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COGNITIVE DIFFERENTIATION IN A GERIATRIC POPULATION

by

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ABSTRACT

The purpose of this study was to test the "differentiation hypothesis" in a geriatric population. 94 male patients (age 52-88) were given the Colored Progressive Matrices (a test of intellectual ability), the Children's Embedded Figures Test (a measure of field dependence) and a socialization rating.

A significant correlation between field dependence and intellectual ability of .58 ($p < .01$) and a coefficient of attenuation of .77 ($p < .01$) lend support to notions that field dependence represents little more than a factor of intelligence. A significant positive correlation of .217 ($p < .05$) between field dependence and socialization was contrary to expectations from previous research and the "differentiation hypothesis". The possibility exists that field dependence may represent something different in old age than in other age groups. These negative findings as well as others from the University of Manitoba suggest a need to reexamine the"differentiation hypothesis" as outlined by Witkin.

Results on age differences suggest that field dependence continues to increase and intellectual ability to decrease with increasing age within the limits of the age span of this study.

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CHAPTER I

INTRODUCTION

Statement of the Problem

Human development refers to a series of changes that individuals characteristically show as they progress in time toward maturity (growth and maturation) and through adult phases toward old age (aging). Terms like maturation and aging imply direction to events, direction that is controlled by psychological, social, and physical environmental forces common to the species and unique to a particular individual (Birren, 1964).

Although old age may represent a substantial portion of an individual's life span, in comparison to other portions of the individual's life, research into old age has lagged far behind. However, improvements in medical and paramedical services as well as a rise in the average standard of living has created a growing senescent population. The 1970 census disclosed that older Americans (65 years of age and over) constitute 10% (20 million) of the total population as compared to 1900 when only 4% of the nation was over 65 (Botwinick, 1973). Corresponding increases have been observed in the average life expectancy of individuals in North America (Canadian Life Tables, 1965-1967).

Along with the tremendous increases in the proportion of older people comes the need to provide services (psychological, social, medical, etc.) to the elderly. Proper services can only come

from an understanding through research into the aging process and the aging individual. An issue may be raised that has troubled numerous researchers in this area. Many studies have utilized subjects from old age institutions typically for economical and practical reasons. Some investigators (Duke University Group) question the generalizability of such findings since only 5% of elderly people are found in institutions and as such may represent a special sub-group. Such arguments are certainly valid if one wants to generalized to the normal aging process. However, if one is interested in improving services to the elderly then one should study those elderly who use these services rather than the 95% who do not.

On the psychological front, one of the most important questions deals with the cognitive abilities of the elderly. Does intellectual functioning decline with increasing age? Wechsler (1958) found that the highest level of mental ability was found at approximately age 24 with a decline beginning after age 30 and continuing as a straight line function into old age. Relatively little has been said of age differences within the old age population, i.e., whether the decline reaches a plateau or continues until death.

Field dependence-independence represents a frequently studied cognitive dimension in the younger age groups. It represents a cognitive style or an approach to solving perceptual problems based on ability to overcome an embedding context. Little has been done in investigating this dimension in the elderly. Some evidence, Schwartz and Karp (1967), suggest that children become progressively more

field independent until about age 24, after which there is an increase in field dependence much the same as found in intellectual abilities. An area of controversy exists within the old age group where some studies suggest a possible plateau in the seventh or eighth decade (Karp, 1967). Sampling bias due to selective survival has been one of the explanations given for such observed trends.

The field dependence dimension identified by Witkin (1962) was originally thought of as a perceptual style. It has now come to be regarded as one manifestation of aperson's general tendency to articulate or structure experience in a global versus analytic fashion - a tendency which "pervades the individual's perceptual, intellectual, emotional, motivational, defensive, and social characteristics" (Witkin, 1962). This forms the essence of the differentiation hypothesis.

The relationship of field dependence and intelligence, although explored in children (e.g., Campbell and Douglas, 1972) and adults (e.g., Dubois and Cohen, 1970) has not been investigated in the elderly. Typically, significant positive relationships are found in the younger age groups.

The relationship of field dependence to social and personality variables has been less consistently demonstrated. Again no data exists with the elderly. Recent studies at the University of Manitoba (e.g., Forsberg, 1970; Schludermann and Schludermann, 1974) failed to find any significant relationships between field dependence and personality factors in children.

The results of this study have both theoretical and practical implications. On the theoretical side, the differentiation hypothesis is being tested in a geriatric population. On the practical side, age differences for the cognitive variables have implications for adjustment in the elderly.

CHAPTER II

LITERATURE REVIEW - FIELD DEPENDENCE

Field Dependence-Independence

Much of the work on the field dependence dimension stems from earlier research projects by Witkin and associates (1962). These investigators suggest that individuals have preferred, stable modes of functioning which is manifested in a broad range of perceptual and intellectual abilities. Furthermore, these stable modes of functioning or cognitive styles seemed to be related to social and personality variables as well and thus may play an important role in adjustment.

Field dependence represents a cognitive style based on ability "to keep an object isolated from compelling background forces" (Witkin, 1962). It resulted from findings with college students which showed large and consistent individual differences on tasks involving the perception of the upright. The results became more interesting when large correlations were found between three dissimilar types of tasks; the Body Adjustment Test (BAT), the Rod and Frame Test (RFT), and the Embedded Figures Test (EFT). The BAT requires an individual seated in a dark room to adjust the tilted chair to thetrue vertical, when surrounded by misleading visual cues provided by a tilting room. The RFT requires an individual seated in a darkened room and facing a luminous rod placed against a tilted frame to adjust the same rod to a vertical position. The EFT requires

the individual to locate simple figures embedded in more complex figures so organized as to obscure the sought after simple figure.

What these seemingly dissimilar tasks have in common is the ability to keep an item isolated from compelling background forces. In the BAT, persons who can align their bodies to the true vertical are able to maintain separateness of body from field and to rely on internal cues to overcome the influence of the surrounding field. Persons who experience difficulty with this task tend to rely on external cues which are intentionally misleading. Similarly, in both the RFT and EFT the influence of the surrounding context must be overcome, and items experienced as discrete from their background.

Thus, on the basis of these tasks, individuals were located on the "field dependent-field independent" continuum, with most people scoring towards the middle. Field independent persons were those who had the ability to overcome the influence of the embedding context, while those who lacked this ability and or who had difficulty with these tasks were designated as "field dependent" (Witkin et al., 1962).

Age Differences and Age Trends

In an attempt to study developmental changes in field dependence Witkin et al. (1962) employed both cross-sectional and longitudinal approaches in studying several groups of children of different ages. All the children were given the BAT, RFT, and the appropriate form of the EFT and then retested several years later. One group of 10 year olds was retested at ages 14 and 17. A group of 17 year olds

was retested at 24. Data on a group of 6 to 9 year olds is also available. Results of both cross-sectional and longitudinal comparisons are consistent. Field dependence is extreme during childhood, but decreases markedly with age through adolescence until about age 17. For the 17-24 period results are somewhat ambiguous. While the longitudinal comparisons continue to show an increase in field dependence, cross-sectional comparisons did not, suggesting a possible reversal of the earlier trends. The inconsistent results stemming from different methodological approaches is not unique to field dependence and will be discussed in a later section.

Schwartz and Karp (1967) attempted to explore differences in field dependence through adulthood and old age. Three groups of subjects, 17, 30-39, and 58-80 year olds were given three tests of field dependence (BAT, RFT, EFT). The results show that field dependence increases significantly with age for each test. Cohen and Axelrod (1962) gave two groups of subjects, 19 young men (mean age of 27.8) and 50 older men (mean age of 68.8) a visual embedded figures test and a tactile embedded figures test. The older group was consistently more field dependent on each test. Interestingly, changes in the visual system and visual ability cannot be used to account for age differences in field dependence. Comalli (1965) also found that a group of 80-90 year olds were significantly more field dependent than a younger control group (25-35 year olds). Thus, studies on age differences agree on a trend of increasing field dependence throughout adulthood and into old age.

Does the same trend continue within the old age population? Comalli (1965) compared a group of 80-90 year olds to a group of 65-80 year olds on the BAT and found that whereas both groups tended to be field dependent, this tendency was greater for the older group, although the results were not significant. Karp (1967) compared three groups of elderly (60-67, 68-74, 75-92 year olds) on two tests of field dependence. Results tend to support the view that there is an increase in field dependence with age. However, the greatest change in field dependence occurs between the 60-67 and 68-74 age groups. Beyond 74, there is relatively little increase in field dependence. Markus and Nielson (1973) gave the CEFT to 201 males aged 69-81. Results show an increase in field dependence with age.

Despite the general trend of increasing field dependence with age, there is some suggestion of a developmental plateau in field dependence, starting in the seventh or eighth decade. This result reopens the possibility of some kind of relationship between field dependence and selective survival, with relatively field dependent people being less likely to survive to 70 or 80 than their more field independent peers. Secondly, lack of longitudinal research makes conclusions about trends tenuous in view of results with intelligence trends.

Relationship with Intelligence

Witkin et al. (1962) studied the relationship between field dependence and intelligence. In one study, the Stanford-Binet intelligence test was given to a group of ten year old males. A

significant correlation of .57 between field independence and intelligence was found. In another study, the Wechsler Intelligence Scale for Children (WISC) was administered to groups of 10 and 12 year olds. Again significant correlations at both ages were found (r of .55 for 10 year olds, r of .73 for 12 year olds). A number of other studies also report significant correlations between field dependence and intelligence in children (Bell, 1955; Crutchfield et al., 1958; Corah, 1965; Pedersen and Wender, 1968; Campbell and Douglas, 1972). Studies at the University of Manitoba also report significant relationships in children. Forsberg (1970) found a correlation of .56 between the Culture Fair Intelligence Test and EFT performance in 14 year old boys. Bereza (1972) found a correlation of .43 between the Otis Intelligence Test and EFT performance in 11 year old boys.

Several studies find similar results with a variety of tests in adults. Jackson (1957) found a correlation of .57 between the American Council on Education Psychological Examination (an intelligence test) and EFT performance in college undergraduates. Dubois and Cohen (1970) report correlations of .56 between EFT performance and State University Administration Examination in college students. Other studies reporting similar results in adults include Elliott (1961), Spotts and Mackler (1967), and Wachtel (1971). No studies are available with old people. It seems then that there is a substantial overlap between field dependence and intelligence in both children and adults.

In an attempt to go "beyond the IQ" and explore the basis of this relationship, Witkin et al. (1962) compared performances on individual Binet items of children differing in the extent of field dependence. They report significant positive relationships between field independence and Block Design, Picture Completion, and Object Assembly subtests of the Wechsler Scale. Low correlations with the rest of the scale led Witkin to conclude that significant relationships between measures of field dependence and intelligence can be explained on the basis of a common requirement for overcoming embedded context. Factor analytic studies (Goodenough and Karp, 1961; Karp, 1962) tend to support this hypothesis.

Since then, the adequacy of this hypothesis has been questioned. Recent findings indicate that field dependence has been found to correlate significantly with intelligence tests that are verbal in nature, although generally correlations are higher with spatial and non-verbal ability. Pedersen and Wender (1968) found that verbal ability correlated .33 with CEFT and performance subscore correlated .46 in children. Other researchers have found similar results (Elliott, 1961; Crandall and Sinkeldan, 1964; Corah, 1965; Gochman, 1966). In a study on college students, Dubois and Cohen (1970) found correlations of .47 with verbal ability and .51 with quantitative ability. Other significant correlations with EFT included English (.30), social studies (.39), art and music (.32), science (.37), math (.56) and total achievement (.54).

In a discussion of these findings and those of others, Dubois

and Cohen point out that the size of these correlations is about the same as those typically found between disparate measures of intellectual ability. That is, these are not atypical if one views field dependence as simply a "semi-specific" factor of ability or intelligence. As such, field dependence may someday be thought of as simply one factor of intelligence.

Differentiation Hypothesis

The relationship between field dependence and intelligence necessitated a broader label for "field dependence-independence" since the latter has very specific perceptual connotation and is therefore too limited for a broader cognitive style. This cognitive style was designated as a "global-articulate" dimension of cognitive function (Witkin et al., 1962) and assesses the extent to which organization of the prevailing field dominates perception of any of its parts. One who experiences in an articulate fashion can perceive items as discrete from their backgrounds; or reorganize a field when the field is organized; or impose structure on a field and so perceive it as organized when the field has little inherent structure (field independent individuals). One who experiences in a global fashion allows the organization of the field to dictate the manner in which the field and its parts are experienced, and when the field lacks structure experience tends to be global and diffuse.

The "differentiation hypothesis" represents Witkin's attempt to place his findings and those of others in a broader theoretical framework. According to this hypothesis, the general capacity "to

keep things apart" in experience reflects the underlying extent differentiation or articulation of experience and ought to be manifested in various areas of psychological functioning. As indicators of differentiation, Witkin postulates:

1. an articulated way of experiencing the world
2. a well defined body concept
3. a clear sense of separate identity
4. characteristic controls and defences.

Scores obtained by these various indicators should be significantly interrelated.

In general, results of extensive investigation by Witkin et al. (1962) support the differentiation hypothesis. Differentiation scores obtained through interviews, figure drawings, Thematic Apperception Test (TAT), and Rorschach were found to relate to each other and to score on the perceptual tests. Degree of articulation of self and the external environment were found to be significantly related. Persons differing in levels of differentiation were found to differ in identifiable ways in personality and in their characteristic controls and defences.

Some criticism has been levied against the differentiation hypothesis. Zigler (1963a; 1963b) makes the following points:

1. numberous findings fail to support the differentiation hypothesis
2. dubious reliability and validity of personality measures based largely on projective measures (TAT, Rorschach, Figure

Drawings)

3. failure to control for intelligence.

It is possible that significant correlations between field dependence and general intelligence may account for the high correlation between field dependence and other variables. Zigler suggests that if the effect of intelligence were partialed out many of the significant correlations obtained might fall below the level of significance.

Recent studies at the University of Manitoba failed to find any relationship between personality measures and field dependence. Forsberg (1970) found no significant relationship between field dependence and any of the California Psychological Inventory Scales. Preliminary data indicates no significant relationships between Group Embedded Figures Test and the Adjective Check List (ACL) personality test, nor any of the Children's Report of Parental Behavior Inventory (CRPBI) scales (Schludermann and Schludermann, 1974).

Relationship with Social and Personality Variables

Witkin et al. (1962) review research which demonstrates significant correlations between field dependence and aspects of personality. Generally, field dependent individuals are described as dependent on their interpersonal relations, suggestible, conforming, passive in their approach to the environment and likely to rely on others for their attitudes and opinions. Field independent persons are more active, assertive, more independent in making judgments, more self-reliant and more self-accepting.

The aspect of dependency on interpersonal relations is an important one for it has repercussions for the elderly. Typically, studies correlate various aspects of personality as measured by test scores and field dependence. Pemberton (1952) in a factor analytic study found that field independent persons tended to be ambitious, persevering, logical, and theoretical. Field dependent subjects tended to be dependent on the good opinion of others and socially outgoing. Similar results were obtained by Crutchfield et al. (1958) who studied army captains and found field dependent individuals to be concerned with good impression, were gregarious, affectionate, considerate and tactful. Field dependent individuals were cold and distant with others, unaware of social stimulus value, strong and individualistic.

A study by Gordon (1953) has shown that field dependent persons tended both to view themselves and to be viewed by others as socially dependent. Bell (1955) on the basis of the concept of inner and outer directed attitudes, developed a scale of four related clusters of attitudes one pole of each cluster reflecting the inner directed (ID), the other the outer directed (OD) orientation. The outer directed pole has its emphasis on need for security, approval, and contact with people and corresponds to some extent to "need for guidance and support". Bell's hypothesis that field dependent subjects would score toward the outer directed pole and field independent subjects toward the inner directed pole of the scale was confirmed.

Not all studies report consistent results. Adevais et al. (1968)

report no significant differences between field dependent and field independent male college students on any of the Minnesota Multiphasic Personality Inventory (MMPI) scales and site similar results by Silverman (in an unpublished study). Goldstein and Neuringer (1968) found little association between scores on the RFT and social dependency in a group of alcoholic subjects. Elliott (1961) found that behavioral measures of social dependence did not relate to scores on the EFT but that self-reported traits and attitudes were consistent with Witkin's findings.

Perhaps significant results are only obtained on self-reports and not when behavioral measures are used. Bard (1973) studied the relationship between the type of physical activity (externally oriented vs. internally oriented) and found that field dependent individuals perform better in team sports while field independent persons perform better in individual sports. As such, there does not seem to be any consistency with either self-reports or behavioral measures.

In studies using children as subjects, various measures of social dependency have been found to correlate significantly with CEFT (Pedersen and Wender, 1968; Crandall and Sinkeldon, 1964; Beller, 1958). Crandall and Sinkledon (1964) found a significant relationship between social dependency as measured in a free play situation and field dependence. However, when the effects of intelligence were partialed out the results were not significant. The results support Zigler's notion that there is no significant

relationship between field dependence and personality traits when intelligence is controlled for.

In summary, whereas in general the results support Witkin's notion about the relationship between field dependence and social dependency these findings are not consistent. When the effects of intelligence are controlled for, reported results are not significant.

CHAPTER III

LITERATURE REVIEW - INTELLECTUAL ABILITY

Numerous studies have attempted to investigate what happens to intellectual abilities with increasing age because of the obvious implications of such research. In spite of the quantity of research, various tests and methodologies, no unequivocal statements can yet be made. However, increases in precision of studies has identified problem areas with which future research can deal with.

Age Differences

Perhaps the most widely quoted research using the cross-sectional approach, i.e., measurements of different aged samples, comes from standardization data of the WAIS (Wechsler, 1958). Over 2000 individuals, ages 16 to 74, were examined. The highest level of mental ability was found at approximately 24 years of age with a decline beginning after age 30 and continuing virtually as a straight line function into old age.

Almost without exception, numerous other studies on age differences and using various intelligence tests have shown a similar pattern. Foulds and Raven (1948) and Foulds (1949) gave the Progressive Matrices test and a vocabulary scale to a large sample of individuals from ages 10 to 60. The results show an increase in ability until about the late teens (18 to 20 years). Between 18 to almost 28 years there is almost no change. After 28 there is a

continual decline into old age. No data is reported for the past 60 age group.

Similarly, Bell and Zubek (1960) examined four groups of individuals (20, 30, 40, and 50 year olds) on the Wechsler-Bellevue (WBIT) and found losses occurring over the entire age range. Bilash and Zubek (1960) gave the King Factorial Aptitude test to 634 subjects between 16 and 89 years of age, and found that general intellectual ability declines from teens to the 70's. Results are not clear past that point. Trembly and O'Connor (1966) tested 33,283 males between ages 10 to above 60 on vocabulary, tonal memory, inductive reasoning, and number memory (aptidues or natural intellectual factors). Results show that whereas each factor showed a different maturity age, the pattern was consistent; an increase in ability followed by a plateau and then a decline. Schaie and Strother (1968) tested 500 individuals, 25 men and 25 women at each five year age level from 20 to 70 years. Results are consistent with previous findings; a rise in scores until about age 30 followed by a steady decline thereafter.

In summary, results on age differences in intelligence are consistent. Intelligence increases until the mid twenties and starts to decline around 30 into old age. Results are not that clear as to what happens within the old age population, i.e., 65 and above.

Pattern of Decline

The results on age differences suggests that intelligence declines as a function of age after early adulthood. However,

intelligence as measured by standardized tests is made up of many abilities, the general breakdown being performance versus verbal groupings. Performance and verbal scores do not show the same age gradients.

Foulds and Raven (1948) and Foulds (1949) found that whereas their performance test (Progressive Matrices) showed the characteristic decline with age discussed previously, verbal scores tended to remain fairly stable or show little decline with age.

This aging pattern of greater decline of performance scores in comparison to verbal scores has been well replicated. Wechsler (1958) reports this pattern in his standardization data. Schaie et al. (1953) gave the Thurstone Primary Mental Abilities test to persons 53 to 78 years of age and found that space and reasoning abilities declined much faster than number, verbal meaning and word fluency. Similar results using the same test were obtained by Kamin (1957) using both community and institutionalized aged. Other researchers obtained comparable results (Botwinick and Birren, 1963 using the WAIS, Bilash and Zubek, 1960, using the King Factorial Aptitude test, and Eisdorfer and Cohen, 1961, using the WAIS).

Eisdorfer et al. (1959) reported that the pattern held for each five year period from 60 to 75 years of age and over, for men and women, for white and Negro subjects, for two levels of socioeconomic status, for people with IQ's over and under 100, and for people residing in the community and in mental hospitals.

Horn and Cattell (1966) studied age differences in fluid and

crystallized intelligence in 297 persons 14 to 61 years of age. Crystallized intelligence is thought to be a type of learned intelligence, an intelligence highly amendable to environmental influences; field intelligence is thought to be less amendable to environmental influence and more innate. The results show that fluid abilities (associative ability, figural relations, intellectual speed, induction, intellectual level) declined with age. Crystallized abilities (ideational fluency, experimental evaluation, mechanical knowledge and verbal comprehension) improved with age. Mixed fluid and crystallized abilities (logical evaluation, sematic relationsh, common word analogies, practical judgment and general reasoning) neither declined nor rose. The results imply that learned abilities because they are practiced throughout life show little decline or might even show improvement.

Different studies do report different amounts of discrepancy between verbal and performance scores. Bilash and Zubek report that verbal abilities hold up well with age until the mid forties and then decline. On the other hand, Trembly and O'Connor showed that vocabulary rose rapidly during early years, then more slowly but never reached a plateau nor declined. This discrepancy may, however, be attributed to different levels of initial ability.

Foulds and Raven and Foulds found that the pattern of decline was not the same for all individuals. Because of their large sample size they were able to plot test scores in relation to ability levels at each age grouping. They found that with the non-verbal

test (PM) decline with age was seen at every ability level. Moreover, the lower the initial level, the greater and earlier the decline. With the verbal test, they found a decline with age when the initial level was low. When the ability level at early life was average, the decline was minimal. On the other hand, when higher ability levels were examined, the verbal scores increased with age.

In summary, studies on age differences show a characteristic pattern of decline, i.e., a greater decline for the performance scores than for verbal scores. Initial ability seems to play a major role in the magnitude of decline for both verbal and performance scores. This pattern may be due to the amedability of different abilities of intelligence to environmental and learning effects.

Age Changes

A number of studies are now available which utilized the longitudinal method, i.e., repeated measures on the same individuals at different times. Bayley and Oden (1955) administered the Concept Mastery Test twice about 12 years apart to 1,103 gifted individuals aged 20 to 50. The results show a highly significant increase in scores on the second testing for all occupations, educational levels and ability levels. It seems then that intelligence of the type tested by the Concept Mastery test (synonyms, antonyms, analogies) continues to increase at least to 50 years of age in gifted individuals.

Owens (1959; 1966) gave the Army Alpha test to 127 males entering college and retested 30 years later and 11 years following

that. During the first 30 years, gains occurred on verbal and informational areas but losses occurred on analogies tests. There was no significant difference between different ability groups on either gains or losses. No significant differences were found during the second retesting, perhaps suggesting that test-retest should occur at wider intervals.

Falek et al. (1960) gave the WBIT to senescent twins and retested eight years later. The results show a decline on all tests. Jarvik et al. (1962) in a follow-up of the senescent twins retested one year later and seven years later. Results show a general increase with age, possibly due to "test-wiseness". Losses occurred only on two speeded tests. Blum et al. (1970) in a further follow-up of the senescent twins found a more rapid decline on the performance scores of the WAIS between ages 73 to 85 than between ages 65 to 73.

Eisdorfer (1963) in a four year follow-up of the Duke sample found no demonstrable decline in subjects aged 60 to 94. Eisdorfer and Wilkie (1968) in a ten year follow-up of the Duke sample found that the decade of 62 to 72 is not associated with rapid intellectual decline and that changes in the 74 to 86 ages "were not striking". Gilbert (1973) in a 35 year follow-up of individuals in their 20's or early 30's and using the Babcott Test of Mental Efficiency found a slight increase in vocabulary levels but a decrease on all efficiency scores and indeces.

In summary, age changes are not as great as age differences.

However, where declines are observed they tend to follow the same classical pattern found in age differences. Longitudinal studies have been criticized because they fail to control for "test-wiseness" and for survivorship, i.e., if only the more able survive to the next testing then this introduces an obvious upward bias. Schaie et al. (1973) in a 14 year follow-up found strong effects of participation on all measured variables, with retest participants scoring higher than dropouts on all variables. Similar results were obtained by Riegel et al. (1967) indicating that both voluntary and involuntary (death) dropouts represent a biasing factor in longitudinal studies.

Reasons for Decline

Numerous factors have been proposed to account for the observed age trends, physiological, psychological, and methodological. On the physiological side, Landahl (1959) proposed that the decrease in the number of neurons accounts for changes in abilities as a function of age. Wechsler (1958) points to the loss in brain weight after age 25 as affecting intellectual performance. The effects of physical health coupled with the increased probability of illness in old age has already been discussed. Wilkie and Eisdorfer pointed out that increases in cardiovascular disease in old age may account for intellectual age differences observed. Unfortunately, these conclusions lack the backing of adequate research.

On the psychological front, several factors have been suggested as affecting test performance in the elderly. The factor of speed has often been proposed although the results are not consistent. Old

people need more time to solve problems (Chown and Davies, 1969), however, Doppellet and Wallace (1955) found that age differences were the same with or without time limits on the WAIS. On the other hand, Schaie and Strother (1968) and Jarvik et al. (1962) report that losses occurred only on speeded tests in their longitudinal paradigms.

Other psychological factors proposed include motivation. Ganzler (1964) found that a group of highly motivated old men performed better than their less motivated counterparts on intelligence. Eisdorfer (1965) feels that the elderly may be more apprehensive because they lack recent exposure to test situations. Rabbitt (1965) suggests that old people have more problems ignoring irrelevant information (increasing field dependence with age tends to support this view).

To what extent are findings specific to the particular method used. Cross-sectional findings consistently showed declines with age, while longitudinal studies do not show the same age gradients. In an elegant study, Schaie and Strother (1968) analyzed data on the same individuals cross-sectionally and longitudinally. The cross-sectional analysis showed declines with age but the longitudinal analysis did not.

Schaie (1970) discusses the differences between cross-sectional and longitudinal analysis. The cross-sectional method compares scores for samples of subjects at different ages who belong to different cohorts (generations) but are measured at the same point in time. Differences between age groups could be a function of actual age

differences, or a function of differences between cohorts, or due both to age and cohort differences. The longitudinal method compares scores for subjects belonging to the same cohort measured at different ages, each measure taken at a different point in time. Differences here can be a function of age changes, or the effects of the environment upon the sample over time, or due to both age changes and time differences. Thus, similar age gradients can be obtained from both methods only if age differences are due to maturational phenomena, unrelated to genetic or cultural variation. In most instances, however, the cross-sectional method will confound age differences with cohort differences and the longitudinal method will confound age changes and time differences. Schaie indicated that during the last half century, people over the generations have shown improvements predominantly in crystallized intelligence. Because of this, he predicts that cross-sectional studies for some time to come will show marked age decrements on measures of crystallized (learned) intelligence, but that longitudinal studies will show little or no decrement with age.

Schaie and Strother (1968) demonstrate a method which permits the joint analysis of age, cohort, and time differences. This method, the cross-sequential design, consists of repeated measures on a population of subjects of various ages sampled at the same time. The results show that age changes in intelligence appear smaller than indicated by cross-sectional data and attributes the differences to environmental opportunity and or genetic changes in the species.

In summary, cross-sectional data has indicated that intelligence declines with age past adulthood. This decline appears greater for performance than for verbal scores. Levels of initial ability affect the rate of decline. Longitudinal studies fail to show the magnitude of decline with age. The confounding aspects of each method may be resolved by the use of cross-sequential techniques. Initial data using this technique has shown that declines occur only on tests where performance speed is important.

CHAPTER IV

LITERATURE REVIEW - THE EFFECTS OF HEALTH AND INSTITUTIONALIZATION

Although research into this area is rather sketchy and indirect (typically, findings in regards to the effects of these variables are incidental or secondary to the main hypothesis of these studies) results are fairly consistent in regards to the negative effects of poor health and institutionalization on the cognitive variables. In spite of the fact that health and institutionalization are so vitally related (since institutionalized individuals tend to be less healthy than the average old person) an attempt will be made to consider these separately for the purposes of this discussion. In reality, however, the effects of health are not usually separated from those of institutionalization since samples of unhealthy individuals typically come from institutions.

Health

Perhaps the classic study on the effects of health was done by Botwinick and Birren (1963). These investigators selected, on the basis of intensive medical examinations two groups of elderly. One group, extremely healthy sample, consisted of individuals who showed no apparent disease of any kind. The other group had abnormalities which were mild, did not inhibit physical or social functioning, and approximated more closely the usual medical concept of the "normally aged". The results showed that the less healthy group performed significantly poorer on six of the WAIS subtests (among

them similarities, block design, picture arrangement). These data indicate that even slight alterations of optimum health of the elderly can adversely affect their intellectual function. Similar results were obtained by Klonoff and Kennedy (1966) who compared two matched groups, one residing in the community and the other in the hospital, on performance with respect to memory and perceptual functioning. The results show that in both groups there was consistent positive relation between the degree of health and ability on both perceptual and memory tests.

The status of relative health is a catch-all category; it does not tell which body system or which groups of systems related to changed intellectual functioning. A number of studies attempt to define health in terms of specific disease classification. Orme (1957) found that senile dementia group scored significantly lower on CPM and verbal ability than either normal aged or elderly depressives. Depression does not seem to affect non-verbal performance. Birren and Spieth (1962) have indicated that individuals with cardiovascular disease perform poorly on psychomotor and intellectual tasks. In another study, Spieth (1964) found that a group of highly intelligent adults who manifested untreated hypertension performed significantly more poorly than did their disease free peers or a group of medically managed hypertensives. Szafran (1965) reported that cardiac output was related to age, was negatively related to speed of decision-making, but that this was not noticeable until information "overload" was achieved. After this point intelligence test

performance was significantly impaired among pilots with reduced cardiac output. Wilkie and Eisdorfer (1968) found that in the Duke sample, hypertensive individuals had lower initial intelligence test scores than did normal subjects. In a ten year follow-up of a group of 60-69 year olds, there was a significant correlation between blood pressure level and the amount of intellectual decline that occurred in both verbal and performance areas. In 70-79 year olds, although none of the hypertensives lived long enough to complete the ten year study there was significant correlation between initial blood pressure level and the amount of decline in verbal ability. Interestingly, the investigators point out that the intellectual decline among the aged found in many cross-sectional studies may be related to the fact that at older ages more persons with cardiovascular or cerebrovascular diseases are included.

Only indirect evidence linking health and field dependence is available. A number of studies have found a relationship between field dependence and alcoholism. Witkin et al. (1962) found alcoholic men to be significantly more field dependent than either non-alcoholics or hospitalized psychiatric patients. Bailey et al. (1961) compared hospitalized patients with chronic brain syndrome and psychotic reactions associated with alcoholism to members of AA who had abstained for one year and a control group of elderly volunteers. Both the AA group and the hospitalized group were significantly more field dependent with the hospital group even more field dependent than AA group. Similar results were obtained by

Karp and Konstaft (1965). If alcoholism as well as chronic brain syndrome can be considered as illnesses, then health does have a role to play in field dependence.

Another avenue of research has yielded interesting results on the relationship between health and cognitive abilities. If one can assume that individuals die as a result of injury or illness to the organism, then dying may signal the presence of a disease and as such represent a measure of health. The problem was brought into focus by the results of Kleemeier (1962), who tested 13 elderly men four times in a span of 12 years using the Wechsler-Bellevue test. Although each of the men showed a decrement, the four men who died shortly after the last test declined much more rapidly in their cognitive abilities than did the survivors. He termed this decline "terminal drop". The same finding was confirmed on data for 70 elderly men with only two testings. After one-half of the sample died, the comparison revealed that the greatest drop was for the diseased group. Riegel (1971) gave the WAIS to 190 elderly men and retested them twice at five year intervals. Individuals who did not survive to the second retesting scored lower than those who did, as did individuals who did not survive to the second retesting. Jarvik and Falek (1963) reported that an annual decrement of at least 2% on Digit Symbol, 10% on Similarities, or any decline on the Vocabulary subtest was a poor omen for survival for five years following the last test (referred to as "critical loss"). Jarvik and Blum (1971) compared 11 pairs of twins where only one member of each

pair showed critical loss. In ten of the eleven pairs the partner with the critical loss succumbed earlier to death. Finally, Hall et al. (1972) also found that levels of performance intelligence (WAIS) were significantly poorer for non-survivors than for survivors. In view of the consistency of findings cognitive variables may serve an important function in prediction of death.

Institutionalization

Some literature exists which compares institutionalized to non-institutionalized individuals on the basis of cognitive function. The results are fairly consistent as to the superiority of the non-institutionalized groups. Kamin (1957) gave Thurstone's Primary Mental Abilities test to matched institutionalized and community aged. He found the community aged superior on all subtests. Klonoff and Kennedy (1966) found that their hospitalized group revealed greater loss of function on memory and perceptual tests than a community based sample. These findings are common and are reviewed by Lieberman (1969).

A number of studies report corresponding results with the field dependence dimension. Comalli (1965) compared matched aged from the community and institution on perception of verticality (field dependence). Although significant results were not obtained, the tendency was for the institutionalized group to be more field dependent. Markus (1971) compared large samples of institutionalized and community men and women on their performance on the Children's Embedded Figures Test. For both men and women, institutionalized

individuals were significantly more field dependent. Other evidence includes the findings of Levinson (1967) who found that recent arrivals to Skid Row were less field dependent than long termers.

Although consistent demonstrable differences between institutionalized and non-institutionalized individuals exist, the reasons for these differences are not that clear. Lieberman (1969) discusses three of the more common hypotheses. One hypothesis suggests that the differences observed are the result of selection bias, Only the ill go to institutions and the effects of health have already been discussed. Another hypothesis suggests that observed differences may be due to the effects of relocation, and the stress associated with a change of environment. Blenkner (1967) suggests that changing of residence tends to disorganize and disorient the older person. Some individuals may never recover from such a confusional state. A third hypothesis suggests that the differences stem from the effects of the institutional environment. Townsend (1962) describes institutions as "dehumanizing, depersonalizing dumping grounds". Lieberman (1969) points to intellectual ineffectiveness and poor adjustment and Blenkner (1967) points to higher mortality rates among individuals in protected environments. Lieberman concludes that at present one is not able to resolve all the variables involved and feels that it may be naive to assume a single factor theory in view of present findings.

In summary, this section has attempted to demonstrate the importance of health and institutionalization on cognitive function

Even slight alterations from optimum health can adversely affect cognitive functioning. Recent evidence, e.g., Jarvik and Blum (1971), suggest a possible use of functioning ability in prediction of mortality. Although consistent differences between institutionalized and non-institutionalized individuals are found in cognitive function, it is not yet possible to resolve the reasons for such differences. Selective bias, effects of relocation, and the effects of instituional environment were suggested.

CHAPTER V

COGNITIVE DETERIORATION AND ADJUSTMENT

Adjustment in old age and in aging has often been a topic in gerontology. However, the usefulness of the concept of adjustment has suffered through poor research technique, inadequate definition of concept, and misuse of existing adjustment batteries. Inability of various investigators to define adjustment rigorously and agree amongst themselves has led to the appearance of several terms postulated as indicators of adjustment. For example, terms like psychological well-being, social adjustment, personal adjustment, self-esteem, happiness, morale, successful aging, and life satisfaction are not always different and in fact these terms seem to have been used interchangeably as explicit and implicit synonyms for adjustment (Graney and Graney, 1973). Adding to this list the usual areas of adjustment studied (family life adjustment, economic adjustment, health adjustment, religious adjustment, residence adjustment, community and social adjustment, occupational adjustment, and functional adjustment) one can see that an investigator attempting to study"adjustment" is in for a rude awakening.

Although there are a number of definitions of adjustment, Britton (1963) gives a fairly comprehensive picture of how a well adjusted individual looks:

> "One who is living a life which is reasonably satisfactory to himself, and which meets the expectations of society. This

> means that he is reasonably healthy and that he is participant in a variety of activities, that he has both personal and specialized contacts with others, and that these interpersonal relations bring him satisfaction. It includes also the notion that the individual feels reasonably self-confident and adequate in initiating action and in intellectual functioning. He maintains a degree of independence and self-sufficiency and as viewed by others he functions appropriately and effectively."
>
> (Britton, 1963, p. 61)

One aspect of Britton's definition deals with the importance of health. The importance of health in the aged cannot be overstated for it is perhaps the primary limiting factor in adjustment (Kutner et al., 1956). The relationship between cognitive function and health has already been covered elsewhere (see section on health) and only a brief summary will be made here. It was shown previously that intellectual ability of individuals who showed deviations from optimum health was lower than for healthy individuals. Furthermore, this was true for overall health as well as specific diseases, e.g., heart disease. The importance of cognitive deterioration in prediction of disease and death was also demonstrated with findings on "terminal drop" and "critical loss". Cognitive deterioration with its relationship to health plays an important role in adjustment.

Another criteria of good adjustment is that it "needs to meet the expectations of society". Certainly society dictates norms or a framework within which behavior is either acceptable or unacceptable. For example, alcoholism (sometimes referred to as a social disease) represents an adjustment for an individual which is not socially acceptable. The finding that alcoholics tend to more field dependence (see section on the effects of health) points to the importance of a

cognitive variable to normative adjustment.

In his definition, Britton points to the importance of "maintaining a degree of independence and self-sufficiency". By this is meant more the ability to care for self in terms of performing the usual activities of daily living as are reflected by functional adjustment rather than economic independence. The ability to care for self and thus be independent of others in such a personal areaswill probably affect the individual's self-confidence. In Deer Lodge hospital individuals were admitted to long term care if they could not function adequately in the community at large. Inability to care for one's self is a primary factor in admissions to nursing homes and other old age institutions. In fact, institutions differ in the amount of care they provide from the heavy nursing care found in most nursing homes to minor health supervision in homes for the aged. The relationship between the cognitive variables and institutionalization has also been discussed elsewhere (see effects of institutionalization). The results were consistent as to the superiority of community living individuals over institutionalized individuals in both the cognitive variables. It seems then that poor cognitive function may be an indicator of functional adjustment.

Another criterion mentioned by Britton and in common use by other investigators is "life satisfaction". Satisfaction with oneself, and with the life one leads represents a major part of an individual's adjustment. Kutner et al. (1956) in studying 500 individuals over 60 found a relationship between intellectual ability

and morale or happiness (as reflected by the Guttman scale). The results show that individuals that are happier and more satisfied with life had higher intellectual ability than individuals who were less satisfied with life and themselves.

Lastly, Britton points to the importance of "participating in a variety of activities" and having both "personalized and specialized contacts" as factors in adjustment. Gilberstadt (1968) administered the WAIS and the Mandel Social Adjustment Rating to 101 male veterans who were hospitalized. The social adjustment scale consists of various areas of adjustment including family life and community and social adjustment. Family life scale deals with relationships within the family structure. Community and social adjustment deals with participation in organized activity, recreational and sports participation, number of close friends and relatives and degree of enjoyment from activities. The results show a significant relationship between WAIS performance IQ and total test scores, as well as subscores for social and community adjustment, family life, health and economic adjustment. Those individuals who scored higher on WAIS performance adjusted better than individuals who obtained lower scores. In an attempt to predict adjustment, using a 24 month follow-up, the results show that the best predictor of adjustment scores, aside from the initial adjustment scores was WAIS performance. WAIS performance was nearly as effective as initial adjustment scores. Gilberstadt concludes that "if intellectual deficit is marked on performance tests, prognosis is poor for social adjustment, in spite of favorable

environmental circumstances".

In summary, cognitive deterioration seems to be related to a number of areas of adjustment, including social, functional, health, and life satisfaction. Thus, the use of cognitive variables may be important in prediction of adjustment in the aged.

CHAPTER VI

HYPOTHESES AND DESIGN OF THE STUDY

The purpose of this study was to investigate the relationship between field dependence, intellectual ability, and degree of social functioning in the aged population as well as age differences for these variables. The CEFT was used as a measure of field dependence, the Colored Progressive Matrices was used as a measure of intellectual ability, and a socialization rating based on frequency of participation in social activities was used as a measure of social functioning.

Results from previous investigations with field dependence point to consistent positive relationships between field independence and the quantitative subscores of a variety of intelligence tests in children and adults. The relationship between field dependence and social and personality variables has been less consistently demonstrated with numerous studies failing to report any significant relationships. Since no data are available for either relationship in the elderly, it will be interesting to see if similar relationships exist in the old age population. Hence, the importance of the first two predictions in terms of the theoretical framework of the differentiation hypothesis.

The present study utilizes both the correlational analysis and the extreme group analysis. The relatively large sample size permits the use of the correlational analysis which has several advantages as

far as the present research is concerned:

1) since most of the previous studies used correlational analysis it becomes easier to compare results across studies
2) the correlational analysis gives a measure of the degree of the relationship, not only an indication of whether a relationship exists or not,
3) correlational analysis allows for an estimation of the strength of the relationship if the measurements of variables involved were perfectly reliable (attenuated correlation),
4) correlational analysis allows for partialling, i.e., the removal of the effect of a variable from the relationship between two or more variables.

Extreme group analysis is used here as a supplement to the correlational analysis, and only for the relationship between field dependence and socialization as small correlations might mask the existence of a significant relationship. The rationale for the use of the extreme group analysis is as follows: if the degree of socialization is linearly related to field dependence (as previous studies indicate), then the logical place to look for such a relationship would be in groups differing maximally on the field dependence variable, i.e., those falling in the extreme ends of the distribution. This procedure ought to exaggerate any differential effects which might exist. If no differences are found between groups having extreme scores on the dependent variable (field dependence), we have strong evidence that field dependence is not linearly related to

socialization and there is no need to look further in this direction. On the other hand, such a finding would not rule out the possibility of a different functional relationship (e.g., curvilinear) between field dependence and socialization. However, there is presently little to indicate that this is the case. If future research points to such a possibility, this would be a matter for further investigation.

Previous investigations on age differences in intellectual ability show declines with increasing age. Whereas most of these studies investigated life span age differences (and thus had one group of old people), relatively few studies have concerned themselves with differences within the old age group. Simple one-way analysis of variance was selected to demonstrate age differences for intellectual ability. The age groups were so selected so as to have approximately equal sample sizes in each group.

Previous findings on age differences in field dependence suggest that field dependence increases throughout adulthood until the seventh or eighth decade of life where it levels off into a plateau. Selective survival of the more healthy and able individuals has been suggested as an explanation for this effect. Simple one-way analysis of variance using the same age groups as for intellectual ability will be used. It is expected that field dependence will continue to increase within the scope of this study.

Predictions

1. Subjects who are more field independent (high scores on

CEFT) will score higher on intellectual ability (CPM). Pearson-product-moment correlation coefficient will be used and $p < .05$ was chosen as the required level of significance in all analyses. A correction for attentuation based on reliability estimates from inter-item correlations (Domain Sampling Theory) will also be used.

2. Lower scores on the CEFT (field dependency) will be associated with higher scores on the socialization rating. Pearson-product-moment correlation with and without partialling out the effects of intellectual ability (CPM). Extreme group analysis using t-test will also be used.

3. As age increases, scores on CPM (intellectual ability) will decrease. Analysis of variance for three age groups; 68 and under, 69-78, 79-88. As a supplementary analysis, Pearson-product-moment correlation and between-age and intellectual ability (CPM) will also be used.

4. As age increases, scores on CEFT will decrease (individuals will become more field dependent. Analysis of variance for three age groups; 68 and under, 69-78, 79-88. As a supplementary analysis, Pearson correlation between age and field dependence (CEFT) will also be used.

CHAPTER VII

Method

Subjects

The sample consisted of 94 male patients from Deer Lodge Veterans hospital in Winnipeg. All patients were armed forces veterans. The sample came from four ward areas (2W, 2E, 3W, 3E) characterized as an active treatment section of the hospital. These are patients who generally live in the community but are in hospital for an acute illness. Typically, these patients are more functionally independent, both physically and mentally, and therefore, more typical of the "average" old person as compared to patients from long term chronic wards.

All the patients were volunteers as they were asked to participate and had the right to refuse. Refusals and drop outs were not uncommon. There were 42 other individuals on whom partial data was obtained but these are not included in this report. This occurred in three types of circumstances: the patient terminated his participation before testing was finished, the patient was discharged before testing was finished, the patient could not continue because of illness or death.

The age of the individuals varied from 52 to 88 years of age. (Mean of 73.1 and standard deviation of 7.6, see Table 1). The high proportion of individuals in the 70-80 bracket is not uncommon for this population as judged by a previous study on life expectancy where it was found that the admitting ages for 980 individuals showed

similar age distribution (mean of 74.9 and a standard deviation of 10.1).

The patients suffered from various illnesses. Diseases of the cardiovascular system were the most prevalent (30.8%) followed closely by diseases of the respiratory system (29.7%). Other diagnoses included diabetes, urinary tract infection, cancer, locomotor disorders and nervous disorders. Severely ill and confused individuals were not included in the study.

Sensory problems (predominantly visual) were common to most individuals. This is to be expected in this type of population as will be discussed later. Since trying to control for this variable would eliminate most of the available subject pool, unless the patient had difficulty in completing the task, he was included in the study. In view of the highly perceptual nature of the task, visual problems probably affected the results.

Socioeconomic level based on education and occupation was quite homogeneous. Most individuals had not completed elementary schooling. Eighteen individuals had some high school and only three had some university. Most of the occupations were of the unskilled or semiskilled variety. All the individuals were retired and receiving fixed pensions (old age, disability allowance).

Selection of Tests and Description of Instruments

Numerous problems are encountered in the measurement of attributes using established tests. Examining the aged is a specialized problem. Most of the testing materials are geared to the

young, not only that they appeal to the young but also in that they measure knowledge and abilities which are a function of proximity to the academic situation. Many of the tasks on the typical test of intelligence may be seen as uninteresting, dull or "silly" by aging individuals. Demming and Pressey (1957) started with the idea that tests used to measure intelligence of aging and aged adults should deal with problems indigenous to adult life. Their reasoning was based partly upon the fact that traditional tests for children, as, for example, the Binet test, have content and tasks relevant to childhood. As such they constructed an information test comprising items very practical in nature. Their test was based on use of yellow pages of a telephone directory, on common legal terms, and on people to get to perform services needed in everyday life. They found a rise in scores through middle and later years with this test, even when these same people declined in their scores with the conventional tests.

Older people tend to block answers particularly on timed tests (Eisdorfer, 1968). They respond more frequently and with better results when they are given additional time, although they may not need the additional time. Thus, in the testing situation, it is necessary to give the average older person more time to answer questions and attempt to control for any anxiety the test situation arouses. The elderly may also be more apprehensive because they lack recent exposure to testing situations and because they fear that they may be losing intellectual ability (Eisdorfer, 1969). Familiarization

with the testing environment prior to the actual testing will often help to alleviate heightened anxiety levels (Troyer et al., 1967).

The test structurally should meet several criteria to be a useful measure in the aged population. Most tests do not have norms for the aged. Thus, whereas these tests might have research potential with the aged (provided they meet other necessary conditions) they have little practical value now. Most of the tests are too long and cumbersome for the older person (for example, the WAIS). The length of a test becomes a crucial issue when one considers that the older person has lower motivation for test taking, he tires more easily (especially those typically found in hospital settings, Botwinick and Birren, 1963) and has shorter attention span (Wang, 1969). It is, therefore, important that the test be as brief as possible (ideally not over 45 minutes).

There are numerous changes in the visual system as a function of age. Visual acuity is relatively poor in young children and improves up to young adulthood. From about the mid twenties to the fifties there is a slight decline in visual acuity and for many persons there is an accelerated decline thereafter (Chaponis, 1950). Other changes in the visual system include diminishing pupil size, thus reducing the amount of light reaching the retina (Birren et al., 1950), increase rigidity of the lens (Birren, 1964) giving rise to a more fixed focus with less ability to adjust to objects close to the eye and a tendency toward requiring higher illumination to attain equal visual recognition (Guth et al., 1956). In general it may be

said that organs of special sense have higher thresholds with advancing age. This means that stimuli must be of greater magnitude or greater intensity in order to produce a sensation (Birren, 1964).

Tremendous individual differences exist within the aged population ranging from those totally senile and with whom little meaningful communication is possible to those of superior ability. As discussed previously, the more able individuals declined less as a function of age than the less able ones on various tests of intelligence. Furthermore, Botwinick and Birren (1963) reported that performance on the WAIS was directly related to the degree of health (this becomes a crucial variable in an institutionalized setting where individuals vary greatly among themselves in degree and nature of illness). In view of such large individual differences, tests with adequate difficulty range are required to discriminate between individuals.

The sample of individuals on whom data are presented varied in their verbal ability. They had very little schooling (majority did not complete elementary school), tended to be of varied cultural backgrounds (English, Irish, Scottish, Ukrainian, Polish). As such, and in view of the numerous findings in the literature that verbal ability remains moderately stable with advancing age, it would be preferable to choose tests that are non-verbal innature (culture fair tests are of the same variety) which tend to measure ability rather than acquired knowledge.

It seems then, that useful tests for the older population

should possess most of the following characteristics:

1) they should be relevant to the old people
2) they should be untimed
3) they should possess adequate age norms
4) they should not be too long or cumbersome
5) they should utilize large stimuli in presentation
6) they should have adequate difficulty range
7) they should be non-verbal in nature

Children's Embedded Figures Test (CEFT)

The Embedded Figures Test (EFT) is an assessment procedure developed by Witkin (1962) to measure the field dependence dimension. The EFT was designed for use with subjects from 10 years to old age. Although the EFT was used with an old age population (Schwartz and Karp, 1967; Karp, 1967), in a pre-testing situation on the Deer Lodge hospital sample, the EFT was found to be much too difficult. Subjects constantly failed most of the items and usually stopped before the testing could be completed. They complained of eye strain and the difficulty of the task. Indeed, the EFT has such thin lines and generally small stimulus figures that in this population it may reflect more visual ability rather than field dependence. For this reason, it was decided to use the Children's Embedded Figures Test (CEFT) in this setting. The discrepancy between this study and those of Schwartz and Karp (1967) and Karp (1967) in the use of appropriate instruments may perhaps be explained on the basis of sampling. The latter utilized individuals living in the community whereas the former

used institutionalized subjects. Interestingly, in his comparison of institutionalized to non-institutionalized aged men, and also using the CEFT, Markus (1971) and Markus and Nielsen (1973) found institutionalized men to be more field dependent.

A version of the EFT, the CEFT, was developed for use with younger children (five to ten year olds) by Karp and Konstad (Witkin et al., 1971). The subjects' task on each trial is to locate a previously seen simple figure within a large complex figure which has been so organized as to obscure or embed the sought after simple figure. The CEFT consists of 25 figures, 11 of which have the simple Tent figure embedded in them, and 14 of which have the simple House embedded in them. Items vary in difficulty with the house figures being generally more difficult than the tent figures. Responses are scored 1 or 0 and the total score equals the number of items passed, 25 being the maximum score.

Norms for this test were established on a sample of 160 children (5 to 12 years of age) and are rather sketchy. The sample was split into four age groups, 5-6, 7-8, 9-10, 11-12, each consisting of 20 males and 20 females. A consistent trend of increasing field independence was found between all age groups.

Reliability estimates for all ages and sexes were quite high, varying from .83 to .90. These reliability estimates are comparable to those obtained for the EFT.

Direct validity measures involving correlations between CEFT and EFT can occur only at the borderline between age groups where

both tests yield sufficient variance when given to the same children. For 11 year olds, the magnitude of these correlations (.83 to .86) suggest that a significant amount (approximately 74%) of the reliable variance of the CEFT may be accounted for by the common variance with the EFT.

There are several advantages in using the CEFT rather than the EFT in this population. Firstly, the CEFT unlike the EFT is untimed. It is the number of correct items rather than the time taken that is important. Secondly, the CEFT utilizes large stimulus cards which are color differentiated. This perhaps was the most important aspect in this population. Finally, it has an adequate difficulty range (no person received a perfect score and everyone received a score which was more than zero), it is primarily non-verbal and it is not too long (usually about 25 minutes).

The disadvantage of the test is that there are no norms, reliability or validity data for old people. Secondly, the stimuli, although of adequate size are not relevant in terms of content to the old age population. Indeed, it is quite apparent immediately that the test is geared for young children, which in some cases angered the patients.

Colored Progressive Matrices (CPM)

The Colored Progressive Matrices (CPM), developed by J.C. Raven in 1949, is a "test of observation and clear thinking" used to measure the degree of intellectual development or deterioration. By itself, it is not a test of "general intelligence". For this purpose

it should be used in conjunction with a vocabulary test (the Mill Hill Vocabulary Scales are usually used as normative data is provided in conjunction with CPM). Because it is akin to the performance scores of other tests, the CPM makes it possible to explore a person's present capacity for productive thinking without depending too much on his recall of information (Raven, 1965).

The test consists of 36 items (three sets of 12 items each). Each problem consists of an illustration with a piece missing from it. The task on each problem is to select the missing piece from among six found on the bottom of each problem. The sets are so arranged as to assess the following stages of qualitative mental development:

1) ability to distinguish identical figures from different figures
2) appreciation of a figure's orientation with respect to self and other objects in the perceptual field.
3) ability to apprehend two or more discrete figures as forming a whole.
4) ability to analyze the perceived whole into its constituent elements
5) ability to compare analogous changes in the character perceived and adopt this as a logical method of reasoning

The developmental aspect of the matrices makes it a good tool to use with children (designed to be used with ages 5-11). It seems, however, that the ability to reason by analogy appears to be one of the earliest to decline in later life, and the one most apt to be seriously

impaired as a result of organic dysfunction (Dils, 1960; Raven, 1965). For this, and other reasons, the CPM can be used with people who have trouble with the English language, aphasia, cerebral palsy as well as people who are intellectually sub-normal or have deteriorated.

The tests have norms, reliability and validity data for children, normal aged, elderly depressives and senile dementia patients. Most of these data, however, were obtained in England. The norms for the elderly were based on a sample of healthy old people, 65-85 years of age, living in the community. Working percentile points are given for each five year interval. Thus a score of 28 rates at the 75% level for a 65 year old, at the 90% level for a 75 year old, and at the 95% level for an 85 year old. Test-retest reliability after a week's interval was .88 for senile people, .70 for the depressed groups, .89 for normal children and .85 for emotionally disturbed children. No reliability data is reported for the normally aged group.

Only one study, Levinson (1959), has attempted to validate the CPM in a normally aged population. Correlations between WAIS and CPM was .56 for full scale, .49 with verbal subscore, and .59 with performance subscore. Using a sample of sub-normal adults, Stacey and Gill (1955) find a correlation of .60 between CPM and Wechsler-Bellevue. Much still needs to be done in terms of standardization data on this type of population.

The use of this test has several advantages in the present setting:

1) the test is untimed
2) the test is one of a non-verbal nature
3) the test is not too long (about 25 minutes)
4) it has an adequate difficulty range
5) it has some norms, reliability and validity data for old people
6) the test construction allows for studies on qualitative changes in abilities of old people
7) although the test is not too relevant to old age, at least it is not insulting to the average old person

Perhaps the only disadvantage the test has is its high reliance on visual ability. People with visual problems (common in the elderly) have difficulty with some of the items.

Socialization Rating (SR)

The socialization rating represents an attempt to determine objectively the degree of present socializing, based on a weighted frequency score. For example, the patient is asked how often he sees his grandchildren. His answer will be placed in five frequency categories; daily, biweekly, weekly, monthly, and annually. These frequency categories are then weighed according to the following formula; 5 points for daily, 4 points for biweekly, 3 points for weekly, 2 points for monthly, and 1 point for annually.

The questions or items are grouped into three major areas; contacts with people, community contacts, and recreation at home. Contacts with people include spouse, children, grandchildren, relatives, friends, neighbors, friendly visitors, legion, other.

Community contacts include hospital, community day center, store, restaurant, beer parlor, park, church, library, car rides, other. Recreation at home includes radio and records, television, reading, writing, handicrafts, cards and games, outings, telephone conversation, and other.

The patient's score represents the sum total of all items, 140 being the maximum score possible, No normative data is available. Some of the obvious problems with this scale will be discussed in a later section.

Procedure

After initially screening out the confused and severely ill patients, each person was approached and asked to participate in the study in the following manner:

> "We are doing a study of older people to learn more about them and what their needs are. Part of this study involves asking a lot of questions, and I'd be very pleased if you could help us".

Volunteers were asked to come to the doctor's examining room, located on each ward, or if the patient was alone in his room, the testing was carried out there. Whatever the case, the testing always occurred in an environment with which the patient was familiar with so as to decrease anxiety levels associated with test taking in the older population (Troyer et al., 1967).

The order of presentation of the tests, although varied at first was fixed at a later date to the following: CEFT, CPM, followed by some interview data (including the SR). It was found that since CEFT was the hardest test it was on that one from which the subjects

tended to drop out. As such, for economical reasons it was decided to proceed in the order of difficulty.

Because it was felt that any study concerning intellectual abilities would pose a threat for the subjects (Eisdorfer, 1969), the subjects were not told the exact nature of each test. Only general explanations were offered. Furthermore, all participants were assured that their responses would be treated in a confidential manner.

All tests were individually administered. Tremendous differences between individuals made standardized instructions for each test impossible to give. Some individuals required more detailed information than others. The following represent the general text of the instructions given for each test:

> CEFT. This test tells me how you look at things. I want you to look at this simple figure and pay particular attention to its size and shape because I am going to ask you later to find a figure of the same size and shape hidden in a more complex figure.

After going through the examples, the subjects usually understood that they were to only pay attention to the outline of the stimulus and that "what's inside may change".

> CPM. This test tells me how you handle certain types of problems. Look at this illustration. Do you see this white piece here? A piece has been cut out of this illustration and the white is an empty space from where the missing piece was taken. This piece, along with other pieces of the same size and shape are placed below this illustration, here. I would like you to tell me in each case which of these six pieces originally came from this illustration.

If a person failed the first time, more detailed information was provided until the correct answer was obtained. Subsequently,

some background information (age, diagnosis information, and other information required for the hospital) as well as the SR scale were obtained in a semistructured interview.

CHAPTER VIII

RESULTS AND DISCUSSION

The results of this investigation are grouped according to the hypothesis due mainly to the multiplicity of statistical methods employed. Since the effects of health are related to cognitive function, an attempt has been made to study this variable.

The Effects of Health

Previous discussion, e.g., Botwinick and Birren (1963) has disclosed that overall health as well as specific diseases negatively affect cognitive function. This was especially true for diseases affecting the cardiovascular system.

In an effort to discover whether a relationship between different diseases and cognitive function existed in the present investigation, the admitting diagnosis was examined for all patients. Because of the relatively small sample size for such an investigation, it is not possible to examine the effects of specific diseases separately. Rather, the diagnoses were grouped as affecting one of the following systems: cardiovascular, respiratory, nervous, locomotor, and excretory. Table 2 represents a summary of one way analysis of variance for these groupings for all variables. The results show no significant different between disease groupings for either the CEFT or CPM cognitive variables. That no significant differences were found is surprising in view of previous research and leads to two possibilities. Firstly, it could be that in our

TABLE 1

Summary of Descriptive Statistics for all Variables

	Mean	S.D.	Range	N
Age	73.09	7.63	52-88	94
CEFT	15.83	5.45	2-25	94
CPM	23.65	5.54	8-35	94
Socialization	55.74	14.52	21.89	94

TABLE 2

Summary of one way Analysis of Variance of Diseases for All Variables

	MS(Bet)	D.F.(Bet)	MS(Wit)	D.F.(Wit)	F
Age	75.15	4	57.35	77	1.31
CEFT	20.30	4	29.04	77	0.699
CPM	41.44	4	27.77	77	1.49
Soc	533.54	4	205.81	77	2.59*

*$p < .05$.

$p < .01$.

sample having cardiovascular or any other disease does not affect cognitive function. Secondly, it could be that cardiovascular disease does affect cognitive function but not in a significantly different manner from other disease groupings. One cannot resolve this problem without having a control group of disease free individuals.

The relationship between disease groupings and age was also not significantl. These results are interesting in view of Wilkie and Eisdorfer's (1968) notion that intellectual decline with age may be attributed to an increase in individuals having cardiovascular or cerebrovascular disease. This trend was not found in the present study.

The relationship between socialization and disease groupings was significant at the .05 level, indicating that a relationship exists between type of disease groupings and the degree of socialization. Such a result should not be totally unexpected. Socialization usually depends on health, especially if it inhibits mobility (e.g., club membership). Thus, one would expect that the locomotor disease grouping should be lower than other disease groupings. This turns out to be the case with the locomotor group having a mean of 45.1 for socialization and the other disease groupings having means of between 56.2 and 59.5 on the socialization variables.

A number of problems with the data require that the results be interpreted with caution. Usually elderly individuals suffer from more than one disease, some of which are known whereas others have

not yet been diagnosed. Secondly, the diagnosis used was the admitting diagnosis, i.e., the reason for which the person is in hospital. This does not mean that the person has no other diseases e.g., a person with a cardiovascular history may be in hospital for a broken leg. He would thus be placed in the locomotor grouping even though he should be in the cardiovascular one. Thirdly, two of the groupings, nervous and excretory consisted of four and six individuals, respectively. Such small sizes are not adequate for proper analysis. In fact, one would be hard pressed to justify the assumption that variances are homogenous. Violation of assumption of homogeneity of variance is a conservative error, i.e., it becomes harder to show significant differences. It thus may have a bearing in some of the non-significant results obtained. Bartlett's test for homogeneity of variance revealed no significant differences and thus one can assume that variances are homogeneous. Nevertheless, larger sample sizes should be used in future investigations to circumvent this problem. Lastly, an adequate control group of relatively disease free individuals is needed to study the effects of health as a whole and the effects of each disease per se. Comparison of disease groups to each other gives only very limited information.

Field Dependence and Intellectual Ability

Pearson-product-moment correlation was used to assess the relationship between field dependence and intellectual ability. As can be seen in Table 3, a correlation of .58 was obtained which is significant at the .01 level.

TABLE 3

Summary of Pearson-Product-Moment Correlations

Between all Variables

	Age	CEFT	CPM	Soc
Age	1.0			
CEFT	-.27**	1.0		
CPM	-.23*	.58*	1.0	
Soc	-.17	.217*	.215*	1.0

*$p < .05$.

**$p < .01$.

Witkin et al. (1962) attempted to explain the correlation between field dependence and performance intelligence on the basis that both tasks required the ability to "disembed". The CPM (an equivalent to performance subscores of other tests) requires the ability to perceive the whole in spite of missing information and then to analyze it in terms of its constituent elements. The ability to analyze and to structure is characteristic of the articulate end of the global-articulate dimension defined by Witkin. As such, the magnitude of the correlation is not surprising. Indeed, one might expect it to be larger due to the similar requirements of both tasks.

The magnitude of the correlation between field dependence and intellectual ability is in agreement with other research with different age groups. The correlation of .58 is well within the range found in previous works with adults (Dubois and Cohen, 1970 found a correlation of .51 and .56) and children (Witkin, 1962 found a correlation of .54 for 10 year olds and .71 for 12 year olds) with performance subscores.

The size of this correlation as well as those reported by others is substantial. Such correlations were determined using measures that are not perfectly reliable. In view of the theoretical implications, it would be interesting to see what the relationship could be if the measures used were perfectly reliable. This is possible by using the coefficient of attenuation. Reliability estimates based on internal consistency and the coefficient of attenuation are presented in Table 4. The attenuated correlation

TABLE 4

Summary for Correction for Attenuation for

Relationship Between CEFT and CPM

	Reliability	r	Attenuation	r
CEFT	.848**			
		.58**		.77**
CPM	.677**			

** $p < .01$.

was .77 and is significant at less than .01 level. This accounts for approximately 60% of the variance.

The magnitude of these correlations have considerable theoretical implications in view of recent criticisms levied against the concept of field dependence. Zigler (1963) pointed out that field dependence represents little more than general intelligence. Similarly, Dubois and Cohen (1970) point out that field dependence may represent one factor of intellectual ability. The results of this study tend to support these views.

Field Dependence and Socialization

As can be seen in Table 3, the correlation between field dependence and socialization was found to be .217 and is significant at the .05 level. It would seem then that field independent persons tend to socialize more (and would be regarded as more socially dependent) than field dependent persons. Such a result would be opposite of what one would expect in terms of Witkin's notions. However, the relationship is an extremely small one (accounting for only 4% of the variance) and would not be significant if the number of correlations in the correlation matrix were taken into consideration (approximate level required for a 4 x 4 matrix at the .05 level would be .288).

In an effort to investigate this relationship more closely, the extreme group analysis was used by forming groups of extremely field dependent and field independent individuals. Those persons who scored in the upper one-third (17 and above) on the CEFT were

designated as the field independent group (Group 1) while those persons who scored in the lowest one-third (9 and below) were designated as field dependent (Group 2). The results of a t-test between the two groups on socialization can be seen in Table 5. The results failed to reach significance indicating that the degree of field dependence does not seem to be related to socialization.

Why the inconsistency of results between the two methods of analysis used? One factor perhaps could be the smaller sample size used in the t-test (63 compared to 96 persons). Sample size relates directly to the level of significance in a t distribution. However, even if a normal distribution would be assumed (a sample size of 120 or more) the level of t required for significance at the .05 level would be 1.98, still much too large for our results. Sample size also effects the standard error of the mean and thus may play an important role in the ease with which significance can be met (the larger the standard error, the smaller the sample size, the harder to reach significance). Finally, in using the extreme group analysis, scores in the middle one-third were eliminated. Possibly the significant correlation may be due to the relationship between scores in the middle range rather than the extreme groups. This would suggest the possibility of another than a linear relationship.

The results from the extreme group analysis fail to clarify the relationship between field dependence and socialization. One would expect that if there was a linear relationship it should certainly show up in the extreme group analysis. The significant

TABLE 5

Summary of t-test Comparison Between Field Dependent and Field Independent Groups on Socialization

	Mean	N	S.D.	D.F.	t
GRP. 1 (17 and over)	57.04	49	14.43		
				61	1.12
GRP. 2 (9 and under)	52.07	14	15.26		

TABLE 6

Summary of Partialling out the Effects of Intellectual Ability from Relationship Between CEFT and Socialization

Before Partialling	After Partialling
r	r
.217*	.115

*$p < .05$.

correlation should not be ignored since there may be several factors involved which may account for such a relationship.

One of the factors involves a problem with the nature of the socialization scale. Basically, it represents a self-report of social behavior. The reliability and validity of self-reports are always questionable, especially when they represent the sole measurement of an attribute. This aspect becomes more important when there may be logical reasons for "faking good" or"faking bad". For example, the individual may fake good so the hospital will allow him to leave earlier because he misses his social relations to a great extent. He might fake bad because: (a) he wants the hospital to improve his social situation no matter how good or bad it presently is; (b) he might want to show to what extent his disability (which might be pensionable) affects his life and thereby receive greater compensation. Secondly, behavioral measures measure behavior but are insensitive to attitudes and values. This has both advantages and disadvantages. In this situation it represents a disadvantage. A number of questions deal with the frequency of contact with relatives, family, close friends, etc. It can be seen that if the individual does not have any family, or if the family lives in another geographic area, it would seem that the individual is not very sociable even though he might be if he had the opportunity. Furthermore, the assumption is made that clubs, and community organizations are readily available to all individuals. This may not always be true. Many individuals come from rural areas where these resources are not

available. Finally, the assumption is made that individuals are able, both physically and economically, to participate in social activities. In reality, it may not be feasible for health or economic considerations to maintain community contacts. Thus, the present scale is not an adequate indicator of socialization. Future research should not rely on one measure of socialization but should use several different types of indicators; behavioral, self-report, ratings, etc.

The finding that field independent individuals socialize more than field dependent ones is as mentioned previously contrary to Witkin's notions. According to the differentiation hypothesis, field dependent individuals were described as dependent on their social relationships, more outgoing, friendly, conforming and likely to rely on others more than field independent persons who are described as cold, distant, and individualistic. Although these surprising results may stem from an artifact of the socialization scale, another factor may be involved.

Perhaps the concept of field dependence is not the same for old people as it is for other age groups. Field dependence in the old may reflect more upon ability rather than personality trait. If this were so, field dependence should behave in a similar fashion as an indicator of intellectual ability. One would expect that intellectual ability would show a positive relationship with socialization if only for the following; (a) individuals who function better intellectually, are healthier and could be more active (ability factor)

(b) previous findings relate intellectual ability and social adjustment. Several factors indicate that field dependence does behave in a similar fashion to intellectual ability. Firstly, the high correlation and coefficient of attenuation between field dependence and intellectual ability was already discussed. Secondly, the magnitude of the correlations between field dependence and socialization and intellectual ability and socialization are nearly identical ($.217\ p < .05$ for field dependence; $.215\ p < .05$ for intellectual ability) (see Table 3). Thirdly, as can be seen in Table 6, controlling for intelligence, by partialling out the effects of intellectual ability from the relationship between field dependence and socialization results in a non-significant correlation of .115 indicating that intellectual ability plays a substantial role in this relationship. Thus, findings support the notion that in our sample field dependence may reflect ability rather than a personality trait. In view of the plausibility of this notion future research should attempt to investigate the nature of field dependence and the differentiation hypothesis in the elderly.

Whatever the case, the results fail to support the differentiation hypothesis as outlined by Witkin. Whether this is specific to this type of population or not is a topic of future investigation. The results, however, are consistent with other research in the same area at the University of Manitoba. Both Forsberg (1970) and Schludermann and Schludermann (1974) failed to find any significant relationships between field dependence and numerous personality

measures in the younger age groups. The differentiation hypothesis should be re-examined in view of the numerous negative findings.

Age Differences in Intellectual Ability

Simple one way analysis of variance was used to demonstrate age differences in intellectual ability. Individuals were placed into three groups according to age; 68 and under, 69-78 and 79-88. The age groups were chosen so as to have approximately equal subjects in each group. The results of the analysis of variance can be seen in Table 7. The F ratio of 4.34 is significant at the .01 level. Supplementary correlational analysis between age and CPM of -.23 is also significant at the .05 level.

It seems then that intellectual ability of the type measured by CPM decreases with age within the age range of this study (between 55 and 88 years) (see Figure 1). Note the decline in a nearly straight line function throughout the age range studied. It will be recalled that the CPM is a non-verbal test of "clear thinking" and is equivalent to performance scores of other tests. As such, results are well within the realm of previous studies on age differences in intelligence. Studies by Foulds and Raven (1948) and Foulds (1949) using the PM have shown that intellectual ability decreases until about 60 years of age. Other studies (Wechsler, 1955) have shown that performance scores decline with age until about age 70. Studies on age differences typically used one group for old people. Only limited information is then available on age differences within old age. Wechsler, 1958, and his age ceiling is 74). This study

TABLE 7

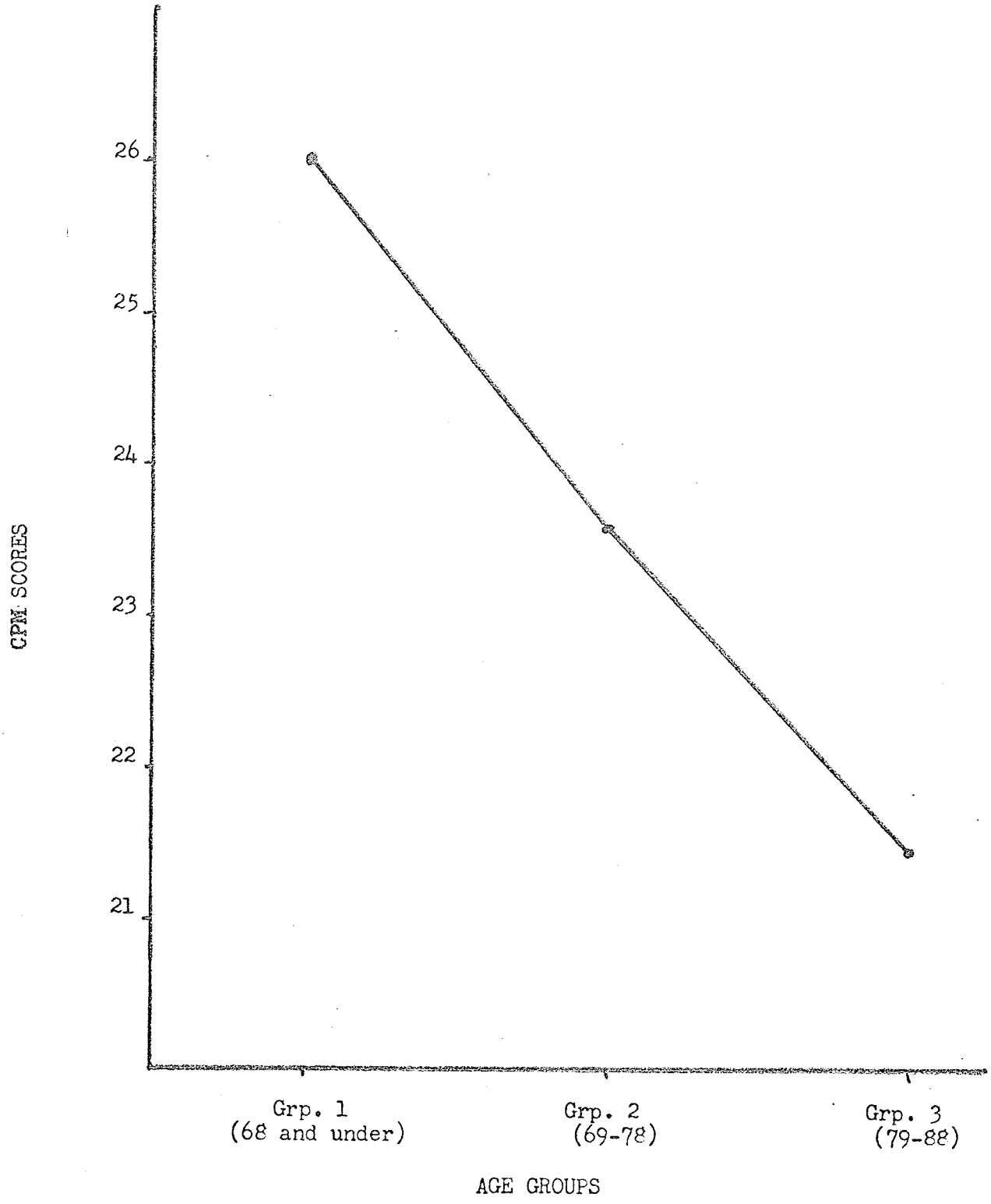
Summary of One Way Analysis of Variance for Age Differences for CEFT and CPM

	MS(Bet)	D.F.(Bet)	MS(Wit)	D F.(Wit)	F
CEFT	104.97	2	2551.33	91	3.74*
CPM	124.08	2	2601.27	91	4.34**

*$p < .05$.

**$p < .01$.

Fig. 1; A graph of age differences for three age groups(Grp. 1- 68 and under, Grp.2- 69-78, Grp.3- 79-88) on CPM performance.



then extends findings on age differences up to 88 years of age. Findings are consistent with previous results; a continual decline in a virtually straight line with age.

Schaie (1970) points out that one drawback of the cross-sectional approach is that it confounds age differences with cohort differences. One aspect of cohort differences mentioned is the level of education of different generations. In an attempt to check whether there are differences between generations in education in the present sample, the ages of individuals having elementary schooling or less were compared to individuals with high school or higher educational level using a t-test. As can be seen in Table 8, a t of 0.46 is not significant. It seems then that educational differences between generations do not seem to play a major role in these results.

Previous findings have established that initial ability plays an important role in the rate of decline observed in many studies on age differences (Foulds and Raven, 1948; Foulds, 1949). These investigators used the level of education as an estimate of initial ability. To investigate whether initial ability affects the rate of decline in the present study, the two groups of different educational levels described previously were compared on their performance on the CPM. The resulting t of -1.36 is not significant (see Table 8). It seems then, that initial ability as measured by level of education attained does not seem to affect the rate of decline. The results must be interpreted in a cautious manner since the educational breakdown is an inexact one. Within each group there were great individual

TABLE 8

Summary of t-Test Comparison Between two Levels of Education for Age, Intellectual Ability, and Field Dependence

		Mean	N	S.D.	DF	t
Age	GRP.1 (Elementary and below)	73.34	73	7.016	24	0.46
	GRP.2 (High School and above)	72.25	20	9.86		
CPM	GRP.1 (Elementary	23.15	73	5.37	29	-1.36
	GRP.2 (High School and above)	25.19	21	6.22		
CEFT	GRP.1 (Elementary and below)	14.93	73	5.28	34	-3.23**
	GRP.2 (High School and above)	18.95	21	4.94		

** $p < .01$.

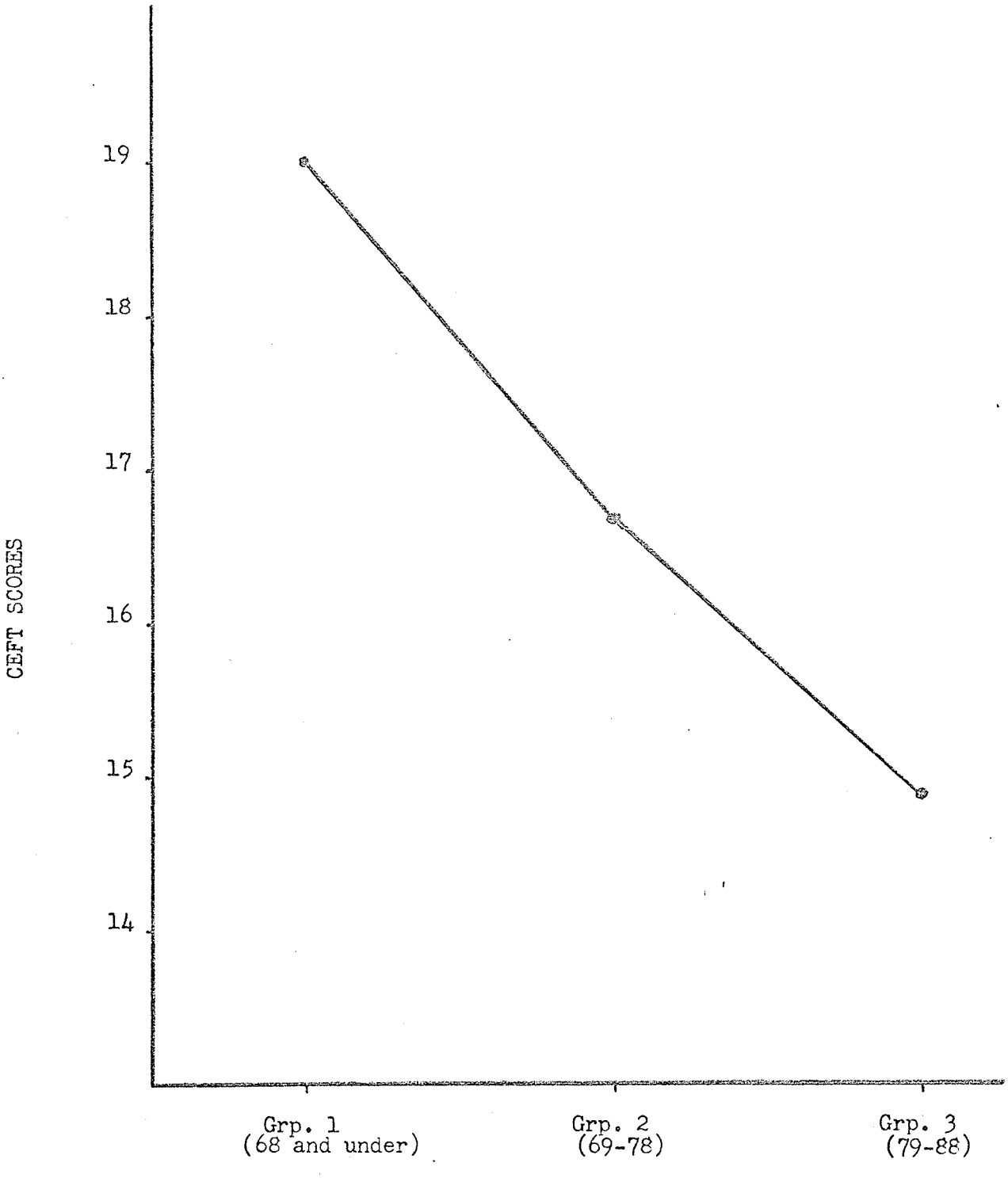
differences. Also a number of individuals received their education in various different countries where the breakdown of elementary and high school may not be a meaningful one.

Age Differences in Field Dependence

Simple one way analysis of variance was used to demonstrate age differences in field dependence, utilizing the same age groups as in age differences in intellectual function. The results of the analysis of variance can be seen in Table 7. The F ratio of 3.74 is significant at the .05 level. Supplementary correlational analysis yielded a correlation of -.27 which is significant at the .01 level.

Thus the results are consistent; field dependence (decreasing scores on CEFT) increases with age within the range of this study (see Figure 2). Note the straight line decline with age (the slope of decline is nearly identical to that of intellectual ability; a slope of 1.37 was found for CEFT, 1.55 was the slope for CPM. Previous studies have shown that field dependence increases with age until about the seventh or eighth decade where it levels off into a plateau (Karp, 1967). Karp suggested that the plateau effect was due to selective survival. The present findings fail to support the findings of Karp. No plateau effect was found and field dependence continued to decline well into the eighth decade. Furthermore, these findings are in agreement with those of Marku and Nielson (1973) who also found an increase in field dependence without plateau effect in both community and institutionalized aged (age range of 69-81). In view of the control group (institutionalized group) in the Markus and

Fig. 2; A graph of age differences for three age groups(Grp.1-68 and under Grp. 2-69-78, Grp. 3-79-88) on CEFT performance.



Nielson study, sampling bias alone cannot be used to explain the discrepancy with the Karp study.

In an attempt to see whether previous level of education is related to age differences in field dependence, individuals of different educational levels (as described previously) were compared on performance on the CEFT. The resulting t of -3.23 is significant at less than .01 level. Individuals who have higher educational levels are more field independent than individuals with lower education. This result may generate two types of explanations. Firstly, field dependent individuals may be those who are having problems at school and thus may drop out early. An alternative explanation may be that school attendance may affect an individual's level of field dependence. This may be a plausible explanation since some of the skills required for CEFT performance (spatial, non-verbal) are usually learned in school. If this were so, field dependence may not represent as stable a characteristic as previously thought. Future research should attempt to clarify this issue.

Supplemental Findings

1. The reliability estimate, based on internal consistency was calculated for the CEFT in a geriatric population (derived from Domain Sampling Theory, see Table 4). The reliability for CEFT was .848 ($p < .01$) and was well within the range of .83 to .90 reported by Witkin et al. (1971) for CEFT in children and also using internal consistency measures.

2. Two methods were used in scoring the CEFT. One method used was to add the number of items correctly answered. The other method was to measure the time taken up to a maximum of two minutes. (It was found that if a person did not get an item by then, giving more time did not meet with success.) Correlation between the two methods yielded a coefficient of -.93 ($p < .01$) indicating that either method may be used.

3. Reliability estimate for CPM (also based on internal consistency) was found to be .677 ($p < .01$) and is not within the range of .70 to .89 reported by Raven (1961) for various groups of elderly persons and children. This may be due to the fact that a different method of estimating reliability (test-retest after a week's interval) was used by Raven. A more plausible explanation may be that the test becomes less reliable the less able the individuals are. The low correlation of .70 reported by Raven was for a group of elderly depressives.

Overall Evaluation and Conclusions

The research reported has both theoretical and practical implications. On the theoretical side an attempt was made to test the differentiation hypothesis in the elderly. The relationship between intellectual ability and field dependence was found to be ,58 with a coefficient of attenuation of .77. The data tend to support the notion that field dependence may represent little more than a factor of general intelligence as suggested by other investigators.

Further support for this notion comes from examining the relationship between field dependence and socialization. Findings were contrary to expectations from the differentiation hypothesis which predicts that field dependent individuals would socialize and participate in activities to a greater extent. The present findings indicate that it is the field independent individuals who are more socially active. The question then arises whether field dependence does not reflect general ability in the aged rather than a personality trait. Future research should concentrate on defining more precisely the role of field dependence in the elderly.

Failure to find support for the differentiation hypothesis may be limited to an institutionalized sample like the present one, or characteristic of all aged. Recent studies at the University of Manitoba also report inability to find support for the hypothesis in younger age groups. In light of these findings and other negative results the differentiation hypothesis needs to be re-examined.

The results on age differences are consistent with previous expectations. Intellectual ability declines as a straight line function within the age limits of this study. These results extend findings on age differences in intelligence to the late 80's from a previous high of mid seventies. There is a similar straight line function of increasing field dependence with age. The results fail to support previous findings of a plateau in the seventh or eighth decade in field dependence. The level of education attained plays an important role in the degree of field dependence the individual

exhibits. At present one is not able to resolve whether this is due to a selective process of the more independent individuals continuing their education longer or whether in fact the length of education affects the individuals level of field dependence.

The practical implications are limited by the inconclusiveness of the results on the differentiation hypothesis and what it means in the aged. If future results indicate that field dependence represents the same concept in the aged then it may have considerable practical implications. One of these, for example, deals with social dependency. Aging is the period of life characterized by "losses", in fact, it is the only period of life where "losses" outnumber the "gains" (Busse and Pfeiffer, 1969). These losses include loss of abilities, loss of financial resources, and loss of friends and relatives through death. It seems reasonable, that loss of social contacts will affect more those individuals who are dependent on them (i.e., field dependent persons) than those who are not and who have never maintained close contacts with people. Slater and Roth (1969) point out that "losses" represent one of the major causes of exogenous depression in the aged. Thus, the ability to screen out individuals that may be susceptible to the effects of losses may be a major step in the prevention of mental illness in the elderly. Once identified, extra effort could be made to replace or substitute new social contacts for those that are lost.

If, on the other hand, research indicates that field dependence represents little more than a factor of intelligence then the

usefulness of this concept in the elderly would not extend past that of intelligence. Both cognitive variables still play a major role in adjustment. The present results indicate that those who scored higher on intellectual ability and those who were more field independent scored higher on the socialization scale. Socialization is one aspect of total adjustment. The relationship between cognitive variables and other aspects of adjustment have also been demonstrated by other investigators. Thus, cognitive variables may serve a useful role in selection of individuals who may potentially have problems in adjustment. Finally, other studies have shown the importance of the cognitive variables in the prediction of illness and death. As such, these variables may represent a very sensitive thermometer of physical functioning of the individual. Perhaps the yearly medical check should include a test of intellectual ability.

Age differences show that field dependence increases with age and that intellectual ability declines with age. In view of the relationship between the cognitive variables and adjustment one would predict that increasing age results in increasing problems of adjustment. This turns out to be the case. Provisions should be made for individuals who are growing old so that adjustment is not such a difficult chore. These provisions may take the form of utilizing large stimuli, well organized and structured material, and more time for designated tasks.

Limitations of the Study

1. A control group living in the community would have enhanced

the findings of this study in the following areas:

a) a relatively disease free group is needed to study the relationship between the cognitive variables and health and institutionalization.

b) a relatively disease free group is needed to evaluate whether the findings are specific to an institutionalized population or characteristic of all old people. This would have both theoretical and practical implications.

2. Adequate measures of socialization are required if one is to circumvent the numerous problems encountered in the present study. Preferably more than one measure should be used.

3. More than one personality trait should be used to evaluate the differentiation hypothesis since results may be specific only to that particular trait.

CHAPTER IX

SUMMARY

The present study attempted to investigate the relationship between field dependence, intellectual ability and socialization as well as age differences for the cognitive variables in a geriatric population. Previous studies have found the field dependence dimension (perceptual style based on ability to overcome embedding context) to relate significantly to scores on intelligence tests (typical correlations were in the .40 to .60 range) in children and adults. No data is available on this relationship in the elderly.

The relationship between field dependence and personality and social variables (as predicted by the differentiation hypothesis) has received less support and has also not been investigated in the elderly. On the basis of the differentiation hypothesis those individuals who are more field dependent should also be more socially dependent and therefore score higher on socialization scales than field independent persons who are viewed as more cold, distant, and individualistic.

Previous investigation on age differences in field dependence have indicated a general trend of increasing field dependency during adulthood and into old age. Within the old age population there is some suggestion that this decline reaches a plateau in the seventh or eighth decade. Sampling bias has been proposed as an explanation for this result. It is expected that field dependence will continue

to increase in the present sample within the age range of this study.

Numerous studies on age differences in intelligence suggest that intellectual ability starts to decline around the mid twenties and continues into old age. Data within the old age population is scarce and does not extent past 74 years of age. It is expected that intellectual ability in the present study will show a decline within the age range of the study.

94 male patients (aged 52-88) from Deer Lodge hospital were given the Colored Progressive Matrices (a test of intellectual ability), the Children's Embedded Figures Test (a measure of field dependence) and a socialization scale.

A significant correlation between field dependence and intellectual ability of .58 ($p < .01$) is consistent with previous findings on other age groups. A coefficient of attenuation of .77 ($p < .01$) supports current views that field dependence may represent little more than a factor of general intelligence.

Contrary to expectations, there was a tendency for field independent persons to socialize more than field dependent ones (a positive correlation of .217 ($p < .05$) was obtained). Indications are that field dependence may reflect more intellectual ability rather than a personality trait in our sample. These negative findings as well as others from the University of Manitoba require a re-examination of the differentiation hypothesis.

Results on age differences support previous findings. Field dependence continues to increase and intellectual ability to decrease

with increasing age within the limits of the age span of this study.

On the practical side, the usefulness of the concept of field dependence in identifying individuals that may be more susceptible to mental illness arising out of stressful aging is discussed. Both the cognitive variables play important roles in the prediction of health and adjustment.

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APPENDIX A

SOCIALIZATION SCALE

PRESENT SOCIALIZING

CONTACTS WITH PEOPLE IN HOME:	RATING	DAILY 5	BIWEEKLY 4	WEEKLY 3	MONTHLY 2	ANNUALLY 1
Spouse						
Children						
Grandchildren						
Relatives						
Friends						
Neighbors						
Friendly Visitor						
Church						
Legion						
Other						

RECREATION AT HOME:

Radio, Records
Television
Reading
Writing
Musical Instrument
Handicrafts
Cards, Games
Outings
Conversation
(telephone)
Others.....

COMMUNITY CONTACTS:

Hospital
Community Day Center
Store
Restaurant
Beer Parlor
Park or Street Bench
Church
Library
Car Ride
Others.....

Sub-total score
TOTAL SCORE