainable children in institutions and the community. In each setting subjects were compared with a control group. The community groups were found to make significant gains over the control groups. However, the finding was contaminated by the fact that the community group was higher in initial mental status than the

institution group. No significant difference in gain scores in social competence occurred between the experimental groups and control groups. An analysis of the school programs revealed that only a small portion of classroom time was actually devoted to training in social competence, and the authors concluded that placement in a special class program did not necessarily insure a systematic developmental and instructional program.

On the basis of his review of the above studies Kirk concluded that research with the severely retarded had yielded relatively negative results. However, more recent research has presented a more encouraging picture.

Peck and Sexton (1961) studied a group of mentally retarded children IQ 25 to 50 and chronological age six to 12 years. Subjects attended either a public school, a community center, or a state remedial center. A control group who received no training was included. Areas of training included social adjustment, self-care, language development, physical development, music, arts and crafts, and economic usefulness. Activities were designed to develop skills in each of these areas. A rating scale was constructed to measure individual progress in the various skills and abilities within each of the seven areas. The overall trend of each rating scale for the experimental groups indicated significant progress in each area over a two year period. In each area of training the four groups as a whole made significant progress during a one-and-a-half year period. Significant gains were not made in the control group.

Conover (1967) conducted day-care programs for severely and profoundly retarded individuals aged four-and-a-half to 21 years. The goal of the program was to lead the subjects to achieve the maximum degree of independence and self-sufficiency. The development of areas such as fine and gross motor co-ordination, communication and social skills was included. Conover states :

> It is most difficult to objectively measure the accomplishments of the day-care program over the last three years. However, it is known that at least 40 children who entered the day-care program have now attained levels which have permitted their inclusion in trainable or educable classes in public schools (page 38).

Conover reports a similar program conducted by Jubenville (1957) which was designed for totally dependent retardates with no age restriction. Promising results are reported from this training centre, but again there has been no objective analysis of the results of the program.

Jacobson, Bernal and Greeson (1974) conducted a program with moderately and severely retarded children. The duration of the program was only 20 hours for one experimental group, and 10 hours for the second. A third group of subjects served as a control and received no treatment. The program consisted of social interaction between subjects and experimenters, with systematic teaching minimised. The goal of the study was to assess the role of socio-motivational factors rather than cognitive achievement factors in IQ gain.

Subjects in the experimental groups showed small but significant increases in IQ as a result of the program. No significant increase in IQ was found for subjects in the no-treatment control condition.

Rowe (1974) devised a program aimed at providing environmental enrichment for a group of severely retarded adult males aged 17 to 38. Subjects were divided into three groups of seven. People with specialist skills, including a gymnast, a physiotherapist, and an art therapist took part in the running of the program which also included playing games, outings to zoos and cinemas, and attention to the modification of individual habits. Subjects were assessed using a technique based on Piaget's developmental theory. This technique, developed by Woodward (1967) assesses the individual's ability in three areas : the ability to solve problems using objects as tools, the ability to explore objects, and the ability to find objects (involving object permanence). After a seven month period, improvements were found in all three areas. Subjects were also tested on the Reynell Language Scale. It was found that although the subjects' ability to speak changed very little, their understanding of what was said to them did improve. Rowe concluded that the results of this study reflected not the growth of intelligence, but a revealing of previously unrealised potential.

Reviewing research with the severely retarded up to 1964 (Reynolds and Kiland, 1953; Goldstein, 1956; Guenther, 1956; Johnson and Capobianco, 1957; Peck, 1960; Hottell, 1958; Cain and Levine, 1963) Kirk (op cit) concluded that :

> Attempts at research with this group have netted relatively negative results.

> Although we have tended to attribute these negative results to the lack of adequate measuring instruments, lack of controlled experimentation, lack of experienced teachers, and short-term research, it might be necessary to find new approaches to the educational programs for these children (page 67).

Few positive results were obtained in these studies, which were concerned chiefly with the feasibility of education of the severely retarded in broad terms, rather than with the development and evaluation of specially designed programs. The researchers generally drew their subjects from training schools where ongoing programs were in progress, and were thus not themselves involved in the design of these programs. Furthermore, little mention is made of what areas were dealt with during training.

Later research reviewed here (Peck and Sexton, 1971; Conover, 1967; Jubenville, 1959; Jacobson, Bernel and Greeson, 1974 ; Rowe, 1974) shows more positive results, and attempts have been made in two cases to include the profoundly retarded. However, two studies lack objective evidence of their effectiveness, and only one included a control group. Little attention has been devoted to work with adults, although the work of Rowe suggests that much can be done in this area.

There are a number of reasons why the design of well-controlled research with the mentally retarded presents problems. As previously mentioned the mentally retarded are a heterogeneous group, and even within the specific categories of retardation extreme variations are often expressed in terms of etiology and

characteristics. The issue is further complicated by the types and degree of multiple disability which may be found. For this reason, Mittler (1970) believes that the mentally retarded do not conveniently fall into traditional experimental designs. Adequate matching of groups presents an enormous problem, for the more handicapped the child, the less comparable he is to any other child, no matter how carefully he may be matched on a series of measurements. With the mentally retarded the problems of individual differences is so great that Mittler calls into question the feasibility of constructing control groups at all.

A second problem concerns the researcher in the setting of a training centre for the retarded. In such a situation he will be unable to delegate one group of subjects to a no-treatment control condition, because all individuals in the centre are there to receive training. If he is to search outside of the training centre for a group of subjects to form a control group, he runs the risk that their living conditions and general environment may no longer be comparable with the subjects in the experimental group.

Another major problem in research work with the severely and profoundly retarded is the lack of suitable measuring instruments for this population. Standard intelligence tests such as the Wechsler Scales will be unsuitable because most, if not all, the items will be beyond the capabilities of the severely or profoundly retarded individual. Many trainable retarded individuals will have mental levels below the age of five years, which restricts the use of standardised instruments to a relatively limited group of tests.

For example, none of the Wechsler Scales has been standardised on children younger than the age of four years, and the norms for the Wechsler Scales do not extend below an IQ of 44, thus making these tests unsuitable for lower levels of IQ and age. There is a need for tests specifically designed for use with this group, rather than attempting to use scales originally designed for use with normal individuals. Gunzburg (1972) has made an advancement in this direction with the development of the Progress Assessment Charts for use with the retarded, but this test does not provide a quantitative method of scoring.

An issue which has received little attention in research is the role of motivational factors in IQ change.

> Behavioral research in mental retardation has traditionally tested the influence of special programs by comparing the pre-test and post-test performance of a group of experimental subjects against scores of a control group who have not received the special treatment. The usual method has been to measure differences between the means of the two groups and to subject these data to some type of statistical procedure to determine if the differences are significant (Smith, 1971, page 243).

The most frequent pre- and post-test measure employed is an intelligence test, and significant increases in IQ are attributed to the effects of the program. Smith (ibid) believes that this procedure fails to take account of the increased interactions between the effects of the program and other variables such as motivation.

Several writers have noted the influence of motivational factors on the IQ test performance of the mentally retarded. Gunzburg (1970) states that "...the typical answer to questions in a test situation is 'I don't know' which does not necessarily reflect ignorance but utter lack of confidence." (page 291).

Braginsky and Braginsky (1972) note the ability of institutionalised retardates to manipulate their IQ test scores according to the consequence they were led to believe would follow a high or low score.

Zigler and Butterfield (1968) conducted a study on culturally deprived children entering nursery school, compared with a control group not attending school. Their results suggest that the increase in IQ found in the nursery group was due solely to motivational factors rather than to cognitive achievement factors. According to Zigler (1967) IQ scores of retarded subjects result to a large degree from their social deprivation.

> Since institutionalised retarded children are an unusually socially deprived group, they may be expected to be highly responsive to modifications in their social environment (Jacobson, Bernal, and Greeson, 1974 page 88).

Zigler (op cit) maintains that the retarded typically experience a greater amount of failure than a normal individual. If the retarded individual can somehow be guaranteed a history of greater success, his behavior should become more normal, regardless

of this intellectual level. Such opportunities for success may be provided in programs carefully designed to suit the capabilities of the subjects. Zigler sees social deprivation of the kind experienced in institutions as resulting in both a heightened motivation to interact with supportive adults, and a wariness of doing so; but once this wariness is allayed, the individual becomes more responsive than the normal individual to social reinforcement, especially in the form of attention, praise and encouragement. Thus, greater familiarity with adults, such as the experimenters involved in carrying out the program, may have an important role in leading to increases in IQ scores on post-testing. The work of Jacobson, Bernal and Greeson (op cit) with severely retarded subjects, supported Zigler's proposals. These workers conducted a study in which two groups of severely retarded children received either 10 or 20 hours of social interaction with the experimenters, with systematic teaching of any kind kept at a minimum. Subjects in the experimental groups showed small but significant gains in IQ as a result of the program, while no significant gains were found in a no-treatment control group.

The work of Zigler and Jacobson et al raises two considerations important in the evaluation and planning of research in this area.

Firstly, if IQ can be raised to some extent simply through social interaction with an experimenter, it is possible that the performance of mental retardates on an IQ test might well underestimate their intellectual functioning, if they are unfamiliar with the tester, and lack confidence in his presence. Thus post-test IQ measures following the running of a program may reflect in part the

effects of that program, but also in large part the effects of changing motivational factors.

Secondly, the effects of a particular program need to be more carefully evaluated in order to attempt to separate the effects of increased stimulation and motivation from the effects of the training techniques employed in the program. Especially where the subjects have a history of deprivation of stimulation, IQ increases following a program may be due not so much to the particular type of program employed, as to an increase in stimulation.

With a greater recognition of the type of problems raised here, the quality of future research should show improvement. While the present review of research reveals a number of inadequacies in the design of previous studies, the results of such studies have indicated that the severely retarded do appear to profit from training. While little work has been conducted with the profoundly retarded, the few studies which have included this group are also encouraging.

2.7. GENERAL AIMS.

The broad aim of the present study is to evaluate the effectiveness of a developmental program which has been designed to provide activities and experiences suitable to the level of functioning of the severely and profoundly retarded resident in an institution. The effectiveness of the program will be evaluated in terms of change in intellectual and social functioning, the two most frequently accepted criteria of mental retardation.

As previously discussed, past research on the training of the severely and profoundly retarded is subject to a number of criticisms. Many studies are difficult to evaluate objectively, as they have failed to employ adequate controls, or to clearly specify the nature of the training program under consideration. Furthermore, several studies have failed to provide objective evidence of their effectiveness. Programs have generally been designed for use with children, and little work has been conducted with adults. Finally, Zigler (1967) has pointed to the role of motivational factors in IQ change following programs, but as yet little attention has been paid to this area in research. It is hoped to overcome some of these problems in the present study, and thus to provide clearer evidence of the effects of training programs for the severely and profoundly retarded.

An attempt will be made to assess the feasibility of including both children and adults in one program. Many institution wards house both children and adults, and if a single ward program could be introduced for

both children and adults at a particular level of functioning, this would to some extend simplify the management of such a program, while at the same time combating the all too frequent neglect of adult retardates.

It is also hoped to provide more adequate controls than previous research by matching the experimental and control groups as closely as possible for relevant variables. With regard to motivational factors, Zigler (op cit) suggests that IQ change may in large part be due to social interaction and greater familiarity with the experimenter during the course of the program being provided. In order to control for this effect as much as possible, all subjects will participate in a familiarisation program in which they are given an opportunity to interact with the experimenter prior to initial testing. This represents an attempt to obtain an optimum performance on pre-test assessment, by overcoming what Gunzburg (1970) refers to as the total lack of confidence displayed by retardates when tested by a strange adult.

In addition to the usual no-treatment control group included in most studies, a second control group will be included which will receive a program designed to provide stimulation while avoiding systematic training in any area. The purpose of the inclusion of this group is to provide an opportunity to assess the effects of a program providing stimulation and social interaction without systematic training in any area, as compared with the effects of a program which does provide systematic training.

According to Zigler (op cit) the mentally retarded suffer from a high degree of social deprivation, and will thus be highly responsive to positive social

interaction. Furthermore, institutionalised mental retardates generally suffer from a certain degree of stimulus deprivation, and should therefore benefit from increased stimulation. Based on these two assumptions it would appear that stimulation without systematic training should have a positive effect. However, it would be expected that a group who receive systematic training, graded to their level of functioning, and designed to improve their abilities in certain areas, should benefit more than a group not receiving systematic training. An attempt will be made to assess this assumption in the present study.

A further aim of the study is to investigate the durability of the effects of the developmental program by conducting follow-up testing a certain period of time after the completion of the program. Clarke (1967) has emphasised that although intervention programs may produce increases in IQ and other measures, there tends to be a decrease in the level of functioning when the program is discontinued. An attempt will be made to assess this.

The work of Clarke et al (1958) has shown that changes in IQ do take place in adult retardates, and as yet there does not appear to be a critical period for intervention designed to increase the level of intellectual functioning. The inclusion of children and adult subjects in this study will provide an opportunity to assess whether or not there is a relationship between chronological age and changes in intellectual functioning following participation in a program designed to increase the level of intellectual functioning.

Various findings have been reported with regard to the relationship between initial level of intellectual functioning, and changes in functioning following participation in a training program. The profoundly

retarded are generally considered ineducable : in line with this, workers such as Goldstein (in Stevens and Heber, 1964) found that children with an IQ below 25 did not profit from a training program. However, more recent work (e.g. Conover in Rothstein, 1971) has revealed positive results with profoundly retarded subjects (IQ below 20).
In order to shed further light on this area, an investigation of the relationship between initial levels of functioning and changes following participation in the program will be carried out.

It is hoped that the present study will provide support for continuing work with the severely and profoundly retarded.

2.8 FORMAL HYPOTHESES

Hypothesis 1.

Post-test mental age, IQ, social age and social quotient scores will be significantly greater than pre-test scores for subjects participating in a developmental program.

Hypothesis 2.

Follow-up mental age, IQ, social age and social quotient scores will be significantly lower than post-test scores for subjects participating in a developmental program.

Hypothesis 3.

Post-test mental age, IQ, social age and social quotient scores will be significantly greater than pre-test scores for subjects participating in a program of unstructured stimulation.

Hypothesis 4.

Follow-up mental age, IQ, social age and social quotient scores will be significantly lower than post-test scores for subjects participating in a developmental program.

Hypothesis 5.

There will be no significant difference between pre- and post-test scores, nor between post- and follow-up scores on mental age, IQ, social age and social quotient for the group of subjects who do not participate in a program

Hypothesis 6.

Post-test mental age, IQ, social age and social quotient scores will be significantly greater for the group receiving the developmental program than for the group receiving unstructured stimulation.

Hypothesis 7.

Post-test mental age, IQ, social age and social quotient scores will be significantly greater for the group participating in the developmental program than for the group who do not participate in a program.

Hypothesis 8.

Post-test mental age, IQ, social age and social quotient scores will be significantly greater for the group participating in the program of unstructured stimulation than for the group who do not participate in a program.

Hypothesis 9.

The chronological age of subjects who participate in the developmental program will not be significantly related to pre- to post-test and post- to follow-up test changes in IQ, mental age, social age and social quotient.

Hypothesis 10.

The chronological age of subjects who participate in the program of unstructured stimulation will not be significantly related to pre- to post-test and post- to follow-up test changes in IQ, mental age, social age and social quotient.

Hypothesis 11.

The pre-test IQ, mental age, social age and social quotient scores of subjects who participate in the developmental program will not be significantly related to pre- to post-test changes on these measures.

Hypothesis 12.

The pre-test IQ, mental age, social age and social quotient scores of subjects who participate in the program of unstructured stimulation will not be significantly related to pre- to post-test changes on these measures.

3. METHOD

3.1 DESIGN

The design of the study is represented in the following table :

	B1	B2	B3
	EXPERIMENTAL GROUP	CONTROL GROUP 1	CONTROL GROUP 11
	n = 14	n = 14	n = 14
A1	Pre-test	Pre-test	Pre-test
	DEVELOPMENTAL PROGRAM	UNSTRUCTURED STIMULATION	NO TREATMENT
A2	Post-test	Post-test	Post-test
	NO TREATMENT	NO TREATMENT	NO TREATMENT
A3	Follow-up test	Follow-up test	Follow-up test

Forty-two institutionalised mental retardates, falling within the categories of profound and severe mental retardation, were assessed on the following measures :

i) The Vineland Social Maturity Scale

ii) The Cattell Infant Intelligence Scale

iii) The Old South African Individual Scale (OSAIS).

A small minority of subjects reached their ceiling on the Cattell Scale. The scores of these subjects on the OSAIS were converted to Cattell scores by means of regression equations, and Cattell scores only were used in the statistical analysis.

On the basis of this assessment, subjects were matched as closely as possible in groups of three for the following variables :

i) chronological age
ii) age on entering the institution
iii) number of years in the institution
iv) mental age, IQ, social age and social quotient.

Each of the three matched subjects was then randomly assigned to one of three groups : Control Group 1, Control Group 11 and the Experimental Group.

Over a four-and-a-half month period, subjects in the experimental group participated in a developmental program. Over the same period of time, control group 1 participated in a program of unstructured stimulation. Control group 11 received no treatment. At the end of this period all subjects were reassessed on the Cattell, OSAIS and Vineland Scales. One-and-a-half months' later, during which time no treatment was given to any group, all subjects were again tested on the three measures.

Changes in IQ, mental age, social age and social quotient for the three groups were investigated by means of two way analyses of variance with repeated measures on one factor. These analyses were followed by analyses of simple main effects and multiple comparisons where necessary.

The relationship between change in IQ, mental age, social age and social quotient and the following variables was investigated using correlational methods :

i) Chronological age

ii) initial IQ, mental age, social age and social quotient.

3.2 SUBJECTS

Forty-two subjects were drawn from one ward in an institution for the mentally retarded in Cape Town. All subjects were Afrikaans speaking males.

In selecting the subjects, a careful analysis was made of the information obtained in their files, in order to assess their suitability for the program. In addition to this, inmates of the ward from which the selection was made were observed once a week for one to two hours, over a one month period, and those who were then considered suitable were discussed with the nursing staff before a final selection was made.

In order to control for the effects of ward environment, all subjects were drawn from a single ward of the institution. No age restriction was placed on the selection of subjects, thus both children and adults were included.

Several criteria were considered in the selection of subjects. Individuals with severe sensory defects, and those who were violent to a degree that they could not participate safely in group activities were excluded. It was originally intended to select only those subjects who were not involved in an ongoing program of any sort, but this criterion had to be modified in order to obtain a sufficient number of subjects. Nine of the subjects selected attend a small school at the institution five mornings a week, where they engage in pre-school activities. These nine subjects were equally divided between the experimental group and the two control groups. The

remainder of the subjects were not included in any ongoing program. Four subjects attended industrial therapy on an irregular basis, and about half helped with the daily ward work. The remainder spent the day unoccupied, except for a weekly walk, a weekly trip to the park, and music therapy once a week for approximately one hour.

All subjects selected were classified as severely retarded in their hospital files. This classification was in some cases based upon the results of an intelligence test, but for those subjects who had spent many years in the institution, the classification had generally been based on clinical assessment. The social functioning of the subjects had also been taken into account in the classification process: however, taking IQ as a criterion of classification, the majority of subjects fell within the category of profound retardation (IQ less than 20) when initially assessed for purposes of this study.

The subjects were heterogeneous in terms of etiology. Information regarding the causes of retardation was obtained from the subjects' case histories and is presented in Table A12 to A14.

It was originally hoped to match the subjects in the three groups for age, length of institutionalisation, mental age, IQ, social age and social quotient. This proved to be impossible due to the limited number of subjects. However, the three groups were made as equal as possible, and statistical analysis was carried out to ensure that no significant differences (in terms of IQ, mental age, social age and

social quotient) existed between the three groups at the beginning of the study. (See Appendix 1).

This means, standard deviations (SD) and ranges of values of chronological age, length of stay in the institution, age at institutionalisation, mental age, IQ, social age, and social quotient of the three groups are presented in Tables 1 to 3.

TABLE 1.

EXPERIMENTAL GROUP			
	Mean	SD	Range
Chronological age.	22y	9y 6m	9y 11m to 43y
Length of instit.	12y 10m	11y	11m to 40y 2m
Age at instit.	9y 2m	5y 5m	2y 1m to 23y 7m
Mental age	27,06	14,64	6,2m to 64m
IQ	15,07	7,23	4 to 33
SA	2,98	1,69	1,00 to 6,00
SQ	14,43	5,20	7 to 24

Chronological age, length of institutionalisation, age at institutionalisation, and pre-test MA, IQ, SA and SQ for the experimental group.

TABLE 2.

CONTROL GROUP 1			
	Mean	SD	Range
Chronological age.	23y 2m	9y 3m	10y 1m to 40 y
Length of instit.	12y 9m	9y 3m	1y 11m to 30y 3m
Age at instit.	10y 4m	3y 10m	3y 4m to 16y 7m
Mental age	25,83	10,48	7,2m to 49m
IQ	14,57	6,02	4 to 26
SA	2,71	1,67	1,00 to 5,60
SQ	13,64	7,71	6 to 27

Chronological age, length of institutionalisation, age at institutionalisation, and pre-test MA, IQ, SA and SQ for Control Group 1.

TABLE 3

CONTROL GROUP 11			
	Mean	SD	Range
Chronological age	21y 7m	10y 11m	7y 10m to 49y 2m
Length of instit.	11y 9m	12y 1m	11m to 45y 3m
Age at instit.	9y 10m	6y 6m	5m to 23y 4m
Mental age	25,57	10,20	8,8m to 43m
IQ	15	6,01	5 to 24
SA	2,99	1,70	1,06 to 5,40
SQ	16,36	7,54	5 to 27

Chronological age, length of institutionalisation, age at institutionalisation, and pre-test MA, IQ, SA and SQ for Control Group 11.

3.3 TESTS

As previously discussed, two criteria are generally considered important in defining mental retardation : intellectual functioning and level of social functioning. It was, therefore, decided to include tests designed to measure each of these functions for use in the present study.

Three tests were selected :
The Vineland Social Maturity Scale
The Cattell Infant Intelligence Scale and
The Old South African Individual Scale.

3.3.1 THE VINELAND SOCIAL MATURITY SCALE

The selection of a measure of social functioning presented relatively few problems. The Vineland Social Maturity Scale (Doll, 1965) is considered to be the "best-known and most widely used scale of social competence" (Gunzburg, in Mittler, 1970, page 293), and is frequently used in work with the mentally retarded.

The Vineland scale is a developmental schedule which is concerned with the individual's ability to look after his own practical needs and to take responsibility. The scale provides

> .....a definite outline of detailed performances in respect of which children show a progressive capacity for looking after themselves and for participating in those activities which lead toward ultimate independence as adults.
>
> (Doll, op cit, page 1).

Social competence is defined as "....a functional composite of human traits which subserves social usefulness as reflecting in self-sufficiency and in service of others." (Doll, 1953, page 2). The scale consists of 117 items which are arranged in order of increasing average difficulty, and which represent progressive maturation in the areas of self-help, self-direction, locomotion, occupation, communication and socialisation. Self-help is further divided into self-help general, self-help eating, and self-help dressing. Each item in the scale is conceived as representing a general growth in social responsibility which is expressed in a detailed performance as an overt expression of that responsibility.

The scale covers an age range of birth to adulthood. Items are arranged in order of normal average life age progression, and are separated into year groups according to the average scores obtained for the scale as a whole.

The information required to score each item is obtained through an interview with an informant, someone intimately familiar with the person scored, such as a parent, guardian, or attendant. The subject himself need not be present or observed. Direct questioning regarding each item is avoided, rather questioning revolves around one particular area of functioning at a time.

Items are scored in the following manner:

+	:	the behavior is habitually performed.
+ F	:	"the subject does not perform (the behavior) at the time of examination because of special restraint or lack of opportunity, but..he formerly did perform successfully" (Doll, 1965, page 11).
+ N.O	:	the behavior is not performed because of lack of opportunity or restraint, "but...he would presumably perform habitually or could quickly learn to perform, if such limitations to behavior were removed" (ibid).
±	:	behavior in an emergent state.
-	:	those items in which the subject has not yet succeeded.

In scoring the scale a basal score is obtained to which additional credits are added. The total score is converted to a social age (SA) from tables provided in the manual. Social age scores are converted into social quotients (SQ) from the formula of social age divided by social quotient, multiplied by one hundred.

The scale was standardised on 620 subjects, with 10 males and 10 females at each year from birth to 31 years.

The validity of the scale was determined chiefly on the basis of age differentiation, comparison of normals and mental retardates, and correlations of scores with judgments of observers who knew the

subjects well. The correlation between observer judgments and test scores for 480 feeble-minded subjects was 0,85 (Doll, 1953).

Social competence depends to some extent on intelligence. Correlation between the Vineland and the Stanford-Binet Intelligence Test vary widely; from the 0,40's to the low 0,80's (Hurst, 1962 in Robinson and Robinson, 1965).

Fromme (1974) reports a correlation coefficient of 0,63. Fromme investigated the use of the Vineland as an estimate of intellectual functioning with normal children, but found that only after a chronological age of 50 months did correlations between Stanford-Binet IQ scores and scores on the Vineland warrant the use of the latter as a rough estimate of intelligence. Anastasi (1969) concludes that in general the correlations between the Vineland and the Stanford-Binet are "...sufficiently low...to indicate that different facets of behavior are being tapped by the two scales." (page 258).

The Vineland has proved reliable and of special use in differentiating between children who are intellectually retarded but socially competent (Werner and Simonian, 1966).

Doll (op cit) reports a test-retest reliability coefficient of 0,92 for 123 cases after various intervals between one day and nine months, with various combinations of same or different examiner and same or different informant. A test-retest reliability coefficient of 0,94 was obtained with 408 mentally retarded subjects over intervals of from 0 to 24 months.

Hurst (1962 in Mittler, 1970) sets the upper limit for test-retest reliability at 0,92 and the lower limit at 0,80.

Gardner (1971) assessed the utility of three behavioral indices, including the Vineland, for studying severely and profoundly retarded children. The Vineland was found to be a valuable measure; scores were normally distributed and were significantly related to clinical judgments of competence.

This brief review of the scale indicates that its reliability and validity are well adequate for purposes of this study.

3.3.2 INTELLECTUAL ASSESSMENT

In selecting a test which would yield a measure of mental age and IQ, the following criteria were considered :

(i) The test should be suitable for use with the severely retarded, in terms of the range of abilities covered, and the norms provided in the manual.

(ii) The test should cover a suitable age range, i.e. it should be suitable for both children and adults.

(iii) The test should cover the same type of abilities contained in the program.

(iv) The test should be available in Afrikaans.

No single test could be found which would provide a range of activities suitable to all subjects in the study. The solution to this difficulty was the use of two tests, The Cattell Infant Intelligence Scale, and the Individual Scale of the National Bureau of Educational Research, now known as the Old South African Individual Scale (OSAIS).

The Old South African Individual Scale

The Old South African Individual Scale (OSAIS) is based on Terman's revision of the Binet Test (1916). Test items cover a wide range of abilities, including comprehension, memory, knowledge of familiar objects, time orientation, ability to make comparisons, and the use of number concepts. The test is heavily weighted with verbal items, especially at the upper levels of the scale.

Test items are grouped into year levels from Year III to Year XX. The scale is graded in difficulty so that the easiest items are within the range of the normal three year old, while the hardest tax the abilities of the normal adult. In taking the test no individual attempts all the items, but is tested only over a range of age levels suited to his ability. A basal age is found at which all tests are passed, and testing is continued upwards until all tests at one age level are failed. In work with the severely retarded it is advisable to extend testing downwards below the basal age, and upwards beyond the age level at which all tests are failed, as the abilities of the severely retarded individual may be more scattered than in the normal individual.

Items are scored on an all or none basis, the minimal performance that constitutes passing being specified in the manual. Some items occur in identical form at different age levels, but different standards of passing are applied. In scoring the test, the total number of items correctly performed is added, and this score is converted into a mental age from tables provided in the manual. A ratio IQ is then obtained from the mental age and chronological age according to the usual formula. For subjects aged 15 years and older, the denominator in the calculation is taken as fifteen.

The original form of the scale (The Official Mental Hygiene Individual Scale, 1927) was designed for use with the mentally retarded, and was standardised in South Africa on 1 300 subjects with additional numbers of 1 732 subjects in 1928 and 1929. This scale covered age levels up to 16 years only. In 1939, Fick extended the scale to include higher age levels, and the scale was renamed the Individual Scale of the National Bureau of Educational Research (now known as the OSAIS). The new scale was standardised on 1 497 cases, both English and Afrikaans speaking, from seven to 16 years of age.

Validity of the scale was demonstrated by correlations with the South African Group Test. A correlation coefficient of 0,74 was obtained.

Test-retest reliability of the official Mental Hygiene Scale was found to be 0,92. Test-retest reliability of the OSAIS was reported to be 0,93 (Fick, 1939).

A disadvantage of the OSAIS in work with the retarded is its heavy weighting of both expressive and receptive language items. Because of the weakness of the severely retarded in the area of language, non-verbally weighted tests such as the Merrill-Palmer are often used with this group. Gersholowitz and Schrire (1974) compared the scores of 25 institutionalised mentally retarded children (mean age 11, 8 years; IQ range 30 to 78) on the OSAIS and Merrill-Palmer. No significant difference was found in mean scores on the two scales, and a significant correlation was found between scores on the two tests. Results suggested that the verbal weighting on the OSAIS does not significantly depress IQ scores in work with the retarded.

The Cattell Infant Intelligence Scale

The Cattell Infant Intelligence Scale was developed as a downward extension of the 1937 Stanford-Binet Scale, Form L. Apart from original items the scale includes Stanford-Binet items and items from the Gesell Developmental Schedules, and other infant tests.

The scale extends from two to 30 months, with items grouped into year levels. During the first year, the age levels are spaced at intervals of one month, at the second year at intervals of two months, and at three month intervals in the first half of the second year. If the individual taking the test passes any item at the thirty month level, he is given the new revised Stanford-Binet Form L, beginning at the three year level.

At the lowest levels of the scale the items include mainly perceptual tasks, such as attending to a voice or turning towards the sound of a bell. Verbal tasks and more complex motor tasks such as pegboards and formboards are introduced with increasing age. At the highest levels the individual follows verbal instructions in using materials such as familiar objects, and pictures.

No definite order for the presentation of items is set, and there is no time limit on individual items nor on the test as a whole. Testing begins with those items likely to arouse interest and to provide an opportunity of success. The testing then extends downwards until items become so easy that all five items of one age level are successfully completed, and upwards until a level is reached at which all five items at one level are failed. All items are scored either plus or minus. The test yields a measure of mental age, and a ratio IQ can then be computed.

The scale was standardised on 274 children, with varying numbers within the sample being retested at the ages of 3, 6, 9, 12, 18, 24, 30 and 36 months. The entire group was not available for all retests. The principal statistical criterion which was employed for item selection was the increase in the percentage of the children passing an item from the one age to the next.

As Anastasi (1969) points out, the validity of infant scales is difficult to determine, as independent estimates of the intelligence of young children is not readily available. Validation is thus based

chiefly on the criteria of age differentiation and prediction of subsequent status. The first criterion is generally used in the selection of test items, and in terms of this criterion the test shows good validity. Over as short a period as a month, clear cut and progressive changes are found. With regard to the second criterion, evidence for validity is much less satisfactory.

The reliability of the scale has been assessed mainly by the split-half method. Split-half reliability of the scale was found to be 0,85 at the 24 month end, and 0,71 at the 30 month level (Cattell, 1960). Cattell does not report test-retest reliabilities, as in work with an infant scale changes would be expected on re-test. For purposes of this study, however, an estimate of test re-test reliability is necessary.

Alpern (1967) assessed the test re-test reliability of a modified form of the scale over a three day period with autistic children. The modified scale consisted of all items from two to 20 months which were considered suitable for older children (three to seven years). Test re-test reliability was found to be 0,93.

In order to obtain a further estimate of test re-test reliability a pilot study was conducted with a group of 20 severely retarded subjects resident in an institution. Details of this study are presented in Appendix 1.

The Cattell Infant Intelligence Scale was developed as a downward extension of the Stanford-Binet Scale, and is considered continuous with the latter. It seemed probable that a certain amount of continuity would exist also between the Cattell Scale and the OSAIS, as the construction of the latter was based upon the Stanford-Binet Scale, and many items on the two tests are identical.

As the OSAIS and Cattell Scales overlap at the three year level, the continuity between the two scales could be estimated by correlating the scores of subjects who score on both tests (i.e. who score at the overlapping area of the two scales).

All subjects in the present study were tested on both the OSAIS and the Cattell Infant Intelligence Scale. The situation thus arose that :

(i) some subjects scored on the Cattell Infant Intelligence Scale only.

(ii) Some subjects obtained scores on both tests (i.e. they scored at the overlapping area of the tests).

(iii) A small minority reached their ceiling on the Cattell, and obtained an OSAIS score only.

As a small minority of subjects scored on the OSAIS only, it was decided to convert their scores to Cattell scores, and to use Cattell scores only for the statistical analysis in this study. In

order to do this, the scores of all those subjects who scored at the overlapping area of the Cattell and OSAIS scales (i.e. those subjects who scored on both scales) were correlated, and a coefficient of correlation was obtained. Based on this correlation coefficient, a regression equation was calculated, and from this equation the scores of those subjects who scored only on the OSAIS could be converted to predicted Cattell scores. This procedure was carried out at each of the testing periods (i.e. before, after and follow-up). Details of these calculations are presented in Appendix 1.

3.4 THE PROGRAMS

The developmental program.

The aim of this program is to provide activities suitable to the level of functioning of the severely and profoundly retarded : and it is designed to improve their abilities in various areas of functioning.

The design of the developmental program was based on two main sources of information : previous programs conducted with severely retarded subjects, and suggested curricula for this group (Morgenstern, 1966; Rowe, 1974; Scheerenberger, 1969; Stevens, 1968; Conover, 1967; Grover, 1971); and an analysis of the stages of development associated with the various abilities to be dealt with in the program. This analysis was based on a study of infant intelligence scales, developmental schedules, and social competence scales (Merrill-Palmer Scale; Gesell Developmental Schedules, 1949; Gunzburg Progress Assessment Charts, 1972; A Developmental Scale for Language Levels, Molloy and Witt, 1969).

Five areas were chosen for inclusion in the program:

communication
fine motor coordination
discrimination
recognition of familiar objects
creative expression.

These areas are frequently stressed in suggested curricula for the severely retarded, and have most often been included in previous programs.

An analysis of the stages of development within each area was carried out. Thus, for examples, activities involving palmar grasp should precede those

involving digital grasp, in the area of fine motor coordination. In each area the range of abilities most likely to be suitable for the severely and profoundly retarded was considered, and goals for these areas were laid out. Activities to be included in the program were then devised to meet these goals.

In certain cases the goals were defined in terms of particular activities, rather than in broad terms. The goals for each of the five areas are set out below.

Area 1: Fine motor and visuo-motor coordination.

The development of simple manipulative response and simple perceptual motor skills is an important step in the training of severely and profoundly retarded children (and adults). Perceptual-motor skills may be used as a foundation upon which to build more complex behavioral repertoires (Hollis et al, in Rothstein, 1971, page 356).

Goals :

(1) The development of the ability to focus on and follow visual stimuli, and the ability to reach for, and obtain objects.

(ii) The development of a stronger palmar grasp, and the development of digital grasp.

(iii) Engaging in the following types of activities designed to improve motor coordination: catching a balloon, rolling and pressing plasticine, ring threading, threading large beads, building with blocks, packing blocks into a container, holding and marking with a crayon, drawing, buttoning and unbuttoning screwing and unscrewing lids of jars.

Area 2. Communication.

Both receptive and expressive communication were included. Development in this area is generally particularly weak in the severely and profoundly retarded, with receptive communication usually better developed than expressive communication. The program in this area was based on the work of Molloy and Witt (1969) who identify four stages in language development. The goals in this area were structured around these four stages.

Goals :

(i) The development of the ability to attend to auditory stimuli such as music.

(ii) The development of the ability to react to auditory stimuli through clapping, beating time to music, reacting vocally to music by chanting, shouting or singing.

(iii) The development of the ability to listen and respond to sound non-verbally through associating words with familiar objects (e.g. the subject is expected to point to an object or body part when it is named); through carrying out simple commands such as sit, or stand; and through showing an understanding of words such as on, in, under, over, up and down, by appropriate action.

(iv) The development of the ability to respond to sounds verbally, through associating sounds with animals, imitating sounds and words, developing a vocabulary of simple naming words, and beginning to use qualifying words such as big, small, long, short, wet and dry.

Area 3 : Creative Expression.

Several workers have used artistic media as an adjunct to psychotherapy with retarded adults and children (Robinson and Robinson, 1965). This activity allows the individual to freely express himself through various media such as finger painting, plasticine modelling, etc. There is no criterion of success or failure attached to this activity, ".....even the child with little talent can be proud of his production...." (Robinson and Robinson, ibid, page 490).

Goals: To develop the ability to express oneself freely through artistic media.

Area 4 : Discrimination.

This area concerns discrimination by shape, size and colour.

Goals:

(i) The development of an awareness of shape, size and texture through manipulation of a selection of objects.

(ii) The development of the ability to discriminate form by sorting and matching cardboard shapes, and by completing post boxes.

(iii) To develop the ability to match and sort objects according to various criteria, and to select the odd one out from a group of objects or pictures.

(iv) To develop the ability to grade objects according to size.

(v) The development of the ability to match objects according to colour.

(vi) the development of the ability to complete simple jig-saws.

(vii) The development of the ability to discriminate objects by use.

Area 5 : Recognition of familiar objects.

Goals : The development of the ability to select a correct object on request: to carry out simple commands involving familiar objects (e.g. put the hat on your head); to match objects; to divide objects into sets (e.g. a brush and comb); to name objects, and to find objects in magazines; to recognise objects by touch; to illustrate the use of objects by gestures and to identify objects by use; to describe objects in pictures.

An account of the activities in each area can now be given : Each of the 37 sessions is described:

The letter F standing for fine motor coordination.

The letter C standing for communication.

The letter CE standing for creative expression.

The letter D standing for discrimination.

The letter R standing for recognition of familiar objects.

Session 1 :

F Catching balloons. (This activity involves visuo-motor coordination. The movement of the balloon through the air is relatively slow, and allows a longer period of time to position the hands to catch it, than would a ball.

C Listening to music (i.e. attending to auditory stimuli).

CE Finger painting.

D Manipulation of objects of different textures.

R Manipulation of familiar objects.

Session 2 :

F Catching ballcons.

C Listening to music.

CE Finger painting.

D Manipulation of objects of different sizes.

R Manipulation of objects.

Session 3 :

F Catching bubbles (an activity involving visuo-motor coordination).

C Beating drums, tins, hands to music (reacting to auditory stimuli).

CE Painting with a brush.

D Manipulation of objects of different sizes and shapes.

R Selecting correct objects on request (e.g. show me the dog).

Session 4 :

F	Catching bubbles.
C	Clapping to music.
CE	Painting with a brush.
D	Colouring cut-out shapes : Square and circle.
R	Selecting correct objects on request.

Session 5 :

F	Catching a ball.
C	Shouting to music.
CE	Using crayons for drawing.
D	Colouring cut-out shapes: squares, circles, triangles.
R	Selecting correct objects on request.

Session 6 :

F	Catching a ball.
C	Humming, chanting to music.
CE	Using crayons for drawing.
D	Colouring different shapes.
R	Selecting correct objects on request.

Session 7 :

F	Manipulation of plasticine : rolling it into a ball.
C	Carrying out simple verbal commands involving familiar objects e.g. give me the spoon.
CE	Modelling with plasticine.
D	Sorting cardboard shapes : square and circle.
R	Simple commands involving familiar objects.

Session 8 :

F	Plasticine : rolling using two hands.
C	Carrying out simple verbal commands involving familiar objects.
CE	Plasticine.
D	Sorting cardboard shapes: square, circle and triangle.
R	Simple commands involving familiar objects.

Session 9 :

F	Manipulation of objects: musical instruments such as a tambourine, accordian, toy piano, organ.
C	Carrying out verbal commands such as sit and stand.
CE	Making a collage . Colouring fish to stick on cardboard.
D	Post-box : placing plastic shapes into correct hole in the box.
R	Simple commands.

Session 10 :

F	Catching a ping-pong ball. Rolling a ping-pong ball from one to another.
C	Pointing to objects when named.
CE	Completing the collage begun in Session 9. Gluing the fishes to cardboard.
D	Post-box.
R	Pointing to objects in the room on request.

Session 11 :

F	Threading shells on cord to make necklaces.
C	Pointing to objects when named.
CE	Threading shells.
D	Post-box.
R	Pointing to objects in the room on request.

Session 12 :

F Threading shells.
C Introduction to prepositions: on and in; (e.g. subject requested to place hat on his head).
CE Threading shells.
D Matching objects (e.g. matching one pencil and another.
R Matching objects to objects in the room, (e.g. matching a toy chair with an actual chair).

Session 13 :

F Looking at magazines: learning to turn the pages and to focus attention on the pictures.
C Prepositions.
CE Making posters using pictures from magazines.
D Matching objects.
R Pointing to objects in pictures on request.

Session 14 :

F Plasticine modelling. Making a cat.
C Prepositions.
CE Plasticine. Free modelling.
D Sorting objects (e.g. balls and blocks).
R Pointing to objects in pictures on request.

Session 15 :

F Looking at magazines.
C More complex verbal commands (e.g. put the spoon in the cup and give them to me).
CE Making posters using pictures from magazines.
D Sorting objects.
R Pointing to objects in pictures on request.

Session 16 :

F Finger games (e.g. wiggling the thumb).
C Complex commands.
CE Making posters using Christmas Cards.
D Selecting the odd one out from objects (e.g. three pencils, one cat).
R Matching objects to the same objects in pictures.

Session 17 :

F Winding wool on cotton reels.
C Imitating sounds of animals.
CE Making a poster of Noah's ark and animals.
D Odd one out from a series of objects.
R Matching objects to pictures.

Session 18 :

F Working with large, interlocking blocks.
C Associating sounds with animals.
CE Noah's ark poster.
D Selecting the odd one out from pictures.
R Selecting the correct object on request.

Session 19 :

F Manipulating a ping-pong ball. This activity was part of the discrimination training in this session.
C Naming animals using Noah's ark poster.
CE Making scrapbooks. Pictures of subjects own choice.
D Placing ping-pong balls in the indentations of an egg box.
R Selecting the correct object on request.

Session 20 :

F	Ping-pong balls.
C	Naming simple objects.
CE	Colouring-in.
D	Ping-pong balls and egg box.
R	Dividing objects into sets; (e.g. a cat, dog, brush and comb to be correctly paired).

Session 21 :

F	Correctly holding a pencil. Simple drawing exercises involving circular movements and vertical and horizontal strokes.
C	Naming objects in classes, (e.g. soap, tooth-brush, towel).
CE	Making designs with coloured adhesive shapes.
D	Introduction to size grading : big and small.
R	Dividing objects into sets (e.g. objects of clothing).

Session 22 :

F	Drawing patterns.
C	Naming objects in classes.
CE	Finger painting.
D	Size grading: big and small.
R	Naming objects in classes.

Session 23 :

F	Solving simple mazes. Fishing : Cardboard fish with metal noses picked up by a magnet attached to the end of a piece of cotton.
C	Prepositions.
CE	Making scrap books.
D	Size grading: big, bigger, biggest.
R	Finding objects in magazines. Subject required to look through a magazine until finding a certain object.

Session 24 :

F	Mazes and fishing.
C	Responding to questions about pictures, (e.g. what is the girl in the picture doing ?).
CE	Folding and tearing paper to make patterns.
D	Size grading: tall and short.
R	Finding objects in magazines (e.g. look through this book until you find a picture of a baby).

Session 25 :

F	Joining dots with a pencil stroke.
C	Responding to questions about pictures (e.g. what is the girl in the picture doing ?).
CE	Paper patterns.
D	Size grading: tall, taller, tallest.
R	Finding objects in magazines.

Session 26 :

F	Joining dots.
C	Qualifying words (e.g. big, small, long, short).
CE	Colouring paper hats and lanterns.
D	Introduction to colour: red and yellow.
R	Recognition of objects by touch.(Subject required to close his eyes and attempt to identify an object such as a ball, by touch.

Session 27 :

F	Post-box.
C	Qualifying words.
CE	Making designs with adhesive shapes
D	Colour
R	Recognition of objects by touch

Session 28 :

F	Post-box.
C	Qualifying words.
CE	Making scrapbooks.
D	Colour.
R	Illustrating the use of objects by gesture (e.g. miming what is done with a mug).

Session 29 :

F	Post-box.
C	Reading a story followed by simple questions about it.
CE	Making scrapbooks.
D	Colour.
R	Illustrating the use of objects by gesture.

Session 30 :

F	Simple jig-saws consisting of two or three pieces.
C	Class names : (e.g. banana and orange are both fruit).
CE	Painting shells.
D	Jig-saws.
R	Identifying objects by use (e.g. which one do you wear on your head ?).

Session 31 :

F	Simple jig-saws.
C	Class names.
CE	Painting shells.
D	Jig-saws.
R	Identifying objects by use.

Session 32 :

F Simple jig-saws.
C Class names.
CE Drawing.
D Jig-saws.
R Identifying objects by use.

Session 33 :

F Pouring water from one container to another.
C Class names.
CE Painting.
D Discrimination of objects by use (e.g. shoe and sock must be matched).
R Identifying objects by use.

Session 34 :

F Cutting with a scissors. Drawing around own hands.
C Review of qualifying words as dealt with in Session 26 to 28.
CE Cutting paper to make paper chains, and colouring it.
D Discrimination of objects by use.
R A picture handed to each subject. Subject then required to raise his hand if he has the picture being described by the experimenter (e.g. who has the picture of the cat ?).

Session 35 :

F Making paper chains by gluing strips of paper together.
C Review of prepositions as dealt with in Session 12 to 14.
CE Making paper chains.
D Review of discrimination by shape as dealt with in Sessions 6 to 11.
R Answering questions about pictures as in Session 34.

Session 36 :

F Making paper chains.
C Describing pictures. Subject asked to name all the objects he sees in a picture.
CE Making paper chains.
D Review of size grading as dealt with in Sessions 21 to 25.
R Describing pictures.

Session 37 :

F Putting paper clothes on cut-out dolls.
C Responding to questions about a story.
CE Colouring clothes for cut-out dolls.
D Review of colour discrimination as dealt with in Sessions 26 to 29.
R Describing pictures.

As Hollis (op cit) has pointed out, the development of manipulative responses and simple visuo-motor skills serves as a starting point for the development of many other abilities. For this reason, these types of activities were stressed in the first sessions, as they provide a groundwork for those activities to be introduced later.

As can be seen from the foregoing outline of the program, activities in the five areas overlap to some extent. In Session 30, for example, the same activity, completing simple jig-saw puzzles, is included under both fine motor coordination and discrimination. Abilities in both of these areas are included in such an activity : fine motor control in picking up the pieces and fitting them together, and discrimination in selecting the correct piece.

Whenever possible, activities were designed to include the whole group of subjects. However, because of differences in the levels of functioning of the subjects, a certain amount of flexibility had to be maintained. It was expected that not all subjects would progress through all the activities included in the program, and that a small minority would not progress beyond the simpler level of activities included. For this reason it was decided to split the group whenever necessary, according to the level of functioning of the subjects. However, at least one group activity was included in each session in which all subjects were able to participate.

In collecting material for use in the various activities, much use was made of the 3, 4, 5 Nursery Program. This is a 'play and learn' course which suggests graded activities and provides materials in such areas as colour discrimination, size grading, and communication.

Although many of the activities included in the program are also included as tasks in the measures of intellectual functioning used in this study, special care was taken that specific tasks on the

IQ scales were not included in the program. Thus, for example, no familiar objects which must be named on the Cattell Scale, were involved in any of the naming activities in the program.

The program was based on the belief that the provision of carefully structured and sequentially ordered activities will aid the individual to move to progressively higher levels of functioning, regardless of his chronological age. What is important, however, is a careful consideration of the level of functioning of the individual, so that activities suitable to that level can be provided.

The unstructured stimulation program

The aims of this program were twofold :

i) to provide the subjects with an opportunity to interact with the experimenter and the two assistants, in order to control for the effects of positive social interaction and increased familiarity with the tester, and

ii) to expose the subjects to stimulation of a visual, auditory and tactile nature, without providing them with systematic training designed to meet their level of functioning. No systematic training in any area was included, as the purpose of the program was to allow some assessment of the effects of stimulation, without the provision of graded teaching or training.

Subjects were provided with materials of various kinds, which they were free to exploit in any manner they wished. No attempt was made to train them to use the materials in a constructive manner, nor were they trained in the correct manner of engaging in certain activities.

The following activities were included in the program :

i) Looking at magazines.
ii) Drawing and colouring-in.
iii) Working with plasticine.
iv) Playing with toys.
v) Listening to music.

Three of the above activities were included in each session.

3.5 PROCEDURE

1) In order that the subjects should be acquainted with the experimenter prior to being tested by her, a familiarisation program was carried out over a nine day period, prior to the commencement of the program. The aim of this program was to attempt to prevent the subjects from performing poorly on initial assessment through lack of confidence or fear in the presence of a strange adult (i.e. the experimenter). During the familiarisation period, the experimenter spent approximately six hours a day in the ward, participating in ongoing ward routine. This included helping with the feeding, dressing and washing of subjects, taking subjects for walks, and supervising them generally in the ward. In addition to this, all subjects were seen individually for approximately 20 minutes each, during which time the experimenter and subject looked at a picture book, and where possible, engaged in conversation.

2) The OSAIS and Cattell Infant Intelligence Scale were administered to subjects in the experimental group and two control groups prior to the commencement of the programs. The senior nursing sister in the ward served as an informant for the Vineland Scale.

3) Over the next four-and-a-half month period the experimental group was given the developmental program twice weekly for approximately one-and-a-half hours per session. Thirty-seven sessions were held over this period, the program lasting 60 hours in all. The experimenter was aided by two undergraduate psychology students, each of whom participated in one session per week.

4) Over the same four-and-a-half month period, Control Group 1 received unstructured stimulation twice weekly for approximately one-and-a-half hours per session. This program lasted 60 hours in all. The experimenter was again aided by the two psychology students in these sessions.

5) Control Group 11 received no treatment during the four-and-a-half month period.

6) At the end of the four-and-a-half month period all subjects were retested on the OSAIS, Cattell Infant Intelligence Scale and the Vineland Social Maturity Scale.

7) The same tests were administered one-and-a-half months later during which time the subjects engaged in normal ward activities, and no programs were given.

4. RESULTS

1. Analysis of Mental Age Scores.

Table 4 presents a summary of the means and standard deviations (SD) of mental age scores for the three groups at each testing period.

The ANOVA results (Table 5) showed a significant interaction effect at the ,01 level (F = 6,20 ; df = 4 , 78).

The simple main effects analysis (Table 6) did not show a significant effect for factor A at B 2, that is the post-test period for the three groups, F = 1,67; df = 2 , 41 (this was not as predicted), nor for factor A at B 3, the follow-up period for the three groups (F = ,44; df = 2 , 41).

The simple main effects analysis indicated a significant difference within the experimental group scores over the three test periods (B at A 1) at the ,01 level (F = 20,02; df = 2 , 78).

Pairwise comparisons (Table 7) of the experimental group scores showed the significance to be over the Before to After period, as predicted (,01 level; Tukey HSD = 8,94; df = 3 , 78); the After to Follow-up period, as predicted (,01 level; Tukey HSD = 4,73; df = 3 , 78); and the Before to Follow-up period (,05 level; Tukey HSD = 4,22; df = 3 , 78).

The mean mental age rose from 27,06 to 33,38 over the Before to After period. This was as predicted.

The mean mental age fell from 33,38 to 30,04 over the After to Follow-up period. This was as predicted.

The simple main effects analysis indicated no significant difference within the Control Group 1 scores over the three test periods (B at A 2) $F = 1,04$; $df = 2 , 78$.

Pairwise comparisons revealed no significant difference over the Before to After period for Control Group 1 (Tukey HSD = ,58; df = 3 , 78). The trend was, however, as predicted. The mean mental age rose from 25,83 to 27,24 over this period.

Pairwise comparisons also revealed no significant difference over the After to Follow-up period for Control Group 1 (Tukey HSD = ,07; df = 3 , 78). The trend was, however, as predicted. The mean mental age fell from 27,24 to 26,28 over this period.

TABLE 4

		Before	After	Follow-up
Experimental Group	Mean	27,057	33,375	30,037
	SD	14,643	14,186	14,021
Control Group 1	Mean	25,829	27,236	26,282
	SD	10,484	12,913	12,032
Control Group 11	Mean	25,571	25,229	26,200
	SD	10,205	10,231	10,978

Means and standard deviations of mental age scores for the three groups.

TABLE 5

Source	SS	DF	MS	F ratio
Between subjects				
A	483,219	2	241,609	,549
Subjects W.G.	17174,100	39	440,362	
Within subjects				
B	127,613	2	63,807	9,132 **
AB	173,332	4	43,333	6,202 **
B X S.W.G.	545,016	78	6,987	,202

** significant at the ,01 level.

Anova Summary of mental age scores.

TABLE 6

Source	SS	DF	MS	F ratio
A at B 1	17,653	2	8,826	,058
A at B 2	504,367	2	252,184	1,665
A at B 3	134,539	2	67,270	,444
W Cell	17719,100	41	151,446	
B at A 1	279,703	2	139,852	20,015**
B at A 2	14,461	2	7,230	1,035
B at A 3	6,793	2	3,396	,486
B X S.W.G.	726,687	78	6,987	

** significant at the ,01 level.

Simple main effects of mental age scores.

TABLE 7

	T U K E Y HSD DF = 3 , 78		
	B 1 : B 2	B 2 : B 3	B 1 : B 3
A 1	8,943**	4,725**	4,218*
A 2	,577	,065	,642

** significant at the ,01 level.

* significant at the ,05 level

Pairwise Comparisons of mental age scores

2. Analysis of IQ Scores.

Table 8 presents a summary of the means and standard deviations (SD) of IQ scores for the three groups at each testing period.

The ANOVA results (Table 9) showed a significant interaction effect at the ,01 level ($F = 4{,}53$; $df = 4 , 78$).

The simple main effects analysis (Table 10) did not reveal a significant effect for factor A at B 2, that is, at the post-test period for the three groups, $F = 1{,}23$; $df = 2 , 42$ (this was not as predicted), nor for factor A at B 3, the follow-up test period for the three groups ($F = ,26$; $df = 2 , 42$).

The simple main effects analysis indicated a significant difference within the experimental group scores over the three test periods (B at A 1) at the ,01 level ($F = 14{,}73$; $df = 2 , 78$). Pairwise comparisons (Table 11) of the experimental group scores showed the significance to be over the Before to After period, as predicted (,01 level; Tukey HSD = 7,63; $df = 3 , 78$) and the After to Follow-up period, as predicted (,01 level; Tukey HSD = 4,58; $df = 3 , 78$).

The mean IQ rose from 15,07 to 18,29 over the Before to After period. This was as predicted.

The mean IQ fell from 18,29 to 16,36 over the After to Follow-up period. This was as predicted.

The simple main effects analysis indicated no significant difference within the Control Group 1 scores over the three test periods (B at A 2), ($F = ,12$; $df = 2 , 78$).

Pairwise comparisons revealed no significant difference in Control Group 1 scores over the Before to After period (Tukey HSD = ,68 ; $df = 3 , 78$). This was not as predicted.

Pairwise comparisons also revealed no significant difference at the After to Follow-up period (Tukey HSD = ,51; $df = 3 , 78$).

TABLE 8

		Before	After	Follow-up
Experimental Group	Mean	15,071	18,286	16,357
	SD	7,227	6,999	7,078
Control Group 1	Mean	14,571	14,857	14,643
	SD	6,022	6,960	6,512
Control Group 11	Mean	15,000	15,000	15,071
	SD	6,013	6,177	5,811

Means and standard deviations of IQ scores.

TABLE 9

Source	SS	DF	MS	F ratio
Between subjects				
A	84,622	2	42,311	,342
Subjects W.G.	4830,24	39	123,852	
Within subjects				
B	28,902	2	14,451	5,809
AB	45,042	4	11,261	4,526**
B X S.W.G.	194,043	78	2,488	

** Significant at the ,01 level.

ANOVA summary of IQ scores.

TABLE 10

Source	SS	DF	MS	F ratio
A at B 1	2,047	2	1,023	,024
A at B 2	105,33	2	52,665	1,226
A at B 3	22,285	2	11,143	,259
W Cell	5024,27	42	42,943	
B at A 1	73,287	2	36,644	14,7297**
B at A 2	,617	2	,309	,124
B at A 3	,047	2	,023	,009
B X S.W.G.	256,236	78	2,488	

** significant at the ,01 level.

Simple main effects of IQ scores.

TABLE 11

	T U K E Y HSD DF = 3 , 78		
	B 1 : B 2	B 2 : B 3	B 1 : B 3
A 1	7,62515**	4,57513**	3,050
B 2	,678	,508	,170

** significant at the ,01 level

Pairwise comparisons of IQ scores.

3. Analysis of Social Age Scores.

Table 12 presents a summary of the means and standard deviations (SD) of the social age scores for the three groups at each testing period.

The ANOVA results (Table 13) showed a significant interaction effect at the ,05 level ($F = 3,14$; $df = 4 , 78$).

The simple main effects analysis (Table 14) did not reveal a significant effect for factor A at B 2, that is at the post-test period for the three groups $F = ,71$; $df = 2 , 42$ (this was not as predicted), nor did it reveal a significant effect for factor A at B 3, the follow-up period for the three groups ($F = ,82$; $df = 2 , 42$).

The simple main effects analysis indicated a significant difference within the experimental group scores over the three test periods (B at A 1) at the ,01 level ($F = 8,49$; $df = 2 , 78$).

Pairwise comparisons (Table 15) of the experimental group scores showed the significance to be over the Before to After period, as predicted (,01 level; Tukey HSD = 5,78; $df = 3 , 78$); and the Before to Follow-up period (,01 level; Tukey HSD = 5,78; $df = 3 , 78$). No significant difference was found in the After to Follow-up period (Tukey HSD = 2,25; $df = 3 , 78$), but the trend was as predicted. Mean social age fell from 3,65 to 3,39 over this period.

The mean social age score rose from 2,98 to 3,65 over the Before to After period. This was as predicted.

The simple main effects analysis indicated a significant difference within the Control Group 1 scores over the three test periods (B at A 2) at the ,05 level ($F = 3,14$; $df = 2 , 78$).

Pairwise comparisons revealed no significant difference over the Before to After period for Control Group 1 (Tukey HSD = 1,88; $df = 3 , 78$). However, the trend was as predicted. The mean social age rose from 2,71 to 2,93 over this period.

Pairwise comparisons revealed a significant difference over the After to Follow-up period for Control Group 1 (Tukey HSD = 3,54; $df = 3 , 78$). The mean social age fell from 2,93 to 2,52 over this period. This was as predicted.

TABLE 12

		BEFORE	AFTER	FOLLOW-UP.
Experimental Group	Mean	2,983	3,651	3,391
	SD	1,691	2,057	2,070
Control Group 1	Mean	2,714	2,931	2,522
	SD	1,668	1,732	1,522
Control Group 11	Mean	2,990	2,978	2,929
	SD	1,704	1,665	1,953

Means and standard deviations of social age scores.

TABLE 13

Source	SS	DF	MS	F Ratio
Between subjects				
A	8,176	2	4,088	,441
Subjects W. G.	361,874	39	9,279	
Within subjects				
B	2,033	2	1,017	5,429
AB	2,349	4	,587	3,1367*
B X S.W.G.	14,606	78	,187	

* significant at the ,05 level.

ANOVA summary of social age scores.

TABLE 14

Source	SS	DF	MS	F ratio
A at B 1	,695	2	,348	,108
A at B 2	4,542	2	2,271	,706
A at B 3	5,288	2	2,644	,822
W Cell	376,48	42	3,218	
B at A 1	3,179	2	1,590	8,48937**
B at A 2	1,174	2	,587	3,13532*
B at A 3	,029	2	,015	,078
B X S.W.G.	19,474	78	,187	

** significant at the ,01 level.

* significant at the .05 level.

Simple main effects of social age scores.

TABLE 15

T U K E Y HSD DF = 3 , 78			
	B 1 : B 2	B 2 : B 3	B 1 : B 3
A 1	5,78091**	2,254	5,78091**
A 2	1,884	3,539*	1,655

** significant at the ,01 level.

* significant at the ,05 level.

Pairwise comparisons of Social age scores.

4. Analysis of Social Quotient Scores.

Table 16 presents a summary of the means and standard deviations (SD) of social quotient scores for the three groups at each testing period.

The ANOVA results (Table 17) showed a significant interaction effect at the ,05 level ($F = 3,17$; $df = 4 , 78$).

The simple main effects analysis (Table 18) did not show a significant effect for factor A at B 2, the post-test period for the three groups, $F = ,55$; $df = 2 , 43$ (this was not as predicted), nor for factor A at B 3, the follow-up period for the three groups ($F = ,91$; $df = 2 , 43$).

The simple main effects analysis indicated a significant difference within the experimental group over the three testing periods (B at A 1) at the ,01 level ($F = 7,39$; $df = 2 , 78$).

Pairwise comparisons (Table 19) revealed a significant difference over the Before to After period, as predicted (,01 level; Tukey HSD = 5,44; $df = 3 , 78$). The mean social quotient rose from 14,43 to 17,36 over the Before to After period. This was as predicted.

No significant difference was found over the After to Follow-up period (Tukey HSD = 2,78; $df = 3 , 78$). However, the trend was as predicted. The mean social quotient fell from 17,36 to 15,86 over this period.

The simple main effects analysis revealed a significant difference within Control Group 1 over the three testing periods (B at A 2) at the ,05 level ($F = 3,71$; $df = 2 , 78$).

Pairwise comparisons showed no significant difference between Before and After social quotient scores for Control Group 1 (Tukey HSD = 1,72; $df = 3 , 78$), but the trend was as predicted. The mean social quotient rose from 13,64 to 14,57 over this period.

Pairwise comparisons revealed a significant difference over the After to Follow-up period at the ,01 level (Tukey HSD = 3,84; $df : 3 , 78$). Mean social quotient dropped from 14,57 to 12,5 over this period. This was as predicted.

TABLE 16

		Before	After	Follow-up.
Experimental Group	Mean	14,429	17,357	15,857
	SD	5,199	6,380	6,927
Control Group 1	Mean	13,643	14,571	12,5
	SD	7,712	7,683	6,700
Control Group 11	Mean	16,357	15,929	15,286
	SD	7,541	7,237	7,750

Means and standard deviations of social quotient scores.

TABLE 17

Source	SS	DF	MS	F ratio
Between subjects				
A	147,82	2	73,910	,523
Subjects W.G.	5512,5	39	141,346	
Within subjects				
B	46,867	2	23,434	5,766
AB	51,468	4	12,867	3,166*
B X S.W.G.	316,996	78	4,064	

* significant at the ,05 level.

ANOVA summary of social quotient scores.

TABLE 18

Source	SS	DF	MS	F ratio
A at B 1	54,613	2	27,307	,548
A at B 2	54,334	2	27,167	,545
A at B 3	90,332	2	45,166	,906
W Cell	5829,49	43	49,825	
B at A 1	60,043	2	30,022	7,38709**
B at A 2	30,142	2	15,071	3,70832*
B at A 3	8,143	2	4,071	1,002
B X S.W.G.	422,661	78	4,064	

** significant at the ,01 level.
* significant at the ,05 level.

Simple main effects of social quotient scores.

TABLE 19

	T U K E Y HSD DF = 3 , 78		
	B 1 : B 2	B 2 : B 3	B 1 : B 3
A 1	5,43538**	2,784	2,651
A 2	1,723	3,84458*	2,121

** significant at the ,01 level.
* significant at the ,05 level.

Pairwise comparisons of social quotient scores.

5. Analysis of IQ scores at the post-test period.

No significant difference was found between the experimental group and the two control groups at the post-test period for MA, IQ, SA and SQ. However, an examination of the means of the three groups at the post-test period for MA and IQ reveals a trend in the expected direction. Examining the IQ scores for example, the mean IQ for the experimental group at the post-test period was 18,29. As predicted, this was higher than the mean IQ score for control group 1 (14,86) and the mean IQ score for control group 11 (15). The failure of the statistical analysis to reveal a significant difference between the three groups appeared to be due mainly to the variability of IQ scores within each group (note the large MS for subjects within groups on the ANOVA summary table 9 for IQ scores). For this reason it was decided to investigate the results when the initial variability in IQ within the group was partialled out. This was done by the use of one way Analysis of Covariance (ANACOVA). As an independent covariate measure for IQ was not available, pre-test IQ had to be used for this purpose. The dependent variable was post-test IQ.

Table[20] presents the adjusted means for the three groups at the post-test period.

Table[21] presents the ANACOVA summary table. A significant F ratio was obtained (,01 level, F = 10,58). Pairwise comparisons revealed the significance to be between the experimental group and control group 1 (Tukey HSD = 5,36 ; df = 3 , 38, ,01 level) and the experimental group and control group 11 at the ,01 level (Tukey HSD = 5,88; df = 3 , 38). There was no significant difference between control group 1 and control group 11 (Tukey HSD = ,52 ; df = 3 , 38).

TABLE 20

Experimental group	Control Group 1	Control Group 11
18,096	15,165	14,882

ANACOVA analysis : adjusted means of the three groups at the post-test period.

TABLE 21

Source	SS	DF	MS	F ratio
A	88,663	2	44,332	10,5838**
Error	159,168	38	4,189	

** significant at the ,01 level.

ANACOVA summary, with adjustment, for IQ scores at the post-test period.

TABLE 22

	T U K E Y HSD DF = 3 , 38.		
	A 1 : A 2	A 2 : A 3	A 1 : A 3
B 2	5,357**	,518	5,875**

** significant at the ,01 level.

Pairwise comparisons of IQ scores for the three groups at the post-test period.

In order to investigate hypotheses 9 to 12, a correlation matrix was calculated for the experimental group scores, and another for control group 1 scores. In order to investigate the possibility of relationships among variables other than those mentioned in the hypotheses (i.e. chronological age, pre-test MA, IQ, SA, SQ; pre- to post-test change in MA, IQ, SA, SQ) a number of other variables were included in each matrix.

Nineteen variables were investigated :

1) Chronological age
2) Number of years of institutionalisation.
3) Pre-test MA.
4) Pre-test SA.
5) Pre- to post-test difference in MA.
6) Post- to follow-up test difference in MA.
7) Pre- to post-test difference in IQ.
8) Age at institutionalisation.
9) Post- to follow-up test difference in IQ.
10) Pre-test IQ.
11) Pre- to follow-up test difference in IQ.
12) Pre-test SQ.
13) Pre- to follow-up test difference in MA.
14) Pre- to post-test difference in SA.
15) Pre- to post-test difference in SQ.
16) Pre- to follow-up test difference in SA.
17) Pre- to follow-up test difference in SQ.
18) Post- to follow-up test difference in SA.
19) Post- to follow-up test difference in SQ.

1. Analysis of scores of the experimental group.

The means and standard deviations of the 19 variables for the experimental group are presented in Table 23.

The correlation matrix is presented in Table 24.

In order to facilitate an examination of the coefficient of correlation relevant to hypotheses 9 and 11, Tables 25 and 26 present the relevant figures.

There were no significant correlation coefficients between pre-test MA, and changes in MA ($r = -,257$; $df = 19 , 12$), changes in IQ ($r = -,164$; $df = 19 , 12$), changes in SA ($r= ,489$; $df = 19 , 12$) and changes in SQ ($r = ,380$; $df = 19 , 12$) over the pre- to post-test period.
This was as predicted.

There were no significant correlations between pre-test IQ, and changes in MA ($r = -,347$; $df = 19 , 12$), changes in IQ ($r = -,268$; $df = 19 , 12$), changes in SA ($r = ,415$; $df = 19 , 12$) and changes in SQ ($r = ,323$; $df = 19 , 12$) over the pre- to post-test period.
This was as predicted.

There were no significant correlations between pre-test SA and changes in MA ($r = ,006$; $df = 19 , 12$), changes in IQ ($r = ,087$; $df = 19 , 12$), changes in SA ($r = ,344$; $df = 19 , 12$), and changes in SQ ($r = ,243$; $df = 19 , 12$) over the pre- to post-test period.
This was as predicted.

There were no significant correlations between pre-test SQ, and changes in MA ($r = -,102$; $df = 19 , 12$), changes in IQ ($r = -,040$; $df = 19 , 12$) and changes in SA ($r = ,201$; $df = 19 , 12$) and changes in SQ ($r = ,126$; $df = 19 , 12$) over the pre- to post-test period.
This was as predicted.

The relationship between pre-test MA, IQ, SA and SQ, and post- to follow-up changes on these measures were also investigated. None of the coefficients of correlation was significant. (See Table 25.

There were no significant correlations between chronological age and changes in MA (r = ,046 ; df = 19 , 12), changes in IQ (r = ,156 ; df = 19 , 12), changes in SA (r = ,276 ; df = 19 , 12) and changes in SQ (r = ,152 ; df = 19 , 12) over the pre- to post-test period.

No significant correlations were found between chronological age and changes in MA (r = ,064 ; df = 19 , 12),changes in IQ (r = ,088 ; df = 19 , 12), changes in SA (r = -,518 ; df = 19 , 12), changes in SQ (r = -,098 ; df = 19 , 12) over the post- to follow-up test period.

No significant correlations were found between the age of institutionalisation and changes in MA (r = ,083 ; df = 19 , 12), changes in IQ (r = ,127 ; df = 19 , 12), changes in SA (r = ,190 ; df = 19 , 12) and changes in SQ (r = ,165 ; df = 19 , 12) over the pre- to post-test period.

No significant correlations were found between the number of years of institutionalisation and changes in MA (r = -,001 ; df = 19 , 12), changes in IQ (r = ,072 ; df = 19 , 12) changes in SA (r = ,144 ; df = 19 , 12) and changes in SQ (r = ,050 ; df = 19 , 12) over the pre- to post-test period.

As would be expected from the method of calculating IQ from mental age, significant correlations at the ,01 level were found for the following variables (df = 19 , 12). See correlation matrix, Table 24 :

pre-test MA and pre-test IQ (r = ,971) ;
Pre- to follow-up test changes in MA, and pre- to follow-up test change in IQ (r = ,981) ;
pre- to post-test change in MA, and pre- to post-test change in IQ (r = ,981) ;
pre - to follow-up test change in IQ, and pre- to follow-up test change in MA (r = ,966);
pre- to post-test change in SA and pre- to post-test change in SQ (r = ,973); pre- to follow-up test change in SA and pre- to follow-up test change in SQ (r = ,990).

A significant correlation coefficient was found for pre- to post-test SA and pre- to follow-up test SA (,05 level , r = ,933).

A significant correlation coefficient was obtained for pre- to post-test change in SA and pre- to follow-up test SQ (,01 level, r = ,949).

A significant correlation coefficient was found for pre- to post-test change in SQ and pre- to follow-up test change in SQ (,05 level, r = ,920).

TABLE 23

VARIABLE NUMBER	MEAN	STANDARD DEVIATION
1	264,143	114,141
2	154,143	132,196
3	27,057	14,643
4	2,983	1,691
5	6,318	4,753
6	- 3,338	4,921
7	3,214	2,665
8	110,000	65,403
9	- 1,929	2,645
10	15,071	7,227
11	1,286	2,840
12	14,429	5,199
13	3,180	5,204
14	,669	,725
15	2,929	3,100
16	,408	,905
17	1,429	3,975
18	- ,261	,346
19	- 1,500	1,653

Means and Standard deviations
of experimental group scores.

TABLE 24

CORRELATION MATRIX : EXPERIMENTAL GROUP

Variable 1	1,00															
Variable 2	,869	1,00														
Variable 3	,450	,250	1,00													
Variable 4	,802	,656	,750	1,00												
Variable 5	,046	-,001	-,257	,006	1,00											
Variable 6	,064	,293	-,052	,157	-,458	1,00										
Variable 7	,156	,072	-,164	,087	,981**	-,454	1,00									
Variable 8	-,011	-,505	,279	,073	,083	-,481	,127	1,00								
Variable 9	,088	,323	-,021	,203	-,425	,981**	-,428	-,500	1,00							
Variable 10	,304	,154	,971**	,652	-,347	-,014	-,268	,220	,004	1,00						
Variable 11	,228	,368	-,173	,271	,525	,488	,540	-,347	,530	-,248	1,00					
Variable 12	,588	,543	,749	,912	-,102	,295	-,040	-,072	,316	,740	,257	1,00				
Variable 13	,194	,379	-,294	,196	,499	,532	,494	-,428	,539	-,348	,966**	,222	1,00			
Variable 14	,276	,144	,489	,344	-,096	-,383	-,095	,190	-,286	,415	-,355	,201	-,483	1,00		
Variable 15	,152 ,973**	,050 1.00	,380	,243	-,140	-,349	-,175	,165	-,262	,323	-,408	,126	-,497			
Variable 16	,023 ,933*	-,133 ,898	,512 1,00	,198	-,105	-,415	-,104	,308	-,316	,469	-,392	,095	-,562			
Variable 17	,078 ,949**	-,078 ,920*	,534 ,990**	,240 1,00	-,115	-,393	-,118	,293	-,288	,484	-,380	,124	-,543			
Variable 18	-,518 ,345	-,649 ,309	,315 ,659	-,204 ,601	-,074 1,00	-,281	-,072	,407	-,229	,359	-,280	-,172	-,457			
Variable 19	-,098 ,458	-,280 ,338	,572 ,698	,121 ,679	-,013 ,865	-,290 1.00	,044	,394	-,202	,557	-,148	,063	-,374			

TABLE 25

	Pre-test MA	Pre-test IQ	Pre-test SA	Pre-test SQ
Pre- post-test difference in MA	-,257	-,347	,006	-,102
Pre- to post-test difference in IQ	-,164	-,268	,087	-,040
Pre- to post-test difference in SA	,489	,415	,344	,201
Pre- to post-test difference in SQ	,380	,323	,243	,126
Post- to follow-up test difference in MA	-,052	-,014	,157	,295
Post- to follow-up test difference in IQ	-,021	,004	,203	,316
Post- to follow-up test difference in SA	,315	,359	-,204	-,172
Post- to follow-up test difference in SQ	,572	,557	,121	,063

Relevant correlation coefficients
for the experimental group.

TABLE 26

	Chronological age	Age at Institution	Years of Instit.
Pre- post-test difference in MA	,046	,083	-,001
Pre- post-test difference in IQ	,156	,127	,072
Pre- post-test difference in SA	,276	,190	,144
Pre- post-test difference in SQ	,152	,165	,050
Post- follow-up test difference in MA	,064	-,481	,293
Post- follow-up test difference in IQ	,088	-,500	,323
Post- follow-up test difference in SA	-,518	,407	-,649
Post- follow-up test difference in SQ	-,098	,394	-,280

Relevant correlation coefficients for the experimental group.

2. Analysis of scores of Control Group 1.

The means and standard deviations of the 19 variables for Control Group 1 are presented in Table 27.

The correlation matrix is presented in Table 28.

In order to facilitate an examination of the coefficient of correlation relevant to hypotheses 10 and 12, Tables 29 and 30 present the relevant figures.

There were no significant correlation coefficients between pre-test MA, and changes in MA ($r = ,569$; $df = 19 , 12$), changes in IQ ($r = ,328$; $df = 19 , 12$), changes in SA ($r = ,416$; $df = 19 , 12$) and changes in SQ ($r = ,177$; $df = 19 , 12$) over the pre- to post-test period.
This was as predicted.

There were no significant correlations between pre-test IQ, and changes in MA ($r = ,571$; $df = 19 , 12$), changes in IQ ($r = ,347$; $df = 19 , 12$), changes in SA ($r = ,387$; $df = 19 , 12$) and changes in SQ ($r = ,282$; $df = 19 , 12$) over the pre- to post-test period.
This was as predicted.

There were no significant correlations between pre-test SA and changes in MA ($r = ,666$; $df = 19 , 12$), changes in IQ ($r = ,525$; $df = 19 , 12$) changes in SA ($r = ,159$; $df = 19 , 12$) and changes in SQ ($r = -,091$; $df = 19 , 12$) over the pre- to post-test period.
This was as predicted.

There were no significant correlations between pre-test SQ, and changes in MA (r = ,663 ; df = 19 , 12), changes in IQ (r = ,552 ; df = 19 , 12), changes in SA (r = ,069 ; df = 19 , 12) and changes in SQ (r = -,111 ; df = 19 , 12) over the pre- to post-test period.
This was as predicted.

The relationships between pre-test MA, IQ, SA and SQ, and post- to follow-up changes in these measures were also investigated. None of the coefficients of correlation was significant (See Table 30)

There were no significant correlations between chronological age and changes in MA (r = ,045; df = 19 , 12), changes in IQ (r = ,102 ; df = 19 , 12), changes in SA (r = ,213 ; df = 19 , 12) and changes in SQ (r = ,017; df = 19 , 12) over the pre- to post-test period.

The relationship between chronological age and post- to follow-up test changes in MA, IQ, SA and SQ was also investigated. None of the correlation coefficients was significant. (See Table 30)

No significant correlations were found between the age at institutionalisation and changes in MA (r = -,102 ; df = 19 , 12), changes in IQ (r = -,207 ; df = 19 , 12), changes in SA (r = -,056 ; df = 19 , 12) and changes in SQ (r = -,132 ; df = 19 , 12) over the pre- to post-test period.

No significant correlations were found between the number of years of institutionalisation, and changes in MA (r = ,088 ; df = 19 , 12), changes in IQ (r = ,188; df = 19 , 12), changes in SA (r = ,236 ; df = 19 , 12) and changes in SQ (r = ,072 ; df = 19 , 12) over the pre- to post-test period.

As would be expected from the method of calculating IQ from mental age, and SA from SQ, significant correlations were obtained for the following variables (df = 19 , 12). See Table 28:

pre-test MA and pre-test IQ (,05 level, r = ,926);
pre- to follow-up test change in IQ and pre- to follow-up test change in MA (,05 level, r = ,920);
pre- to follow-up test change in SA and pre- to follow-up test change in SQ (,01 level, r = ,957).

A significant correlation was also found at the ,05 level for chronological age and number of years of institutionalisation (r = ,914).

TABLE 27

VARIABLE NUMBER	MEAN	STANDARD DEVIATION
1	278,214	111,406
2	153,857	111,234
3	25,829	10,484
4	2,714	1,668
5	1,408	3,647
6	- ,954	2,479
7	,286	1,978
8	124,429	46,255
9	- ,214	1,528
10	14,571	6,022
11	- ,071	1,817
12	13,643	7,712
13	,454	3,261
14	,218	,270
15	,929	1,385
16	- ,191	,672
17	- 1,143	3,231
18	- ,420	,620
19	- 2,071	2,615

Means and standard deviations
of Control Group 1 scores.

TABLE 28

C O R R E L A T I O N M A T R I X : C O N T R O L G R O U P 1

Variable 1	1,00														
Variable 2	,914*	1,00													
Variable 3	,222	,064	1,00												
Variable 4	,267	,145	,831	1,00											
Variable 5	,045	,088	,569	,666	1,00										
Variable 6	-,195	-,230	-,371	-,200	-,488	1,00									
Variable 7	,102	,188	,328	,525	,901	-,367	1,00								
Variable 8	,210	-,206	,379	,292	-,102	,083	-,207	1,00							
Variable 9	-,006	-,110	-,117	,046	-,385	,812	-,487	,248	1,00						
Variable 10	-,039	-,131	,926*	,675	,571	-,439	,347	,219	-,295	1,00					
Variable 11	,076	,108	,267	,649	,754	,100	,777	-,076	,133	,152	1,00				
Variable 12	-,160	-,202	,746	,864	,663	-,206	,552	,099	-,124	,762	,558	1,00			
Variable 13	-,098	-,077	,354	,594	,748	,215	,728	-,051	,187	,305	,920*	,585	1,00		
Variable 14	,213	,236	,416	,159	-,129	-,453	-,313	-,056	-,218	,387	-,455	,069	-,489	1,00	
Variable 15	,017	,072	,177	-,091	-,179	-,481	-,357	-,132	-,262	,282	-,552	-,111	-,566	,79	
	1,00														
Variable 16	-,150	-,023	-,066	-,409	-,328	-,087	-,509	-,306	-,008	,038	-,585	-,354	-,433	,51	
	,567	1,00													
Variable 17	-,089	,013**	-,135	-,521	-,344	-,146	-,499	-,243	-,085	-,015	-,644	-,502	-,495	,44	
	,616	,957	1.00												
Variable 18	-,410	-,277	-,233	-,495	-,253	,155	-,385	,320	,108	-,058	-,386	-,338	-,165	,09	
	,282	,877	,850	1,00											
Variable 19	-,118	-,022	-,260	-,596	-,330	,075	-,427	-,231	,034	-,168	-,503	-,562	-,312	,12	
	,232	,882	,909	,901	1.00										

TABLE 29

	Pre-test MA	Pre-test IQ	Pre-test SA	Pre-test SQ
Pre-post test difference in MA	,569	,571	,666	,663
Pre-post test difference in IQ	,328	,347	,525	,552
Pre-post test difference in SA	,416	,387	,159	,069
Pre-post test difference in SQ	,177	,282	-,091	-,111
Post follow-up test difference in MA	-,371	-,439	-,200	-,206
Post follow-up test difference in IQ	-,117	-,295	,046	-,124
Post follow-up test difference in SA	-,233	-,058	-,495	-,338
Post follow-up test difference in SQ	-,260	-,168	-,596	-,562

Relevant correlation coefficients

for control group 1.

TABLE 30

	Chrono-logical age	Age at In-stitution	Years of Institut.
Pre- post-test difference in MA	,045	-,102	,088
Pre- post-test difference in IQ	,102	-,207	,188
Pre- post-test difference in SA	,213	-,056	,236
Pre- post-test difference in SQ	,017	-,132	,072
Post- follow-up test difference in MA	-,195	,083	-,230
Post- follow-up test difference in IQ	-,006	,248	-,110
Post- follow-up test difference in SA	-,410	-,320	-,277
Post- follow-up test difference in SQ	-,118	-,231	-,022

Relevant correlation coefficients
for control group 1.

5. DISCUSSION

DISCUSSION.

5.1 : Evaluation of the results in terms of theoretical background and the formal hypotheses proposed for the present study.

> The study of mental retardation was a stepchild of scientific research until 1950. An attitude of hopelessness toward it prevailed, and except for the work of a few undaunted, highly dedicated workers like Itard, Sequin, Binet, Goddard, Benda and Wallin, little was accomplished.
>
> (Rothstein, 1971, page 545).

In recent years the output of research in mental retardation has greatly accellerated. Research findings laid a groundwork for innovation in the practice of the training of mental retardates. Rothstein (ibid) maintains that adoption of research findings is the real test of research activities. There are four steps towards adoption; awareness, interest, evaluation and trial.

This study has been concerned with the evaluation and trial of a program designed to increase the level of social and intellectual functioning of the severely and profoundly retarded. It is now possible to turn to the results of the study.

The experimental group who received the developmental program showed a significant increase in mental age, IQ, social age and social quotient on assessment after participation in the developmental program. No significant increase was found for control group 11, the no treatment control group, over this period, nor for control group 1, who received a program of stimulation without systematic training. This finding indicates that the developmental program had a positive effect in terms of improved social and intellectual functioning.

The profoundly retarded, who comprised the majority of subjects in this study, are often considered to be capable of little in the way of learning, and are classified as ineducable. This classification often leads to a pessimistic outlook where work with this group is concerned. However, this study demonstrates increases in IQ, mental age, social age and social quotient for subjects falling within the category of profound mental retardation as pre-test assessment. Five subjects in the experimental group improved to the extent that they moved from the classification of profound retardation to that of severe retardation over the pre- to post-test period. This finding would appear to support Grover's (1974) contention that no retarded individual should be considered ineducable, but that even the most profoundly retarded will respond to training techniques specially designed to meet their level of functioning and particular needs.

As predicted, the effects of the developmental program dissipated when the program was terminated, and there was a significant decrease in IQ and mental age over the post to follow-up period for the experimental group.

This decrease in intellectual functioning occurred over as short a period as one-and-a-half months, and supports Clarke's (1967) view that the effects of a program will dwindle over time if not reinforced.

In order to more carefully evaluate the effects of the developmental program, the changes over the pre- to follow-up testing period were investigated. There was a significant increase in mental age scores over the pre- to follow-up testing period. Thus, even taking into account the significant decrease in mental age over the post- to follow-up testing period, an overall increase was found from pre- to follow-up testing. However, no significant increase was found in IQ scores over the pre- to follow-up test period. This implies that mental age must have increased at approximately the same rate as chronological age, so that no significant increase in IQ was found. The trends, however, were in the expected direction.

An interesting finding was that social age and social quotient scores did not significantly decrease over the post- to follow-up period. Thus the effects of the program on social functioning appeared to be more enduring than the effects on intellectual functioning. A possible explanation for this is that after the termination of the program the subjects still had the opportunity to practice social skills, such as dressing and general self-help, while little opportunity arose for the practice of more intellectual tasks.

Over the before to follow-up testing period, the experimental group showed a significant increase in social age scores. However, there was no significant increase in social quotient over this period, implying

that chronological age increased at approximately the same rate as social age, so that no significant increase in the social quotient scores was detected. However, the trend in social quotient scores was in the expected direction.

As institutional deprivation is generally acknowledged as contributing to progressive intellectual retardation, due largely to environmental inadequacy, it was predicted that control group 1 would respond positively to a program providing stimulation without systematic training. However, results indicated no significant increase in mental age, IQ, social age and social quotient over the pre- to post-test period for this group. This finding does not agree with the results of post research (discussed in the introduction to this study), which has shown increases in IQ for deprived groups following the provision of more stimulating conditions.

Three possible explanations for this finding can be proposed. Firstly, it is possible that the subjects' level of deprivation of environmental stimulation in the institution was not so great that twice weekly sessions of unstructured stimulation could lead to a significant increase in intellectual and social functioning. Secondly, it may be suggested that at low levels of mental retardation, the provision of stimulating experiences without systematic and reasonably intensive training is not sufficient to lead to significant change in terms of intellectual and social functioning. Finally, Zigler (1967) has suggested that a part of the increase in subjects' intellectual functioning following programs may be due to the subjects' increased familiarity with, and confidence

in the presence of the experimenter. It is possible that when this effect is controlled for to some extent, as in the present study by the inclusion of a familiarisation program, increases in the level of intellectual functioning will not be as marked as they might otherwise have been.

No significant difference between post and follow-up test scores was found for control group 1 on mental age and IQ. However, a significant decrease was found in social age and social quotient scores over the post to follow-up period. Both the mean social age and the mean social quotient on follow-up testing were slightly below the pre-test means on these measures. This implies that although the program of unstructured stimulation did not have a positive effect in terms of an increase in the level of social and intellectual functioning, its termination led to a decrease in social functioning below the initial pre-test level. No clear explanation of this result is evident from an examination of the literature. It could be hypothesised, however, that the subjects' level of motivation fell to a level below that of pre-testing when the program was terminated, and thus they no longer performed at an optimum level on follow-up testing.

Although significant within group differences were found in the present study, statistical analysis did not reveal significant differences between the three groups at the post-test period. However, although no significant difference was found between the experimental group and either of the control groups, this should not be taken to mean that the developmental program did not have a positive effect. The program did lead to a significant increase in post-test scores of MA, IQ, SA and SQ for the experimental group, but these increases were not so great as to lead to a significant difference between the experimental group and the no treatment group.

An examination of the statistical analyses revealed that the major reason for the failure to obtain significant differences between the three groups at the post-test period, was the variability within each of the three groups. It is encouraging to note that when the variability within the groups was controlled for by statistical techniques, a significant difference was found between the experimental group and control group 1, and between the experimental group and control group 11. This finding supports the positive effects of the developmental program.

The problem of critical periods for intervention aimed at overcoming the effects of deprivation has been discussed in the introduction to this study. Statistical analysis revealed no significant relationship between the chronological age of subjects and pre- to post-test changes in mental age, IQ, social age and social quotient for both the experimental group and control group 1. This finding suggests that intervention may be effective over a wide age range, and is not restricted to a critical period during childhood. Furthermore, the subjects' age at institutionalisation, and the length of time spent in the institution were not significantly related to pre- to post-test changes in mental age, IQ, social age and social quotient. These findings support the work of Rowe (1974) and Clarke, Clarke and Reiman (1958) who have demonstrated increases in intellectual functioning in adult retardates, and have suggested that the effects of deprivation may be to some extent overcome even in adulthood. This is explanable in terms of Piaget's theory (previously discussed) which maintains that although periods of developmental sensitivity do exist, these are tied not to the child's chronological age, but to his behavioral level. The conclusion of Stein and Susser (1971) is thus supported: intervention appears justified throughout the recognised period of mental development and later.

No significant relationship was found between the pre-test mental age, IQ, social age and social quotient scores of the experimental group and control group 1, and pre- to post-test changes in mental age, IQ, social age and social quotient. This indicates that the subjects' initial level of functioning was not related to their potential for change. Furthermore, no significant relationship was found between pre-test mental age, IQ, social age and social quotient, and post to follow-up test changes in these measures. It thus appears that an individual's potential for change should not be judged in terms of his present level of functioning, but that as Grover (op cit) has emphasised, no individual should be considered ineducable.

5.2 : Methodological considerations.

Although an attempt was made in the present study to overcome some of the methodological criticisms of past research in this area, a number of problems were encountered in the present work.

The selection of a measure of intellectual functioning for use with the severely and profoundly retarded presented great difficulties, finally solved by the use of two tests. This procedure is not entirely satisfactory, no matter how carefully matched the two tests appear to be. This difficulty points to a pressing need for the design of a measure of intellectual functioning for use with the severely and profoundly retarded. At present many researchers improvise their own scales for use with this group, which prevents meaningful comparison of research results, and retards progress in this area.

An attempt was made in the present study to introduce more adequate controls than previous research by the introduction of a program of familiarisation with the experimenter prior to initial assessment. This procedure did not, however, allow for an investigation of the effects of increased familiarity with the experimenter. This could have been achieved by the inclusion of three control groups in the study: one receiving no treatment, one unstructured stimulation, and one social interaction with the experimenter. This would have allowed for a comparison of the effects of unstructured stimulation, and the effects of a familiarisation program. Unfortunately, this was not possible in the present study due to the limited number of subjects available.

The heterogeneity of the retarded population has been discussed in the introduction to this study. This heterogeneity presents problems in adequately matching groups of subjects, as Mittler (1970) has emphasised. In the present study subjects were matched as closely as possible on a number of variables, but exact matching was impossible to achieve. Consequently there were small differences between the means of the three groups on pre-test measures, although statistical analyses indicated that no significant differences existed between the groups on initial assessment.

Three further difficulties must be mentioned. Firstly, the problem of experimenter bias may have been present in the current research, as the tester was aware of the group to which each subject belonged, when testing was conducted. This could have been eliminated by the introduction of a second experimenter who would carry out a blind assessment of the subjects at each testing period.

Secondly, the subjects from the three groups interacted freely on the Ward throughout the duration of the program. It is possible that as the subjects in the experimental group improved in terms of intellectual and social functioning, they had a stimulating effect on subjects in the two controlled groups, leading to their improved functioning in these areas. However, if this effect did take place, it was of little account, as neither control group 1 nor control group 11 showed significant increases in intellectual and social functioning.

Finally, the study was of short duration, and it is possible that a longer term study would have revealed clearer results in terms of between group differences.

Despite these problems, it is felt that the present study did reveal certain important results which have implications for clinical practice.

5.3 : Implications of the present study for practice.

The present study has attempted to evaluate the effects of a developmental program designed for severely and profoundly retarded children and adults. The results of the study have a number of implications for practice.

The findings of the study indicate that the profoundly retarded, and the severely retarded, are capable of benefiting from activities and experiences suitable to their level of functioning. Furthermore, the initial level of functioning of a subject was not significantly related to the amount of change of which he was capable. At present, provision is made in many countries for the severely retarded, in terms of schools or day care centres which provide training facilities for this group. However, as the profoundly retarded are generally considered ineducable, they are often excluded from opportunities for training, and many may remain in institutions where the relatively deprived environment only adds to their already severe degree of retardation. Findings such as those of the present study suggest that greater facilities should be provided for the profoundly retarded individual, who should not be considered as functioning at too low a level to benefit from a developmental program of some sort. Grover (1974) has summed up this belief in the following statement :

> How then should each and every concerned person.....regard the mentally retarded infant, child, adolescent or adult ? I will tell you, NOT as an object of pity, not hopelessly, not statistically or merely in terms of his present level of competence, or lack of competence, but rather as one who, given a better environment, new or different experiences,

> enlarged opportunities and fresh challenges, can - and will - move forward, very slowly in many cases, in very small gradations of superior skill or behavior, but nevertheless, forward (page 6).

It is noteworthy that Grover mentions both adolescent and children in the above statement. The findings of the present study indicate that adults are capable of change in intellectual and social status, and imply that a critical period for intervention does not appear to exist. However, this by no means detracts from the importance of early intervention. It would seem reasonable that the earlier the period at which work with the retarded individual is begun, the greater the amount of time available for learning experience and growth.

The present study raises a number of comments regarding the running of programs with the retarded. Adults and children participated in the same program in this study, and this was found to present few problems. It was noticed that the adult subjects showed an interest in helping the younger subjects with certain tasks, and often acted as useful assistants in this regard. However, a problem was presented by the heterogeneity of the subjects. Subjects in the experimental group, although in the majority classified as profoundly retarded according to their pre-test assessments, covered a rather wide range of levels of intellectual and social functioning, thus presenting difficulties in designing activities suitable for all group members. In order to overcome this problem, the group had to be split on certain occasions with one group of subjects engaging in a simpler level of activities than the others. This points to a need to maintain a certain degree of flexibility in the design of programs, as not all subjects can be expected

to progress through the planned activities at the same rate. Due to the short term nature of the present study, certain subjects did not progress beyond the simpler activities in the program, although they did show improvements on their initial levels of functioning. With a longer term program they would have had the opportunity to progress further.

Another finding which suggests that programs should be conducted over a long term period is that the level of social and intellectual functioning of the experimental group dropped significantly when the program was terminated. It seems clear from this finding that continuous opportunities are required to engage in activities and experiences designed to foster growth. When such opportunities are removed, and subjects are again existing within relatively deprived environmental conditions, their level of functioning will decrease.

Finally, the present study showed little positive effects following the provision of stimulating experiences without systematic training. This suggests that programs must be carefully designed, taking into account the subjects' level of development and particular needs, if they are to lead to improved functioning in the intellectual and social realms.

6. CONCLUSION.

The results of the present study are encouraging for the continuing development of training methods and facilities for the severely and profoundly retarded over a wide age range.

A developmental program designed specifically for the level of functioning of the severely and profoundly retarded led to significant increases in the level of social and intellectual functioning of the subjects. However, these increases were not of sufficient magnitude to show a significant difference between the experimental group and a no-treatment control group, or a control group receiving unstructured stimulation.

Nevertheless, it is felt that the results of the study support the contention that continuing work with the severely and profoundly retarded is justified and necessary, particularly in view of the finding that the termination of the developmental program led to a significant decrease in the level of social and intellectual functioning. This points to the need to view the problem of providing training facilities for this group not as an intervention measure over a short term period, but as a continuing process throughout the retarded individual's lifetime. As Johnson and Capobianco (1957) have emphasised, a total solution to the problems of the severely and profoundly retarded must involve life planning. Future research should thus attempt to proceed in this direction.

REFERENCES

Alpern, G. D. — Measurement of 'untestable' autistic children. Journal of abnormal psychology, 1974, 72 (6), pp.478 - 486.

Anastasi, A. — Psychological testing. (3rd Ed). London : Collier-MacMillan, 1969.

Bell, R. W. & Deneberg, V. H. — The inter-relationships of shock and critical periods in infancy as they affect adult learning and activity. Animal Behavior, 1963, 11, pp. 21 - 27.

Bijou, S. — A functional analysis of retarded development. In N. Ellis (Ed.) International review of research in mental retardation. Volume 1. New York : Academic Press, 1966.

Bijou, S. — The mentally retarded child. Psychology Today, June, 1968.

Blackman, L. S. — Research needs in the special education of the mentally retarded Exceptional Children, 1963, 29, 8 pp. 377 - 383.

Braginsky, D. & Braginsky, B. — Hansels and Gretels. Studies of children in institutions for the mentally retarded. New York : Halt, Rinehart and Winston, 1971.

Braginsky, D. & Braginsky, B. — The intelligent behavior of mental retardates. A study of their manipulation of intelligence test scores. Journal of Personality, 1972, 40, 4, pp. 558 - 563.

Caldwell, D. M. — The usefulness of the critical periods hypothesis in the study of filiative behavior. In N. Endler; L. Boulter and H. Osser (Eds.). Contemporary issues in developmental psychology. London : Holt, Rinehart and Winston, 1970.

Cattell, P. — The measurement of intelligence of infants and young children. New York: Psychological Corporation, 1960.

Clarke, A.D.B. & Clarke, A.M. — How constant is IQ ? Lancet, 1953, ii, pp. 877 - 880.

Clarke, A.D.B., Clarke, A.M.& Reiman, S. — Cognitive and social changes in the feebleminded. Three further studies. British Journal of Psychology, 1958, 49, pp. 144 - 157.

Clarke, A.D.B. & Clarke, A. M. — Some recent advances in the study of early development. Child Psychology and Psychiatry, 1960, 1 , pp 26 - 36.

Clarke, A.D.B. & Clarke, A.M. — Mental deficiency : the changing outlook. New York : Free Press, 1965.

Clarke, A.D.B. — Learning and human development. British Journal of Psychiatry, 1967, 114, pp. 1061 - 1077.

Clarke, A.D.B. — Recent advances in the study of subnormality. London: National Association for Mental Health, 1969.

Conover, J. V. — Community day-care program for severely and profoundly retarded children. In J. H. Rothstein (Ed.) Mental retardation : readings and resources. (2nd ed). New York: Holt, Rinehart and Winston, 1971.

Davenport, R. K., Menzel, E. W. & Rogers, C.M. Effects of severe isolation on (normal' juvenile chimpanzees : health, weight gain and stereotyped behaviors. Archives of General Psychiatry, 1966, 14, pp. 134 - 138.

Dennis, W. & Najarian, P. Infant development under environmental handicaps. Psychological Monographs, 1957, 71, No. 7.

Dennis, W. Causes of retardation among institutional children : Iran. Journal of Genetic Psychology, 1960, 96, pp. 47 - 59.

Doll, E. Measurement of social competence. A manual for the Vineland Social Maturity Scale. Minnesota: American Guidance Service, 1953.

Doll, E. Vineland Social Maturity Scale. Condensed Manual of directions. Minnesota: American Guidance Service, 1965.

Dybward, G. Challenges in mental retardation. New York: Columbia University Press, 1964.

Elkind, D. Children and adolescents. Interpretive essays on Jean Piaget. (2nd ed). New York : Oxford University Press, 1974.

Ellis, N. (Ed.) International review of research in mental retardation. Vol. 1. New York : Academic Press, 1966.

Endler, N., Boulter, L. & Osser, H. Contemporary issues in developmental psychology. London: Holt, Rinehart and Winston, 1970.

Fick, M. L. — An individual scale of general intelligence for South Africa. Pretoria : S. A. Council for Educational and Social Research, 1939.

Fromme, D. K. — On the use of the Vineland Social Maturity Scale as an estimate of intellectual functioning. Journal of Clinical Psychology, 1974, 30, 1, pp. 55 - 57.

Gardner, J. M. & Giampa, F. L. — Utility of three behavioral indices for studying severely and profoundly retarded children. American Journal of Mental Deficiency, 1971, 76, 3, pp. 352 - 356.

Gersholowitz, N. & Schrire, S. — Comparative scores on two intelligence tests with mentally retarded children. South African Medical Journal, 1974 Sept), pp. 1923 - 1924.

Gesell, A. — Gesell developmental schedules. New York : Psychological Corporation, 1949.

Giraudeau, F. L. — Cultural familial retardation. In N. Ellis (Ed.) International review of mental retardation. Vol. 1. New York: Academic Press, 1966.

Goffman, E. — Asylums. Essays in the social situation of mental patients and other inmates. Harmondsworth: Penguin, 1961.

Grover, V. M. — A guide for teachers in junior training centres. S. A. National Council for Mental Health, 1971, 25 , pp. 1 - 17.

Grover, V. M. — The Morris Ginsburg Memorial Lecture. (Reprint). October, 1974.

Gunzburg, H. C. Subnormal adults. In P. Mittler (Ed). The psychological assessment of mental and physical handicaps. London: Methuen, 1970.

Gunzburg, H. C. Progress assessment chart of social development. Manual, (2nd ed). Birmingham : SEFA, 1972.

Hannam, C. Parents and mentally handicapped children. Harmondsworth: Penguin, 1975.

Hebb, D. O. The organisation of behavior. New York : Wiley, 1949.

Held, R. & Hein, A. Movement-produced stimulation in the development of visually guided behavior. Journal of Comparative and Physiological Psychology, 1963, 56 pp. 872 - 876.

Held, R. & Bauer, J. A. Visually guided reaching in infant monkeys after restricted rearing. Science, 1967, 155, pp. 718 - 720.

Henderson, N. D. Behavioral effects of manipulation during different stages in the development of mice. Journal of Comparative and Physiological Psychology, 1964, 57, pp. 284 - 289.

Hollis, J. H. & Gorton, C. E. Training severely and profoundly developmentally retarded children. Mental Retardation, 1967, 5, 4, pp. 20 - 24.

Jacobson, L. I, Bernal, G. & Greeson, L. E. Effects of programmed social interaction on the measured intelligence of institutionalised moderately and severely retarded children. Journal of Mental Deficiency Research, 1974, 18, pp. 87 - 91.

Johnson, G. Capobianco, R.J. — Research project on severely retarded children. Special report to the New York State Inter-departmental Board, 1957.

Kanner, L. — History of the care and study of the mentally retarded. Springfield : Charles C. Thomas, 1964.

Kershner, J. — Intellectual and social development in relation to family functioning : a longitudinal comparison of home versus institutional effects. American Journal of Mental Deficiency, 1970, 75, 3, pp. 276 - 284.

King, R. D. Raynes, N. & Tizard, J. — Patterns of residential care. Sociological studies in institutions for handicapped children. London: Routledge and Kegan Paul, 1971.

Kirk, S. & Johnson, G. O. — Educating the retarded child. New York : Houghton Mifflin Company, 1951.

Kirk, S. and Johnson, G. O. — Early education of the mentally retarded. Urband : University of Illinois Press, 1965.

Kirk, S. — Early education of the mentally retarded. Urband: University of Illinois Press, 1965.

Knott, M. G. — The history of mental retardation. In J. Rothstein (Ed.) Mental retardation : readings and resources. New York : Holt, Rinehart and Winston, 1971.

Kohlberg, L. — Early education : A cognitive-developmental view. Child Development, 1968, 39, 4 pp. 1013 - 1062.

Lance, W. D. — School programs for the trainable mentally retarded. Education and Training of the Mentally Retarded, 1968 (Feb.), 3, 1, pp. 3 - 9.

Levine, S. — The effects of infantile experience on adult behavior. In A. J. Bachrach (Ed.) Experimental Foundations of clinical psychology. New York : Basic Books, 1962.

Levine, S. & Broadhurst, P. L. — Genetic and ontogenetic determinants of adult behavior in the rat. Journal of Comparative and Physiological Psychology, 1963, 56, pp. 423 - 428.

Lyle, J. — The effect of institutional environment upon verbal development in imbecile children. 1. Verbal intelligence. Journal of Mental Deficiency Research, 1959, 3 , pp. 122 - 228.

Mayer-Gross, W. Slater, E. & Roth, M. — Clinical psychiatry. (3rd ed.). London : Balliere, Tindall and Caddell, 1974.

MacMahon, J. F. — The adolescent feebleminded in law and practice. British Medical Journal, 1952, 11, pp. 254 - 256.

McNemer, Q. — A critical examination of the University of Iowa Studies of environmental influences upon IQ. Psychological Bulletin, 1940, 37, 2, pp. 63 - 92.

Mittler, P. — The psychological assessment of mental and physical handicaps. London : Methuen, 1970.

Mittler, P. (Ed.) Assessment for learning in the mentally handicapped. Study group No. 5. London : Churchill Livingstone, 1973.

Molloy, J. S. & Witt, B. T. Development of communication skills in retarded children. In Mental Retardation : selected Conference papers. Springfield, 211 : State Department of Mental Health, 1969.

Morgenstern, M. Low-Beer, H. & Morgenstern, F. Practical training for the severely handicapped child. Lavenham : Lavenham Press, 1966.

Mussen, P. H., Conger, J. J. & Kagan, J. Child development and personality. (3rd ed.) New York : Harper and Row, 1969.

Norris, D. Some observations on the school life of severely retarded children. Journal of Mental Subnormality, Monograph Supplement, July, 1968.

Peck, J. R. Sexton, C. A comparative investigation of the learning and social adjustment of trainable children in public school facilities, segregated community centres, and state residential centres. Project Number SAE 6430, cooperative Research Program, United States Department of Health, Education and Welfare, Office of Education, 1959.

Philips, J. Psychopathology and mental retardation. American Journal of Mental Deficiency, 1967 (July), 124, 1, pp. 29 - 35.

Riesen, A. Effects of early deprivation of photic stimulation. In S. F. Osler and R. E. Cooke (Eds.) The biosocial basis of mental retardation. New York : John Hopkins, 1965.

Robinson, H.B. & Robinson, N.M. — The mentally retarded child. A psychological approach. New York : McGraw-Hill, 1965.

Rohwer, W. — Prime time for education: early childhood or adolescence. Harvard Educational Review, 1971 (Aug.) 41, 3, pp. 316 - 341.

Rothstein, J. H. — Mental retardation: readings and resources. (2nd ed.) New York : Holt, Rinehart and Winston, 1971.

Rowe, D. — The effect of a more stimulating environment on the behavior of a group of severely subnormal adults. British Journal of Mental Subnormality, 1974 (June), 20, 38, 1, pp. 6 - 13.

Rutter, M. — Maternal deprivation reassessed. Harmondsworth : Penguin, 1972.

Rutter, M. & Martin, J. (Eds.) — The child with delayed speech. London: Spastics International Medical Publications, 1972.

Scheerenberger, R.C. — Nursery school experiences for the mentally retarded. In Mental retardation: selected Conference papers. Springfield, Ill: Illinois State Department of Mental Hygiene, 1969, pp. 47 - 60.

Scheerenberger, R.C. — Mental retardation: definition, classification and prevalence. Mental Retardation Abstracts, 1964 (Oct. - Dec.), 1, 4, pp. 432 - 441

Schucman, H. — Evaluating the educability of the severely mentally retarded child. Psychological Monographs, 1960, 501, 74, 14.

Shakespeare, R. — The psychology of handicap. London : Methuen, 1975.

Skeels, H.M. & Skodak, M. — A final follow-up study of one hundred adopted children. Journal of genetic psychology, 1949, 75, pp. 85 - 125.

Smith, R. M. — An introduction to mental retardation. New York : McGraw - Hill, 1971.

Somerville, J. W. Jacobson, L, Warnberg, L. & Young, W. — Varied environmental conditions and task performance by mentally retarded subjects perceived as distractable and non-distractable. American Journal of Mental Deficiency, 1974, 79, 2, 204 - 209.

Spitz, R. A. — Hospitalism : An inquiry into the genesis of psychiatric conditions in early childhood. In Psychoanalytic Studies of the Child, Vol. 1. New York : International Universities Press, 1945, pp. 53 - 74.

Spitz, R. A. — Hospitalism: A follow-up report. In Psychoanalytic Studies of the Child, Vol. 2. New York : International University Press, 1947, pp. 313 - 342.

Spitz, H. H. — Field theory in mental deficiency. In N. R. Ellis (Ed.). Handbook of mental deficiency. New York : McGraw - Hill, 1963.

Stein, Z. & Susser, M. — The mutability of intelligence and the epidemiology of mild mental retardation. In S. Chess and A. Thomas (Eds.) Annual progress in child psychiatry, and child development. New York : Brunner and Mazel, 1971.

Stevens, H.A. & Heber, R. (Eds.) — Mental retardation. A review of research. Chicago: University of Chicago Press, 1964.

Stevens, G. D. — An analysis of the objectives for the education of children with retarded mental development. American Journal of Mental Deficiency, 1958, 63, 2, pp. 225 - 235.

Strauss, A.A. & Lehtinen, L.E. — Psychopathology and education of the brain injured child. New York : Grune and Stratton, 1947.

Terman, L. M. — The measurement of intelligence. Boston: Houghton Mifflin, 1916.

Thompson, T. & Grabowski, J. (Eds.) — Behavior modification of the mentally retarded. New York : Oxford University Press, 1972.

Tizard, J. — Residential care of mentally handicapped children. British Medical Journal, (i), pp. 1041 - 1046.

Tredgold, A. F. — A textbook of mental deficiency. Baltimore: Williams and Wilkins, 1952.

Ullman, L. and Krasner, L. — A psychological approach to abnormal behavior. Englewood Cliffs : Prentice - Hall, 1969.

Werner, E. & Simonian, K. — The social maturity of pre-school children in Hawaii; Results of a community survey and a review of two decades of research. Journal of Social Psychology, 1966, 69, pp. 197 - 207.

Wiesel, T. N. & Hubel, D. H. — Receptive fields of cells in striate cortex of very young, visually inexperienced kittens. Journal of neuro-physiology, 1963, 26, pp. 994 - 1002.

Winer, B. J. — Statistical principles in experimental design. (2nd ed.) New York : McGraw - Hill, 1971.

Wright, S.W. & Tarjan, G. — Mental retardation : a review for pediatricians. American Journal of Diseases of Children, 1963 (May), 105, pp. 511 - 526.

Young, W. M. — Poverty, intelligence and life in the inner city. Mental Retardation, 1969, 7 , 2, pp. 24 - 29.

Zigler, E. — Social reinforcement, environmental conditions and the child. American Journal of Orthopsychiatry, 1963, 33, 614 - 623.

Zigler, E. — Familial mental retardation : a continuing dilemma. Science, 1967 , 155, pp. 292

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

APPENDIX 1

1. PILOT STUDY OF THE TEST - RETEST RELIABILITY OF THE CATTELL INFANT INTELLIGENCE SCALE.

The aim of this study was to assess the test retest reliability of the Cattell Infant Intelligence Scale when used with mental retardates, and when administered in Afrikaans rather than English. Because the Cattell Scale is designed for work with infants, little attention has been paid to test - retest reliability. In work with an infant scale changes in score are expected to occur over as short a period as one month, thus split-half rather than test - retest reliability has been the chief concern. However, for purposes of the major study reported here an estimate of test - retest reliability was required.

Method.

Twenty subjects were drawn from two wards of an institution for the mentally retarded. All were classified as severely or profoundly retarded in their hospital files, and all were Afrikaans speaking. Ten subjects were males and 10 females, ranging in age from 11 years 3 months to 44 years 5 months.

All subjects were assessed on the Cattell Infant Intelligence Scale administered in Afrikaans. Although there is no standard Afrikaans version of the scale, many items require few verbal instructions, and in several cases the examiner may phrase instructions in his own words. The scale was thus easily administered in Afrikaans rather then English.

After a period of one week all subjects were again assessed on the Cattell Scale. A period of one week was chosen as it allowed sufficient time for possible practice effects to dissipate.

Results.

Results are presented in Table A 1.

TABLE A 1

Subject	Sex	Age	Classi-fication	Pre-test MA	Post-test MA
1	F	11y 3m	Profound	21,0	25,4
2	F	11y 6m	Profound	2,0	2,1
3	F	12y 0m	Profound	16,0	19,6
4	F	13y 2m	Severe	31,2	28,0
5	F	18y 6m	Severe	38,0	37,4
6	F	20y 0m	Severe	32,2	35,8
7	M	20y 0m	Severe	37,0	41,4
8	M	23y 1m	Severe	38,0	36,0
9	F	25y 3m	Severe	42,0	45,0
10	F	26y 8m	Severe	34,8	36,8
11	F	27y 3m	Severe	39,0	41,0
12	F	29y 9m	Severe	34,2	37,0
13	M	29y 10m	Severe	41,0	46,0
14	M	29y 10m	Severe	36,4	35,4
15	F	33y 6m	Severe	32,0	29,0
16	M	34y 4m	Severe	38,0	41,0
17	M	34y 7m	Severe	43,0	47,0
18	M	38y 8m	Severe	32,0	35,0
19	M	40y 2m	Severe	42,8	45,0
20	F	44y 5m	Severe	35,8	32,0

SEX, AGE, CLASSIFICATION AND PRE- AND POST-TEST SCORES OF THE TWENTY SUBJECTS.

Pre- and post-test mental age scores were analysed by means of a correlation matrix. The means and standard deviations of pre- and post-test scores are presented in Table A 2.

TABLE A 2.

Variable number	Mean	SD
1	33,32	9,974
2	34,795	10,507

MEANS AND STANDARD DEVIATIONS.

The correlation matrix is presented in Table A 3.

TABLE A 3

C O R R E L A T I O N M A T R I X	
Variable 1	
1,000	
Variable 2	
,964	1,000

A correlation coefficient of ,96 was obtained. This was significant at the ,01 level, (df = 2 , 12).

Conclusions.

The pilot study on the test - retest reliability of the Cattell Infant Intelligence Scale yielded a correlation coefficient of ,96 (significant at the ,01 level). The reliability of the scale, therefore, seemed sufficiently high to warrant its use in the major study.

2. ANALYSIS OF PRE-TEST SCORES.

In order to ensure that no initial significant differences existed between the experimental group snd the two control groups, one way analyses of variance of pre-test scores were carried out for the following variables :

1) chronological age
2) pre-test MA
3) pre-test IQ
4) pre-test SA
5) pre-test SQ

1. Chronological age.

The ANOVA summary table is presented in Table A4

TABLE A4

Source	SS	DF	MS	F ratio
A	2754	2	1377	,097
Error	556315	39	14264,5	

ANOVA summary table for chronological age.

The obtained F ratio was not significant, indicating that no significant difference existed between the experimental group and the two control groups on pre-test chronological age.

2. Pre-test MA.

The ANOVA summary table is presented in Table A5

TABLE A5

Source	SS	DF	MS	F ratio
A	17,652	2	8,826	,062
Error	5570,16	39	142,825	

ANOVA summary table for pre-test MA

The obtained F ratio was not significant, indicating that no significant difference existed between the experimental group and the two control groups on pre-test MA scores.

3. Pre-test IQ.

The ANOVA summary table is presented in Table A6.

TABLE A6.

Source	SS	DF	MS	F ratio
A	2,047	2	1,023	,025
Error	1620,36	39	41,548	

ANOVA summary table for pre-test IQ

The obtained F ratio was not significant, indicating that no significant difference existed between the experimental group and the two control groups on pre-test IQ scores.

4. Pre-test SA.

The ANOVA summary table is presented in Table A7.

TABLE A7

Source	SS	DF	MS	F ratio
A	,695	2	,348	,122
Error	111,099	39	2,849	

ANOVA summary table for pre-test SA

The obtained F ratio was not significant, indicating that no significant difference existed between the experimental group and the two control groups on pre-test SA scores.

5. Pre-test SQ.

The ANOVA summary table is presented in Table A8

TABLE A8

Source	SS	DF	MS	F ratio
A	54,619	2	27,310	,571
Error	1863,86	39	47,791	

ANOVA summary table for pre-test SQ

The obtained F ratio was not significant, indicating that no significant difference existed between the experimental group and the two control groups on pre-test SQ scores.

3. CONVERSION OF OSAIS SCORES TO CATTELL SCORES

Tables A9 to A11 present the OSAIS scores for subjects in the three groups at each test period.

In order to convert OSAIS scores to Cattell scores for those subjects who reached their ceiling on the Cattell scale, the scores of those subjects who scored on both scales were correlated.

1. Pre-test scores.

   At the pre-test period the correlation between Cattell and Osais scores was calculated (r = ,886). The mean Cattell score was 29,19, the mean OSAIS score 30,41.

   The following regression equation was then calculated :

   Predicted Cattell score = observed OSAIS score X , 973 -,64.

   From this equation OSAIS scores marked with an asterisk (See Tables A9 to A11) were converted to Cattell scores.

2. Post-test scores.

   At the post-test period the correlation between Cattell and OSAIS scores was calculated (r = ,78). The mean Cattell score was 31,97, the mean OSAIS score 34,07.

   The following regression equation was thus calculated :

   Predicted Cattell score = ,79 X OSAIS score + 4,9656.

   From this equation OSAIS scores were converted to Cattell scores where necessary.

3. Follow-up test scores.

At the follow-up test period the correlation between Cattell and OSAIS scores was calculated (r = ,81). The mean Cattell score was 30,76, the mean OSAIS score 33,89.

The following regression equation was then calculated.

Predicted Cattell = ,8419 X observed OSAIS score + 2,2306.

From this equation OSAIS scores were converted to Cattell scores where necessary.

TABLE A9

	EXPERIMENTAL GROUP		
Subject	Before	After	Follow-up
1			
2			
3	30	34	28
4	28	40	28
5			
6	28	38	38
7	28	42	36
8			
9	30	40	32
10	26	34	
11	34	44	44
12	66*	74*	69*
13	42	46*	44
14	26	26	26

* scores to be converted to Cattell scores.

OSAIS mental age scores for the experimental group at the three test periods.

TABLE A10

CONTROL GROUP 1			
Subject	Before	After	Follow-up
1	26	26	26
2			
3	34	36	32
4			
5			
6	36	44	42
7	38	52	51
8	51*	61*	55.5*
9		24	30
10	28	34	30
11	26	26	26
12			
13	34	42	40
14	24	24	24

* to be converted to Cattell scores.

OSAIS mental age scores for Control Group 1 at the three test periods.

TABLE A11

CONTROL GROUP 11			
Subject	Before	After	Follow-up
1	26	26	26
2			
3	32	28	36
4	26	26	26
5	25	28	28
6			
7	38	40	44
8	26	26	32
9	30	30	26
10	30	30	34
11			
12	45*	42	42
13	36	38	44
14	34	34	34

* to be converted to Cattell scores.

OSAIS mental age scores for Control Group 11 at the three test periods.

APPENDIX 11

TABLE A12

EXPERIMENTAL GROUP	
SUBJECT	CASE HISTORY
1	Etiology unknown.
2	Mentally retarded from birth.
3	Brain damage at birth.
4	Mentally retarded from birth Spastic diplegia.
5	Severe jaundice at birth Many autistic features.
6	Mentally retarded from birth Deformed skull. Epileptic.
7	Microencephalic.
8	Down's Syndrome.
9	Etiology unknown.
10	Mental retardation due to anoxia at birth.
11	Down's Syndrome
12	Etiology unknown.
13	Etiology unknown.
14	Down's Syndrome.

Case histories of the Experimental Group

TABLE A13

CONTROL GROUP 1	
SUBJECT	CASE HISTORY
1	Mentally retarded from birth. Two siblings also mentally retarded.
2	Mentally retarded from birth. Epileptic from the age of six months.
3	Mentally retarded from birth. Epileptic from the age of 15 months.
4	Down's Syndrome. No speech.
5	Brain damage at birth.
6	Etiology unknown. Attends industrial therapy.
7	Etiology unknown.
8.	Etiology unknown. Epileptic.
9	Etiology unknown.
10	Mentally retarded from birth due to brain damage. Epileptic.
11	Etiology unknown.
12	Down's Syndrome.
13	Down's Syndrome.
14	Mentally retarded from birth. No speech.

Case histories of Control Group 1.

TABLE A14

CONTROL GROUP 11	
SUBJECT	CASE HISTORY
1	Retarded from birth. Two siblings also mentally retarded.
2	Etiology unknown.
3	Etiology unknown. No neurological abnormalities.
4	Down's Syndrome.
5	Mentally retarded from birth.
6	Mental retardation due to birth anoxia.
7	Down's Syndrome.
8	Etiology unknown.
9	Down's Syndrome.
10	Retarded from birth. Epileptic.
11	Uniform development until 3 years of age. Etiology unknown.
12	Down's Syndrome.
13	Down's Syndrome.
14	Down's Syndrome.

Case histories of Control Group 11

TABLE A15

EXPERIMENTAL GROUP			
Subject	Chronological Age	Length in Institution	Age entered Institution
1	9 yrs 11 mths	4 yrs 9 mths	5 yrs 2 mths
2	11 yrs 4 mths	3 yrs 3 mths	8 yrs 1 mth
3	12 yrs 1 mth	7 yrs 0 mths	5 yrs 1 mth
4	14 yrs 7 mths	4 yrs 7 mths	10 yrs 0 mths
5	15 yrs 4 mths	4 yrs 4 mths	11 yrs 0 mths
6	18 yrs 9 mths	9 yrs 4 mths	9 yrs 5 mths
7	21 yrs 0 mths	13 yrs 4 mths	7 yrs 8 mths
8	22 yrs 1 mth	14 yrs 5 mths	7 yrs 8 mths
9	24 yrs 6 mths	- 11 mths	23 yrs 7 mths
10	26 yrs 0 mths	13 yrs 5 mths	12 yrs 7 mths
11	25 yrs 10 mths	23 yrs 9 mths	2 yrs 1 mth
12	27 yrs 9 mths	12 yrs 10 mths	14 yrs 11 mths
13	36 yrs 0 mths	27 yrs 9 mths	8 yrs 3 mths
14	43 yrs 0 mths	40 yrs 2 mths	2 yrs 10 mths

Chronological age, length of institutionalisation and age at institutionalisation for the Experimental Group

TABLE A16

CONTROL GROUP 1			
Subject	Chronological Age	Length in Institution	Age entered Institution
1	10 yrs 1 mths	1 yr 11 mths	8 yrs 2 mths
2	12 yrs 8 mths	4 yrs 3 mths	8 yrs 5 mths
3	13 yrs 3 mths	6 yrs 10 mths	6 yrs 5 mths
4	15 yrs 2 mths	11 yrs 10 mths	3 yrs 4 mths
5	15 yrs 11 mths	2 yrs 0 mths	13 yrs 11 mths
6	18 yrs 10 mths	6 yrs 6 mths	12 yrs 4 mths
7	29 yrs 5 mths	12 yrs 10 mths	16 yrs 7 mths
8	23 yrs 5 mths	9 yrs 11 mths	13 yrs 6 mths
9	24 yrs 7 mths	9 yrs 2 mths	15 yrs 5 mths
10	26 yrs 4 mths	13 yrs 3 mths	13 yrs 1 mth
11	26 yrs 11 mths	20 yrs 0 mths	6 yrs 11 mths
12	31 yrs 0 mths	21 yrs 0 mths	10 yrs 0 mths
13	37 yrs 1 mth	29 yrs 9 mths	7 yrs 4 mths
14	40 yrs 0 mths	30 yrs 3 mths	9 yrs 9 mths

Chronological age, length of institutionalisation, and age at institutionalisation for Control Group 1

TABLE A17

CONTROL GROUP 11			
Subject	Chronological Age	Length in Institution	Age entered Institution
1	7 yrs 10 mths	1 yr 11 mths	5 yrs 11 mths
2	10 yrs 11 mths	6 yrs 8 mths	4 yrs 3 mths
3	11 yrs 6 mths	6 yrs 8 mths	4 yrs 10 mths
4	11 yrs 7 mths	11 yrs 2 mths	- 5 mths
5	17 yrs 0 mths	8 yrs 1 mth	8 yrs 11 mths
6	19 yrs 0 mths	6 yrs 2 mths	12 yrs 10 mths
7	20 yrs 2 mths	- 11 mths	19 yrs 3 mths
8	21 yrs 6 mths	11 yrs 8 mths	9 yrs 10 mths
9	19 yrs 0 mths	6 yrs 2 mths	12 yrs 10 mths
10	25 yrs 7 mths	13 yrs 8 mths	11 yrs 11 mths
11	25 yrs 6 mths	9 yrs 6 mths	16 yrs 0 mths
12	28 yrs 1 mth	4 yrs 9 mths	23 yrs 4 mths
13	35 yrs 5 mths	31 yrs 7 mths	3 yrs 10 mths
14	49 yrs 2 mths	45 yrs 3 mths	3 yrs 11 mths

Chronological age, length of institutionalisation and age at institutionalisation for Control Group 11

TABLE A18

Subject	CATTELL MA			OSAIS MA		
	Before	After	Follow-up	Before	After	Follow-up
1	6,2	9,2	6,8			
2	17,2	19,4	18,4			
3	30,8	35,0	33,0	30,0	34,0	28,0
4	24,4	37,0	29,8	28,0	40,0	28,0
5	8,0	15,0	13,6			
6	34,4	41,0	39,0	28,0	38,0	38,0
7	24,4	29,0	28,0	28,0	42,0	36,0
8	14,8	19,4	17,2			
9	30,8	40,0	23,4	30,0	40,0	32,0
10	25,0	40,4	40,0	26,0	34,0	
11	33,4	45,0	36,0	34,0	44,0	44,0
12	64.0*	63,62*	60,32*	66,0	74,0	69,0
13	42,0	41,43*	46,0	42,0	46,0	44,0
14	23,4	31,8	29,0	26,0	26,0	26,0

* score converted from OSAIS score.

Cattell and OSAIS mental age scores for the Experimental Group

TABLE A19

Subject	CATTELL MA			OSAIS MA		
	Before	After	Follow-up	Before	After	Follow-up
1	27,2	28,0	25,4	26,0	26,0	26,0
2	16,0	18,4	16,8			
3	32,6	39,0	37,0	34,0	36,0	32,0
4	7,2	8,2	8,6			
5	17,2	12,0	15,6			
6	28,8	30,2	30,0	36,0	44,0	42,0
7	38,2	45,0	42,0	38,0	52,0	51,0
8	49,0*	53,31*	49,95*	51,0	61,0	55,5
9	21,0	21,4	20,0		24,0	30,0
10	24,8	22,0	26,4	28,0	34,0	30,0
11	26,0	24,6	23,2	26,0	26,0	26,0
12	17,2	18,2	16,4			
13	33,4	40,0	40,0	34,0	42,0	40,0
14	23,0	21,0	16,6	24,0	24,0	24,0

* score converted from OSAIS score.

Cattell and OSAIS mental age scores for Control Group 1

TABLE A20

Subject	CATTELL MA			OSAIS MA		
	Before	After	Follow -up	Before	After	Follow -up
1	22,4	26.0	18,0	26,0	26,0	26,0
2	8,8	8,6	9,0			
3	29,8	31,4	33,4	32,0	28,0	36,0
4	20,0	21,8	22,8	26,0	26,0	26,0
5	25,4	22,6	29,2	25,0	28,0	28,0
6	12,2	11,4	12,6			
7	36,6	35,2	38,0	38,0	40,0	44,0
8	24,0	25,0	25,8	26,0	26,0	32,0
9	29,2	28,2	26,8	30,0	30,0	26,0
10	27,8	26,8	30,8	30,0	30,0	34,0
11	10,4	8,4	8,4			
12	43,0	43,0	42,0	45,0	42,0	42,0
13	36,4	35,8	41,0	36,0	38,0	44,0
14	32,0	29,0	28,8	34,0	34,0	34,0

* score converted from OSAIS score.

Cattell and OSAIS mental age scores for Control Group 11

TABLE A21

EXPERIMENTAL GROUP			
SUBJECT	BEFORE	AFTER	FOLLOW-UP
1	7	7	5
2	13	14	13
3	21	23	22
4	14	21	16
5	4	8	7
6	18	21	20
7	13	15	15
8	8	10	9
9	16	21	12
10	13	21	21
11	17	23	19
12	33	33	31
13	22	22	24
14	12	17	15

IQ scores of the Experimental Group
at the three test periods.

TABLE A22

CONTROL GROUP 1			
SUBJECT	BEFORE	AFTER	FOLLOW-UP
1	22	22	20
2	11	12	11
3	21	24	22
4	4	4	5
5	9	6	8
6	15	16	16
7	20	23	22
8	26	25	26
9	11	11	10
10	13	11	14
11	14	13	12
12	9	9	9
13	17	21	21
14	12	11	9

IQ scores of Control Group 1 at the three test periods

TABLE A23

CONTROL GROUP 11			
Subject	BEFORE	AFTER	FOLLOW-UP
1	24	26	18
2	7	9	7
3	22	22	23
4	14	15	16
5	13	12	15
6	6	6	7
7	19	18	20
8	13	13	13
9	15	15	14
10	14	14	16
11	5	4	4
12	22	22	22
13	19	19	21
14	17	15	15

IQ scores of Control Group 11 at the three test periods.

TABLE A24

	EXPERIMENTAL GROUP					
	VINELAND SA			VINELAND SQ		
Subject	Before	After	Follow-up	Before	After	Follow-up
1	1,12	1,59	1,00	11	15	10
2	1,41	1,47	1,35	12	13	11
3	1,89	2,05	2,05	16	16	16
4	1,59	1,60	1,53	11	11	10
5	1,00	1,06	0,89	7	7	5
6	2,70	3,70	3,50	14	19	18
7	3,00	4,50	4,30	14	21	20
8	1,65	1,65	1,35	7	7	6
9	2,50	4,20	4,20	10	17	17
10	5,20	5,20	4,80	21	21	19
11	4,00	6,00	6,00	16	24	24
12	6,00	7,00	7,00	24	28	28
13	5,00	6,30	6,00	20	25	24
14	4,70	4,80	3,50	19	19	14

Social age and social quotient scores
for the Experimental Group

TABLE A25

CONTROL GROUP 1						
	VINELAND SA			VINELAND SQ		
Subject	Before	After	Follow-up	Before	After	Follow-up
1	1,83	2,20	2,05	18	21	19
2	1,41	1,41	1,30	9	11	10
3	2,90	2,90	2,90	22	21	21
4	1,00	1,06	0,83	7	7	5
5	1,47	1,53	1,12	9	9	7
6	5,00	5,20	3,70	27	27	19
7	4,50	4,59	2,80	18	18	11
8	5,60	6,30	6,30	24	27	26
9	1,65	1,77	1,89	7	7	8
10	1,94	1,94	1,94	8	8	8
11	1,77	2,60	2,50	7	10	10
12	1,83	1,89	1,71	7	8	7
13	5,50	5,60	4,80	22	22	18
14	1,59	2,05	1,47	6	8	6

Social age and social quotient scores
for Control Group 1

TABLE A26

CONTROL GROUP 11						
	VINELAND SA			VINELAND SQ		
Subject	Before	After	Follow-up	Before	After	Follow-up
1	1,77	1,71	1,59	23	21	19
2	1,06	1,06	1,06	10	9	9
3	2,50	2,59	2,60	22	22	22
4	1,89	2,50	2,30	16	21	19
5	2,70	2,50	1,94	16	14	11
6	1,06	1,06	1,06	6	5	5
7	5,40	5,20	4,20	27	25	20
8	2,20	2,06	1,77	10	9	8
9	5,00	4,50	3,70	26	23	19
10	1,83	1,71	1,47	7	7	6
11	1,35	1,41	1,12	5	6	4
12	5,40	5,60	6,80	22	22	27
13	5,00	5,00	5,60	20	20	22
14	4,70	4,80	5,80	19	19	23

Social age and social quotient scores
for Control Group 11

TABLE A27

EXPERIMENTAL GROUP			
Subject	Before	After	Follow-up
1	Profound	Profound	Profound
2	Profound	Profound	Profound
3	Severe	Severe	Severe
4	Profound	Severe	Profound
5	Profound	Profound	Profound
6	Profound	Severe	Severe
7	Profound	Profound	Profound
8	Profound	Profound	Profound
9	Profound	Severe	Profound
10	Profound	Severe	Severe
11	Profound	Severe	Profound
12	Severe	Severe	Severe
13	Severe	Severe	Severe
14	Profound	Profound	Profound

Classification of subjects in the experimental group at each testing period.

TABLE A28

CONTROL GROUP 1			
Subjects	Before	After	Follow-up
1	Severe	Severe	Severe
2	Profound	Profound	Profound
3	Severe	Severe	Severe
4	Profound	Profound	Profound
5	Profound	Profound	Profound
6	Profound	Profound	Profound
7	Severe	Severe	Severe
8	Severe	Severe	Severe
9	Profound	Profound	Profound
10	Profound	Profound	Profound
11	Profound	Profound	Profound
12	Profound	Profound	Profound
13	Profound	Severe	Severe
14	Profound	Profound	Profound

Classification of subjects in
Control Group 1 at each testing period.

TABLE A29

CONTROL GROUP 11			
Subject	Before	After	Follow-up
1	Severe	Severe	Profound
2	Profound	Profound	Profound
3	Severe	Severe	Severe
4	Profound	Profound	Profound
5	Profound	Profound	Profound
6	Profound	Profound	Profound
7	Profound	Profound	Severe
8	Profound	Profound	Profound
9	Profound	Profound	Profound
10	Profound	Profound	Profound
11	Profound	Profound	Profound
12	Severe	Severe	Severe
13	Profound	Profound	Severe
14	Profound	Profound	Profound

Classification of subjects in Control Group 11 at each testing period.

TABLE A30

EXPERIMENTAL GROUP				
	MENTAL AGE		IQ	
Subject	Before to After	After to Follow-up	Before to After	After to Follow-up.
1	+ 3,0	- 2,4	0	- 2
2	+ 2,2	- 1,0	+ 1	- 1
3	+ 4,2	- 2,0	+ 2	- 1
4	+ 12,6	- 7,0	+ 7	- 5
5	+ 7,0	- 1,4	+ 4	- 1
6	+ 6,6	- 2,0	+ 3	- 1
7	+ 4,6	- 1,0	+ 2	0
8	+ 4,6	- 2,2	+ 2	- 1
9	+ 9,2	- 16,6	+ 5	- 9
10	+ 15,4	- ,4	+ 8	0
11	+ 11,6	- 9	+ 6	- 4
12	- ,38	- 3,3	0	- 2
13	- ,57	+ 4,57	0	+ 2
14	+ 8,4	- 2,8	+ 5	- 2

Pre- to post-test, and post- to follow-up test changes in MA and IQ for the experimental group.

TABLE A31

EXPERIMENTAL GROUP				
	SOCIAL AGE		SOCIAL QUOTIENT	
Subject	Before to After	After to Follow-up	Before to After	After to Follow-up
1	+ ,47	- ,59	+ 4	- 5
2	+ ,06	- ,12	+ 1	- 2
3	+ ,16	0	0	0
4	+ ,01	- ,07	0	- 1
5	+ ,06	- ,17	0	- 2
6	+ 1,0	- ,2	+ 5	- 1
7	+ 1,5	- ,2	+ 7	- 1
8	0	- ,3	0	- 1
9	+ 1,7	0	+ 7	0
10	0	- ,4	0	- 2
11	+ 2,0	0	+ 8	0
12	+ 1,0	0	+ 4	0
13	+ 1,3	- ,3	+ 5	- 1
14	+ ,1	- 1,3	0	- 5

Pre- to post- , and post- to follow-up test changes in SA and SQ for the experimental group.

TABLE A32

CONTROL GROUP 1				
	MENTAL AGE		IQ	
Subject	Before to After	After to Follow-up	Before to After	After to Follow-up
1	+ ,8	- 2, 6	0	- 2
2	+ 2,4	- 1, 6	+ 1	- 1
3	+ 6,4	- 2, 0	+ 3	- 2
4	+ 1,0	+ , 4	0	+ 1
5	- 5,2	+ 3,6	- 3	+ 2
6	+ 1,4	- ,2	+ 1	0
7	+ 6,8	- 3,0	+ 3	- 1
8	+ 4,31	- 3,36	- 1	+ 1
9	+ ,4	- 1,4	0	- 1
10	- 2,8	+ 4,4	- 2	+ 3
11	- 1,4	- 1,4	- 1	- 1
12	+ 1,0	- 1,8	0	0
13	+ 6,6	0	+ 4	0
14	- 2,0	- 4,4	- 1	- 2

Pre- to post , and post- to follow-up test changes in MA and IQ for control group 1.

TABLE A33

CONTROL GROUP 1				
	SOCIAL AGE		SOCIAL QUOTIENT	
Subject	Before to After	After to Follow-up	Before to After	After to follow-up
1	+ ,37	- ,15	+ 3	- 2
2	0	- ,11	+ 2	- 1
3	0	0	- 1	0
4	+ ,06	- ,23	0	- 2
5	+ ,06	- ,41	0	- 2
6	+ ,20	- 1,5	0	- 8
7	+ ,09	- 1,79	0	- 7
8	+ ,70	0	+ 3	- 1
9	+ ,12	+ ,12	0	+ 1
10	0	0	0	0
11	+ ,83	- ,1	+ 3	0
12	+ ,06	- ,18	+ 1	- 1
13	+ ,10	- ,8	0	- 4
14	+ ,46	- 1,03	+ 2	- 2

Pre- to post-, and post- to follow-up test changes in SA and SQ for Control Group 1.

APPENDIX 111

G.P.-S.9840—1950-1—20.000. S.

U.E. 66.

INDIVIDUAL SCALE OF THE NATIONAL BUREAU OF EDUCATIONAL RESEARCH.
INDIVIDUELE SKAAL VAN DIE NASIONALE BURO VIR OPVOEDKUNDIGE NAVORSING.

Name _____
Naam

Age at Examination _____ Date of Examination _____
Ouderdom by ondersoek *Datum van ondersoek*

Examiner's Signature _____ School _____
Handtekening van ondersoeker *Skool*

Mental Age _____ I.Q. _____ Other tests (specify) _____
Verstandsouderdom *I.K.* *Ander toetse (spesifiseer)*

Notes on Examination _____
Opmerkings by ondersoek

Year III.—*Jaar III.*

1. Points to :—
Wys na :—

Mouth *Mond* ____ Eye *Oog* ____ Nose *Neus* ____ Hair *Hare* ____

2. Two digits :—
Twee syfers :—

(*a*) 8–1 ____ (*b*) 9–4 ____ (*c*) 3–7 ____

3. Gives own sex.
Gee sy geslag.

4. Gives surname.
Gee sy van.

5. Familiar objects (4 right) :—
Bekende voorwerpe (4 reg) :—

Pocket knife *Sakmes* ____ Pencil *Potlood* ____
Door key *Deursleutel* ____ Hat (felt) *Hoed (velt)* ____
Penny *Pennie* ____ Watch *Oorlosie* ____
Box of matches *Vuurhoutjiedoos* ____

6. Pictures (enumeration) :—
Prentjies (opnoeming)

1. ____
2. ____
3. ____

Year IV.—*Jaar IV.*

7. Three digits :—
Drie syfers :—

(*a*) 6–4–1 ____ (*b*) 3–5–2 ____ (*c*) 8–3–7 ____

8. Two lines (3 or 5).
Twee lyne (3 of 5).

9. Counts four pennies.
Vier pennies tel.

10. Familiar objects (no error) :—
Bekende voorwerpe (geen foute nie) :—

Pocket knife *Sakmes* ____ Pencil *Potlood* ____
Door key *Deursleutel* ____ Hat (felt) *Hoed (velt)* ____
Penny *Pennie* ____ Watch *Oorlosie* ____
Box of Matches *Vuurhoutjiedoos* ____

11. Comprehension of questions:—
Begrip van vrae :—

(*a*) When you are sleepy.
As jy vaak is.

(*b*) When you are cold.
As jy koud voel.

(*c*) When you are hungry.
As jy honger het.

12. Six syllables.
Ses lettergrepe.

Year V.—*Jaar V.*

13. Copies square.
Vierkant namaak.

14. Knows age.
Ken ouderdom.

15. Ten syllables.
Tien lettergrepe.

16. Four digits :—
Vier syfers :—

(*a*) 4–9–3–7 ____ (*b*) 2–8–5–4 ____ (*c*) 7–2–6–1 ____

17. Aesthetic comparison. (no error.)
Estetiese vergelyking. (geen foute nie.)

18. Patience (2 of 3 trials : 1 min.).
Kaartspel (2 uit 3 poginge : 1 min.).

19. Comparison of weights.
Vergelyking van gewigte.

20. Colours :—
Kleure :—

Red *Rooi* ____ Green *Groen* ____ Blue *Blou* ____ Yellow *Geel* ____

Year VI.—*Jaar VI.*

21. Definition (use and no error) :—
Definisie (gebruik en geen foute nie) :—

Chair *Stoel* ____ Table *Tafel* ____ Doll *Pop* ____
Pencil *Potlood* ____ Horse *Perd* ____ Fork *Vurk* ____

22. Memory for commissions.
Geheue vir opdragte.

23. Comprehension of questions :—
Begrip van vrae :—

(*a*) Raining.
As dit reent.

(*b*) House on fire.
As die huis aan brand is.

(*c*) Wheel falls out.
As 'n wiel uitval.

24. Pictures (description).
Prentjies (beskrywing).

25. Coins (4 right) :—
Muntstukke (4 reg) :—

6d. ____ 1d. ____ 1s. ____ 3d. ____

26. Twelve syllables.
Twaalf lettergrepe.

27. Right and left :—
Regs en links :—

R. hand _____ L. eye _____ R. ear _____
R. hand *L. oog* *R. oor*

28. Counts 13 pennies.
Tel 13 pennies.

Year VII.—*Jaar VII.*

29. Knox C (1st attempt).
Knox C (1ste poging).

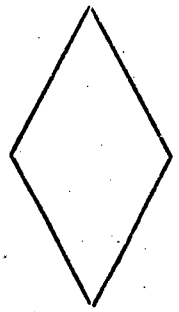
30. Omissions in pictures.
Uitlatings in prentjies.

31. Number of fingers.
Aantal vingers.

32. Sixteen syllables.
Sestien lettergrepe.

33. Copy Diamond.
Ruit namaak.

34. Bow-knot.
Dubbel-strik maak.



Year VIII.—*Jaar VIII.*

35. Comprehension of questions.
Begrip van vrae.

(a) Break someone's things.
As jy iemand se goed breek.

(b) Late for school.
As jy laat is vir skool.

(c) If playmate hurts you unintentionally.
As jou maat jou onopsetlik beseer.

36. Days of week.
Dae van die week opnoem.

37. Counting backwards (20–1).
Agtervit tel (20–1).

38. Three digits (backwards) :—
Drie syfers (agteruit) :—

(a) 2–8–3 _____ (b) 4–2–7 _____ (c) 9–6–8 _____

39. Differences :—
Verskille :—

Water-milk ; stone-egg ; wood-glass.
Water-melk ; klip-eier ; hout-glas.

40. Five digits :—
Vyf syfers :—

(a) 5–2–9–4–7 _____ (b) 6–3–8–5–2 _____ (c) 9–7–3–1–8 _____

Year IX.—*Jaar IX.*

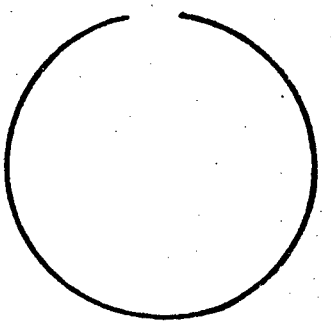
41. Dictation : "See the little boy".
Dikte : "Kyk na die hondjie".

42. Similarities (2 things) Dog-horse ; apple-peach ; wood-coal ; iron-silver.
Ooreenkomste (2 voorwerpe) : Hond-perd ; appel-perske ; hout-steenkool ; yster-silver.

43. Making sentences (3) words : Boy-river-stone : man-horses-cart ; work-money-men.
Sinne maak (3 woorde) : Jongetjie-rwier-klip ; man-perde-kar ; werk-geld-mans.

44. Ball and Field (inferior plan).
Bal soek in Veld (plan van swak gehalte).

45. Knox D (1st attempt).
Knox D (1ste poging).



Year X.—*Jaar X.*

46. Definitions (superior to use):
Definisies (beter as gebruik):

Horse; Chair; Table; Fork.
Perd; Stoel; Tafel; Vurk.

47. Arithmetic (1 and 2).
Rekene (1 en 2).

48. Months of the year.
Maande van die jaar.

49. Arranging weights.
Rangskikking van gewigte.

50. Healy and Fernald.
Healy en Fernald.

51. Detecting absurdities.
Ontdekking van ongerymdhede.

Year XI.—*Jaar XI.*

52. Calculating change.
Berekening van kleingeld.

53. Designs.
Patroontekeninge.

54. Four digits (backwards):
Vier syfers (agteruit):
(*a*) 6–5–2–8 (*b*) 4–9–3–7 (*c*) 8–6–2–9

55. Six digits:
Ses syfers:
(*a*) 2–5–0–3–6–4 (*b*) 8–5–3–9–1–6 (*c*) 4–7–1–5–8–2

56. Finding rhymes.
Rymwoorde vind.

57. Reading and memories.
Lees en onthou.

Year XII.—*Jaar XII.*

58. Twenty syllables.
Twintig lettergrepe.

59. Word association (60 words: 3 min.).
Assosiasie van woorde (60 woorde in 3 min.).

60. Comprehension of questions:
Begrip van vrae:
(a) Why save money.
Waarom ons geld spaar.
(b) Before beginning something difficult.
Wat om te doen alvorens iets moeilliks te begin.
(c) Judge more by actions than words.
Oordeel deur dade liewer as deur woorde.

61. Ball and Field (superior plan).
Bal soek in Veld (plan van beter gehalte).

Year XIII.—*Jaar XIII.*

62. Finding likenesses (3 things).
Ooreenkomste vind (3 voorwerpe).

63. Dissected sentences (a, b and c) (2 out of 3).
Verdraaide sinne (a, b en c) (2 uit 3).

64. Pictures (interpretation).
Prentjies (verklaring).

65. Problem questions.
Probleemvrae.

66. Vocabulary (21 words correct).
Woordeskat (21 woorde reg).

Year XIV.—*Jaar XIV.*

67. Definitions abstract words: Pity; honesty; justice; envy; revenge.
Definisies van abstrakte woorde: Medelye; eerlikheid; regverdigheid; afguns; wraak.

68. Interpretation of fables (4 points).
Verklaring van fabels (4 punte).

69. Reasoning test 1 (a or b correct).
Redeneringstoets 1 (a of b reg).

70. Enclosed boxes.
Ingeslote dosies.

Year XV.—*Jaar XV.*

71. Knox E (2nd attempt).
Knox E (2de poging).

72. Vocabulary (30 words correct).
Woordeskat (30 woorde reg).

73. Reasoning test 2.
Redeneringstoets 2.

74. Induction test.
Induksietoets.

75. Arithmetic (3, 4, 5–Two correct out of the three).
Rekene (3, 4, 5–Twee reg uit die drie).

Year XVI.—*Jaar XVI.*

76. Difference between abstract words: Laziness-Idleness; poverty-misery; avarice-thrift; lie-mistake; character-reputation.
Verskil tussen abstrakte woorde: Luiheid-ledigheid; armoede-ellende; gierigheid-spaarsaamheid; leuen-vergissing; karakter-reputasie.

77. Absurdity 1.
Ongerymdheid 1.

78. 26 Syllables.
26 *Lettergrepe.*

79. Five digits (backwards):—
Vyf syfers (agteruit):—
(a) 6–9–4–8–2 (b) 3–1–8–7–9

Year XVII.—*Jaar XVII.*

80. Paper cutting test.
Papiersnytoets.

81. Absurdity 2.
Ongerymdheid 2.

82. Drawing reversed triangle.
Omgekeerde driehoek teken.

Year XVIII.—*Jaar XVIII.*

83. Disarranged sentences—(d).
Verdraaide sinne—(d).

84. Filling cans—Arithmetic 6.
Opvulling van kanne—Rekene 6.

85. Reasoning test 3.
Redeneringstoets 3.

86. Seven digits:—
Sewe syfers:—
(a) 2–1–8–3–4–3–9 (b) 9–7–2–8–4–7–5

Year XIX.—*Jaar XIX.*

87. Vocabulary (41 words correct).
Woordeskat (41 woorde reg).

88. Disarranged sentences—(e).
Verdraaide sinne—(e).

89. Absurdity 3.
Ongerymdheid 3.

90. Six digits (backwards):—
Ses syfers (agterstevoor):—
(a) 4–7–1–9–5–2 (b) 5–8–3–2–9–4

Year XX.—*Jaar XX.*

91. Filling cans—Arithmetic 7.
Opvulling van kanne—Rekene 7.

92. Eight digits:—
Ag syfers:—
(a) 7–2–5–3–4–8–9–6 (b) 4–9–8–5–3–7–6–2

93. Seven digits (backwards):—
Sewe syfers (agterstevoor):—
(a) 4–1–6–2–5–9–3 (b) 3–8–2–6–4–7–5

ENGLISH :—

Johannesburg, 5th September. A fire last night burned three houses near the centre of the city. It took some time to put it out. The loss was fifty thousand pounds and seventeen families lost their homes. In saving a girl who was asleep in bed a fireman was burnt on the hand.

ARITHMETIC :—

1. Peter plays marbles. He starts with 15. First he loses 8 and then he wins 6. How many has he then? (47)

2. John's grandmother is 86 years old. If she lives, in how many years will she be 100 years old? (47)

3. If a man's salary is £20 per month and he spends £14 per month, how long will it take him to save £300? (75)

4. If two pencils cost 5 pence, how many pencils can you buy for 50 pence? (75)

5. At 15 pence a yard how much will 7 feet of cloth cost? (75)

6. Given a three-pint measure and a five-pint measure, how will you measure out ONE pint exactly, using nothing but these two vessels and not guessing at the amount? Begin by filling the three-pint vessel first. (84)

7. Given a three-pint and a five-pint vessel measure out exactly 7 pints. (91)

AFRIKAANS :—

Johannesburg, 5 September. Gisteraand het 'n vuur drie huise naby die middel van die dorp afgebrand. Dit het 'n tyd geneem om die vuur dood te maak. Die skade was vyftig duisend pond, en sewentien families is nou sonder huis. Terwyl 'n brandweerman 'n meisie, wat in haar bed aan slaap was, gered het, het hy sy hande verbrand.

REKENE :—

1. Piet speel albaster en hy begin met 15. Hy verloor eers 8 en wen later 6. Hoeveel het hy dan? (47)

2. Jan se ouma is 86 jaar oud. As sy aan die lewe bly, hoeveel jare sal dit duur voordat sy 100 jaar oud is? (47)

3. As die salaris van 'n man £20 per maand is en hy gee £14 per maand uit, hoe lank sal hy neem om £300 bymekaar te maak? (75)

4. As 2 potlode 5 pennies kos, hoeveel potlode kan jy vir 50 pennies koop? (75)

5 Teen 15 pennies per jaart, hoeveel sal 7 voet van die stof kos? (75)

6. Iemand gee jou 'n drie-pint-kan en 'n vyf-pint-kan. Hoe sal jy presies EEN pint afmeet as jy net hierdie twee kanne gebruik en nie eenvoudig skat nie? Begin deur eers die drie-pint-kan vol te maak. (84)

7 Iemand gee jou 'n drie-pint-kan en 'n vyf-pint-kan, meet presies 7 pinte af. (91)

ABSURDITIES :—

1. The three men laughed, they stopped suddenly as the eyes of each met those of the others across the table. (77)

2. Bill Smith, who afterwards married his widow's sister, always said it was a man's misfortune if he had a bad sister, but his own fault if he had a bad wife. (81)

3. Every rule, even this one itself, has an exception. (89)

ONGERYMDHEDE :—

1. Die drie mans het gelag, en skielik hou hulle op toe die oë van elk een die oë van die ander mans oorkant die tafel ontmoet. (77)

2. Willem Smit, wat later met sy weduwee se suster getroud is, het altyd gesê dat dit 'n man se ongeluk was as hy 'n slegte suster het, maar sy eie skuld as hy 'n slegte vrou het. (81)

3. Daar is 'n uitsondering op elke reël—selfs op hierdie een. (89)

DISARRANGED SENTENCES :—

(a) A DEFENDS DOG GOOD HIS MASTER BRAVELY. (63)

(b) FOR THE COUNTRY AN WE STARTED EARLY AT HOUR. (63)

(c) TO ASKED PAPER MY TEACHER CORRECT I MY. (63)

(d) HARDEST THE US SOLUTION GIVES THE SATISFACTION OF PROBLEMS GREATEST THE. (83)

(e) NOT GOOD WORTH BE OF EASILY A OVER-ESTIMATED THE NAME CAN. (83)

VERDRAAIDE SINNE :—

(a) VERDEDIG 'N DAPPER HOND GOEIE BAAS SY. (63)

(b) ONS VAKANSIE PLAAS TOE VIR GAAN DIE. (63)

(c) EK HET MEESTER MY VERBETER GEVRA WERK TE. (63)

(d) PEERBOOM DIE RUS SKADUWEE IN MAN DIE SE GAAN ONGESNOEIDE. (83)

(e) MOEILIKSTE DIE ONS OPLOSSING GEE DIE BEVREDIGING VAN PROBLEME GROOTSTE DIE. (88)

REASONING TESTS :—

1a. Jack said to his sisters : " Some of my flowers are buttercups ". His sisters knew that all buttercups are yellow. Ann said : " All your flowers should be yellow ". Mary said : " Some of your flowers are yellow ". Hester said : " None of your flowers are yellow ". Which girl was right ? (69)

1b. My brother wrote to me : " To-day I have walked from Rietfontein where I had an accident yesterday and broke one of my limbs ". Can you find out from this what he had probably broken—his right arm, left arm, right leg or left leg ? (69)

2. I started from the door of my house and walked 100 yards. I turned straight to the right and walked 50 yards. I turned straight to the right again and walked 100 yards. How far am I from the door of my house ? (73)

3. A pound of meat should roast for half-an-hour. Two pounds of meat should roast for three-quarters of an hour. Three pounds of meat should roast for one hour. Eight pounds of meat should roast for two hours and a quarter. Nine pounds of meat should roast for two hours and a half. From this can you discover a simple rule by which you can tell from the weight of a joint how long it should roast ? (85)

REDENERINGSTOETSE :—

1a. Willem sê vir sy susters : „ Party van my blomme is botterblomme ". Sy susters weet dat alle botterblomme geel is. Anna sê toe : „ Al jou blomme moet geel wees ". Lenie sê : „ Party van jou blomme moet geel wees ". Hester sê : „ Nie een van jou blomme is geel nie ". Watter meisie is reg ? (69)

1b. My broer skryf aan my : „ Ek het vandag van Rietfontein af gestap, waar ek gister 'n ongeluk gehad het en een van my liggaamsdele gebreek het ". Kan jy hieruit aflei wat hy waarskynlik gebreek het—sy regterarm, linkerarm, regterbeen of linkerbeen ? (69)

2. Ek begin by die deur van my huis en loop 100 tree. Ek draai presies regs en loop 50 tree. Daarna draai ek weer presies regs en loop 100 tree. Hoe ver is ek van my huis se deur af? (73)

3. 'n Pond vleis behoort 'n halfuur te braai. Twee pond vleis behoort driekwartier te braai. Drie pond vleis behoort 'n uur te braai. Ag pond vleis behoort twee-en-'n-kwartier te braai. Nege pond vleis behoort twee-en-'n-halfuur te braai. Kan jy 'n eenvoudige reël opstel waardeur jy volgens die gewig kan bereken hoe lank 'n stuk vleis behoort te braai ? (85)

WOORDESKATTOETS		VOCABULARY	
	25. ongeag		25. isolate
	26. sakie		26. aloe
1. dam	27. onnatuurlik	1. orange	27. recharge
2. gare	28. oplei	2. grip	28. leisurely
3. hokkie	29. remskoen	3. steamer	29. array
4. vooros	30. karaat	4. parent	30. fluke
5. soheentoe	31. ellendeling	5. four	31. crest
6. stokdoof	32. bondgenoot	6. search	32. mutineer
7. handskoenmaker	33. verkwik	7. rabbit	33. barb
8. kleurling	34. gelaatstrek	8. lord	34. sprightly
9. naweek	35. punktuasie	9. report	35. finality
10. smeek	36. kontrakteur	10. tower	36. vitality
11 luiperd	37. bandelier	11. suppose	37. timorous
12. onaangenaam	38. distilleer	12. scenery	38. refinement
13. he den	39. deursig	13. polo	39. authorise
14. moedswilligheid	40. krediteur	14. advance	40. sentiment
15. euntjie	41. dyk	15. farther	41. synopsis
16. aangeklaagde	42. kwansel	16. pellet	42. nullify
17. juwelierswinkel	43. indigestie	17. tunic	43. epoch
18. tas	44. koffieservies	18. chrysanthemum	44. offing
19. ondertussen	45. vanweë	19. rogue	45. grandiloquent
20. bloutong	46. isoleer	20. household	46. corona
21. skeeloog	47. imperiaal	21. strain	47. philology
22. verowering	48. verstoktheid	22. heroism	48. monochromatic
23. aluminium	49. droesem	23. overdue	49. sidereal
24. redenering	50. passement	24. prank	50. germane

CONVERTING NUMBER OF TESTS PASSED INTO MENTAL AGES.
ONSETTING VAN GETAL TOETSE GESLAAG NA VERSTANDSOUDERDOMME.

No. of Tests passed ... *Getal toetse geslaag*	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Mental age ... *Verstandsouderdom*	2	2·2	2·4	2·6	2·8	2·10	3	3·2	3·4	3·6	3·8	3·10	4	4·1½	4·3	4·4½	4·6	4·7½	4·9	4·10½	5	5·1½	5·3	5·4½

No. of Tests passed ... *Getal toetse geslaag*	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Mental age ... *Verstandsouderdom*	5·6	5·7½	5·9	5·10½	6	6·2	6·4	6·6	6·8	6·10	7	7·2	7·4	7·6	7·8	7·10	8	8·2½	8 4½	8·7½	8·0½	9	9·2	9·4

No. of Tests passed ... *Getal toetse geslaag*	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
Mental age ... *Verstandsouderdom*	9·6	9·8	9·10	10	10·2	10·4	10·6	10·8	10·10	11	11·3	11·6	11·9	12	12·2½	12·4½	12·7½	12·9½	13	13·3	13·6	13·9	14·0

No. of Tests passed ... *Getal toetse geslaag*	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
Mental age ... *Verstandsouderdom*	14·2½	14·4½	14·7½	14·9½	15	15·3	15·6	15·9	16	16·4	16·8	17	17·3	17·6	17·9	18	18·3	18·6	18·9	19	19·4	19·8	20

INFANT INTELLIGENCE SCALE

Record Form

Copyright 1940 by Psyche Cattell

No. ..... Name .....

Examiner .....Race .....Age .....

Referred by .....Date of Exam. .....M.A. .....

Test Satisfactory .....Date of Birth .....I.Q. .....

Remarks:

Willingness				
1	2	3	4	5

Self-confidence				
1	2	3	4	5

Social-confidence				
1	2	3	4	5

Attention				
1	2	3	4	5

2nd Month
1. Voice, attends (supine)
2. Inspects environment (supine)
3. Ring, follows, horizontal (supine)
4. Follows moving person (supine)
5. Babbles or coos

a. Ring, follows vertical (prone)
b. Head, lifts (prone)

3rd Month
1. Ring, follows in circle (supine)
2. Feeding, anticipates (bottle)
3. Cube, regards (sitting)
4. Spoon, regards (sitting)
5. Fingers, inspects (supine)

a. Chest, lifts by arms (prone)
b. Head erect and steady

4th Month
1. Fingers, manipulates (supine)
2. Hands, open
3. Ball, follows (sitting)
4. Voice, turns to (sitting)
5. Activity increased at sight of toy (supine)

a. Rattle, recovers from chest (supine)
b. Rattle, active play (supine)

Month		
2	× .2	
3	× .2	
4	× .2	
5	× .2	
6	× .2	
7	× .2	
8	× .2	
9	× .2	
10	× .2	
11	× .2	
12	× .2	
14	× .4	
16	× .4	
18	× .4	
20	× .4	
22	× .4	
24	× .4	
27	× .6	
30	× .6	
S–B III	× 1	
S–B III–6	× 1	
S–B IV	× 1	
Total		

THE PSYCHOLOGICAL CORPORATION
304 East 45th Street
New York 17, N. Y.
Printed in U.S.A.

5th Month

1. Bell, turns to (sitting)
2. Ring, attains (supine)
3. Transfers object from hand to hand (supine)
4. Pellet, regards (sitting)
5. Spoon, picks up (sitting)

---

a. Rattle, attains at shoulder (supine)
b. Ring, pulls down (supine)

(After 5 months all items are given in the sitting position)

6th Month

1. Cube, secures
2. Cup, lifts
3. Mirror, manipulates
4. Reaching, unilateral
5. Reaching, persistent

---

a. Cube, approaches 2nd

7th Month

1. Pellet, attempts
2. Mirror, pats and smiles
3. Ring, inspects
4. Cube, takes two
5. Paper, exploits

---

a. String, grasps
b. Peg, pulls out

8th Month

1. Ring, pulls by string
2. String, manipulates
3. Says " dada," etc.
4. Pellet, secures
5. Bell, interest in details

---

a. Hand preference
b. Spoon, bangs

9th Month

1. Pellet, scissor grasp
2. Spoon, looks
3. Bell, rings
4. Adjusts to gesture
5. Adjusts to words

---

a. Imitates sounds

10th Month

1. Toy, uncovers
2. Cup and cube, combines
3. Third cube, attempts
4. Spoon-rattle, hits outside
5. Peg board, fingers holes

---

b. Spoon-cup, spoon first

11th Month

1. Pellet, plucks
2. Cube under cup, secures
3. Box and stones
4. Words, one
5. Cube in or over cup

---

b. Doll, squeaks

Muscular control
- Raises head (prone)
- Raises chest (prone)
  - Uses arms (prone)
- Balances head (sitting)
- Rolls over
- Sits unsupported
- Raises to sitting
- Creeps
- Pulls to standing
- Walks sideways
- Stands unsupported
- Walks unsupported
- Runs

Ring, lying
- Regards, 2
- Follows, horis., 2
- Follows, vertical, 2
- Follows, circular, 3
- Increased activity, 4
- Approaches, 4
- Attains, 5
- Pulls down, 5
- Inspects, 7

Cube
- Regards, 3
- Attains, 6
- Approaches 2nd, 6
- Takes 2nd, 7
- Attempts, 3rd, 10
- Takes, 3rd, 14
- Takes, 4th, 16

Pellet
- Regards, 5
- Attains, 6
- Takes, 8
- Scissors, 9
- Plucks, 11
- Bottle, fingers, 14
  - Imitates, 14
  - Solves, 16

12th Month

1. Spoon, imit, beating
2. Cubes, in cup, one, No.....
3. Pencil, marks
4. Spoon-rattle
5. Words, two (list)

---

a. Doll, hits in imitation

13th and 14th Months

1. Words, three (list)
2. Cube, unwraps
3. Glass, frustration
4. Pellet-bottle, imitates
5. Peg, out and in

---

a. Cube, takes third
b. Box, opens

15th and 16th Months

1. Formboard, round block
2. Words, five (list)
3. Beads in box
4. Pellet-bottle, solves
5. Round box, closes

---

a. Pegboard, urges No. placed.....
b. Scribble in imitation

17th and 18th Months

1. Cubes, 10 in cup, No.....
2. Doll, one part
3. Formboard, Rd. hole rev., a..... b....., 1
4. Pencil, scribble
5. Picture, points to one

---

a. Asks with words. Examples.....
b. Pegboard A. No. placed.....

19th and 20th Months

1. Tower of three
2. Formboard, square
3. Stick, attains object
4. Doll, commands, two
5. Doll, points to three

---

a. Selects box containing toy
b. Pegboard B

21st and 22nd Months

1. Square box, covers
2. Words, combines
3. Formboard, solves (small)
4. Pictures, points to two
5. Doll, commands, 3

---

a. Doll, points to 5
b. Identifies object by name, 2

Pencil

Marks, 12
Imitates, 16
Scribble, 18
Stroke, 27
H–V line, 30
Stroke-circle, 30

Tower

1st trial.....
2nd trial.....
3rd trial.....
Other .....

Pegboard

Pulls out, 7
Fingers, 10
Out and in, 14
Urged, 16
A, 18
B, 20

Formboard

Rd. block, 16
Rd. Rev., 18
Square, 20
Solves, 22
Solves Rev., 30

Words spoken

Dada, 8
1, 11
2, 12
3, 14
4,
5, 16
6,
7,
8,
9,
10,
Est. No.....
Ask with words, 18
Combines words, 22

Doll-Chair

Chair
Drink
Nose

Doll, points

Hair
Mouth
Ears
Hands
Eyes
Nose
Feet

23rd and 24th Months

1. Identifies objects by name, 4
2. Paper, attempts fold
3. Watch, incomplete, 3rd
4. Stanford-Binet commands, 2
5. Names objects, 3

---

a. Picture vocabulary, 3
b. Cubes, replace in box

3rd year 1st quarter (25th, 26th and 27th Month)

1. Train, blocks in row
2. Egg beater
3. Pencil, imitates stroke
4. Picture vocabulary, 7
5. Pictures, points to 6

---

a. Names objects, 4
b. Digits, 4–7, 6–3, 5–8, 1

3rd year 2nd quarter (28th, 29th and 30th Month)

1. Tower-bridge
2. Pencil, H–V..... S–C....., 2
3. Formboard, rotated, 1
4. Paper, folds definitely
5. Identifies by use, 4

---

a. Pictures, points to, 7
b. Cube just one

3rd year 2nd half (S–B, III)*

1. Stringing beads (4 +) (2 min.) No. .....
2. Pict. voc. (12 +) No. .....
3. Block bridge
4. Pict. mem. (1 +) a..... b.....
5. Circle (1 +) a..... b..... c.....
6. Three dig. (1 +) 641..... 352..... 837.....

Alt. Form board: rotated (2 +)

4th year 1st half (S–B, III–6)*

1. Simple commands (3 +) a..... b..... c.....
2. Pict. voc. (15 +) No. .....
3. Compar. sticks (3 of 3, or 5 of 6)
4. Pict. I (2 +) a..... b..... c.....
5. Ident, by use (5 +)
6. Compre. I (1 +) a..... b.....

Alt. Cross

4th year 2nd half (S–B, IV)*

1. Pict. voc. (16 +) No. .....
2. Obj. from mem. (2 +) a..... b..... c.....
3. Pict. compl.: man (1 point)
4. Pict. ident. (3 +) No. .....
5. Forms (8 +) No. .....
6. Compre. II (2 +) a..... b.....

Alt. Sent. mem. I (1 +) a..... b.....

Picture points

Dog
Shoe
Cup
House
Clock
Basket
Flag
Book
Star
Leaf

Picture vocabulary

Shoe
Clock
Chair
Bed
Scissors
House
Table
Hand
Fork
Basket
Glasses
Gun
Tree
Cup
Umbrella
Knife
Stool
Leaf

Ident. by name

Kitty
Button
Thimble
Cup
Engine
Spoon

Names Objects

Chair
Auto
Box
Key
Fork

Commands

Kitty
Spoon-Cup
Block-thimble

Objects by use

Cup
Shoe
Penny
Knife
Auto
Iron

* The items for these ages are copyright, 1937, by Houghton Mifflin Company and used by permission of and special arrangement with, the publishers, Houghton Mifflin Company.

VINELAND SOCIAL MATURITY SCALE

EDGAR A. DOLL, Director of Research
The Training School at Vineland, New Jersey

NAME ..... Sex ..... Grade ..... Date .....
Year Month Day

Residence ..... Descent ..... Born .....
Year Month Day

M.A. ..... I.Q. ..... Test Used ..... When ..... Age .....
Years Months Days

Occupation ..... Class ..... Years Exp. ..... Schooling .....

Father's Occupation ..... Class ..... Years Exp. ..... Schooling .....

Mother's Occupation ..... Class ..... Years Exp. ..... Schooling .....

Informant ..... Relationship ..... Recorder .....

Informant's est. ..... Basal Score* .....

REMARKS:

Additional pts. .....

Total score .....

Age equivalent .....

Social quotient .....

Age Levels

0 - I

..... 1. "Crows"; laughs .....
..... 2. Balances head .....
..... 3. Grasps object within reach .....
..... 4. Reaches for familiar persons .....
..... 5. Rolls over .....
..... 6. Reaches for nearby objects .....
..... 7. Occupies self unattended .....
..... 8. Sits unsupported .....
..... 9. Pulls self upright .....
..... 10. "Talks"; imitates sounds .....
..... 11. Drinks from cup or glass assisted .....
..... 12. Moves about on floor .....
..... 13. Grasps with thumb and finger .....
..... 14. Demands personal attention .....
..... 15. Stands alone .....
..... 16. Does not drool .....
..... 17. Follows simple instructions .....

* For method of scoring see Manual of Directions.

I - II

..... 18. Walks about room unattended .....
..... 19. Marks with pencil or crayon .....
..... 20. Masticates food .....
..... 21. Pulls off socks .....
..... 22. Transfers objects .....
..... 23. Overcomes simple obstacles .....
..... 24. Fetches or carries familiar objects .....
..... 25. Drinks from cup or glass unassisted .....
..... 26. Gives up baby carriage .....
..... 27. Plays with other children .....
..... 28. Eats with spoon .....
..... 29. Goes about house or yard .....
..... 30. Discriminates edible substances .....
..... 31. Uses names of familiar objects .....
..... 32. Walks upstairs unassisted .....
..... 33. Unwraps candy .....
..... 34. Talks in short sentences .....

II - III

..... 35. Asks to go to toilet .....
..... 36. Initiates own play activities .....
..... 37. Removes coat or dress .....
..... 38. Eats with fork .....
..... 39. Gets drink unassisted .....
..... 40. Dries own hands .....
..... 41. Avoids simple hazards .....
..... 42. Puts on coat or dress unassisted .....
..... 43. Cuts with scissors .....
..... 44. Relates experiences .....

III - IV

..... 45. Walks downstairs one step per tread .....
..... 46. Plays cooperatively at kindergarten level .....
..... 47. Buttons coat or dress .....
..... 48. Helps at little household tasks .....
..... 49. "Performs" for others .....
..... 50. Washes hands unaided .....

IV - V

..... 51. Cares for self at toilet .....
..... 52. Washes face unassisted .....
..... 53. Goes about neighborhood unattended .....
..... 54. Dresses self except for tying .....
..... 55. Uses pencil or crayon for drawing .....
..... 56. Plays competitive exercise games .....

V - VI

57. Uses skates, sled, wagon
58. Prints simple words
59. Plays simple table games
60. Is trusted with money
61. Goes to school unattended

VI - VII

62. Uses table knife for spreading
63. Uses pencil for writing
64. Bathes self assisted
65. Goes to bed unassisted

VII - VIII

66. Tells time to quarter hour
67. Uses table knife for cutting
68. Disavows literal Santa Claus
69. Participates in pre-adolescent play
70. Combs or brushes hair

VIII - IX

71. Uses tools or utensils
72. Does routine household tasks
73. Reads on own initiative
74. Bathes self unaided

IX - X

75. Cares for self at table
76. Makes minor purchases
77. Goes about home town freely

X - XI

78. Writes occasional short letters
79. Makes telephone calls
80. Does small remunerative work
81. Answers ads; purchases by mail

XI - XII

82. Does simple creative work
83. Is left to care for self or others
84. Enjoys books, newspapers, magazines

XII - XV

85. Plays difficult games
86. Exercises complete care of dress
87. Buys own clothing accessories
88. Engages in adolescent group activities
89. Performs responsible routine chores

XV - XVIII

..... 90. Communicates by letter .....
..... 91. Follows current events .....
..... 92. Goes to nearby places alone .....
..... 93. Goes out unsupervised daytime .....
..... 94. Has own spending money .....
..... 95. Buys all own clothing .....

XVIII - XX

..... 96. Goes to distant points alone .....
..... 97. Looks after own health .....
..... 98. Has a job or continues schooling .....
..... 99. Goes out nights unrestricted .....
..... 100. Controls own major expenditures .....
..... 101. Assumes personal responsibility .....

XX - XXV

..... 102. Uses money providently .....
..... 103. Assumes responsibility beyond own needs .....
..... 104. Contributes to social welfare .....
..... 105. Provides for future .....

XXV +

..... 106. Performs skilled work .....
..... 107. Engages in beneficial recreation .....
..... 108. Systematizes own work .....
..... 109. Inspires confidence .....
..... 110. Promotes civic progress .....
..... 111. Supervises occupational pursuits .....
..... 112. Purchases for others .....
..... 113. Directs or manages affairs of others .....
..... 114. Performs expert or professional work .....
..... 115. Shares community responsibility .....
..... 116. Creates own opportunities .....
..... 117. Advances general welfare .....

Published by

EDUCATIONAL TEST BUREAU
EDUCATIONAL PUBLISHERS, Inc.
Minneapolis - Nashville - Philadelphia

rinted 1957

yright, 1936, by the Vineland Training School