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COGNITIVE CONTROLS AND ADAPTATION IN THE AGED

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COGNITIVE CONTROLS AND ADAPTATION

IN THE AGED

by

GISELLE CYCOWICZ

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1/24/82
Date

January 26, 1982
Date

Edgar F. Borgatta
Chairman of Examining Committee

Herbert D. Salzman
Executive Officer

Dr. Edgar F. Borgatta

Dr. Howard Ehrlichman

Dr. Sam Messick
Supervisory Committee

The City University of New York

Abstract

COGNITIVE CONTROLS AND ADAPTATION IN THE AGED

by

Giselle Cycowicz

Adviser: Professor Edgar F. Borgatta

This research was designed to (a) investigate cognitive controls in middle and old age and (b) study the adaptive significance of cognitive controls as personality factors influencing adaptation in old age. It was hypothesized that (1) less differentiated cognitive control functioning would be found in the older than in the middle age group; (2) higher life satisfaction would be related to more differentiated cognitive control performance and to higher levels of social interaction in both age groups; and (3) an environmental-personality fit effect on life satisfaction and depression scores would be found in both age groups. Fifty individuals in each of two groups, aged 43-60 and 63-89, equally divided by sex, were the subjects studied. They were relatively healthy individuals living in a middle class Brooklyn community. The data for the study included measures of three cognitive controls: leveling-sharpening, scanning, and constricted-flexible control; two measures of adaptation: life satisfaction and depression; and two measures of social involvement: social interaction and psychological involvement. A measure of

verbal intelligence was included for comparison with the effect of the cognitive controls. The results indicated (1) less differentiation in all cognitive control performance in the older group relative to the middle aged group; (2) significant positive correlations between life satisfaction and cognitive control scores and negative correlations between depression and cognitive control scores in the older group. Regression analyses revealed that (3) only in the older group and with the constricted-flexible control did the results support the hypothesized environmental-personality fit effect on lessened depression scores. Although these results must be interpreted with caution because of the possibility of cohort effects, they tentatively suggest some guidelines for programs for the elderly: (1) Information and stimulation should be calibrated to the processing capacity of the older individual at the time they are supplied; (2) degree of social outlets should also be geared to the processing capacity and needs of the elderly individual; while social overstimulation may lead to withdrawal or tension on the part of the individual, disuse and stagnation may accelerate the decline in cognitive functioning.

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CHAPTER I

INTRODUCTION

Cognitive controls have been studied for the past 30 years as quasi-permanent personality structures, which negotiate between and integrate information from the external world and that from the internal world of needs and affect. As such, the controls are assumed to possess an important role in the selection and interpretation of information and in the way the latter enters into broadening or narrowing the person's life space. The seminal work in the area has been accomplished by Klein (1954) and his followers: Gardner, Holzman, Klein, Linton and Spence (1959); Gardner, Jackson, and Messick (1960); Gardner and Long (1960a, 1960b); Gardner (1962); Wachtel (1972); Wolitzky and Wachtel (1973); Santostefano (1964, 1969, 1977, 1978), and their structures labeled cognitive controls. A number of cognitive controls have been studied by these researchers.

A parallel stream of research emanated from Witkin Dyk, Faterson, Goodenough, and Karp (1962); Witkin (1967); Witkin, Goodenough, and Oltman (1977); and Kagan (1970). The structures of these researchers were named "cognitive styles."

Both sets of investigators established important relationships among the control dimensions and various personality variables, e.g., intellectual abilities,

defenses, learning, memory, self-nonsel self differentiation, and in the case of Witkins' style, field articulation, even physiological differentiation.

It was found that people show individual differences in their typical performance on cognitive control measures (e.g., tests of perception, attention deployment) and that their scores on these will fairly reliably predict performance on some other variables mentioned above.

An individual's adaptability was found to be related to his ability to shift controls between levels (Santostefano, 1978). Adaptiveness, according to the above, is manifested when under an atypical situational demand a person shifts from his typical level of cognitive functioning to a higher or lower level. This ability to shift was termed "plasticity" by Santostefano and was thought to be determined by factors like constitutionally given temperament, activity level, sensory threshold, etc., as well as by the nature of the individual's previous life experiences. The person's life experiences are believed to have a role in molding the nature of his cognitive control pattern through his repeated adaptation and readaptation to the life situation.

Santostefano's model of cognitive development proposes that:

The cognitive control functioning of a given individual (in terms of each control principle) is represented by a single level of that continuum and by a range of levels. The single level determines the particular organization . . .

of the individual, i.e.: a stabilized structure . . . modified slowly by the process of long term adaptation. . . . The range of levels defines control principles through which a person temporarily moves (either regressively or progressively) as he deals with relatively brief changes that are for him unusual. (p. 345)

In spite of all the theoretical interest in the cognitive controls, it will be demonstrated in the literature review that there is virtually no systematic attempt to look at the lifespan pattern of the controls, and even fewer efforts to elucidate the adaptive nature of these, by relating them to extrinsic criteria. Santostefano (1978) and Wachtel (1972) pointed out the need to clarify the conditions under which cognitive control shifts occur and the necessity to assess the nature of these shifts. The distinction between competence and performance in the shifts (Bearison, 1974) needs to be kept in mind as well. Furthermore, the adaptive significance to the individual not only of his performance in single cognitive controls but of certain patterns among a number of cognitive controls in terms of degree of differentiation in each control, is to to be explored. Similarly, the utility of one arrangement of controls (or style) over another to the individual begs to be clarified.

In another quite active source of research, one dealing with the elderly, we encounter observations related to the physiological, physical, and social changes to which the aging person is expected to accommodate. The continual changes at times result in serious psychological

consequences: lack of satisfaction, reduced self-esteem, reduced social contact and, in many cases, withdrawal from activities to various degrees. At times even continued or increased social interaction results in dissatisfaction. In a number of studies, which attempted to resolve the life satisfaction question as it relates to activity vs. disengagement (the two constructs assumed by different investigators to be implicated in the capacity to adjust to old age), a sizable relationship was found between social role activity and satisfaction (Maddox & Eisdorfer, 1962; Neugarten, Havinghurst, & Tobin, 1968; Neugarten, 1973; Havinghurst, Neugarten, & Tobin, 1968; Havinghurst, Munnicks, Neugarten, & Thomae, 1969; Larson, 1978). Yet the role activity index did not explain fully life adjustment patterns; most of the investigators concluded that a personality factor was implicated in the interaction between activity level and life adjustment.

The assumption that underlies the present study is that cognitive controls, based on their role in adaptation, as was mentioned above, will also have a significant role in predicting an individual's adaptation to old age.

The present study was designed to accomplish two goals: (1) to extend the investigation of selected cognitive control principles to a middle aged and an aged population, and (2) to examine several measures of cognitive controls and other personality variables as factors in adaptation to life in an aged population. Degree of

adaptation will be measured by the Life Satisfaction Index (Neugarten, Havighurst, & Tobin, 1961) and the Zung Self Rating Depression Scale (Zung, 1967).

A fairly new construct, termed Referential Competence (Bucci & Freedman, 1978) was shown to be negatively related to depression (Bucci & Freedman, 1980, in print). The construct was described as a process of linking a precept (a color strip, e.g.) to a word (as measured by Card II of the Stroop Color Word Test), and as having pervasive regulatory effects. This construct was investigated in the present study to determine its role both in the cognitive controls and in life satisfaction.

CHAPTER II

LITERATURE REVIEW

Theoretical Framework

The present study was based on the premise that a limited number of fairly stable personality structures, variously called cognitive controls and cognitive styles (depending on the investigator or on the generality or specificity of their influence in the personality), exert an influence over a wide range of behaviors as a person encounters reality (Bieri, 1971; Gardner et al., 1959; Gardner et al., 1960; Wolitzky & Wachtel, 1973; Gardner, 1962). As stated by Gardner et al. (1959):

Presumably, these dimensions concern modes of coping with particular situational frameworks of task, stimulus constraints and intentions for which the modes are especially relevant and suited. They manifest themselves through perceptual, recollective and other functions. To emphasize their orientation toward reality and environmental structures we have thought of such organizational tendencies as adaptive controls, and of their behavioral consequences adaptive solutions. (p. 1)

Psychological research returned to the study of the cognitive processes with a big spurt in activity in the late 1940s after a long period of rejection of "mental" activities as a legitimate topic of investigation. Rather than the formal aspects of cognition, the "how much" of past cognitive research by Galton, Wundt, Fechner, for example, the interest this time turned to the functional aspect, the "what does it do for the individual." For some

investigators, personality structures became the focus of study; they were believed to explain man's ability to perceive order and understand regularities when facing a world which is uncertain, complex and inconsistent in many ways. The new trend in the research of cognitive controls or cognitive styles was to focus interest on laws of perception in the perceiver, rather than the stimuli alone, and came to be known as the "New Look" in perception and cognition. (For a more thorough review of the history of cognitive control research, see Kagan and Kogan, 1970; and Wolitsky and Wachtel, 1973.)

Cognitive controls are conceived as "intervening variables that define principles by which motoric behavior, perception, memory and other basic qualitative forms of cognitive functioning are organized as the individual coordinates himself with his environment" (Santostefano, 1978). The focus in cognitive control research is to establish how cognitive mechanisms serve the individual in his effort to manage, regulate and adapt the environmental information to his needs and motives.

Santostefano (1978) attempted to integrate concepts of cognitive psychology with biodevelopmental and psychoanalytic principles. To this end he used cognitive controls as constructs in behavioral assessment and treatment:

What does an observer see when peering through this lense [that is formed by cognitive, developmental and psychoanalytic principles and observations]? He sees a person engaged in purposeful cognitive activity--regularing body tempos,

scanning, selecting, avoiding, remembering, organizing, conceptualizing--all behaviors that shape and direct information, including feelings and needs, permitting the person to maintain an active, purposeful, adaptive balance between information from external and internal sources.

Encounters between cognition and environment produce control mechanisms that facilitate the selection, avoidance or rearrangement of stimulation, in order "to create a 'fit' between the individual's cognitive apparatus and his environment. This fit is presumed to foster adaptation and further psychological growth" (Santostefano, 1978, p. 100).

The term "cognitive control" has been used synonymously with "cognitive style" by some investigators. However, Santostefano (1978) clarified the distinction, indicating that the two terms are not to be used interchangeably.

Cognitive Styles: Witkin and Kagan

Cognitive style, according to Santostefano (1978), was the designation given by Witkin et al. (1962), Witkin et al. (1977), and Kagan (1970) to their constructs; field dependence-field independence and analytic-global categorization, respectively, presumably to denote the stylistic character of their construct in contrast to ability. Gardner et al. (1959), on the other hand, refer to style as an arrangement of controls within a person, the combination of which may have consequences for the person not deducible from individual controls alone. The Gardner et al. (1959) study was an attempt to interrelate several

cognitive controls to observe the patterns of the relationship, i.e., a "general style."

Thus, it was felt that although levelers may seem "passive" on the Schematizing Test, it is not warranted to conclude that the same persons will be equally passive on other cognitive control tasks. A more complete understanding of a person's cognitive behavior would require information concerning his position relative to all control principles called into play. Gardner et al. (1959) clustered persons with similar patterns on several cognitive control tasks, to see whether clusters more than individual cognitive control performances would have predictive power for performance on a Personal Inventory. Some homogeneity was expected in members of a cluster. The hypothesis was confirmed only for the female clusters: they showed more consensus to 234 statements of the inventory on a variety of topics than subjects similar in their position to single controls ($p < .02$). It should be noted that the clusters consisted of 3 to 5 subjects. At best, then, this finding should be taken as a clue to the utility of further investigation of the predictive power of the configuration of cognitive controls in a person, rather than attempting to predict behavior based on single principles. In general, in correlational and factor-analytic terms, the measures of the individual cognitive controls were found to be independent of each other in an adult population, with low correlations between them (Gardner et al., 1960).

This is not quite so with children. Santostefano (1978, p. 186) found in the factor analysis of cognitive control scores of normal public school children that measures of cognitive control contributed in a minor way to measures that primarily defined another cognitive control. Factors loaded in a direction which indicated a consistent relationship among the controls: broad extensive scanning was related to ignoring irrelevant information (flexible control); flexible control was related to maintaining differentiated memory images (sharpening); and sharpening was related to employing many categories on the Object Sorting Test. In other words, a more highly differentiated performance on one cognitive control was found to be related to similar performance on another cognitive control task. This was not so with the factor loadings of the orphaned and brain-damaged children's scores. In orphaned and brain-damaged children, narrow scanning was found together with flexible control:

If the public school children are considered, for discussion's sake, to represent no unique vulnerabilities in coping with information demands, they can be said to use a style that combines broad scanning with ignoring both peripheral and contextual bits of information. The styles of the public school, orphaned, and brain-damaged children, then, differ in unique ways when aspects of focal attention and field articulation are combined to cope with the environment (Santostefano, 1978, p. 187).

The contradictory findings from the two populations (children and adults) with respect to relationships between cognitive controls lead one to wonder why there is more

homogeneity in the styles of children than in the styles of adults. One could speculate that changes in the cognitive control patterns in response to adaptive requirements during the process of maturing tends to bring about diversity in patterns. Santostefano brought this out in saying that various compromises or modifications in a cognitive control are employed in terms of the developmental ideal (the differentiated end of the cognitive control) when individual cognitive controls combine to form a style. This is especially so in pathological development, but may also occur in normal life-span development. This compromise is believed to serve the "unique psychological vulnerability" of the person. Thus every combination of cognitive controls is adapted by the person to suit his needs, just as defenses in the conflict area will be adapted to serve specific needs of the individual. It also follows that no value judgment can be made with respect to a style unless the adaptive value of it to the individual is considered.

Since there are no data available on cognitive control styles and their adaptive utility in the aged, one of the aims of the present study was to observe this pattern and analyze it in terms of its utility for life adjustment.

Gardner et al. (1960) correlated and factor analyzed several cognitive controls with tests of different intellectual abilities to see whether these might be subsumed by a style. Only the field articulation factor

had loadings of ability measures (flexibility of closure and spatial relations). The other control dimensions seemed unrelated to intellectual abilities.

In this work, "cognitive control" will be used to designate individual controls in keeping with the followers of Klein (1954), i.e., Gardner et al., 1959; Gardner et al., 1960; Gardner and Long (1960a, 1960b); Gardner (1962); Santostefano (1964, 1969, 1978).

The cognitive control research was guided by an effort to add research on perception to the study of personality. Motivational and defensive processes as well as roles of conscious and unconscious factors in perception were examined (Klein, 1954; Gardner et al., 1959; Wolitzky & Wachtel, 1973).

Two different streams led to the present state in cognitive control research. Witkin's group (1967) started in the 1940s with the exploration of perception of the vertical. Without the guidance of any theory, the group discovered individual consistencies in the perception of the upright, which Witkin conceptualized as the cognitive style of field dependence-field independence. This led to the development of measures like the Rod & Frame Test and the Embedded Figures Test which are in extensive use today. It also led to the proliferation of studies relating field dependence-field independence (or field articulation, as the style has come to be called) to a great number of variables (Witkin et al., 1962; Oltman, Ehrlichman & Cox,

1973; Witkin et al., 1977). Since the stylistic tendency of field dependence-independence was found not to be limited to perception but was congruent with intellectual and other psychological processes, Witkin and his colleagues posited a broader, "articulated-global cognitive style," which they believed subsumed the perceptual style, along with an ever-growing number of variables. These still dominate the cognitive structures literature today. Aside from conceptualizing a global differentiation hypothesis, no serious attempt was made by Witkin's group to integrate their construct into a comprehensive scheme of personality functioning.

Differentiation designates a system which is aware of more distinct self-nonsel self boundaries, both externally and in feeling, and has more differentiated psychological and physiological functions, i.e., hemispheric laterality (Witkin et al., 1977). Differentiation is measured by a Draw a Figure Test (Witkin et al., 1962) and scored by the degree of differentiation exhibited by the number of distinct body parts the person draws. It is to spotlight the experience a person has of his body in contrast to the other tests which tapped his experiences of "out there."

The differentiation hypothesis was based on Werner's developmental principle of increasing differentiation and hierarchical integration of the maturing organism. This hypothesis indeed seems to fit many of the findings of field-dependence studies; however, as Santostefano (1978,

p. 99) observes, the same hypothesis "can be used as a way of viewing all behavior." The term "differentiation" will be used in this work to denote a more mature level of cognitive control functioning.

Kagan (1970) and his coworkers accidentally discovered that people based classification of pictures of persons on different dimensions. A large segment of the subjects grouped the pictures on the basis of "a shared objective element" that was a component part of the total stimulus, e.g., "these three men go together because they have no hair." These subjects were called "analytic" because the classification involved the differentiation of a set of stimuli into a subcomponent. Others preferred to classify the pictures on the basis of "abstract-inferential" characteristics or "thematic" ones. It was found that these various "conceptual styles" of categorizing (the analytic or the non-analytic) entailed different behavioral characteristics. The person who preferred the analytic concepts was more intelligent and more independent. He also was concerned with intellectual mastery and with social recognition. The results of a number of studies indicated that two fundamental variables produced analytic categorization: reflection and visual analysis.

Kagan and his colleagues discerned two stable stylistic dimensions upon which individuals were distributed and which had an effect upon the conceptual style of analytical-abstract, inferential or thematic classification.

The two dimensions are reflection-impulsivity and visual analysis. Reflection is an index of the person's ability to delay a response in the process of searching for an alternative in a problem-solving task. The test to measure reflection-impulsivity is the Matching Familiar Figures Test (MFFT). A great number of behavioral variables were correlated with reflectiveness, e.g., children who are reflective were found to use better strategies in problem solving and were found better in inductive reasoning than their impulsive counterparts.

Visual analysis, the second dimension, describes the person's tendency to analyze complex stimuli into component parts. It is measured by a set of complex designs that contain a background pattern, a figural component and elements which comprise the figural component.

The two dimensions are believed to be fundamental dispositions independent of each other but both to be heavily implicated in classification style, which in turn underlies other information processing activities.

Both Witkin and Kagan used correlational studies to relate the measures of their principles to a wide array of independent situations without any guiding theoretical framework. The cognitive style model seemed to demonstrate that an underlying consistent style of cognitive functioning is fundamental to many psychological functions. The concepts took on the properties of a trait, rather than individual cognitive mechanisms serving in specific

stimulus situations, which is characteristic of cognitive controls. These will be discussed next.

The Menninger Group

The seminal work of the second stream of research in cognitive structures, namely in cognitive controls, began with Klein's studies in the subjective aspects of cognition (Klein, 1954). This research was continued at the Menninger Clinic by his co-workers (Gardner, Holzman, Klein, Linton, & Spence, 1959; Gardner, Jackson, & Messick, 1960; Gardner & Long, 1960a, 1960b; Gardner, 1962). The present study will be using the cognitive control constructs as variables.

Klein's formulations used psychoanalytic theory as their basis utilizing the structural view of personality for one (e.g., primary and secondary process structures and defenses) and behavior as a "self-regulative, dynamic system, with ego mechanism of defense which attempt to bring impulses into harmony with environmental limitations and opportunities and to organize the experiences of an individual, giving them a unique consistent stamp (i.e., personality character)" (Santostefano, 1978, p. 100). The major theoretical thrust for Klein's work came from the theoretical advances made by ego-psychologists Hartman and Rapaport (1961) who had developed the notion of a "conflict-free" sphere of the ego, i.e., secondary process functioning. According to this view, the cognitive mechanisms

serve the individual as instruments of accommodation and adaptation between internal needs and external conflicts. The interplay of the cognition with the environment influences the emergence of control mechanisms, which serve to choose and adapt stimulation, so that the individual's apparatus fits his environment.

The questions asked by this group of researchers were related to the purpose of these controls, to the environmental conditions under which they operate and to how many controls could account for the range of functioning an individual is faced with.

In the past 30 years a number of cognitive controls have been studied. They do not represent the whole range of principles that might be operating on an individual's cognitive faculties, though they constitute an important aspect of adaptation. Some of the cognitive control dimensions studied by the Menninger Group are scanning-focusing, leveling-sharpening, field articulation, tolerance for unrealistic experience, and equivalency range. Of late the body-image-tempo regulation control was developed by Santostefano (1978).

Several control principles have been found to be quite independent of each other in an adult population, but not so in children (Gardner et al., 1959; Santostefano, 1978).

In the present study, three cognitive control dimensions are to be studied. The dimensions and the rationale for their choice will be described below.

Cognitive Controls

A brief description of the three cognitive controls to be studied here follows. The dimensions are: leveling-sharpening, the scanning control, and constricted-flexible control.

Almost all of the studies in cognitive controls employed young adults as subjects, until Santostefano undertook to investigate cognitive controls in children (1964, 1969, 1978). No systematic studies were done to extend the research to an adult or aged population.

In keeping with the critique of Wolitzky and Wachtel (1973) that using only one task to measure each cognitive control adds task-specific error to other errors, an effort will be made in the current study to use more than one measurement for each cognitive control. There will be a limitation in the present study with respect to the number of controls investigated as well as with respect to the number of measures used because of the type of population studied, i.e., a middle aged and elderly group. Consideration had to be given to the length of the testing session which the stamina, attention span and lifestyle of the elderly will allow. In studying children, Santostefano (1978) was faced with similar limitations. He was led to construct alternate measures because the traditional tests seemed inappropriate for the population he studied. In addition, single measures were used by him for each cognitive control principle to avoid fatigue and

boredom in his subjects.

In the present study, Santostefano's versions of some of the tests will be used, i.e., for scanning control the Scattered Scanning Test, and for leveling-sharpening the Leveling-Sharpening House Test and the Aggression Test (Santostefano, 1978). These tests will be used in preference to the traditional tests used on adults both because they are deemed more appropriate for the age group studied and in order to compare the patterns of cognitive control functioning of the adult population with that of children whom Santostefano (1978) studied.

Leveling-Sharpening

Gardner et al. (1959, p. 3) chose not to use an earlier description of leveling-sharpening as "systematic changes in memory traces," as the latter had been referred to in studies on the alterations in rumor; instead they defined leveling-sharpening as "modes of organizing a sequence of stimuli, leveling implying a low level of articulation in a sequence of stimuli, whereas sharpening a high level of articulation."

The results of factor analysis of the Gardner et al. study (1959) indeed revealed that leveling-sharpening was relevant to situations involving temporal patterning of stimuli; this was consistent with their conception of leveling-sharpening. This cognitive control was not found to refer to discrimination of differences, but rather to "differentiation in memory organization as a function of

the extent to which successive stimuli assimilate to each other" (p. 100).

Santostefano defined leveling-sharpening as "the manner in which an individual perceives and makes adaptive use of information that remains stable and also changes over time. . . . Some individuals . . . merge new information with memories . . . they construct relatively undifferentiated memory images of ongoing experiences [levelers]. Others tend to maintain discrete impressions and memories over time [see Cognitive Controls and Attention, below] and to differentiate present information from memory images of past information; thus elements do not lose their individuality over time [in sharpeners]" (Santostefano, 1978, p. 102).

Santostefano repeatedly used the concept "construction and maintenance of differentiated memory images" as the process involved in leveling-sharpening (pp. 102, 127, 455, e.g.). He did not elaborate or define memory image, but from his context "image" can be understood as a broader memory configuration, a "Gestalt" in the mind of the individual.

Since Gardner et al. (1959) used a Kinesthetic Time Error Test (a set of weight-judging tasks) as one of their tests for leveling-sharpening, it is easy to understand that they could not refer to the process as dealing with a memory image. In contrast to that, Santostefano (1978) and the present study employed only visual tasks, and the use of

"image" appears appropriate. It seems that the concept of "patterning of stimuli" in a visual medium is not inconsistent with the concept of a memory image. The latter is similarly not inconsistent with the earlier views of leveling-sharpening, which Gardner et al. chose not to use, namely, "systematic changes in memory traces." The latter concept was formulated by researchers (Carmichael, Hogan & Walter, 1932; Allport & Postman, 1947, as reported by Gardner et al., 1959), in dealing with an auditory memory trace, namely rumor.

In the present study Santostefano's definition of leveling-sharpening, namely, "the construction and maintenance of a memory image," will be employed.

Traditionally, the main task used to measure leveling-sharpening has been the Schematizing Test. It consists of a series of squares projected on a screen to be judged by the subject in sets of five. The subject sees five individually projected squares, first in ascending order, then twice in random order, for three seconds each time. Without interruption, after the three projections, the smallest one is removed and a new square substituted, larger than any previously seen. Thus the sizes of the squares in the sets gradually increase as the smallest square is removed and replaced with one larger than the largest in the set. Assimilation, or leveling, is manifested when the subject fails to keep pace with the

increase in size (Gardner et al., 1959; Gardner et al., 1960; Wolitsky & Wachtel, 1973). Some subjects (levelers), for example, judged a 13-inch square to be only 5 inches (Gardner & Long, 1960). Ranking accuracy and two increment error scores were derived from the test by Gardner et al. (1959), but subsequent investigators (Gardner et al., 1960) used one increment error score since the two increment errors correlated .84 for women and .90 for men. In the Gardner et al. (1959) study, a separate leveling-sharpening factor was obtained only for the female subjects.

A kinesthetic time error test was used in a judgment task using weights as well. (For a detailed report on the various measures, see Gardner et al., 1959.)

Santostefano (1978) constructed several leveling-sharpening tests. The Leveling-Sharpening House Test will be used in the present study. Some validating data of the instrument will be presented below.

As is true of most of the cognitive control principles, leveling-sharpening has been studied extensively to clarify the process that characterizes it. At the same time, studies had been conducted to learn how these processes are involved in other functions. Results from some of these studies provide supportive evidence that the leveling-sharpening dimension is a relevant factor in a serial learning task and in recall of clearer memories (Gardner & Long, 1960b). Gardner et al. (1959) report repressors (identified by various Rorschach indicators) to

be predominantly levelers. Eight of the 30 men in that study used repression as a principal defense. Six of these were in the leveling half of the index based on ranking accuracy and increment error scores. In the women, 11 out of 30 used repression as a defense. Nine out of these were relatively extreme levelers ($p < .03$). Eight of the 11 showed low ranking accuracy ($p < .125$) and 9 had high increment error scores ($p < .05$); both scores are leveling indices. In a psychiatric population, sharpening was found to be related to paranoid symptoms in schizophrenics, while leveling was related to a less differentiated schizophrenia (Hirschfield, 1975). In neurotics, sharpening related to obsessive symptoms. The expectation of a relationship between hysteria and leveling (extreme repression) was not confirmed in this study. The usefulness of the schematizing test as a possible diagnostic tool was demonstrated.

Santostefano conducted extensive studies to validate several cognitive control principles. He factor analyzed arrays of scores of school children for construct validation. With the Leveling-Sharpening House Test (LSHT), as described in detail in Chapter IV (Instruments), two independent factors emerged several times. One concerned the degree to which a global vs. a differentiated memory image was obtained by the child. This factor was revealed in the first stop score and the number of correct changes, with factor loadings of .91 and -.92 in the two scores. The

second factor concerned the maintenance of unstable and fluid vs. stable constructions of memory images, with loadings of .97 by each score: (1) the number of incorrect changes perceived in the information contained in the picture, and (2) the number of incorrect changes in information not contained in the stimulus material (fabulation). Both factors seem to satisfy the definition of leveling-sharpening.

Some convergent and discriminant validation of the LSHT was obtained by Gunnoe (reported by Santostefano, 1978) in a factor analytic study, in which Piagetian tasks, some neurological tasks and a standardized test of mental maturity were tested along with cognitive controls. The Piagetian task of conservation of substance loaded on the leveling-sharpening factor (LSHT). The loading was .38 of the conservation in contrast to .78 and $-.57$ for LSHT scores. The underlying process in the conservation task was thought to be the maintenance of a clearly differentiated memory image of the size of clay before it was deformed into smaller balls. Clarity of a memory image is one of the features attributed to the leveling-sharpening process. The California Test of Mental Maturity Delayed Recall loaded on the leveling-sharpening factor $-.36$. This loading corroborated the Gardner and Long (1960) finding referred to above in that it implicates leveling-sharpening in the process of constructing and maintaining a clear memory image. Immediate recall did not load on the factor

presumably because it involves a different process than delayed recall or leveling-sharpening.

Criterion-related validity studies with the LSHT on school aged children involved correlations with intelligence tests (the WISC and Otis Lennon Mental Abilities Test), with personality tests (test anxiety and achievement motivation) and SES. The relationship between masculinity and femininity in college students was obtained as well (with the Gough Femininity Scale).

No significant correlations were expected between the LSHT and the Otis-Lennon MAT and the WISC, nor were any found to a significant degree (on 84 hospitalized children aged 4-17). However, in a factor analytic study employing cognitive controls and WISC scores on the same children, some WISC Subtests loaded to a minor degree on certain cognitive control factors, e.g., the WISC Vocabulary Subtest score loaded on a factor defining the field-articulation principle (the constricted-flexible control) and the Information Subtest scores loaded on a leveling-sharpening factor. These findings indicate that attending to irrelevant information is associated with low vocabulary scores and, in the case of Information, that a high fund of information is associated with a tendency to maintain stable images in hospitalized children.

In general, though, cognitive controls emerged virtually unchanged as separate factors when the WISC scores were added to the cognitive control scores. The

WISC scores for the most part appeared as separate factors (Santostefano, 1978, p. 229).

A social deprivation index was correlated with various leveling-sharpening scores obtained in 5th grade boys by Garrity (see Santostefano, 1978). Significant correlations were found ($r = -.52$, $p = .01$) between the two measures. It was speculated that lack of stimulation experienced by the deprived children tends to produce global fluid memory images. The suggestion of a unique effect of the environment in relating present to past images is interesting, but the explanation needs further verification. One could just as easily argue that in the homes of deprived children there is at times overstimulation. In that case it could be said that leveling is an adaptive process to level information to some fantasized past memory. This relationship needs to be clarified.

In the same study, test anxiety was found to relate significantly with LSHT scores ($r = .34$, $p < .01$), suggesting leveling-sharpening to be a factor in the management of anxiety. The mechanism is not clear. An interesting relationship was found between masculinity and femininity and leveling-sharpening (using the LSHT and Gough Femininity Scale) on 45 college students, 22 males and 23 females. The study revealed that for males, a higher degree of masculinity was related to sharpening and a lower degree to leveling ($r = .30$ to $-.43$, $p = .1$ and $.05$) for different scores of the males on the LSHT. For females the

correlations were not significant but the trend suggested an opposite relationship: a high degree of femininity tended to relate to sharpening of information, while masculine tendencies led to leveling. It seems that a sex role identification syntonic with the gender was seen as leading to more differentiated stages of this cognitive control than a dystonic sex role identification. The causal relationship between unresolved Oedipal issues and cognitive control development is a worthwhile area to be explored.

Consistency in leveling-sharpening studies were reported by Santostefano (1978), using alternate form tests in stress and no-stress situations. The dual goal was to test the instruments' reliability and to observe changes in leveling-sharpening under different conditions of stress (plasticity). One study by Guthrie (see Santostefano, 1978, pp. 373, 374, for the picture and description of the test) used a Leveling-Sharpening Parachute Test, the other a Leveling-Sharpening Hospital Test. Both tests were constructed on the same principle as the LSHT. The Hospital Test was given to three groups of adults, 15 subjects to be undergoing surgery and two control groups: 20 hospitalized non-surgical patients and 11 nonhospitalized males. The two tests (LS Hospital and LSH Tests) were given just prior to the surgical operation of the experimental group, near the hospital bed for the hospitalized patients and outside the hospital for the nonpatient control group. The group differences were in the expected direction.

Leveling as shown on the Hospital Test was significantly higher in the experimental (surgical) group ($t = 2.96$, $p = .01$ between the experimental and the outside group and $t = 1.87$, $p = .08$ between the experimental and the hospitalized controls). The results with the LSHT paralleled those of the Hospital Test. The results suggested a regressive reorganization of the leveling-sharpening control during this type of stress in the direction of leveling of information by the experimental group. The concept of plasticity was given support by this study.

The Parachute Test was administered along with the LSHT on two occasions to 22 parachutists about to jump (experimentals) and 22 (control) parachutists with no plans for jumping. The two tests were given one week before jumping and about one hour prior to jumping at the airport (to the experimental group). The control group took their second tests in their regular environment, one week after the first test.

The results showed that the experimental group shifted significantly toward greater sharpening at the second testing, i.e., towards alertness to information, both on the Parachute Test scores and on the LSHT. The experimentals demonstrated plasticity in their cognitive control functioning under stress. Nevertheless, significant correlation between the two sessions in the LSHT performance was found for all subjects. For the controls, $r = .67$, $p = .01$ and for the experimentals $r = .70$, $p = .01$. The

results of both studies suggested that the LSHT provides a stable measure over a short term, in stressful and normal conditions as well as plasticity in the adaptive direction, depending on the situation.

Test retest reliability over a five-year period was provided by Santostefano. Testing children on five occasions between kindergarten and 5th grade, he obtained correlation coefficients with the LSHT on the order of .60 ($p = .01$) between one year and the next, and lower coefficients when comparing performance in kindergarten with that of higher grades. In another study reported by Santostefano of two administrations of an LS Circles Test over a four-year period, correlations in the .40s ($p = .01$) were obtained in four scores of the LS test. In the second study of two testings over a three-year period, only one score correlated significantly ($r = .37$, $p = .05$). Thus some evidence of long-term as well as short-term stability was found in this cognitive control function with the LSHT and other LS tests.

Gardner and Long (1960a) retested 38 subjects about 22 years old, three years after they had been tested on four cognitive control principles: leveling-sharpening, constricted-flexible control, the scanning principle, and equivalency range. Correlations of .36 ($p < .05$), .45 ($p < .01$), and .52 ($p < .001$) were obtained with the three scores of the Schematizing Test (leveling-sharpening) over the three years. These were the lowest of the correlation

coefficients of all four cognitive control principles. The results offer support to the assumption that cognitive controls are relatively stable features of cognitive organization.

In sum, some of the findings of various investigators were not always consistent with each other. Stability of cognitive controls was consistent, but Gardner et al. (1959) found sex differences in the factor structures, while Santostefano (1978) found no major consistent sex differences in his boys and girls from kindergarten to adolescence. The difference in child rearing practices between the 1940s in Kansas, where the Gardner et al. (1959) studies were conducted, and in the 1970s in Boston, where Santostefano (1978) studied his children, may be a factor in the different results for male and female subjects in the two sets of studies. It is quite possible that the increased focus on relatively equal educational goals for boys and girls in the recent past in the more liberal North helped to promote certain skills implicated in the cognitive control performances of female children.

Santostefano more than Gardner et al. ventured out to correlate cognitive controls with variables without any theoretical guidance.

The leveling-sharpening control was deemed relevant to the study of the elderly because of the widely observed tendency of aging people to dwell on their past experiences. Lewis (1971) found that aging people reminisce more; he

attributed this to an attempt to identify with a time of higher self-esteem in one's life than the present one. Lewis believed with other authorities that remote memory is more vivid than present recall and that "vividness of the past is motivated by emotional needs in old age" (p. 246). The ability of memory to distort positively the past may serve the need to reduce the discrepancy between present self-esteem and an idealized past one. Lewis found that reminiscing and non-reminiscing are consistent characteristics of a person and furthermore that non-reminiscers tend to see the past in negative terms in contrast to reminiscers. He investigated the thesis that reminiscers show a higher degree of consistency between present and past self-concept than the non-reminiscers. He obtained $r = .89$ and $.76$, respectively for reminiscers and non-reminiscers, $t = 2.16$, $p < .025$. He found that "a denial of threat to the self esteem produced a link of the present and past." Lewis also felt that his findings provide support for disengagement theory, as referring back to the past mitigates the difficulty of withdrawal.

Reminiscing, as Lewis defined it, seems to be the real-life counterpart of leveling, i.e., the assimilation of the present to the past. In this view, a certain amount of "disengagement" or "reminiscing" or "leveling" relative to the past is seen as beneficial.

In one of the few studies of cognitive controls on an aged population with a single cognitive control, Warren

and Staines (1974) compared a 14-32 year old group with a 50-90 year old group in leveling-sharpening. The following was found:

1. The mean was significantly higher in the older group (a tendency to level, $\chi^2 = 3.71$ ($p < .05$)). When the older group was divided into decades, no significant variation was noted within the older group.

2. The mean scores of the young levelers and sharpeners (the upper and lower 27% of the scorers) and the older levelers and sharpeners, were significantly different ($p < .01$). An age trend toward leveling was suggested.

3. A correlation of age and increment error was found to be significant ($p < .01$) until age 50; after age 50 no significant correlation was found.

The study indicated that leveling-sharpening studies can be extended to the upper age ranges, but that different performance can be expected in that range.

The Scanning Principle

The scanning principle, called focal attention by Santostefano, denotes the cognitive behavior applied by an individual when a field needs to be scanned, and the properties of this information registered. Individuals on one end of the continuum, scanners, direct their attention broadly to many aspects of the stimulus field, while the non-scanners deploy attention narrowly (see the paragraph on attention, above). In Santostefano's (1978) formulation

this cognitive control contains two component processes: active vs. passive and broad vs. narrow scanning. Since hierarchically the scanning principle is proposed to follow body ego-tempo regulation control, it follows that motility is regulated and integrated in the process of directing attention to a field of information (Santostefano, 1978, p. 339).

To observe directly the scanning process, direct recordings of eye movements had been obtained by Gardner and Long (1962), while the subjects performed size estimation tasks, the traditional measure of scanning (reported by Wolitzky & Wachtel, 1973). The correlations between the various eye movement measures showed positive correlations across conditions, the correlations between the latter and size estimation were low. Similarly, studies on a psychopathological population employing the above measures produced low correlations. Nor was eye movement behavior found to be related to psychiatric classification.

Gardner et al. (1959) used a size estimation task in which a circle of light had to be adjusted to match the size of a standard disc. Overestimation is assumed to be a function of excessive centration, i.e., limited scanning. A low average error denotes a relative scanner. The test was based on Piaget's notion of centration which holds that overdeployment of attention to a circle will produce overestimation as the function of the size of the circle and the duration of centration. Centration is believed to

be an immature cognitive behavior.

Scanning emerged as a factor for men only in the Gardner et al. (1959) study, with scores in size estimation, many distant associations in a Free Association Test and Ranking Accuracy in schematizing loading highly on the factor, among others. Subjects who were relative scanners were slow on the color naming task (Card II of the Stroop Color Word Test). It seems paradoxical that people who are active scanners should be relatively slow in the color naming task. The interpretation was offered that the slowing may have been caused by a "hyperawareness of many elements" in the field (Gardner et al., 1959, p. 85) due to the active internal scanning by the subjects.

This demonstrates that it is difficult to make predictions of interactions among cognitive tasks because speed in one such task may slow down the other.

Santostefano's (1978) Scattered Scanning Test of Focal Attention (SST) attempts to measure the two component processes hypothesized by him to be part of the control: the degree of the narrow or broad scanning, reflected in the total distance in centimeters covered by the sequence of shapes, and the degree of passivity or activity reflected in the number of correct shapes marked on the test in unit time. This test will be used in the present study and will be described in the Methods section.

In the Gardner et al. (1959) study, scanning emerged as the factor with the largest share (12.3% out of 39.6%) of

the total score variance of the correlation matrix for men. No scanning factor was obtained for women. This factor pattern seemed to confirm the definition of the cognitive control principle. Extreme scanning entailed an active perusal of objects and led to the awareness of many objects and their properties. The following are a few of those performances characterizing a high scanning score:

(1) many distant associations (in content) from a stimulus word in a Free Association Test; (2) stable size estimation judgment of a disc, and size constancy in the above; (3) relatively slowed color naming on the Stroop Color Word Test; (4) accurate ranking accuracy of the Schematizing Test. A high degree of awareness of multiple aspects of the object in extensive scanning leads to the stabilization of the object and to sharpening. Surprisingly, the leveling-sharpening factor obtained from the women's scores had no loadings of any scanning scores.

In Santostefano's (1978) studies the factor of the scanning principle, as measured by the SST, emerged clearly in all factor analytic studies. No separate correlation matrices for boys and girls were factor analyzed; therefore no comparison can be made between these and Gardner's factor structures. However, in several separate correlations of boys' and girls' cognitive control scores (leveling-sharpening, scanning, field articulation and categorizing), few correlations indicated a significant difference between the sexes.

In kindergarten boys and girls, rated as typical learners or suspect learners, the SST "number correct" score was significantly different in the typical learners (a mean of 15 for boys and 16.5 for girls; $p = .01$, with $n = 75$ in each group). Suspect learners showed no significant difference. In a later sample a similar relationship was found between boys and girls and typical and suspect learners, with a $p = .05$. In 22 scores used for this study, 4 showed a significant difference in the first year between boys and girls; one score showed two; and the later study showed no significant sex differences at all. No major consistent differences were found from age 5 years to adolescence by Santostefano (1978), in contrast to major sex differences that were found in the adults by Gardner. As with cognitive control combinations, discussed above, which were found different in children and in adults, differences in individual cognitive controls in males and females may crystalize during the adaptation process to life requirements in later years.

The SST and the Fruit Distraction Test were correlated with teachers' ratings of attentiveness and inattentiveness, to pursue criterion-related validity (Santostefano, 1978). The scanning control is defined in terms of breadth of attention deployment. As was predicted, children who were found by their teachers to be most inattentive, produced less mature scores on the SST, and vice versa. Each of the mean differences was significant. The test was

repeated once. In the first year ($n = 52$) $p = .01$ and $.001$; in the next $p = .05$ and $.001$ for the two scores. Thus the hypothesized characteristic of the scanning control was corroborated by an extrinsic criterion.

Gardner et al. (1959) found a relationship between scanning and defenses. The defense of isolation was briefly defined as one "that operates to separate affect from idea so that potentially unpleasant ideas become more tolerable." Whereas repression narrows awareness, isolation broadens it. In order to remove the affective component from thought, isolation produces an excessive emphasis on logic and the spatial and temporal features of objects, and a deemphasis of the affective connotations of the latter.

As was predicted, subjects who manifested the defense of isolation fell into the extreme scanning half of the distribution. Nine out of 30 men showed indications of isolation in their Rorschach protocol, and indeed 8 out of the 9 were extreme scanners ($p < .02$).

Gardner et al. (1959) pointed out that the relationship between isolation and scanning is unidirectional. Isolators may be scanners but not all scanners are isolators.

Gardner and Long (1960b) found test-retest reliability (after three years) of the scanning control to be significant ($p < .001$). Santostefano (1978) found similar level correlations over a five-year period in kindergarten to 5th grade children.

No significant differences in the scanning scores of

high and low SES children were found by Santostefano (1978), but the trend ($r = -.13$) indicated that low SES children tended to perform in a less differentiated manner on scanning tasks.

The choice of the scanning control for the present study was based on the assumption that scanning behavior is a relevant cognitive function in the times of change. Scanning the external environment for clues in environmental demands, to match one's internal organization, may be a significant adaptive process. Harvey (1966) describes adaptation as scanning the environment, assessing and reassessing the means and goals. Adaptation involves the articulation of new alternatives, expanding the boundaries of the system to include previously deviant events. Although this formulation is theoretical, intuitively it seems to implicate a cognitive process which sweeps the environment in broad, active movements.

The Cognitive Control of Constricted Flexible Control

The cognitive control of constricted-flexible control, conceptualized by Klein (1954), was studied by Gardner et al. (1959) and Gardner et al. (1960). In the 1959 study this control did not load as a separate factor, but loaded on the field articulation factor (Witkin's field-dependence-independence). Gardner et al. described the process as "field articulation," i.e., the articulation of the field into relevant and irrelevant parts to be attended

to selectively. Gardner et al. (1960, p. 48) and Santostefano (1978, p. 197) did not find the relationship between constricted-flexible control and Witkin's field articulation that Gardner et al. (1959) found. Both studies found correlations between the two sets of tests to be nonsignificant ($r = .10$ between a Fruit Distraction Test score and the Rod and Frame Test score, and $r = -.13$ between Color Word Test interference and Embedded Figure Test). Santostefano (1978) adapted the term field articulation for this control (the control that was called constricted-flexible control).

The constricted-flexible control is defined as the degree of susceptibility to interference from compelling but task-irrelevant stimuli. The articulated end of this dimension, characterized by relatively fast performance on Card III of the Stroop Color Word Test, defines a person who selectively withholds attention from irrelevant information and is relatively undisturbed by it. A person on the slower end of the continuum is slowed down by directing attention to relevant as well as irrelevant stimuli in the field.

Klein (1954) found that a person's relative stand on this cognitive control dimension determines his ability to cope with need and affect. This was investigated using thirst as an independent variable on a group of subjects preselected for high and low scores on the interference task. Under high-need conditions, the high interference subjects exaggerated their typical size underestimating

tendencies. The subjects low in interference increased their tendency to overestimate size (see Wolitzky & Wachtel, 1973, for a more thorough review). Gardner et al. (1959), like Klein (1954), used an Incidental Recall Test and a Size Estimation Test as well as Color Word Test for the construct. All of the above loaded on the field articulation factors, the Rod and Frame Test loading the heaviest on this factor (.91 as compared to .66 Color Word interference and in the .40s for size estimation). Gardner et al. (1960) found the Color Word Test an adequate measure of the constricted-flexible control (p. 32).

Santostefano (1978) constructed a test, the Fruit-Distraction Test, which parallels to some extent the Stroop test, but has several different interference cards. The test has been used successfully with children, where reading the printed words sometimes posed difficulties; the test was found to be useful with adolescents as well. It seems that the process that the test calls into action fits the operational definition of the field articulation control, i.e., the deployment of attention to or the withholding of it from irrelevant but compelling stimuli.

Santostefano (1978) used the Fruit Distraction Test (FDT) extensively to obtain validation for this construct. In the study mentioned earlier, the FDT too, as the SST, was found to correlate significantly with teachers' ratings of children's attentiveness in the classroom. The inattentive children took more time to name the colors of the fruit on Card II, presumably because they were more

distracted by the interfering stimuli than the attentive ones. Six comparisons of FDT performance and inattentiveness reached significance in two consecutive years of observation.

FDT scores and scores from other cognitive control tasks were correlated with SES indices. Of the ten scores yielded by the correlations, only the FDT interference correlated significantly with the SES ($r = -.50$, $p = .01$). Children who were distracted by interfering stimuli seemed to have come from a lower SES.

In several of the factor analytic studies, field articulation (or constricted-flexible control) formed two separate factors: one with loadings of the SST and two Fruit Distraction Test scores and a California Test of Mental Maturity numbers test. This factor confirmed the hypothesized relationship among various controls, i.e., that the scanning control (the cognitive control believed to be acquired before the constricted-flexible control) appears to be integrated by the constricted-flexible control. Scanning loads on a separate factor, as well. The factor with FDT, SST and the numbers test suggested a relationship between broad scanning, the ability to resist distracting stimuli and math ability.

A second constricted-flexible control factor was defined by a FDT and the Bender Gestalt Test. The loadings indicated that a child who is distracted by irrelevant background colors, draws poorly organized Bender drawings. It

seems that the constricted-flexible control implicates a process involved in the management of context, and figure-ground relation (Santostefano, 1978).

In a factor analysis of cognitive control performance with intellectual performance (using WISC scores), one factor was obtained with loadings of the WISC Vocabulary scores (loading of $-.31$), along with two FDT interference scores ($.62$ and $.58$). The direction of the loadings indicated that attending to irrelevant information is related to a lower vocabulary score and conversely the ability to resist distraction is related to higher vocabulary scores; this relationship is hard to interpret.

In a correlation of cognitive control test scores with 3rd grade Iowa skill scores, the FDT correlated most consistently with Vocabulary ($r = .26$), Reading ($r = .28$, $.31$), Language ($r = .26$ to $.36$), and Math ($r = .24$ to $.39$). Children who ignored irrelevant information showed a tendency to score high on all the Iowa subtests mentioned. The field articulation control seemed to have been implicated in the management of the format, and not the content areas of the Iowa test.

Comalli et al (1962) investigated the Stroop interference effect on a group of 235 subjects aged 7-80. A U-shaped curve was found to describe the interference effect across the life span. In the performance on all three cards of a modified Stroop test the performance was poorest in young children, improved until about age 20-25,

and decreased again with older age. The mean interference times of the 65-80 year old group appeared similar to the mean time of the 10-11 year old; the mean color naming and word reading time of the oldest group were found similar to that of the 15-16 year old group's time. No explanation is offered for the decline in this cognitive activity, beyond noting a "regression."

Gardner and Long (1960b) found the stability (after three years) of constricted-flexible control to be significantly high ($r = .54$ to $.75$, $p < .001$ on the scores obtained).

Santostefano (1978) found the stability of certain FDT scores to be significant ($p = .01$) between kindergarten and 5th grade. The Object Sorting test scores showed the least stability of all the cognitive control scores seemingly because the abstracting ability implicated in the categorizing cognitive control is believed to develop last and may not be stabilized until later than at age 10 (5th grade).

In the present study the Stroop Color Word Test will be used to measure the constricted-flexible control and the first two cards to assess Referential Competence. An alternate form test, the Object-Word Test, will be used as well, to gather reliability data from the present sample.

In sum, the literature revealed certain consistencies (in the process that was thought to define the construct, and the stability data) and some inconsistencies (the factor

structure in the males and females, albeit the samples studied were of different ages). Some of the findings corroborated the definition of the construct, while others need further explication.

Field articulation control is deemed relevant to the study of elderly for similar reasons as is the scanning control. In assessing life goals and means, and meaningful clues in the environment, the cognitive ability to hold images clearly in mind seems to be implicated. As Botwinick (1973), in talking about rigidity and the aging process, said, "Life demands that one reexamine and modify prior patterns by inhibiting some, maintaining others, and overcoming the tendency to act the same way."

Systems Theory

A major assumption of cognitive control is one that underlies most personality research, viz., that of finding general laws and regulatory principles to which an individual responds in his behavior and which determine individual differences between people (Gardner et al., 1959). The goal of cognitive control research is to seek relationships between lower level personality constructs, i.e., individual control principles, motives, percepts and motor responses, and find hierarchic organizations of functions and structures; also to relate other personality variables to these control principles, in order to establish configurations of functions, clusters that might constitute

"styles" (Gardner et al., 1959). For example, cognitive controls with intellectual abilities were studied by Gardner et al. (1960). Positive results emerged relating field articulation with spatial ability and flexibility of closure. Leveling-sharpening was found related to associative memory.

Several attempts have been made to represent the cognitive controls within a larger system. Wardell and Royce (1978) constructed a hierarchical model of cognitive structures; they conceptualized a complex, multitiered model of "cognitive styles" as a class of "integrators" of cognitive and affective traits in personality. Personal meaning lies at the top of this pyramid; sensory and motoric systems at the bottom. Relevant to the present study are the cognitive and affective systems, which presumably transform the information into adaptive representations (unique to the individual), which apply a variety of memory, association, and decision processing. The styles and value systems have a central integrative role and also determine self image and life style.

A different type of hierarchic model was proposed by Santostefano (1978, pp. 339-342) who established in extensive cross-sectional and longitudinal studies the pattern of cognitive control development in children. He found cognitive development to proceed from a global mode in early childhood to a differentiated, articulated and integrated one in the mature individual. He defined

globality and differentiation in terms of self-world relations and modes of functioning (e.g., intellectual activity and drive expression).

The model he constructed consisted of the sequence in which different cognitive controls are assumed to dominate cognitive functioning at a different age of the child. Body control-motor regulation (a cognitive control, developed and tested by Santostefano, 1978) dominates early development and reaches its mature state early; it is followed by the principle of focal attention (scanning), field articulation, leveling-sharpening and, lastly, equivalency range. Each succeeding principle subordinates and integrates the earlier ones. The progression of the development of cognitive controls follows the general cognitive progression of the child, i.e., a cognitive control develops when the child is capable of handling the task denoted by the control. Each succeeding principle in the hierarchy denotes a higher degree of differentiation; leveling-sharpening demands a higher level of differentiation because the activities it includes (constructing and maintaining memory images) are more complex than those of the previous stages, i.e., sampling the environment for information in the scanning principle. This sequence of development was corroborated in the factor analytic studies. The developmental cognitive control hierarchy may be relevant to the present study, in that it may provide the background against which the pattern of various cognitive controls can be assessed during the

aging process. It was predicted that cognitive control development across the life-span would be U-shaped, and some findings provided support of a dedifferentiation in old age (Cicirelli, 1976; Comalli et al., 1962; Warren & Staines, 1974). For more details on this see Cognitive Control and Aging.

Cognitive Controls and Attention

Several cognitive control dimensions have been conceptualized in attentional terms. Scanning (named focal attention by Santostefano, 1978) was described as broad vs. narrow attention deployment for information both in the external environment and internally from memory. Some people focus only on the salient features of the field, while others search extensively even when this is inefficient. Wardell and Royce (1978) described scanning as "deployment of attention intensively and in a focused manner, yet with extensive coverage of relatively incidental aspects of the field."

Leveling-sharpening can also be interpreted in terms of attentional intensity with respect to multiple vs. single features of the stimulus object. Gardner (1962) speculates that assimilation may be due to weak cathexis of the new stimulus; i.e., when the stimulus event is not central in the attentional field due to characteristic unavailability of cathectic energy, leveling might ensue as a typical response mode.

The attentional dimension relevant to the constricted-

flexible control (named field articulation by Santostefano, 1978) is the articulation of attention to irrelevant features of a stimulus in the face of irrelevant but compelling stimuli. Low articulation (constrictedness) is defined by interference (slow reading), i.e., an inability to restrict attention.

Silverman (1964, 1968) discussed deficient patterns of cognitive behavior in schizophrenics in terms of atypical attention deployment (minimal or maximal scanning, e.g., along with minimal or maximal performance on the Rod and Frame Test). Silverman (1964) formulated a mechanism of attention, which restricts the spontaneous deployment of attention in schizophrenics; the authors presented neurophysiological findings supporting the hypothesized mechanism.

Cognitive Controls and Adaptation

Cognitive controls have for the most part been investigated as a theoretical enterprise without real world referents, or extrinsic validation. Field dependence-independence is the one style which has been studied most extensively. The external validations of this style cover a gamut of functions from interpersonal tendencies, intellectual abilities, neurophysiological differentiation to psychopathology. The overall picture of cognitive control research as this relates to real life criteria is found to be disappointing by Kogan (1973). For several cognitive

controls no extrinsic behavioral criteria were sought in spite of the stated "adaptive significance" of the constructs. The course and configuration of various controls within the individual and the implications of the latter have but for a few attempts by Santostefano (1977, 1978), not been undertaken. We do not know, for example, what impact, if any, the patterns of cognitive controls have upon the individual's actual life experience, at any age. Thus the ultimate value and meaning of cognitive controls for the individual need to be questioned (Kogan, 1973).

Santostefano began studying cognitive controls in children in the 1960s when he observed in his clinical work that psychopathology in children was related to cognitive deficits. His research led him to design remedial tasks to restore the deficient areas in the particular cognitive controls.

Santostefano (1977, 1978) argues, referring to the adaptive process, that every cognitive response takes the form of an adaptation or readaptation. One reacts when the equilibrium between one's understanding of a situation and the environment is upset.

The individual faces the environment with an evolved set of personality organization (e.g., perception, cognition, affectivity), while the environment presents the individual with a continuous organization of stimulation. In a typical interaction of the individual and his environment, the organizational readiness of the former and the stimulation

of the latter are relatively suited to each other, i.e., the "psychological structures already available to the individual are suited to handle the confrontation" (Santostefano, 1978, p. 25). When the fit between the two forces is not fully matched, shifting is required on the part of the individual, both to earlier levels and at times to acquisition of new strategies. Environmental context determines which behavior is adaptive.

It used to be believed by cognitive theorists that individual differences in cognitive behavior are distortions caused by needs and conflicts. Present-day cognitive control theory is based on the assumption that deviations from a standard of veridicality need not be ineffective or maladaptive. At times, the suspension of a strict reality orientation is in keeping with an adaptive requirement (Gardner et al., 1959). In the main, a person is seen as adhering to reality orientation (Wolitzky & Wachtel, 1973).

Since the role of cognitive development was seen implicated in adaptation and psychopathology, the source of motivation for cognitive action was looked into by some investigators. Digressing from the earlier psychoanalytic theory of motivation based on drive and needs, Santostefano (1977) postulated a disequilibrium model of cognitive control development, and indeed of motivation, as was implied above. Applying Holt's formulation according to which a "perceptive-evaluative mismatch" is posited as a source of action, an individual compares existing information

with incoming information. "When a discrepancy is perceived between potential and existing information and between the value of each, a mismatch exists, that motivates . . . Holt views a wish as initiated by a cognitive-affective state, something like dissatisfaction, which arouses anticipation of pleasure and/or displeasure" (Santostefano, 1977, p. 56). Thus the cognitive conflict is assumed to possess motive force. The cognitive structures, which evolve in the course of life adaptation, become motivational in character too and enter into causal determination of behavior (Gardner et al., 1960).

A vignette illustrates Santostefano's disequilibrium model of motivation. A child experiences a dissatisfaction, a motivational state of imbalance, for a particular "stimulus nutriment." In this search to satisfy his particular need, he discards a ten-piece puzzle, finding it too complex, and therefore less valued to satisfy the imbalance. A five-piece puzzle satisfies him, but also prevents him from developing higher level differentiation and cognitive organization. This is behavior characteristic of someone who struggles to avoid potentially more complex information, i.e., a child in need of cognitive therapy. Another child, a more normal one at the same age level, may find a ten-piece puzzle unsuited because his organizational complexity dictated a more complex 15-piece puzzle, further widening his existing structures.

In other words, there are two elements in the

match: the present level of organization of the person, and the ego ideal the child has internalized, in which he experiences pleasure in learning and engaging information for the sake of the activity itself, if he is cognitively active and psychologically well.

In the present study, the subjects' degree of social engagement will be assessed as an independent variable and the index of engagement used to see what role it plays in the elderly person's satisfaction with life. It will be used both as a single variable and/or in combination with the person's scores on the cognitive control tests. The example given above of the "cognitive match" of the child's cognitive control level and the toy's complexity could serve to explain the relationships between cognitive controls and social engagement, which are expected to influence life satisfaction in the elderly. Certain cognitive controls (e.g., leveling-sharpening) are characterized by active or passive deployment of attention at the two ends of the continuum of this cognitive control. If a person, for example, whose typical mode is an "active" one, has an opportunity for more active participation in social activities, it will be hypothesized that such a person will experience a better fit between his needs and the environment, and will be more satisfied with life. Conversely, a mismatch will produce a continued cognitive-affective imbalance, manifested in lack of life satisfaction and, perhaps, depression.

Harvey (1962) characterized adaptiveness as flexibility and mobility and as a capacity to be sensitized to changing events. Cognitive control principles are postulated to intervene in alerting the organism to configurations in the field that need to be attended to or ignored for the sake of the individual's well-being.

The individual's capacity to adapt flexibly to a higher or lower level of functioning in response to demands of the environment is especially crucial in older age, when some slowing sets in, due to the person's physiological and physical deterioration. Shifting becomes more difficult, as was evidenced in the various studies on rigidity (Schaie, 1958; Schaie & Strothers, 1968; Chown, 1961; Botwinick, 1973). It will be hypothesized here that the retention of a more active and a more flexible cognitive control pattern in old age will determine in a major way how the aged person will adjust to life.

In view of the adaptive significance of cognitive controls expressed by all researchers, it is indeed surprising that such limited effort to understand the real-life manifestations of the controls was shown. Wachtel (1972) decries the paucity of research that explicitly attempts to investigate the adaptive functions of cognitive controls. Many of the tests seem to measure a desire to perform accurately rather than a tendency to manage information. By being too structured, the tests foreclose the subjects' interpretation of the adaptive requirements of the tasks

and preclude observing a vitally important element of functioning (Wachtel, 1972; Wolitsky & Wachtel, 1973).

Since the above observation was made, there seems to be no evidence of an increased effort to correct the omission. On perusing the literature, only in the area of field dependence-independence and conceptualization do there appear new studies relating the above to extrinsic criteria.

One reason for the dearth of research in the cognitive control area in general may be the complex nature of the measures employed, and the manner of their administration. This is in contrast to field articulation and reflection-impulsivity, which yield a steady flow of publications.

The cognitive control research emanated from a clinical setting and was based on psychoanalytic theory. As a result, the tasks were individually administered. Several tests were employed for each cognitive control principle. Witkin's Embedded Figure Test, which has been widely used by itself to tap field articulation, is a paper-and-pencil test and lends itself to group administration for children and adults. Kagan's Matching Familiar Figures, too, is a fairly simple paper-and-pencil test used widely by itself in correlational studies of reflection-impulsivity.

Beginning in the middle 1960s, Santostefano simplified the cognitive control tests and has been using single

tests for each cognitive control principle in his work with children. The tests, however, are still complex and time-consuming, especially where several cognitive control principles are studied at the same time, like when the adaptive significance of cognitive controls are investigated.

Nevertheless, the fruitfulness of the above work with children was encouraging enough to propel the exploration of a virtually untested population from a cognitive control point of view, the elderly. In the study undertaken here, cognitive control scores with measures of life adjustment will be correlated.

Cognitive Controls and Aging

As was mentioned above, most of the cognitive control research was conducted using young adults or children as subjects. "Where elderly subjects are concerned, one draws a virtual blank" (Kogan, 1973). Even where research is reported in this area, interpretations are offered in ontogenetic terms rather than in cohort or generational terms, even though done in cross-sectional design. For example, Comalli et al. (1962) studied the interference effect on a population of a wide age range. The authors report a U-shaped pattern, with children and older adults performing similarly but suggesting different psychological processes in the two groups. Yet no interpretations are given beyond a general conclusion, that in terms of Werner's

concept of differentiation and hierarchic integration, dedifferentiation and loss of integration occurs. Cicirelli (1976) and Warren and Staines (1974) offered similar, simplistically worded findings of a decline in differentiation.

Again, the present effort is an attempt to gain some insight into the cognitive control functioning in an older adult population; to investigate the course of the three cognitive controls listed above, and observe their pattern with respect to each other.

One final issue of some relevance to the present study is the issue of polarity in terms of value or lack of it.

Witkin and his colleagues feel that in contrast to abilities, where more of an ability is better, performance on cognitive styles tasks entails different characteristics for the individual on each end of the continuum. Both ends may be equally adaptive for the individual. For example, a more analytic attitude characterizes a person who is field independent, whereas a higher level interpersonal approach defines a person who is field dependent.

Similarly, Gardner et al. (1959) and Santostefano (1978) claim that both ends may be adaptive for the individual even though the latter found the development of cognitive controls to proceed ideally toward differentiation. Wolitsky and Wachtel (1973) challenge the bipolar value-view, claiming a societally more desirable status for field

independence. Kogan (1973) resolved the issue of polarity by categorizing the cognitive controls in three groups: (1) based on accuracy vs. inaccuracy of performance (e.g., field independence, constricted-flexible control); (2) based on the value imposed upon one end of the pole, but veridicality of the assessment procedure is not the issue (analytic vs. non-analytic categorization); and (3) a group in which neither veridicality nor value judgment are relevant (Pettigrew's Category Width, e.g.). The relevancy to the above distinctions lies in the question whether they hold across the lifespan. Kogan states, "one may well ask whether cognitive dispositions that were capacities in childhood and stylistic preferences in middle adulthood, again become cognitive capacities in old age." Kogan suggests that identical stimulus arrays may have different psychological meanings at different ages (Kogan, 1973, p. 173). The relevance of this may be that cognitive controls or cognitive styles may supplant intellectual abilities in old age in their function as "capacities to act purposefully and deal effectively with one's environment" (Wechsler, 1952).

Summary on Cognitive Controls

As we have seen, the work that Klein and his co-workers (Gardner et al., 1959; Gardner et al., 1960) began in the early 1950s (and Witkin and his co-workers, and Kagan and his followers) was fruitful in establishing the

existence of cognitive structures specifying distinctions and finding relationships between these and other personality and behavioral variables. Important work has been begun in outlining developmental patterns and in constructing or hypothesizing a developmental hierarchy of cognitive controls (Santostefano, 1978). The adaptive features of the controls have been analyzed (Klein, 1954; Gardner et al., 1959; Wolitzky & Wachtel, 1973; Wachtel, 1972; Santostefano, 1977, 1978) with results indicating the utility of cognitive controls in this domain.

We have also observed that research in the lifespan development in cognitive controls is virtually absent from the literature. Similarly, outside of Santostefano's work in cognitive controls and adaptation (studies using both children and adults), no investigation attempted to use extrinsic criteria to validate the adaptiveness of different patterns of controls.

In view of the interest in tracing the developmental curve into an upper age group and in order to use real-life referents as correlates to cognitive controls, this study will consider aging as the arena in which adjustment to life will be measured in relation to cognitive control performance.

In the next section, a review of some literature on aging, relevant to this study, will be presented.

Aging

The present section will consider the feasibility of placing the phenomenological and psychological aspects of the aging process into the framework of cognitive control theory. Some literature relevant to the aging process and to successful aging will be touched upon. Depression, a widespread phenomenon noted in the elderly in various degrees, will be discussed as a negative index of life adjustment in the present study. Several theories of depression in the aged will be mentioned. Finally, Referential Competence will be described as it is hypothesized to relate to depression and other cognitive functions.

It is a truism that as people age they undergo continuous and serious changes. Some changes occur as a result of interaction with the environment, as the aging person adapts to biological and social events. These changes at times are drastic. They demand reassessment of means and goals within changing contexts and frequently lead to stress, unhappiness, and various degrees of depression.

Frequently, for example, chronic illnesses begin to show up in advanced age. Decreased sensory acuity and a slowing in motoric activity are experienced and lead to reduced motility. A decreased maintenance of vigilance in the psychological area is often observed and may result in higher distractibility to irrelevant information with concomitant difficulty in responding to increasing amounts

of information (Birren, 1970). A loss of self-esteem often accompanies the above experiences. Social forces contribute to the changes as well: people and social institutions withdraw from involvement with the elderly and deprive them of an arena for action by progressively orienting toward the young (Botwinick, 1973). Frequent losses of friends and family is a further source of change that the elderly need to adjust to, and is a source of sadness, thoughts of impending death, and depression.

All of the above lead to an observed narrowing of the social and psychological world. The curtailment of activities and diminished or changed pattern of social interaction, implied in the above, often result in a lessening of responsiveness to external stimuli, turning one's interest inward and toward the past (Botwinick, 1973; Lewis, 1971).

Neugarten et al. (1973) studied consistent age differences in the perception of the self with respect to the external world. Life demands were said to account for these differences. For example, at age 40, the world was experienced to reward boldness and risk-taking, while at age 65, conforming and accommodating. Corresponding to this is a movement through (1) ego mastery (activity); (2) passive mastery; (3) an increase in inner world orientation; (4) a constriction in the ability to integrate a wide range of stimuli with lessened relatedness; and finally (5) a self-centered position with respect to the external world.

The sequence of patterns of self-concept outlined above bears a resemblance to various levels of cognitive control behavior, e.g., in the scanning or leveling-sharpening behavior: at the differentiated end of scanning and leveling-sharpening the performance is characterized by active, broad scanning and sharp, vigorous deployment of attention to features of the stimulus, respectively. The dedifferentiated end is characterized by passive, narrow scanning and global attention, seemingly blending present experiences with past perceptions.

Several areas of behavior in the elderly have been investigated, initiated both by interest in life span developmental patterns and as factors in the patterns of aging, e.g., intellectual and cognitive functioning, rigidity, and morale or life satisfaction. Some literature on the above topics will be mentioned as they relate to the present study.

Intellectual Functioning

Intelligence has been defined as an "aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment" (Wechsler, 1952). Based on this definition, the widely used WAIS and WISC and other intelligence tests have been constructed to tap various factors of the above capacities and were validated on various age groups. Intelligence tests have been adapted as measures of

achievement in the young and validated in diverse domains of activity.

In old age, intellectual functioning has been found to undergo changes. A decline has been observed in fluid intelligence (constitutionally given) in contrast to crystallized intelligence (one acquired with education and experience), which is less prone to deterioration (Matarazzo, 1972; Birren & Morrison, 1961). Birren and Morrison (1961) found scores of some of the verbal subtests of the WAIS to increase slightly with age (the correlation of Vocabulary with age $r = .02$). The performance subtests were found to decline significantly with age. The highly declining Digit Symbol performance ($r = .38$) was explained by an inability to hold in memory an unfamiliar symbol while decoding it. Leveling-sharpening was suggested as tapping a similar function (Birren & Morrison, 1961). Siegler and Botwinick (1979) found in a 20-year longitudinal study that intellectually superior adults seem to maintain their intellectual ability over many years, while the less able show more change.

In cognitive tasks, Papalia and Bielby (1974) found regressive phenomena with age in Piagetian logical tasks, while Sinnott and Guttman (1978) found no decline in similar tasks.

Labouvie-Vief (1977, 1980), Fisher (1973), Fisher and Pierce (1967), Shaie (1977-78), and Birren (1970) question the utility or validity of using the scores of

intelligence tests as indices of significant behavior in old age. They urge a reexamination of the present tools for assessing the cognitive capacities on the elderly (Labouvie-Vief, 1980). The tests used have been validated on younger people, the authors claim, and in older adulthood different capacities may be implicated in cognitive behavior. Moreover, it may be wise to reexamine in older subjects certain constructs which were deemed to be cognitively immature in younger adults or adolescents. Even rigidity, claimed to be maladaptive for learning, may be a manifestation of an adaptive need for stability. It may indicate an accumulated wisdom in the aged (Labouvie-Vief, 1977, 1980). The Piagetian idea of equilibration, too, an important factor in cognitive growth in children, is questioned by the above author. In the young, disequilibrium is believed to propel action by creating a cognitive conflict. A mature person may tolerate and even thrive on contradiction. Ergo, to use contradiction in thinking as a motive for cognitive performance in older age groups may be inappropriate. Santostefano's (1977) views on cognitive conflict as a motive to action are discussed in the section on cognitive controls and adaptation. It is yet to be seen, in view of Labouvie-Vief's and Santostefano's observations, how adults and the aged handle cognitive conflict. Harvey (1966), too, employs cognitive conflict as a motive in his formulation (see the section on Aging and Life Satisfaction).

Eisdorfer and Cohen (1980) reflect the thoughts of

the above-mentioned investigators of intelligence in the elderly. They state that intellectual competence in adulthood and old age is to be based on criteria built upon the life context of the population under study and is not to be a projection from populations of other stages in life.

Schaie (1977-78) posited a stage model based on life requirements at different ages. The author states that different cognitive factor structure dominates different stages. Childhood and adolescence, for example, are characterized by "acquisition"; young adulthood by "achievement"; middle age by "executive" or "responsible" tasks, and old age by "reintegration." Cognitive processes in the latter age are moderated by motivational and attitudinal variables. Cognitively an overload is reached and simplification is demanded in line with reduced responsibilities. As life changes, Schaie feels, cognition is not disengaged but selectively deployed.

The literature on intellectual and cognitive abilities in old age, in sum, does not show an unequivocal decline. A number of investigators, however, stress that to assess success in adjustment in the aged, there is a need to devise alternate criteria than the ones used to assess it in the young. For the latter the extant standard intelligence tests have been found to be fairly effective tools.

For the purposes of the present study, the critical writings seem to point to the need to examine cognitive

strategies and stylistic features as relevant indices of effective functioning in old age, in addition to intelligence per se.

Rigidity

Certain cognitive controls have been conceptualized as spanning a flexible-rigid continuum. In the constricted-flexible control, e.g., the constricted subjects are characterized as resisting change (Gardner et al., 1959), while the flexible subjects show a more open and flexible performance. Leveling can also be conceived of as a certain rigidity in not moving perceptually with the increase in the changing stimuli. The adaptive view of the cognitive controls is similarly depicted in terms of flexibility of movement within a range of functioning (Santostefano, 1978).

A tendency toward rigidity is said to be part of aging. There is an observed tendency to repeat a habitual pattern of behavior where change is expected. Rigidity as part of the aging process has been studied, analyzed into components, and studied as components of other processes (Chown, 1961; Schaie, 1958; Schaie & Struthers, 1968; Heglin, 1956; Botwinick, 1973). Several types of rigidity were isolated by Chown (1961) and by Schaie (1958), and found to increase with age in cross-sectional studies. The latter investigator identified Motor-Cognitive rigidity, Personality-Perceptual rigidity, and Psychomotor Speed as

the three types of rigidities to be related to aging. He considered rigidity to be so characteristic of old age that he expected to be able to predict functioning in old age by this construct, alone or in combination with intelligence. He found an overall increase in all three types of rigidity he identified, significant at the .01 level. The most significant increase took place in Motor-Cognitive rigidity which was defined as the ability to shift from one activity to another. The Motor-Cognitive rigidity increment was found from age 25-30, while the Personality-Perceptual rigidity at age 41-45, and a Psychomotor Speed rigidity increase was found to begin at age 31-35.

Schaie and Struthers (1968) retested some of Schaie's (1958) subjects in a more complex cross-sequential design. The authors obtained contradictory results in the retesting. Only one of the three types of rigidity, the Psychomotor Speed, increased with age. The authors raised some methodological questions about the possible cohort effects in traditional cross-sectional research.

The rigidity issue has not been resolved yet. It remains to be further explicated in terms of its function for the aged person (see Labouvie-Vief, 1977, 1980), as well as in terms of its influence in processes which facilitate or hinder adjustment in aging. The present study may offer an opportunity to observe the implications of increased rigidity in cognitive functioning and in life adjustment in middle and old age.

Aging and Life Satisfaction

Two points of view of adjustment in old age characterize the current social psychological literature: activity theory (Maddox & Eisdorfer, 1962; Neugarten et al., 1968; Havighurst et al., 1968) and disengagement theory, attributed to Cumming and Henry. The activity theory implies that older people desire to stay active after retirement. The theory states that if an elderly person is given the opportunity to continue to find suitable substitute occupations for those that he relinquishes due to physical decline and retirement, and if he is able to find friends for those he loses by death, such a person will age optimally.

The disengagement theory argues that decreased social interaction is mutually promulgated both by society and the individual, both being desirous of the aging person's withdrawal. Furthermore, the theory argues that this withdrawal process begins before society begins to demand it and that the process has intrinsic, developmental qualities.

The paradigmatic study in life adjustment, which uses activity level as a variable, employs a research design in which lists of various role activities are rated by the subjects to point out the extent of their involvement in each role. Typically, a morale or life satisfaction index or other index of subjective satisfaction is administered, and the results correlated with the social engagement scores.

In some cases, personality tests are administered (Vander Plate & Fitzgerald, 1976) or projective tests are employed to establish a personality type (Havinghurst et al., 1968).

Maddox and Eisdorfer (1962) investigated the morale-activity theory. In a design clearly differentiating between the 250 60-94 year old elderly subjects in terms of levels of activity and morale, the authors found that indeed 73% of their subjects fell in the high activity-high morale and low activity-low morale category as the activity theory predicted. However, they suggested that "under some conditions a negative association may exist between activity and morale" (p. 255); that some amount of withdrawal from social participation or other activity might be beneficial for some older people. Fourteen percent of the elderly subjects fell into the high activity-low morale category, while 13% fell into the low activity-high morale group. The activity hypothesis was confirmed to a limited degree: disengagement theory, overall, was disconfirmed, but the authors recognized that the formulations were oversimplified as certain intervening variables were obscured in the process. The findings of a proportion, albeit small, of subjects in the low activity-high morale group suggested a disengaged person who feels satisfied with low activity. The high activity-low morale group suggested that activity level alone is no guarantee for well-being. The low activity-high morale group manifested the tendencies ascribed to "disengagement."

In further studies on the activity theory by a number of investigators, inconclusive relationships were found consistently between activity level and life satisfaction. Apparently neither the activity theory nor the disengagement theory adequately explain the facts of satisfaction in aging (Havighurst et al., 1969; Edwards & Klemack, 1973; Vander Plate and Fitzgerald, 1976; Larson, 1978). The above studies are fairly unequivocal in recognizing activity level as an important variable implicated in life satisfaction in the aged, but also in positing personality variables as factors in accounting for those cases which do not clearly fall into the category predicted by either of the two theories. Neugarten (1968) posited a personality factor which was defined by the degree of role activity in combination with a certain degree of life satisfaction and a personality factor derived by responses to the TAT. The Kansas City Study of Adult Life, as the Havighurst et al. (1968), Neugarten et al. (1968) study was called, used and validated a Life Satisfaction Index (1961) and the Social Engagement Indices on which some of the tests in the present study were based.

Vander Plate and Fitzgerald (1976) found in a study of 42 elderly people aged 61-90, 32 of which were females and 10 males, that interpersonal activity significantly correlated with outgoingness, enthusiasm and responsiveness as personality variables. At the same time the authors found disengagement to take place in six out of twelve roles

during aging. Disengagement was not found to be related to personality variables but was seen as reflecting more "social-structural" variables; i.e., "It is likely that the reported disengagement of the oldest women has the highest reported level because these individuals have lost role opportunities for reasons of death and physical and fiscal difficulties rather than some active decision on their part to push away from society" (p. 46). The older widowed female was found to decrease her activities most from age 50 on ($r = .55$ with marital status, $.46$ with age and $.26$ with sex).

In addition to the Social Role Rating Scale and four Cattell PF16 personality items administered to their subjects, Vander Plate and Fitzgerald obtained three demographic variables: age, sex and marital status from which the correlation coefficients were obtained. The size of the sample and the breakdown of the subjects along sex lines should make the reader cautious with respect to interpretations of the above data.

Conner et al. (1979) speculate that quality of interaction is the key to well-being.

In conclusion, the findings are pointing to the personality variables to explain the variation with which an individual will adjust to aging, given the opportunity to engage or not to engage in social interaction.

Kobasa (1979) studied personality as an underlying characteristic influencing hardiness, defined as the ability

to cope with stressful events. She identified three categories of characteristics found in people who could avert illness under stress: (1) sense of control over events; (2) commitment to various areas of one's life, that is, a sense of purpose; (3) viewing change as a challenge, rather than a threat.

The hardiness characteristics hypothesized by Kobasa are relevant to the present study which is to investigate hardiness in dealing with life in the aged. Some of the features of Kobasa's hypothesized characteristics are similar to those described by cognitive control investigators as adaptive responses, manifested in certain cognitive control tests. Harvey (1966) states; "The ability to generate alternative means to a valued end and to assimilate diversity and contradicting events without loss or abandonment of the goal are important aspects of the generic dimensions of flexibility and adaptability. Such abilities are doubtlessly related to the capacity for creative behavior" (p. 39). Harvey further states that flexibility and adaptability are contingent on the degree of differentiation and integration of the person and that the latter two are impaired by closedness of the system to conflicting inputs. Insulation from incongruent events and avoidance of challenge mean that the conflict within the system which propels to action is not perceived; this can result in an inarticulated, undeveloped state of the system, precluding the ability to generate multiple definitions of a situation

and result in a narrow range of response alternatives.

Thus Harvey ties cognitive behavior (differentiation and integration] to the kind of openness and receptiveness to changes that Kobasa describes in characteristic (3) above. He also implies that perception of conflicting events initiates thought and action. As implied by Harvey (1966), Kobasa (1979), and by Dolen (1980), social involvement often leads to exposure to events that may be expected to arouse conflict and ultimately lead to more active cognitive functioning, more differentiation and selectiveness among means and goals, and ultimately to better adjustment.

The focus of interest of the present study were the elderly and some of their behavioral manifestations. The decision was made to test for comparison a middle aged group as well. The decision was based on the desirability to observe the changes in the cognitive control patterns from middle age to old age. As was mentioned above, different cognitive and social factors may be operating in the two groups. The middle aged group is expected to be different, cognitively, from the younger adult groups that had been tested in previous studies, and also from the older group. Schaie (1977-78) postulated a sequence of stages of adult development. The older group, according to the author, is characterized by "reintegration" or Erikson's "ego integrity" stage, with the major focus of the individual being goal reformulation and "overload reduction"; the middle aged group is in the "executive" or "responsible"

stage. While the latter individuals are still active and physically mobile, their responsibility at this stage for others (for a family or job) already changes these persons' attitudes from the earlier free-wheeling entrepreneurial, goal-directed style to a pattern that facilitates integration of long-term goals. In cognition, this stage is characterized by problem-solving skills, greater flexibility, lessened field dependence, a gain in crystallized (learned), but a loss in fluid (constitutionally given) intelligence.

There is at this stage a beginning of difficulty in dealing with new bits of information in contrast to retrieval of old information. Intelligence tests are no longer relevant to this stage since they do not reflect well on integrative and interpretive ability. Intellectual competence at this stage may be better measured by tasks measuring cognitive styles and problem-solving skills. This stage, along with the earlier stages, is still one of increased complexity in contrast to the last stage, the "integrative" one (Schaie, 1977-78), where reduction of complexity is the characteristic trend.

Children of people at this stage are usually grown, in many cases out of the house, and the adults, in the climactery, are beginning to manifest some psychological signs of aging (Benedek, 1975). In women, e.g., menopause at times induces stresses and frequently various degrees of depression; men may begin to experience a diminished sense

of virility, and a loss of power with respect to younger co-workers.

The above changes may manifest themselves in cognitive control tasks, which may be quite different from those of the older group, but also different from the younger adult groups.

Summary on Aging and Cognitive Controls

The literature reviewed in the last section led to the original formulation of the present study. An overwhelming emphasis was placed by most investigators in the area on some personality variable to be conceptualized to account for the variations in life adjustment with activity level as one factor.

Observation of older people reveals that persons who remain active in some capacity display a more hopeful and youthful attitude. For the most part, this has been borne out by research findings. Yet it was also shown by many investigators that there are inactive older people who are happy, and active ones who are not. It seemed from perusing the literature that the results of the few attempts to identify the character of the personality, which will predict various degrees of life adjustment depending on the person's level of activity (Neugarten et al., 1968; Vander Plate & Fitzgerald, 1976), are circular. Life satisfaction as well as a personality type and activity level define the independent variable in the formula to produce a pattern of

aging as a dependent variable (Neugarten et al., 1968).

For Vander Plate and Fitzgerald (1976) the identified personality factor (outgoing, enthusiastic, responsive) correlates most highly with interpersonal activity ($r = .43$ to $.63$). No personality factor correlates with disengagement in that study. The particular personality factors seem to be in keeping with what would be expected of an active, participating individual and may be explaining an effect, not a cause.

It would seem that the goal ought to be to identify a personality variable, which in interaction with an environmental variable produces a fit (or misfit) which makes prediction of life adjustment possible.

Cognitive control researchers repeatedly observed the need to investigate the adaptive aspects of cognitive controls by correlating them with extrinsic criteria. Some data on the adaptive nature of cognitive controls in short-term adaptation have been presented and described above (Santostefano, 1978; Witkin et al., 1977). It seems from all the above that the typical cognitive control performance of an elderly person might be usefully investigated as personality variables which may influence adjustment in old age.

Investigators in the area of intelligence in the aged have been asking for and suggesting alternative ways of conceptualizing and measuring adaptive behavior in that age group. In the young, various intelligence and cognitive

tests have been used successfully. The extant tests were not found to tap the adaptive requirements that impinge on the elderly and thus found to be invalid tools.

The expectation that adjustment should relate to a personality-environment fit is not new. French, Rogers, and Cobb (1974) conceptualized a model, which allows adjustment to be approached quantitatively. The model shows the relationship among certain variables assumed to characterize mental health: adaptation, contact with reality, accuracy of self-assessment, and defense. In the model, adjustment is conceived as "the goodness of fit between characteristics of the person and the properties of his environment." A distinction is made in the model between the objective and subjective environment, and objective and subjective "person" (as he is and as he sees himself).

Subjective person-environment fit is relevant to the present study. The fit is defined as $F_s = E_s - P_s$ (subjective fit equals subjectively perceived environmental supply minus a subjectively measured amount of supply, necessary to satisfy this person's needs), and $F_o = E_o - P_o$ (the objective counterpart to the above). Objective fit minus subjective fit is used to determine the individual's contact with reality.

The authors of the above formulation presented several findings confirming the usefulness of the model. In one study of 2,000 high school boys, correlations of measures of person-environment fit with three independent variables

were obtained: self-esteem, negative affective states, and dropping out of school.

Of interest here is the finding that subjective P-E fit with respect to intellectual demands correlated with self-esteem $r = .198$, with negative affective states $.150$, and with dropping out of school $.131$. These correlation coefficients account for less than 4% of the variance even though they are significant beyond the $.05$ level. The model obviously needs refining but the trends suggest that there is merit in taking person-environment fit into account in considering an individual's adaptation. The authors note; "Adequate tests of the usefulness of the P-E fit model will depend on our ability to measure both the demands of the person and of the environmental supplies to meet those demands. Similarly, commensurate measures of the demands of the environment and of the abilities of persons to meet those demands must be developed" (p. 330).

The present study will not use the French et al. (1974) notation. Rather, it will make use of an objective measure of the person, namely, his cognitive control scores, and his subjective assessment of the supplies of the environment (his social activity index, which is here translated as his opportunity to interact socially). Coping or adjustment will be assessed subjectively by a self-report instrument of life satisfaction and negatively by a depression index.

Certain cognitive control principles are characterized

by the amount of vigor or energy a person employs to accomplish the task. For example, Gardner (1962) speculates that "levelers may have unusually limited quantities of neutralized energy for spontaneous cathexis of new stimulus events . . . individuals may be strikingly different in their quantities of deployable cathectic energies" (p. 196). The scanning principle, too, is characterized by Santostefano (1978) as containing two components: breadth or narrowness and activity or passivity of scanning. The factor loadings in Santostefano's studies indicate that broad scanners are also active scanners in spite of slowness in motor tempo. For the three measures of the Scattered Scanning task, the factor loadings were .96, .76, and .73, while for the motor tempo the loading was -.44. Santostefano interprets the findings as indicating primarily a measure of vigor of visual scanning rather than a motor speed.

The Menninger group did not interpret scanning in terms of vigor or energy although mention was made by Gardner et al. (1959) of the scanner's tendency to actively peruse objects about him and continually searching or scanning the field. However, the lower end of the scanning dimension, too, can be interpreted as intensive visual scanning, but with a narrow beamed focus. Thus the activity factor in scanning is not clearly established. The activity or vigor vs. passivity dimension manifested in leveling-sharpening and tentatively in the scanning dimension, will be used in an attempt to predict a fit between environmental

factors and personality.

Certain constitutionally determined factors such as personal tempo and reactivity are said to influence the shape of the cognitive controls in the individual (Santostefano, 1978). They will to some extent determine the breadth and the degree of activity employed to scan the environment and the amount of attention he will employ to form a stable impression of information that changes over time. Personal tempo was purposely controlled in Santostefano's test of scanning, the SST.

Whatever model of motivation one uses, whether the psychic energy model (Gardner et al., 1959; Gardner, 1962) or the disequilibrium model (Santostefano, 1977), it seems that the innate activity factors mentioned above will have a role in determining the amount of energy in the case of the energy model, or the degree of reactivity to a perceived disequilibrium. It is believed here that the same underlying factor will determine how much social activity an individual requires to satisfy his need for "social nutriment."

It is one of the subsidiary aims of the present study that the potential value of a "vigor" dimension in certain cognitive control principles be explored in their interaction with opportunities for social activity.

Depression and Referential Competence

In the present study, two indices of life adjustment were used: the Life Satisfaction Index and the Zung

Depression Scale. The rationale for the choice of a depression index was that depression is one of the most frequent difficulties found in aging. It is so widespread that Zinberg and Kaufman (1978) consider the ability to tolerate depression as at least one of the concomitants of successful aging.

Meaningful aging, according to Benedek (1975), implies the acceptance of one's aging, the finality of life, if this is not interfered with by physical or mental illness. Benedek outlines factors that "influence the course of depression in old age, indeed the psychology of old age, since all psychological change caused by aging has a depressive tone" (p. 357). Beside the concrete losses and needs to adapt to various changes facing him in old age, the person mourns for the self that is not the efficient organ that it was. Yet the individual's mode of adaptation shapes his capacity to face the vicissitudes of old age.

Several models of depression were conceptualized to account for depression at various ages. Schmale and Engel (1975) formulated a somatic regulatory process which produces what the authors call a "conservation-withdrawal" reaction "in which, while active engaging serves to enable the organism to find external sources of nutriment, security and comfort, inactivation and disengagement may occur when the environment is perceived as no longer providing needed nutriment, security or comfort, or when the organism's attention is turned to internal needs such as repair, renewal or

growth" (p. 18]. This formulation supports the regression conception of Santostefano (1978] and others (e.g., Wachtel, 1972] with respect to cognitive controls as well, in that it recognizes the adaptive value of some withdrawal behavior when it is used "in the service of the ego." But pathological withdrawal may occur when the environment is seen unrewarding because of over- or understimulation. Feelings of helplessness accrue where expected gratification is not forthcoming or where active attempts to pursue objects in the environment are unsuccessful, or conversely, when the attempt to avoid situations that produce discomfort are unsuccessful.

Some models tried to place the locus of depression in the cognitive domain, i.e., in the structures which mediate between reality and affect, or within various parts of the brain.

Basch (1975] conceptualized depression as a disturbance in the message processing functions of the brain. The brain here is seen as an open system, serving self-set goals based on information processed by cognitive apparatus from the environment. When this process is no longer viable, the system turns into itself and ceases to be an open system, like in anaclytic depression.

The infant, who is unstimulated, converts into a closed system because of loss of message from the cerebrum to the brainstem. A state is created in which signals no longer become information messages (p. 515).

Bucci and Freedman (1980) posited a cognitive-linguistic model of depression in which the information processing system is believed to malfunction, as in Basch's model. Even though the basic cognitive processes of perception, thinking and memory are believed to remain intact, the process which is seen as impaired in this model is the one which the authors termed Referential Competence (Bucci & Freedman, 1978). It is a linguistic function conceptualized as the process of translating the private affective imagistic representation of an idea into a shared public verbal system. The referent may be entered as a perception from the outside, as in viewing a picture, or from memory images on the inside. Referential Competence is a naming process viewed not only as a person's ability to express himself, or form concepts, but as the capacity to generate verbal representations de novo from verbal or nonverbal stimuli.

The construct is believed to be of far-reaching importance in the initiation and direction of behavior (Vygotsky, 1962). In concept formation, e.g., all basic intellectual functions are said to be involved; they are, according to Vygotsky, necessary but not sufficient without the use of the sign or word (p. 58). "All the higher psychological functions are mediated processes, and signs are the basic means used to master and direct them."

Bucci and Freedman (1980) suggested that the impairment of referential competence "accounts directly for the

inability to identify feelings associated with experiential emptiness [of depression and] . . . is implicated in a more pervasive way in many of the behavioral or even physiological dysfunctions associated with severe depression, although it is premature to specify the nature of the causal relationship at this time" (p. 7). It seemed to Bucci and Freedman (1980) that this basic linguistic process was related to behavioral, cognitive and even physiological symptoms of depression, independent of the aetiology of depression; they stressed, however, that the hypothesized relationship concerned "depressive illness only and is not proposed with respect to transitory depressed mood states" (p. 8).

Referential Competence has been investigated in relation to depression (Bucci & Freedman, 1980). It was measured by Card I and Card II of the Stroop Color Word Test. In the 1978 study, color naming speed was computed as the difference between a subject's naming of the color on Card II and his predicted time based on regression of color naming time on Card I (word reading). In the study with depressed subjects (1980), a simple subtraction score was used: Card II minus Card I.

In a study with five depressed patients tested by means of Card I and Card II of the Stroop Color Word Test and the Zung Depression Scale, referential competence scores of four out of five of the patients were found to correlate positively with depression scores. Referential competence scores were also found to reverse, i.e., when the four

patients came out of depression they produced higher referential competence scores than they had produced while severely depressed (88.3 seconds vs. 59.3 seconds).

The results of that study showed the name retrieval time (IT minus I) for four out of five depressed patients to be almost four times as great as for the subjects in a comparably aged normal population, 88.3 seconds for the depressed vs. 23.8 seconds for a normal group studied by Comalli, Wapner, and Werner (1962).

In view of the findings that one out of the five cases studied showed many differences in performance, the question was raised whether a depressive disorder "accompanied by high referential activity may have different properties and prognosis from a depressive disorder where referential activity is also impaired" (Bucci & Freedman, 1980, p. 25).

Referential competence is believed to be especially useful in diagnosing depression where usual symptoms of manifest lowered affect are absent. The findings of this study are suggestive but remain tentative, until results with a larger sample will be obtained.

Several conceptualizations of depression in terms of the aging process in cognitive terms, i.e., as a message processing dysfunction (Basch, 1975) or as an information processing dysfunction in which the linking of referent to symbol (object to word) is faulty (Bucci & Freedman, 1978, 1980), were sketched. The choice of depression as an index

of maladaptation in the present study seems justified because of the indicated relationship between aging and depression and between cognition and depression. Both constructs are to be observed in this study.

The choice of referential competence as a construct to be investigated in the present study is of intrinsic interest as a possible correlate to some of the cognitive controls as well as an index of depression. It was not expected that in the sample of population of the present research, many severe cases of depression will be found, since by definition the sample was to consist of relatively well-functioning older individuals. The use of both the referential competence construct and the Zung Depression Scale was to be exploratory. In this case, the assumption was made that the causal sequence between referential competence and depression is such that the person who habitually has a lower rate of naming speed will be inclined to become depressed more readily or be of a lower, flatter mood generally, even if the level of depression does not reach pathological proportions.

Referential competence was found (Bucci & Freedman, 1978) to manifest itself on three representational levels: the kinesic, linguistic, and cognitive. Operationally the concept has been defined by Bucci and Friedman (1978, 1980) in terms of (1) the integration of hand movement with the production of speech; (2) language production, as measured by a spontaneously produced five-minute monologue; and

(3) speed of color naming on the Stroop Color Word Test.

The rate of "object focused hand movements" in normal subjects was found to vary significantly with individual differences in color naming time. Four depressed subjects were found to average fewer hand movements than normal college students (3.75 hand movements per 100 words for the depressed as compared to 9.54 per 100 words for the healthy subjects, as reported by Bucci and Freedman, 1980).

Language production was assessed in terms of imagery and ideas in words, i.e., (1) specificity vs. generality of stylistic expression, and (2) concreteness vs. abstractness. Positions on these dimensions had been quantified (Bucci & Freedman, 1980). The talks of depressed patients, in contrast to normal ones, was found to be "rambling, repetitious and vague," in contrast to the more specific, concrete and vivid production of the normal subjects.

No difference between the color naming speed of male and female subjects was found by Bucci and Freedman (personal communication).

The absolute color naming speed of the individual may not be a relevant factor in depression. Rather, it may be the relative decline in color naming within the individual in depression, that is a significant dimension. This phenomenon is not alien in cognitive research; a decline in performance on the Wechsler intelligence tests, especially on the Performance Subtests as compared to the Vocabulary Subtest, is used as a diagnostic sign (Rapaport, Gill, & Shafer, 1975).

CHAPTER III

STATEMENT OF THE PROBLEM

The cognitive control literature revealed that the study of cognitive control dimensions across the life span and with respect to the cognitive controls' adaptive significance has been neglected.

The geriatric literature showed an effort to identify some personality factor as an explanatory principle for mode of adjustment in old age. Two viewpoints have guided the research on life adjustment: activity theory and disengagement theory. Valuable findings and methodological sophistication accrued from these studies. However, the relationship between activity levels and life adjustment in old age has not become fully clarified. There appeared to be a missing link. The personality variables offered by the investigators in the field as intervening variables were not found satisfactory.

The present study was an attempt to identify such a personality variable.

A list of hypotheses are advanced below. It should be noted that for hypotheses 1 and 2 the expected outcomes were based on evidence from studies of individual cognitive controls on aged populations.

There was no theoretical formulation to guide hypothesis 3. The hypothesized relationships among cognitive controls, social activity and life adjustment were formulated

tentatively. The relationships in hypothesis 3 were based on the assumption that a fit, or congruence between a personality type and the environment, will yield life satisfaction at all ages; a lack of fit will produce dissatisfaction and/or depression. In this study the personality type was defined by cognitive control scores, and the environment by the opportunity to engage in social activities. The environmental fit formula was defined as follows: congruence between level of activity (or vigor) in the leveling-sharpening and in the scanning principle, and between level of social interaction = life satisfaction; misfit = dissatisfaction.

Hypothesis 4 was based on the demonstrated ability of flexible subjects in the constricted-flexible control to handle emotions better (Klein, 1954). This is an adaptive characteristic and was assumed to influence adaptation in old age.

In hypothesis 5 the relationship between color naming and depression was based on Bucci and Freedman (1978), and between color naming and scanning in Gardner et al. (1959).

Hypothesis 6 was based on Birren and Morrison (1961) and Gardner et al. (1960).

Hypotheses

1. There will be a decrease in cognitive control scores in the older age group, i.e., a trend toward leveling, more narrow-passive scanning and toward more constricted control.

2. A mild slowing in color naming is expected in the older age group (Comalli, Wapner & Werner, 1962).

3. Within both age groups, a range of individual differences in cognitive control performance is expected. The following relationships are tentatively expected to emerge among the three sets of variables studied, i.e., cognitive control scores, level of social interaction (measured by the Social Interaction Questionnaire and the Psychological Involvement Measure), and life satisfaction and depression (measured by the Life Satisfaction Index A and by the Self Administered Depression Scale, respectively).

3a. High scorers in leveling-sharpening (relative sharpeners) and high scorers in the scanning control (broad and active scanners) are most often expected to manifest relatively higher levels of social activity. Low scorers in leveling-sharpening (relative levelers) and low scorers in the scanning control (narrow and passive scanners) are expected to manifest relatively low levels of social activity.

3b. Congruence between the scores in leveling-sharpening and social involvement and between scanning and social involvement (high cognitive control-high environment) are expected to yield a relatively high life satisfaction index along with a low depression score; conversely, congruence between leveling-sharpening and social involvement and between scanning and social involvement (low cognitive control-low environment) are expected to yield relatively high life satisfaction index with low depression scores. 3b represents a good personality-environment fit.

3c. Relative sharpeners and relative broad and active scanners combined with low social activity levels are expected to show a relatively low life satisfaction index with a high depression index; levelers and narrow, passive scanners with high social activity levels are expected to yield a relatively low life satisfaction index with a high depression index. 3c represents an incongruent personality-environment condition, i.e., a poor fit.

4. High scorers in the constricted-flexible control (flexible subjects) are expected to produce a relatively high life satisfaction index and a low depression index because of the demonstrated ability of these subjects to handle emotions better. This is an adaptive psychological characteristic, with potential utility in old age. No prediction is made with respect to this principle and social activity level.

5a. Referential competence (color naming) scores are expected to correlate negatively with depression.

5b. A negative correlation is similarly expected between color naming and broad-active scanning, as was found by Gardner et al. (1959).

6. Verbal intelligence (as measured by the Thorndike short vocabulary test) is expected to have low correlation with age and with cognitive control test scores. No prediction can be made for a relationship between verbal intelligence and social activity, and verbal intelligence and life satisfaction.

A warning is in order here. One should be cautious in sweeping interpretations of developmental trends from the present comparisons between the two groups. In spite of the effort to select subjects of similar SES for the study, a social class imbalance in the two groups is obvious. Moreover, it is clear that educational and childrearing techniques and focus undergo important changes in a space of 25 years (which is the difference in the mean age of the two groups studied). The above may have differentially affected the philosophy guiding social interaction, philosophy toward aging per se, and cognitive control performance in the two groups.

CHAPTER IV

METHOD

The data for this study were provided by measures of three cognitive controls, a referential activity measure, and two quantified social interaction measures. A life satisfaction index and a depression scale were used as indices of life adjustment.

Subjects

Two groups of subjects, Group 1, aged 43-60, and Group 2, aged 63-89, were used, 50 in each group, each equally divided by sex. The subjects came from the community and were in relatively good physical condition. The local YMHA (with many programs geared toward the elderly) and senior citizen day centers were approached for referrals of the older subjects. Additional persons of the desired age were individually sought out and interviewed in the Boro Park and Flatbush communities of Brooklyn.

The subjects were mostly of middle middle or lower middle class. The distribution of occupations in the respective groups was as follows (following the Hollingshead and Redlich, 1958, classification):

	<u>Group 1</u>	<u>Group 2</u>
1. Executives, major professionals, proprietors of concerns	7	3
2. Managers and proprietors of medium-sized businesses, lesser professionals, administrative personnel of large concerns	23	3
3. Owners of small independent businesses, semi-professionals	8	6
4. Owners of little businesses, sales workers	10	28
5. Skilled workers	2	10
Total*	50	50

It is evident that the younger group was represented by a higher number of subjects in the professions and larger businesses than the older group in which most of the subjects had been in small businesses, sales, or the skilled labor force.

Twenty-three of the older subjects, and 19 of the younger ones, were born in the United States; the rest were foreign born, mostly from European countries. The subjects were predominantly Jewish, with about 30% Catholics, mostly of Italian extraction.

A good part of the older subjects were approached in senior citizens' centers, but a few were contacted by phone and interviewed in their homes. All of the younger subjects were tested in their homes. Most of the younger subjects

*While Hollingshead and Redlich, 1958, provided seven categories, in the present sample none of the subjects were in the lowest two categories.

were in the work force (except for some women, who were housewives]; almost the entire older group was retired. While the SES of the two groups was not even, the younger group having been in a higher mean class, the SES of the entire group was skewed toward the middle class, and the group as a whole was above subsistence level.

As in all cross-sectional studies employing groups of large age differences, the present study was subject to cohort effect, as was shown in the imbalance between the two groups in the distribution of occupations. This effect will need to be taken into consideration in the analysis; however, no attempt was made to control for the effect by employing a cross-sequential design as was suggested by Baltes, Reese, and Nesselroade (1977).

Procedures

The older subjects were approached in groups at the senior citizens' centers and requested to participate in the study. At the beginning, an attempt was made to administer the pencil-and-paper tests to the older subjects in groups of three or four. This proved to be unwieldy since many of the subjects required assistance and became restless when attention was paid to other subjects. In addition, since the cognitive control tests had to be given individually, the testing would have had to be interrupted and continued the next day, for all but one member of these little groups. A number of these subjects refused to come back a second time

and their data were lost. Therefore, it was found more time-consuming, but safer to administer each test individually. Only twice was an attempt made to administer the written tests in groups before this method was abandoned.

A total of 113 subjects were approached. For the most part the subjects were cooperative and 102 subjects finished all the tasks. The scores of two of these subjects could not be used because their performances were very extreme. An additional ten subjects did not complete their tests for various reasons: some refused to come back for a second testing when for reasons of timing this was necessary; others did not show up even though they promised to come back. A few subjects became anxious and refused to continue. Of these ten subjects, nine were in the older age group and only one was of middle age (50 years old). The scores of the completed tests of these "dropouts" were compared to the relative group means. It was found that most of these scores fell within 1 SD of the respective group mean scores. Only 4 of about 40 scores fell below 1 SD of the group mean, but these, too, were very close to 1 SD from the mean.

In most cases, the subjects were interested to learn about the tests. Some subjects admitted after completing the Life Satisfaction Index and the Depression Scale that they had never thought about the questions raised, and that it felt good to contemplate them.

Only about 20% of the older subjects found the tests

tiring, but completed the battery anyway. Ten instruments were used. These will be described below. The entire test took 40-60 minutes per person.

Instruments

Leveling-Sharpening House Test (LSHT) (Santostefano, 1978)

See Appendix B for a copy of the test.

This test consists of 60 two-dimensional line drawings of a house, printed on a card, shown to the subjects one at a time for five seconds each. Elements of the drawings are gradually omitted, beginning with the fourth card. Altogether 19 omissions occur over the 60 presentations. The subject is to look at the displays and tell the examiner when he perceives a change. In terms of the cognitive control of leveling-sharpening, subjects who detect changes early and report changes immediately when the changes occur, and who report a large number of the changes, maintain distinct images of memory, and keep the present information distinct, i.e., are "sharpeners." Those who report changes late, and who do not recognize many changes, are "levelers."

The question of how an individual chooses to use his cognitive control capacity in different situations (whether a person, for example, who is found in the laboratory to be a sharpener will be one in everyday situations) is related to questions about the consistency in using other cognitive functions across different situations. These questions need to be explored more fully. One answer to the above questions

resides in the perception of the individual of the adaptive demand of the situation. Studies with the Leveling-Sharpening Parachute Test and the Leveling-Sharpening Hospital Test, reported above, were a good attempt to find answers to the question of the generality of cognitive control functioning across situations.

An impressive list of validating data using the LSHT was obtained by Santostefano and his colleagues. Some results are presented above in the leveling-sharpening cognitive control section. Construct validating data were derived from factor analytic studies. Criterion-related validating data were obtained correlating intelligence tests, personality tests, Piagetian tasks and other tasks with the LSHT. Alternate test reliabilities were established by constructing similar tests and using them together on several consecutive occasions under stressful and no-stress conditions. Data were also obtained demonstrating the stability of the construct.

Three scores are obtained from this test:

(1a) first stop score: the number of the card on which the first correct change is perceived; (1b) number of correct changes; (1c) leveling-sharpening ratio "takes into account which correct changes were not perceived, which were perceived, and how soon they were perceived" (p. 454).

The present test was chosen because of the ease of administration to the present population. The traditional test of leveling-sharpening, the Schematization Test, uses

series of squares. It was thought that it may be tiring and unusual to the present population. Besides, the use of a projector and screen would have been unwieldy, as the subjects were tested individually, some in their own homes. The cards of the LSHT are mounted in a hard cover folder and shown page by page. The content of the test is a familiar one, neither too simple nor too sophisticated for this age group. A study using 200 aged subjects is being undertaken now by Santostefano, using the present test as well as the Scattered Scanning Test (personal communication).

The present study was employing three cognitive control tests and a number of other variables. Since some cognitive control tests had multiple subscores, the results of comparisons would have been difficult to interpret. For the sake of clarity to the reader, it was decided to combine those subscores of the LSHT which most highly correlated with the other subscores. The LSHT 1b (number correct) correlated $r = -0.9183$ ($p < 0.001$) with LSHT 1c (leveling-sharpening ratio) and correlated with LSHT 1a to a $p < 0.001$ level of significance ($r = 0.5420$).

An additional reason for using the L-S ratio in the new score was the fact that the ratio is a composite of the other scores, and is deemed to be a good representative of the construct.

The LSHT 1c subscore is negatively keyed, i.e., the higher the degree of differentiation, the lower the score, while the LSHT 1b is positively keyed. In order to

facilitate adding linearly the two subscores, LSHT lc had to be corrected for the negative keying. This was accomplished by subtracting each score from 32 (the maximum score was 29) and thus obtaining a positive score. The new combined score was named COMLST.

Leveling-Sharpening Aggression Test (LSAT) (Santostefano, 1978)

This test is similar in format to the Leveling-Sharpening House Test except for the number of cards shown (63), the content, and the number of changes (20). (See Appendix C for a picture of the test.)

The card is a picture of two fighting cowboys, in traditional garb. It was designed to tap aggressive impulses in children. In the present study, the second test of leveling-sharpening was used (1) as an alternate leveling-sharpening test to test the validity of the construct as well as the reliability of the instrument because no multiple testing of the subjects was going to be conducted, and (2) to observe whether a possible change in leveling-sharpening as a result of the aggressive nature of the stimulus would occur.

Zimberg and Kaufman (1978) state that the defense most applicable to the aging person is regression. It is said to be necessary in order to maintain homeostatic balance, because of altered instinctual and environmental conditions. The altered instinctual conditions refer to some loosening of ego control, frequently with an increase in overt

aggression. It is therefore plausible that an aggressive stimulus such as the LSAT will elicit in an older person different reactions than in a younger one. A younger person may repress the aggressive reaction by not deploying attention on the cards, that is by increased leveling (to an aggressive stimulus in contrast to a neutral one). An older person may exercise less control and give vent to increased aggressive impulses by keener attention.

The average level of cognitive control functioning on the leveling-sharpening control was expected to be tapped by the LSHT and a somewhat different score to be obtained on the LSAT as a function of latent aggressiveness of the subjects. The difference between the score on the LSHT and the LSAT may very well be due to actual differences in the difficulty of the tests; no cross-validating data are available on the two tests. The scoring is the same as for the LSHT. Three scores are obtained: 2a, 2b, and 2c, similar to 1a, 1b, and 1c.

Because this test was used mainly for validation and reliability, it was not administered to the entire population; only 16 out of the 50 middle aged and 15 out of 50 older subjects completed the LSAT. The correlations of the LSAT scores with other test scores were performed with uncombined scores. These scores were not used in the ANOVAS or the regression analysis, since the Leveling-Sharpening House Test scores alone were used to test the leveling-sharpening construct. The combined LSAT scores were unnecessary.

Scattered Scanning Test (SST) Form 2 (Santostefano, 1978)

This test is used to assess the scanning cognitive control principle. The present test was used instead of the traditional Size Estimation Test used in the Gardner et al. (1959) studies, for the reasons mentioned above with respect to the LSHT, namely, greater ease in administering this test to the subjects of this study.

Traditionally the Size Estimation Test was used for scanning. It required the subject to adjust a variable circle of light, emanating from a light box. Since in this study the apparatus had to be brought to the subjects' home or to the geriatric center, and since ten instruments had already been given to the subjects, it was decided that only one scanning test be given (see Appendix I for a sample test).

The SST consists of a 16 x 23 inch sheet of paper on which are printed randomly scattered geometrical shapes. The subjects are first tested for personal tempo on a Motor Tempo Test (MTT), where they are timed for the marking of 18 shapes. Next the subjects are allowed to practice on a Training Trial Sheet, an 8-1/2 x 11 inch sheet with the same symbols. At last, the SST is administered and timed. Thirty seconds are given to mark circles and crosses (out of five possible shapes), while the examiner marks a second test sheet indicating the actual paths of the movements.

Some validating data on the SST derived from factor analytic and other correlational studies are presented in

the Scanning Control section above.

The SST was administered with a slight variation from the method suggested by the manual. In the present study, the subjects were instructed to mark the circles and crosses as fast as they can, rather than at their natural speed as the manual suggests. The decision to do this was made because it was felt that some competitive people will rush even when told not to do so and these will get higher scores. Others are more obedient and will be scoring low. Urging them to do their best in terms of time, removes at least some error of different levels of competitiveness.

Six scores are obtained from this test:

(3a) Number correct (within 30 seconds).

(3b) Number incorrect.

(3c) Total distance score (measured in centimeters) covered by the subject in marking the shapes. This is a linear measure and is scored by actually measuring the distance between the consecutive shapes crossed off by the subject and totaling the distances.

(3d) Mean distance score. Total distance divided by total number of shapes marked (correct and incorrect), minus 1.

(3e) SST Ratio I (active passive scanning). This ratio represents the number of shapes per unit time during the test proper, divided by the number of shapes per unit time during the MTT. The value of this Ratio I is obtained by multiplying the number of shapes marked during 30 seconds,

by the time necessary to mark the 18 shapes of the MTT, and is divided by 100. The higher the ratio value, the greater the activity of scanning. For example, the same number of shapes marked by two subjects on the SST, where one subject is slower and one faster, shows more activity on the part of the slower subject.

(3f) SST Ratio II (narrow broad scanning). Here the number of seconds the subject took to mark each shape on the MTT is multiplied by the total distance covered by the sequence of shapes marked. Again, the motor aspect of the response is taken into account. The higher the ratio value, the broader the scanning.

Just as in the case of the LSHT, and for similar reasons, two of the three Scattered Scanning Test subscores were combined by linear addition of the SST 3e and SST 3f subscores. In the case of the SST, no correction for keying was necessary. The new combined scores are named COMSST.

Stroop Color Word Test (Stroop, 1935)

This test was used here to assess both the field articulation control principle and Referential Competence. The test consists of three cards: Card I; a series of four color names printed in ten columns on ten lines in black ink (100 words); Card II: a color naming card with colored patches equivalent in length and arrangement to the color words on Card I; and Card III: an interference card consisting of color names printed in incongruent colors, e.g.,

the word "blue" is printed in red ink. The task on Card I is to read the words, on Card II and Card III to name the colors. On Card III the subject is to name the colors in the face of the interfering stimulus of the word.

For the field articulation principle, the speed of the total Card III minus the speed of the total Card II was used to determine the degree of susceptibility to interference. Two scores were used in the present study: (4a) interference score; (4b) color naming score (Bucci & Freedman, 1978, 1980). This score is obtained by subtracting the word reading score on Card I from the color naming score on Card II.

Gardner et al. (1959) and Gardner et al. (1960) used the Stroop Color Word Test and a Size Estimation Test. A regression formula was used to obtain the interference score. Comalli et al. (1962) used the total color naming time on Card III as the score in a cross-sectional study using subjects aged 7-89. Santostefano (1978) has used an especially designed test for field articulation, named Fruit Distraction Test. He recommended using the Stroop CWT on subjects above age 12 because the Fruit Distraction Test may be too simple. The Stroop CWT was used here rather than the Fruit Distraction Test because the Stroop CWT has been used to assess both constricted-flexible control and referential competence. The latter construct was studied in the present study and it was thought desirable to use similar tests as far as possible as were used in previous studies.

The Object Word Test (OWT)

This instrument was administered as an alternate-form test to the Stroop CWT.

The Cards I and II of this instrument have been patterned after the same cards of the CWT, with a different content. It has been constructed by a research team at Downstate Medical Center (Barroso, 1976), and the objects tested for familiarity and identifiability in tachistoscopic presentation.

Card I contains 100 words of common objects (bell, house, flower, tree) in ten rows of ten columns on each card. Each word has the same number of syllables and sound patterns as the Card I of the CWT. Object Card II contains line-drawings in black and white of the objects listed in Card I. The object names on Card I and the pictures of the objects on Card II are randomized parallel to the CWT. This test has been tested only in a preliminary study (Bucci & Freedman, in preparation). The reading time on the words of Card I was the same as on Card I of the CWT. It was found before (Denckla & Rudel, 1976) that object naming takes longer than color naming, even though the colors are learned later in life than object names. The relationship of the two latencies (Card I and Card II) are in the expected direction. People experience the linkage of the word to the idea (in the colors and the objects) as automatic. For the purposes of referential competence it is fruitful to explore various domains of content in studying the linking process; for the

purposes of constricted-flexible control, Card III is the crucial card. Card III was not constructed by the Downstate group. It was constructed especially for the present study in the following way: Over each object picture the name of a different object was drawn, e.g., the picture of a house and on it the conflicting word "bell," or "flower." The task was to name the object and overcome the intruding tendency to read the word (see Appendix J).

These tests have not been validated and the present study allowed it to be tested against the CWT. The two tests were expected to correlate to a significant degree.

Life Satisfaction Index A (Neugarten et al., 1961)

This scale was constructed to measure psychological well-being, using criteria presumed to operationally define successful aging. The Life Satisfaction Rating Scale (LSRS) was constructed rationally on the basis of analyses of lengthy interviews with some 1,700 subjects living in a community in the Kansas City area (aged 50-89). The LSIA to be used here was derived from the LSRS. The LSIA consists of 20 items, presumably tapping the five components isolated in the rating scales. These are: (1) zest (vs. apathy), described as "enthusiasm of response and degree of ego involvement" (high), to "bored with most things" (low); (2) resolution and fortitude: the opposite of feeling resigned or of passively accepting that which life has brought him. The individual reporting this may even feel

that "life was a series of hard knocks" but has stood up under them (p. 137) (high), to intro- or extra-punitiveness for failure or disappointment experienced (low); (3) congruence between desired and achieved goals (this seems self-explanatory; (4) self-concept. High rating goes to a person concerned with his appearance, grooming, and who is satisfied with himself, willing to give advice to others. Low scorers are those who feel "old," incompetent, "I'm endured by others"; (5) mood tone: high: cheerful, optimistic; low: pessimistic, bitter. (See Appendix D for a full scale.)

The LSIA has been validated (Adams, 1969; Dobson et al., 1969), and used extensively (Lieberman, 1978-79); Wiley, 1970; Edwards & Klemack, 1973).

Adams (1969) analyzed the LSIA on 508 subjects aged 65 to 80+, living in the community. His subjects received a mean score of 12.5 with a SD of 3.6, as compared to a mean score of 12.4 with a SD of 4.4 of the Neugarten et al. (1961) original sample. In a biserial correlation of all items, two items seemed to perform poorly in contributing to the total LSIA ($r = .16$ and $.28$, respectively, where $.30+$ was desirable). The two items were: "I feel my age, but it doesn't bother me" and "compared to other people my age, I've made a lot of foolish decisions in my life." Both items were also felt to be subject to dual interpretation and to have poor discriminating ability between the high and the low scorers.

Factor analysis revealed five factors; however, the distribution of the variance of the factors (34%, 8%, 7%, 5%, and 4%) suggested only one major factor, presumably life satisfaction, as the authors of the instrument had suggested. The two items listed above showed the least communality with the major factor (.07 and .008). Adams suggested that the two items be omitted from the LSIA. Indeed, some later studies used shortened versions of the LSI.

Self-concept (a component presumably tapped by the LSIA) was not represented in the factor structure as a separate factor. Adams theorized that self-concept may be inherent in all the other items. In general, the LSIA was found by him to provide a fair estimate of life satisfaction.

Lieberman (1978-79) used the LSIA as a measure of well-being in a study on 360 foreign born subjects aged 40-80. He found the instrument stable and the items culture-free. He obtained the following correlations: $-.51$ between symptoms and LSI, $-.14$ between depression and LSI, and $.35$ between health and LSI.

Wiley (1970) applied the Kuder-Richardson formula 20 to the LSIZ (13 items) and obtained reliability of $.79$. She reports in general satisfactory results with the test.

The LSIA appeared applicable to the population investigated in the present study because of its format and the culture-free nature of its items. It was expected that the population would be of multiethnic composition.

A somewhat modified scoring system was used in the

present study for the LSIA. The test consists of 20 statements, the answer to which the subject has to mark in an "agree," "disagree," or "?" column. Some statements are positively keyed, others negatively. The author's instructions are to give a 1 for an answer which represents optimism, 0 for one which shows lack of satisfaction, and 0 for a "?" answer.

It was felt that a "?" answer should be between a 1 and a 0, as it was an undecided one, and should be credited with a score of $1/2$.

To do away with fractions, the final value of the score was doubled. Both methods were used for computation (the old method to facilitate a comparison to other studies). The difference was not great. The means of the old and new methods (LSIA 6a and 6b, respectively) were 12.80 and 13.66.

Self-Rating Depression Scale (SDS) (Zung, 1965)

The author of SDS used commonly found characteristics of depression to construct a 20-item self-administered scale. The items are divided into three categories:

- (1) pervasive mood (e.g., crying spells, sadness);
 - (2) physiological equivalents (loss of appetite, weight loss, fatigue); and
 - (3) psychological concomitants (agitation, retardation, emptiness, confusion, indecisiveness, etc.).
- Ten items are worded positively (e.g., "I feel downhearted and blue"), and ten negatively ("I feel hopeful about the future"). The items are rated on a four-point scale (1 = a little of the time, 4 = most of the time).

The author reports some validating data. A significant difference was found in the mean indices of the depressive and control subjects (a mean of 0.74, range 0.63 to 0.90, $n = 31$ for the depressed group, and a mean of 0.33, range=0.25 to 0.43, $n = 100$, $p < 0.01$ for the control group). He also reports on the differentiating ability of the test between depressed patients and those with depression-like symptoms. The latter were identified on the basis of SDS as having suffered from other pathologies. The mean SDS index of the latter group was .53, significantly different ($p < .01$) both from the depressive and from the control groups.

The test has been used clinically. Bucci and Freedman, 1980, p. 14) included the scale in their study on elderly patients because of "its brevity and inclusion of items reflecting somatic and behavioral as well as mood factors."

The SDS was selected for the present study for the same reasons. (See Appendix E for the SDS and the scoring key.)

As was stated above, the sample of population studied here was not expected to be characterized by a large number of cases of depression of pathological degree. Nevertheless, because of the pervasive nature of depression in old age cited by many researchers, a wide range of scores on the SDS was expected, reaching into the pathological level.

The use of a depression scale as an index of adaptation (or maladaptation) seemed warranted on the basis of the research findings on the prevalence of depression in the aged population. Although no statement to this effect was made by Zung (1965), it was expected that even in the lower ranges of SDS scores, the scale will discriminate among individuals of varying degrees of dissatisfaction with life, at least in the older age group.

Social Interaction Questionnaire (SIQ) (Dolen, 1980)

The SIQ is a self-rating scale based on Havinghurst et al. (1969) Social Role Rating Scale. The latter instrument was designed to measure the extent of social engagement of an elderly population in 12 roles, reflecting the major areas of a person's social lifespaces.

The ratings on the Social Role Rating scale were derived from lengthy interviews with retired people in six countries. The interview schedules were designed to elicit questions in relation to the degree of the social role activities of the individuals. No special theory of social role behavior guided the construction of the scale; it represented a pragmatic approach to obtain the information.

Not all people were assumed to be engaged to equal degree in all areas, but the roles were perceived to provide a criterion on which to compare individuals or groups.

The SIQ is a rating scale of twelve role categories, each role participation quantified in terms of

the amount of time spent in the role. (The SIQ is reproduced in Appendix F.)

The twelve roles are: spouse, parent, grandparent, kin, housekeeper, neighbor, friend, worker, club/association member, church member, acquaintance, and civic/political member. The scoring is based on a 5-point scale (0, 2, 4, 6, 8 where 0 = no activity and 8 = high activity). Depending on the number of roles engaged in, the possible range is 0 to 96. "The rating was based on activity, not formal status. The subject may have been a grandparent, parent, etc., but if there was no time, effort, or contact in the role, the subject was rated zero" (Dolen, 1980).

The score was derived by the level of participation within each role, divided by the number of roles available to the subject.

Dolen (1980) used in her study six different social engagement measures as independent variables; she reported that the SIQ provided the major predictive power to all of the findings. None of the other social interaction predictors significantly accounted for unique variance in the dependent variable. The correlation achieved for role activity and an independent variable (a social-cognitive task) was .37, almost as large as the correlation based on all six predictors.

Dolen reported a pilot study on an elderly population undertaken to validate a written format of one of the tests in her study. No significant difference was found

between an oral response to the test and a written response ($t = 8, p < .05$).

Although the measure tested in the pilot study was not the one used in the present study, it indicated that written formats can be used on older people.

Psychological Involvement Measure (PIM) (Dolen, 1980)

This instrument, too, was redesigned by Dolen, based on a Havinghurst et al. (1969) measure. Its purpose is to assess the time spent by the subjects in planning, thinking or worrying about the same twelve roles listed in the SIQ. The categories are rated on a 4-point scale (0-3). The score is derived by the sum of the ratings divided by the number of roles available to the subject. The total range is 0-36.

This measure was used in the present study to examine the subjective sense of social involvement as a factor in life satisfaction.

Havinghurst et al. (1968) state that the present test and SIQ are usually but not always related. Most often the person who is engaged in interactions with many people is also invested in others, while the withdrawn person tends to be psychologically withdrawn. Nevertheless, Havinghurst et al. feel (p. 164) that there may be persons who become isolated but try unsuccessfully to maintain a social involvement, or persons whose activities remain high in spite of their preference for increased privacy. Based on this, the two engagement measures (SIQ and PIM) may proceed independently.

Havinghurst et al. (1968) called the precursor of the present instrument "Ego Investment in Present Roles," and treated it as a social engagement rather than a psychological engagement measure. Havinghurst et al. used an additional measure using TAT, which they called "psychological engagement measure." That test was not used here; however, the PIM was regarded as a psychological engagement measure. (See Appendix G for a sample test.)

Ego investment or psychological involvement as it was called here, was found by Havinghurst et al. (1968) to decline significantly with age ($p < .05$).

Thorndike Form A Verbal Test (VT)

A brief intelligence test was administered in this study to control for intelligence as a factor in cognitive controls performance. A verbal test was chosen because vocabulary has been proven to show little drop in older age (Birren & Morrison, 1961). The VT was chosen because of its brevity and reliability and validity, and because of its proven usefulness in polls of various populations. It is a 20-word multiple choice vocabulary test adapted by Thorndike (1942) from his longer Educational Research Intelligence Scale, the CAVD (see Appendix H).

In a study of intelligence in the United States, Miner (1957) used this test in a survey of 1,500 people aged 10 to 75 in 48 states in various occupations of a wide range of occupational levels and areas of residence.

The test has been standardized by Thorndike by comparing the scores with a simultaneously administered Otis Self Administering Intelligence Examination to about 1,000 students, grades 7 to 11. The American Council Psychological Examination (ACE) was given to 268 college entering freshmen. The norms of the Otis MA and the percentile equivalent of the ACE verbal scores are presented by Miner (1957). A VT score of 17 (out of a possible 20) corresponds to a 99 percentile of entering college freshmen; a 12 to a MA of 17.2 of the Otis MA and a 42 percentile of the college freshmen; and a 6 to a MA of 10.5.

Thorndike reported several reliability data. In an even-odd split-half method, a value of .85 was obtained. Parallel form reliability for a cross-section of adults was reported as .915.

Miner obtained norms with the VT relating the latter to various social and demographic variables such as education, social class, sex, age group, and others. These were useful for the present study as a basis for comparing the two age groups of the present study: 43-60, and 63-89, with the normative data.

Miner found that the mean VT of the 45-54 year old group was 11.20 with a SD of 3.90, the second highest mean score with the highest SD of his population, ranging from 10 to 75+. The 65-74 group produced a mean score of 10.64 with a 3.56 SD. The latter mean score was equivalent to that of the 18-24 group, but the SD was smaller (3.06).

In comparison, the present mean scores of the two groups were: 15.25 with SD of 2.77 of the 43-60 age group and a mean of 12.00 with SD of 3.52 for the 63-89 age group.

The test was administered by the examiner and, because of the large number of tests given to each person, it was essential that this test be as brief as possible.

A modification in the scoring was introduced right at the beginning of the testing on purely rational grounds: a score of 1/5 was assigned to each omitted answer. The rationale was that by guessing, the chances of selecting the right answer was 1/5, and therefore the subject was not penalized for omissions. The difference between the old and the revised score was very small. For the entire age range (43-89), the relative mean scores were 13.5 for VT 1 (the old scoring method) and 13.73 for VT 2 (the new scoring method). The new score was used in the computations.

Because of the foreign background of a few of the subjects, the vocabulary test could not be completed by some of them; only 40 out of 50 of the younger subjects and 35 of the older ones completed the test. Since the English vocabulary level of many of those subjects who completed the VT did not seem to correspond to their general level of intelligence, the Vocabulary Test as such was felt to be an inadequate measure of intelligence for the present sample. This emerged after the tests had been completed.

Besides the above measures, a cover page was provided, assuring the subjects of confidentiality. A

demographic questionnaire was attached as well with questions relating to age, sex, country of birth, past or present occupation, and relative health (see Appendix A).

Data Analysis

In order to test hypotheses 1 and 2, the mean value of all tests was derived and tabulated. An ANOVA was performed to observe the developmental trends within each response area.

To test hypothesis 3, namely, that agreement or a fit between certain cognitive controls and social involvement is an intervening variable that determines life satisfaction in the elderly, there was a need to generate a single variable that could measure agreement between cognitive controls and social involvement. The hypothesis could then be reduced to read: agreement leads to satisfaction and disagreement to dissatisfaction.

Several methods of arriving at such a single variable were possible:

1. Deriving the deviation scores from the combined scores of the Social Involvement Questionnaire (SIQ) and the Psychological Involvement Measure (PIM), and from the combined cognitive control measures, and using the products of the deviations of the combined cognitive controls and combined SIQ with PIM deviations as a measure of agreement.
2. Deriving the product of deviation scores (as in 1) of the combined SIQ and PIM scores and of individual cognitive control scores.

3. Using the absolute value of the difference in the standardized deviation scores for either the combined cognitive control and the combined SIQ and PIM measures, or from the individual cognitive controls and the latter.

4. Using the simple product of a combined cognitive control score and a combined social involvement score. The latter method was used here and will be described below.

Regression equations were then applicable using life adjustment variables as dependent variables (life satisfaction or depression) with four possible sets of independent variables, to test hypotheses 3a and 3c: (1) the individual cognitive control score; (2) the combined social involvement measures (SIQ and PIM); (3) the agreement variables (cross products); (4) the referential competence score.

The resulting F ratios show to what level of confidence the variations in the life adjustment variables can be accounted for by the predictor variables.

By using agreement variables as well as the component variables in the regression equation, the observation of the relationships between life adaptation and cognitive variables may be enriched.

CHAPTER V

RESULTS

The results of the analysis will be evaluated against the specific hypotheses set forth on pages 88 through 91. Subsequently, additional findings will be presented that bear on other questions raised at various parts of the text.

Summary of the Hypotheses

The following trends were expected in the older age groups:

1. Increased leveling, narrower and more passive scanning, and more constricted control.
2. A mild slowing in color naming.

The following relationships had been anticipated between the cognitive control principles, social involvement, and life satisfaction and depression:

3a. High scores in the leveling-sharpening and the scanning controls were expected most often to lead to higher social involvement; low scores on the above control principles to low social involvement.

3b. Congruence between the scores in leveling-sharpening and in social involvement and between the scanning control and social involvement (high cognitive control-high environment, and low cognitive control-low environment) were to yield relatively high life satisfaction and low depression scores.

3c. Incongruence between scores in leveling-sharpening and social involvement and between scores in the scanning control and social involvement (high cognitive control-low environment and low cognitive control-high environment) were to produce relatively low life satisfaction and high depression scores.

4. A relatively high correlation was expected between scores in the constricted-flexible control and life satisfaction.

5a. Referential competence scores were expected to correlate negatively with depression.

5b. Referential competence scores were expected to correlate negatively with the scanning control.

6. A low correlation was expected for verbal intelligence scores and age, and for verbal intelligence and the cognitive control principle scores.

The major variables investigated in the present study were:

1. Three cognitive control variables: (a) leveling-sharpening; (b) the scanning control; (c) constricted-flexible control.

2. Two social involvement measures: (a) social interaction; (b) psychological involvement.

3. Two life adjustment measures: (a) life satisfaction; (b) depression.

Aside from these, some demographic variables were obtained from each subject: age, education, occupation,

state of health, and verbal intelligence. These were gathered without a specific hypothesis in mind.

Frequencies, measures of central tendencies, and intercorrelations were obtained of all the above variables within the total sample of subjects and in the two subgroups (age group 1: ages 43-60; age group 2: ages 63-89), each comprising 50 subjects, 25 males and 25 females.

Findings

Hypotheses 1 and 2

Table 1 lists some means and standard deviations of the major variables. On Tables 2 and 3, the results of two-way analyses of variance, investigating the specific age trends with respect to the same variables, are presented. Table 2 shows the changes that occur over two age groups (between ages 43-60 and 63-89) and Table 3 lists the changes that occur over the same age span, when this is broken down into four groups: group 1 (43-52), group 2 (53-60), group 3 (63-70), and group 4 (71-89).

For a two-group, one-way ANOVA, the F-ratio yields identical values to the squared Student t-ratio, $t = \sqrt{F}$, or $t^2 = F$ (Haber & Runyon, 1969). For the sake of compactness, the results of the ANOVA will be presented in t-test terms. The F-probabilities of the ANOVA become 2-tail t-probabilities.

The following differences between the groups emerged from the two-group ANOVA, as is illustrated in Table 2: for all cognitive control scores, that showed a difference in

TABLE 1
MEANS AND STANDARD DEVIATIONS OF THE MAJOR
VARIABLES IN THE ENTIRE SAMPLE AND IN THE
TWO SUBGROUPS

Variable	Total Sample n = 100		Age Group 1 n = 50		Age Group 2 n = 50	
	Mean	SD	Mean	SD	Mean	SD
Cognitive Controls						
COMLST*	21.10	0.75	24.79	0.87	17.40	0.99
COMSST**	23.10	0.55	23.04	0.75	23.16	0.82
constricted flexible control	59.97	32.67	47.32	16.47	72.62	39.48
Referential Competence	34.59	14.40	30.00	10.68	39.18	16.18
Social Involvement						
social interaction	5.17	0.96	5.40	0.80	4.93	1.05
psychological involvement	1.94	0.46	2.07	0.36	1.81	0.52
Life Adjustment						
life satisfaction	27.32	8.38	28.84	7.65	25.80	9.54
depression	0.415	0.097	0.394	0.084	0.436	0.11
education	4.17	1.551	4.92	1.35	3.42	1.37
verbal intelligence	n=75 13.73	3.52	n=40 15.25	2.77	n=35 12.00	3.52

*A combined score of two Leveling-Sharpening House Test scores, the LSHT 1b and LSHT 1c after a correction of the latter was made for negative keying. The correction was accomplished by subtracting each score from 32 (the maximum score in the sample was 29).

**A combined score of two Scattered Scanning Test scores, the SST 3e and SST 3f, the scanning ratios 1 and 2.

TABLE 2
ANOVA ASSESSMENT OF CHANGES IN
COGNITIVE CONTROL VARIABLES
OVER TWO AGE GROUPS

Variables	Group 1 n=50 Mean	Group 2 n=50 Mean	t-value	t-probability
L-S first stop, 1a	17.58	22.86	2.820	0.0058
L-S number correct, 1b	10.30	7.17	5.271	0.0000
L-S ratio, 1c	17.50	21.74	5.607	0.0000
Scanning number correct, 3a	37.54	27.62	4.631	0.0000
Scanning* total distance, 3c	280.54	211.12	4.893	0.0000
Color naming time difference, RC 4a	30.00	39.18	3.348	0.0012
Constricted- flexible control, interference, 4b	47.32	72.62	4.181	0.0001
Depression, SDS	0.39	0.44	2.186	0.0312
Social interaction, SIQ	5.40	4.94	2.447	0.0154
Psychological involvement, PIM	2.07	1.81	2.891	0.0047
Vocabulary test	n=40 15.25	n=35 12.00		0.0000

*All other scanning subscores did not differ significantly over the two age groups.

TABLE 3

ANOVA ASSESSMENT OF CHANGES IN
COGNITIVE CONTROL VARIABLES
OVER FOUR AGE GROUPS

Cognitive Control Variables	Group 1 n=23	Group 2 n=27	Group 3 n=17	Group 4 n=33	Significance at 0.05 level by LSD Procedure
	Mean				
L-S COMLST	27.73	22.29	17.98	17.10	Groups 1-2, 1-3, 1-4, 2-3, 2-4
Scanning COMSST	23.61	22.55	23.85	22.80	No two groups were signifi- cantly differ- ent at 0.05 level
Color naming RC 4a	27.96	31.74	40.47	38.52	Groups 1-3, 1-4, 2-3
Constricted flexible interfer- ence 4b	43.52	50.56	61.12	78.55	Groups 1-4, 2-4
Vocabulary	15.91	14.35	11.40	12.24	Groups 1-3, 1-4, 2-3, 2-4

performance in the two age groups, the performance was less differentiated in the older group than in the younger one. Table 2 illustrates that of the cognitive control scores, all leveling-sharpening subscores, the constricted-flexible control score, and two of the scanning subscores (number correct and total distance covered) attained statistical significance of $p \leq 0.006$). Color naming was significantly slower for the older group ($p = 0.001$); social interaction and psychological involvement showed a significant decrease with increasing age ($p = 0.02$ and 0.005 , respectively), and depression an increase with increasing age ($p = 0.03$). The difference in life satisfaction was not statistically significant but showed a trend toward lessening ($p = 0.08$).

Table 3 presents the means in the four age groups of the three cognitive controls and color naming, and indicates those groups, between which significantly different results were obtained. Contrasts were obtained by applying the Least Significant Difference method (SPSS User's Manual, 1975), for a 0.05 level of Alpha. For leveling-sharpening and for scanning, combined scores were used for the computation. In leveling-sharpening, Groups 1-2, 1-3, 1-4, 2-3, and 2-4 showed significant differences; no scanning score difference was found at the 0.05 level between any groups. Color naming was significantly different in Groups 1-3, 1-4, and 2-3, and constricted-flexible control in Groups 1-4 and 2-4. No subgroups differed significantly on depression. In life satisfaction, Groups 1-4 differed significantly at the 0.05 level.

Deviations from linearity were not detected in the age span investigated in any of the cognitive control principles.

It is of interest to note that in the two-group ANOVA, depression was found to be significantly different between the groups, and life satisfaction was not, while in the four-group ANOVA the reverse was found.

Tables 4 and 5 compare the means and SDs of some of the cognitive control principles and of referential competence scores for various age groups, using data from the present as well as from other studies. Table 4 illustrates a developmental trend, which is at a somewhat undifferentiated level at age 6-7, reaches a high degree of differentiation by 5th grade (age 10-11) and begins to dip soon after, through to old age.

The 5th graders achieved, by far, scores of the highest differentiation. The two older age groups (subjects in the present study) showed scores well below the level of the 1st graders in this comparison. The reason for the findings in this comparison does not suggest itself readily. It might be that some of the tasks in the school work at the present time lead to the development of a tendency toward better performance on these cognitive control tasks.

Table 5 does not lend itself to easy interpretation. For one, Comalli et al. (1962) used a modified CWT, using only three colors instead of the four used here; furthermore, the ages are grouped differently in Commali et al.'s study.

TABLE 4
MEANS AND SDs OF THE LEVELING-SHARPENING
HOUSE TEST FOR VARIOUS AGE GROUPS

Variables	1st Graders ⁴ n=22		5th Graders n=16		Young ⁵ Adults 19-24 n=45	Group 1 43-60 n=50		Group 2 63-89 n=50	
	Mean	SD	Mean	SD	Mean	Mean	SD	Mean	SD
LSHT 1a ¹	10.20	0.95	7.60	0.80	11.60	17.58	7.22	22.86	11.01
LSHT 1b ²	12.40	0.36	14.40	0.42	14.05	10.30	2.68	7.14	3.28
LSHT 1c ³	13.10	0.62	9.70	0.89	12.50	17.51	3.62	21.74	3.92

¹Leveling-Sharpening House Test, first stop

²L-S, number correct

³L-S ratio

⁴from Santostefano, 1978, p. 300

⁵from Lemieux, 1965, as reported by Santostefano, 1978, p. 225

TABLE 5

MEANS OF REFERENTIAL COMPETENCE AND THE
INTERFERENCE SCORE ACROSS THE LIFE SPAN

Variables	Age ³ 7	Age ³ 10	Age ³ 13	Ages ³ 25-34	Ages ³ 35-44	Ages ³ 65-80	Group 1 43-60 n=50		Group 2 63-89 n=50	
	n=24	n=25	n=29	n=14	n=16	n=15	Mean	SD	Mean	SD
Referential Competence ¹	37.1	30.5	25.4	21.5	15.3	23.8	30.00	10.68	39.18	16.18
Interference ²	127.8	91.5	68.1	45.3	52.0	96.2	47.32	16.47	72.62	39.49

¹Stroop CWT, Card II minus Card I

²Stroop CWT, Card III minus Card II

³Comalli et al., 1962

It seems that Comalli's subjects as a group did better on the color naming but more poorly on the interference test than the present sample.

Hypothesis 3a

Correlations between the leveling-sharpening control, measured by a combined leveling-sharpening score (COMLST) and social involvement, measured by a combined social involvement score (SOCI), and between a combined scanning score (COMSST) and SOCI, and between interference and SOCI, yielded results shown in Table 6. The correlations between COMLST and SOCI reached significance only in the entire age group ($p = 0.01$); in Group 1 the correlation was far from significant, and in Group 2 there was a positive trend approaching significance ($p = 0.06$).

The correlations between COMSST and SOCI, and Interference and SOCI were statistically highly significant for the total sample and for Group 2 (the older group). In Group 1 only the correlation coefficient of COMSST and SOCI approached significance ($p = 0.06$). It seems that at least some cognitive control principles are related to heightened psychological involvement and social activity: the leveling-sharpening cognitive control across ages 43-89 and scanning and interference across ages 43-89 and 63-89. The causal relationship can only be speculated on.

Correlations in the entire sample between life satisfaction scores and leveling-sharpening, and life satisfaction

TABLE 6
CORRELATIONS OF SOCIAL INVOLVEMENT
WITH LEVELING-SHARPENING (COMLST)
AND SCANNING (COMSST)

SOCIAL INVOLVEMENT WITH COMLST ¹			SOCIAL INVOLVEMENT WITH COMSST ²		
Total Sample Ages 43-89 n=100 r	Group 1 43-60 n=50 r	Group 2 63-89 n=50 r	Total Sample Ages 43-89 n=100 r	Group 1 43-60 n=50 r	Group 2 63-89 n=50 r
0.226****	-0.058	0.218*	0.214***	0.221*	0.232**

*p = 0.06 n.s.

**p = 0.05

***p = 0.02

****p = 0.01

¹Combined Leveling-Sharpener House Test score

²Combined Scattered Scanning Test score

and interference were significant to the $p \leq 0.01$ level. Between depression scores and the above cognitive controls it was significant to the $p \leq 0.001$ level; depression and scanning correlated in the entire sample to a $p \leq 0.03$ level of significance.

No significant correlations were found among the above variables in the younger group; in the older age group, all cognitive controls reached significance with both life satisfaction and depression to $p \leq 0.05$ - $p \leq 0.001$ levels (see Tables 10 to 12).

Hypothesis 3b

To obtain a congruence measure between the cognitive control principles and social involvement, each combined cognitive control score was multiplied by the combined social involvement score (SOI), and the product served as the congruence measure. Multiple regression analyses were then performed, with life satisfaction and depression scores (respectively) as dependent variables, the social involvement scores being entered first, the individual cognitive control score next, and last the cross-product.

Social involvement is known to be a strong factor in life satisfaction (Neugarten et al., 1968; Havinghurst et al., 1968; Maddox & Eisdorfer, 1962); therefore it needed to be controlled by being entered into the regression equation first. Similarly, the single cognitive control and social involvement measures needed to be controlled when the effect

of the congruence was being tested. Tables 7 through 9 list the results of the regression analyses.

Multiple regression analyses with life satisfaction and with depression as independent variables were performed for the entire sample and separately for the two age groups. To control for age, the age variable was entered first in the regression analysis for the entire sample (over the age span of 43-89), but not for the individual groups. Age was found to be significant in life satisfaction at a $p = 0.05$ level for the entire age span studied. For life satisfaction as a dependent variable (Table 7), social involvement (SOCI) was highly significant ($p < 0.01$). Leveling-sharpening (COMLST) approached significance ($F = 3.42$; the critical value for $p = 0.05$ is 3.94). Neither the other individual cognitive controls nor any of the cross-products were significant as predictors for life satisfaction. In the regression analysis for the entire age span, with depression as a dependent variable (Table 7), age was significantly predictive at $F = 6.83$, $p < 0.05$ level of significance (approaching the $p = 0.01$ level, the critical value of which is $F = 6.90$). SOCI was significant ($F = 18.93$, $p < 0.01$). COMLST showed a trend, approaching significance at 0.05 level ($F = 3.81$, with a critical value of 3.94 at $df = 1, 98$). The interference score of the constricted-flexible control was significant at the $p = 0.05$ level ($F = 4.74$) and the cross-product of interference and SOCI significant for depression at the $p = 0.01$ level ($F = 8.02$).

TABLE 7

MULTIPLE REGRESSION ANALYSIS
TOTAL SAMPLE, $n = 100$, $DF = 98$

Variables	F value	F probability	
Life Satisfaction Regressed on Cognitive Controls and Social Involvement			
Age	5.32	0.05	
SOCI (combined social involvement)	28.63	0.01	
COMLST (L-S) (combined leveling- sharpening)	3.42	n.s.	Critical value for 0.05 = 3.94
CPLST (leveling- sharpening cross- product)		n.s.	

COMSST (combined scanning)		n.s.	
CPSST (scanning cross-product)		n.s.	

Interference (constricted- flexible control)		n.s.	
CPINTR (cross- product)		n.s.	

Referential competence (color naming)		n.s.	
Referential competence (cross-product)		n.s.	

(continued)

TABLE 7
(continued)

Variables	F value	F probability	
Depression Regressed on Cognitive Controls and Social Involvement			
Age	6.83	0.05	Critical value for 0.01 = 6.90
SOCI (combined social involvement)	18.93	0.01	
COMLST (combined leveling-sharpening)	3.87	n.s.	Critical value for 0.05 = 3.94

COMSST (combined scanning)		n.s.	
Referential competence (color naming)		n.s.	
Interference	4.74	0.05	
CPINTR (interference cross-product)	8.02	0.01	

TABLE 8
 MULTIPLE REGRESSION ANALYSIS
 GROUP 1 (AGES 43-60), n = 50, DF = 48

Variables	F value	F probability
Life Satisfaction Regressed on Cognitive Controls and Social Involvement		
SOCI (social involvement)	7.76	0.01
COMLST (leveling-sharpening)		n.s.
CPLST (leveling-sharpening cross-product)		n.s.

COMSST (scanning)	4.17	0.05
CPSST (scanning cross-product)		n.s.

Interference (constricted-flexible)		n.s.
CPINTR (cross-product)		n.s.

Referential competence (naming)		n.s.
Cross-product referential competence (naming)		n.s.

(continued)

TABLE 8
(continued)

Variables	F value	F probability
Depression Regressed on Cognitive Controls and Social Involvement		
SOCI (social involvement)		n.s.
COMLST (leveling-sharpening)		n.s.
CPLST (leveling-sharpening cross-product)		n.s.

COMSST (scanning)		n.s.
CPSST (scanning cross-product)		n.s.

Interference		n.s.
CPINTR (interference cross-product)		n.s.

Referential competence (color naming)		n.s.
Cross-product referential competence (color naming cross- product)		n.s.

TABLE 9

MULTIPLE REGRESSION ANALYSIS
GROUP 2 (AGES 63-89), n = 50, DF = 1, 48)

Variables	F value	F probability
Life Satisfaction Regressed on Cognitive Controls and Social Involvement		
SOCI (social involvement)	22.29	0.01
COMLST (leveling-sharpening)	4.94	0.05
CPLST (leveling-sharpening cross-product)		n.s.

COMSST (scanning)		n.s.
CPSST (scanning cross-product)		n.s.

Interference (constricted-flexible)		n.s.
CPINTR (interference cross-product)		n.s.

Referential competence (color naming)		n.s.
Cross-product referential competence (color naming cross-product)		n.s.

(continued)

TABLE 9
(continued)

Variables	F value	F probability	
Depression Regressed on Cognitive Controls and Social Involvement			
SOCI (social involvement)	19.19	0.01	
COMLST (leveling- sharpening)	8.55	0.01	
CPLST (leveling- sharpening cross- product)		n.s.	

COMSST (scanning)		n.s.	
CPSST (scanning cross-product)		n.s.	

Interference	6.33	0.55	Critical value for 0.01 = 7.29
CPINTR (interference cross-product)	5.89	0.05	

Referential competence (color naming)		n.s.	
Cross-product referential competence (color naming cross-product)		n.s.	

TABLE 10
CORRELATIONS AMONG COGNITIVE CONTROLS,
SOCIAL INVOLVEMENT, AND LIFE ADJUSTMENT VARIABLES
TOTAL SAMPLE, n = 100

Variables	SOCI ¹	COMSST	Interference	Referential Competence	Life Satisfaction	Depression
COMLST ²	0.266***	0.192**	0.460****	0.395****	0.282***	-0.306****
COMSST ³	0.214**		0.164*	0.039	0.104	-0.213**
Interference ⁴	-0.316****			0.347****	-0.247***	0.354****
Referential Competence ⁵	-0.316				-0.034	0.072
Life Satisfaction ⁶	-0.113****					-0.649****
Depression ⁷	-0.453****					

¹Combined Social Interaction and Psychological
Involvement Score (SIQ and PIM)

²Combined Leveling-Sharpening Score

³Combined Scanning Score

⁴Stroop CWT Card III minus Card II

⁵Stroop CWT Card II minus Card I

⁶LSIA

⁷Zung Depression Scale

*p ≤ 0.05
**p ≤ 0.03
***p ≤ 0.01
****p ≤ 0.001

TABLE 11

CORRELATIONS AMONG COGNITIVE CONTROLS,
SOCIAL INVOLVEMENT, AND LIFE ADJUSTMENT VARIABLES
GROUP 1 (43-60), n = 50

Variable	NEWSST 3e	COMSST	Interf.	Ref. Comp.	Life Sat.	Depr.	SOCI
COMLST ¹		0.171	0.294**	0.339***	0.027	0.054	-0.058
COMSST ²			0.084	-0.106	-0.176	-0.187	-0.221
Interference ³				0.296**	0.130	-0.093	0.001
Referential Competence ⁴					0.171	-0.153	0.294**
Life Satisfaction ⁵						-0.513****	0.373***
Depression ⁶							-0.226
SOCI ⁷							
NEWSST 3e ⁸			-0.158	-0.331***	-0.130	-0.018	0.048
NEWSST 3f ⁸	0.692****		-0.235*	-0.260**	-0.054	-0.214	0.130

¹Combined Leveling-Sharpening score

*p ≤ 0.05

²Combined Scanning score

**p ≤ 0.03

³Stroop CWT Card III minus Card II

***p ≤ 0.01

⁴Stroop CWT Card II minus Card I

****p ≤ 0.001

⁵LSIA

⁶Zung Depression Scale

⁷Combined Social Interaction and Psychological
Involvement score

⁸New Scanning Scores

TABLE 12
CORRELATIONS AMONG COGNITIVE CONTROLS,
SOCIAL INVOLVEMENT, AND LIFE ADJUSTMENT VARIABLES
GROUP 2 (63-89), n = 50

Variable	NEWSST 3e	COMSST	Interf.	Ref. Comp.	Life Sat.	Depr.	SOCI
COMLST ¹		0.272**	0.375***	0.263**	0.372***	-0.440****	0.218
COMSST ²			-0.236*	-0.009	-0.315***	-0.247*	-0.232*
Interference ³				0.249*	-0.318***	0.447****	-0.320***
Referential Competence ⁴					-0.055	0.085	-0.186
Life Satisfaction ⁵						-0.715****	0.563****
Depression ⁶							-0.534****
SOCI ⁷							
NEWSST 3e ⁸			-0.384***	-0.254*	0.378***	-0.239*	0.309**
NEWSST 3f ⁸	0.719****		-0.469****	0.224	0.350***	-0.384***	0.361***

¹Combined Leveling-Sharpening score

*p ≤ 0.05

²Combined Scanning score

**p ≤ 0.03

³Stroop CWT Card III minus Card II

***p ≤ 0.01

⁴Stroop CWT Card II minus Card I

****p ≤ 0.001

⁵LSIA

⁶Zung Depression Scale

⁷Combined Social Interaction and Psychological
Involvement Score

⁸New Scanning score

For age group 1 (ages 43-60), with life satisfaction as the dependent variable, Table 8 indicates that SOCI was significant, but at a lower level than for the entire group ($F = 7.76$, $p < 0.01$). COMSST (the combined scanning score) was the only other variable reaching significance at the $p < 0.05$ ($F = 4.17$) level.

With depression as the dependent variable, no variable (SOCI, the cognitive control variables or their products) reached significance as predictors (see Table 8).

For age group 2 (ages 63-89) with life satisfaction as the dependent variable, SOCI was significant beyond the $p < 0.01$ level ($F = 22.29$). COMLST (leveling-sharpening) was the only cognitive control principle to reach significance at the $p < 0.05$ level. No cross-product reached significance (see Table 9).

With depression as the dependent variable in age group 2, SOCI and COMLST (leveling-sharpening) reached a $p < 0.01$ level of significance, and interference (constricted-flexible control) and the cross-product of SOCI and interference reached a $p = 0.05$ level of significance ($F = 6.33$ and 5.89 , respectively) as predictor variables (see Table 9).

It is of some interest to note that at different stages of life, different cognitive controls become important factors to these "life adjustment" scores. A second finding of interest is the fact that depression as an index of life adjustment may be relevant in older age but not in middle age.

Hypothesis 4

Correlations between constricted-flexible control and life satisfaction, and constricted-flexible control and depression reached a significance level of $p \leq 0.01$ ($r = -0.318$, $r = 0.447$, respectively) in age group 2, and $p \leq 0.007$ ($r = -0.247$, $r = 0.354$) in the entire sample of subjects. In the younger age group, the correlations did not reach significance (see Tables 10, 11, and 12). Thus, the demonstrated ability of flexible subjects to handle emotions better (Klein, 1954) may be a factor in coping with the stresses of old age. (The interference score is negatively keyed; the higher the score, the lower the flexibility. Negative r with life satisfaction means that the lower the time it takes to read the colors, i.e., the more flexible the subject, the higher is the life satisfaction and the lower is depression.)

Hypothesis 5a

Contrary to expectations, correlations between referential competence and depression did not reach significance levels in any of the age groups.

This lack of correlation may have been due to the relatively low mean level of depression of the present sample, i.e., .394 in the middle and .436 in the older group. Scores below .50 on the Depression Scale are considered within the normal range and ought not to be expected to be reflected in deficits in the referential competence of the individual.

Hypothesis 5b

Gardner et al. (1959) found relative scanners to be slow in color naming, implying that a "hyperawareness of many elements" may slow down the person in this scanning task. The present data did not bear this out, as Tables 10, 11, and 12 indicate. Of the six scanning subtests, five were positively correlated with color naming in age group 1, and all six in group 2. The only negative correlations with color naming occurred in a subscore which proved to be meaningless in the present population, namely, "number incorrect." Only ten out of the 100 subjects marked one object incorrectly and two marked two objects incorrectly.

The "number correct " (SST 3a) was said to denote the degree of activity-passivity, and the "total distance covered " (SST 3c) the degree of broadness or narrowness of scanning. Both of these subtests correlated significantly with color naming in both age groups. In group 1 the correlation coefficients were $r = -0.3714$ ($p = 0.004$) and -0.3199 ($p = 0.012$) for SST 3a and SST 3c, respectively; in group 2, the older group, the coefficients were $r = -0.3265$ ($p = 0.010$) and -0.3374 ($p = 0.008$) for the respective variables. The color naming score is a timed response and the resulting correlation coefficient with the SST scores is negative when a more flexible person has a broader, more active way of scanning.

The negative correlations of Gardner et al. (1959) were not found in this study.

Hypothesis 6

Correlations between verbal intelligence and age, cognitive controls and life adjustment variables are listed on Table 13. In the entire age range, verbal intelligence correlated beyond the $p < 0.01$ level of significance with interference (constricted-flexible control, $r = -0.278$) and with depression ($r = -0.288$), and a $p < 0.001$ with age ($r = -0.480$) and COMLST (leveling-sharpening, $r = 0.572$).

In age group 1, verbal intelligence correlated with COMLST ($r = 0.372$, $p < 0.01$) and with age ($r = -0.276$, $p = 0.04$).

In age group 2, the correlations between verbal intelligence and leveling-sharpening reached a significance level of $p = 0.003$ ($r = 0.459$) and between verbal intelligence and depression $p = 0.03$ ($r = -0.317$).

The results provide evidence for the different role of verbal intelligence at different ages. The correlation between verbal intelligence and depression in old age is of interest. A correlation between verbal intelligence and age should have been expected on the basis of a cohort effect.

Table 2 lists the changes in verbal intelligence scores in the two age groups, and Table 3 the changes in verbal intelligence, when the entire age range is broken down into four groups.

TABLE 13

CORRELATIONS OF VERBAL INTELLIGENCE WITH AGE,
COGNITIVE CONTROL SCORES, AND
LIFE ADJUSTMENT VARIABLES

Verbal Intelligence With:	Total Sample n = 75 43-89	Group 1 n = 40 43-60	Group 2 n = 35 63-89
Age	-0.480***	-0.276*	n.s.
L-S	0.572***	0.372**	0.459**
Scanning	n.s.	n.s.	n.s.
Constricted- Flexible	-2.780**	n.s.	n.s.
Referential Competence	n.s.	n.s.	n.s.
Life Satisfaction	n.s.	n.s.	n.s.
Depression	-0.288**	n.s.	-0.317*

*p ≤ 0.05

**p ≤ 0.01

***p ≤ 0.001

Additional Issues

(1a) Correlations between life satisfaction and verbal intelligence, and life satisfaction and cognitive control scores in the separate age groups were to be examined to see whether cognitive controls may supplant intellectual abilities as factors in coping functions in old age (see Chapter II, Aging and Intellectual Functioning).

(1b) The change in verbal intelligence over time was to be assessed by ANOVA.

(2) Intercorrelations among all cognitive control variables in the different age groups were to be looked at to compare the configurations among the cognitive controls in the groups with that of children and the young adults in which this has been observed (Gardner et al., 1959; Santostefano, 1978; see Chapter II, Systems Theory).

(3) Performances on the Leveling-Sharpening House Test and the Leveling-Sharpening Aggression Test were to be compared to see whether the LSAT, in contrast to the LSHT, produced more leveling in the younger population than in the older one because of the aggressive nature of the stimulus (see Chapter IV, Instruments).

(4) The validity of the leveling-sharpening construct and the constricted-flexible construct, and the reliability of their respective instruments were to be investigated. Alternate form tests were administered to a limited number of subjects and their respective scores compared.

(5) Comparisons of cognitive control scores and life adjustment variables in males and females were to be made.

Findings on Issues 1-5 Above

(1a) Correlations between verbal intelligence and life satisfaction did not reach significance levels in either age group ($p = 0.44$ and 0.34 , respectively, in groups 1 and 2 (see Table 10)).

Correlation between verbal intelligence and depression was not significant in the younger group ($p = 0.29$), but reached an $r = -0.317$, $p = 0.03$ in the older group.

Of the cognitive control scores, only the scanning ratio (SST 3e) reached a correlation of 0.05 level of significance with life satisfaction ($r = -0.227$) in the younger group. In the older group, life satisfaction correlated positively with all leveling-sharpening subscores ($p = 0.05$ to 0.007), four scanning subscores ($p = 0.02$ to 0.005) and the constricted-flexible control score ($p = 0.01$).

Life satisfaction correlated with occupation in both groups ($p = 0.03$).

(1b) Two one-way ANOVAs were performed to assess the change in verbal intelligence over time. One was a two-group ANOVA (ages 43-60 and 63-89), and the second one a four-group one: group 1 (ages 43-52), group 2 (53-60), group 3 (63-70), and group 4 (71-89). Over the two age groups, the change was significant at the $p < 0.001$ level ($F = 20.005$). When the age span was broken down into four

groups, significant differences emerged at the $p = 0.05$ level between the following groups (using the LSD method): 1-3, 1-4, 2-3, and 2-4. The means of the four groups were the following: group 1, 15.91; group 2, 14.35; group 3, 11.40; and group 4, 12.24. There is a clear trend toward lessening of verbal ability, interestingly reaching the lowest point in the 63-70 group. A strong cohort effect should not be ruled out here since the composition of the age groups was so different.

The conjecture that cognitive controls, in contrast to intellectual abilities, may play important roles in coping skills in old age was corroborated. Life satisfaction was not related to verbal intelligence in any of the groups. Depression was negatively related to intelligence in the older group, as was mentioned in hypothesis 6. However, in the older group, life satisfaction correlated with all three cognitive controls, while in the younger group with only one.

(2) Intercorrelations among all variables were obtained. Tables 10, 11, and 12 list the matrix of Pearson Product-Moment correlations among some of the major variables.

Findings by Gardner et al. (1959) of a positive correlation between scanning and leveling-sharpening were corroborated by the present results ($r = 0.272$, $p = 0.03$) in group 2 and in the total sample ($r = 0.192$, $p = 0.03$), but not in group 1.

It is evident that the correlation coefficients of the cognitive control scores are different for the different

age groups. In age group 1, six of the correlations attained a $r = 0.294$ to 0.519 , $p \leq 0.05$. Out of these, three had a $p \leq 0.01$. In the older age group, 15 correlations attained $r = 0.236$ to 0.715 , $p \leq 0.05$, out of which ten reached a $p \leq 0.01$.

The older age group shows greater variance; this could be accounted for in part by the larger age span in the older group (26 years vs. 17 years in the younger group).

In computing the SST3e and SST 3f (the scanning ratios) by means of the formula provided by the manual, it became evident that extremely good scores in the Motor Tempo Test (MTT) result in low ratio scores, which are ostensibly indices of active-broad scanning. The reason for this is that the ratios employ in their numerator the speed of the MTT; if the MTT value is high (if the performance is slow), the ratio becomes large. It was felt that the personal tempo may be an important factor in the scanning performance of children (on whom the Scattered Scanning Test has been validated) but in adults, motor tempo may be of reduced significance. The MTT factor appears to be excessive in its effect on the SST ratio.

It was speculated that if this relative effect of MTT in the ratio is reduced, the outcome in the ratio will become a truer measure of the construct of scanning in adults. An attempt was therefore made to reduce the effect of motor speed by using in the formula for the scanning ratios (SST 3e and SST 3f, see the description of the SST on p. 101 above)

the square root of the MTT rather than the raw value of MTT.

Correlations were performed with the two new variables (named NEWSST 3e and NEWSST 3f). Some correlations are shown on Tables 11 and 12. The results indicate that 11 correlations between these new variables and the other cognitive control and life adjustment variables are stronger in the expected direction than those of the original SST scores or the combined COMSST. This can be seen in part on Tables 11 and 12. None of the computations were performed with the new variables; in most of the other computations, the old SST 3E and SST 3F were combined, as was mentioned above.

The results show a higher degree of homogeneity in the cognitive control performance (high scores on one cognitive control resulting in a high score on other cognitive controls) in the older sample than in the younger group studied here, and by Gardner et al. (1959).

(3) The LSAT test was administered to 31 subjects (16 in group 1 and 15 in group 2). The difference between LSHT subscores (LSHT 1a, 1b, 1c) and LSAT subscores (LSAT 2a, 2b, 2c) of the 31 pairs was computed for the separate age groups and a t-test performed to test the significance in the mean difference between the two sets of tests in the two age groups. It was expected that the younger group produce greater mean differences. None of the differences in fact were significant, and only in one of the three subscores was

the mean difference between the two tests smaller in the older group than in the younger group. That difference did not reach significance ($p = 0.08$ one-tail).

Contrary to expectations, the aggressive nature of the stimulus of the LSAT did not seem to produce more leveling in the younger group than in the older one.

(4) Alternate form tests were administered in two of the cognitive controls. The Leveling-Sharpening Aggression test was given to 31 subjects, 16 and 15 in groups 1 and 2, respectively, as an alternate to the Leveling-Sharpening House Test. The Object Word Test was given to 19 and 15 subjects in age groups 1 and 2, respectively, as an alternate to the Stroop Color Word Test. The correlation coefficients of five out of the six subtests in the two sets of tests were highly significant ($p < 0.001$). Only the "first stop" subscores of the LSHT and LSAT did not correlate significantly ($p = 0.247$) in the younger group.

The construct of leveling-sharpening and constricted-flexible control received some validation, and the instrument proved to be fairly reliable (see Appendix K).

(5) An assessment was made of the effect of the sex of the subject on the major variable. T-tests were performed on the differences between the means of the performances of male and female subjects on those variables. The results are shown in Table 11. All the comparisons yielded highly similar scores. The lowest probability was obtained from the constricted-flexible control score

($p = 0.236$). Other t -values reached probability levels of $p = 0.938$. In sum, the males and the females in the present sample performed highly similarly on the cognitive control tasks and in referential competence, and had similar life satisfaction and depression scores, and similar education.

TABLE 14
MEANS OF THE MAJOR VARIABLES
BY SEX OF THE SUBJECTS

Variables	Males n = 50		Females n = 50		Pooled Variance Estimate	
	Mean	SD	Mean	SD	t value	t proba- bility
Education	4.32 ¹	1.53	4.02	1.57	0.97	0.336
Referential Competence	34.42	15.19	34.76	13.72	-0.12	0.907
Constricted- flexible	56.08	31.78	63.86	33.41	-1.19	0.236
Scanning ²	23.14	5.65	23.05	5.40	0.08	0.938
L-S ³	20.25	7.46	21.94	7.59	-1.12	0.266
Life Satisfaction	26.68	9.56	27.96	7.96	-0.73	0.467
Depression	0.4132	0.11	0.416	0.082	-0.15	0.879

¹12 grades of school = 4, 14 years = 5

²Combined score from two Scattered Scanning ratios

³Combined scores from two LSHT 1b and 1c (Leveling-Sharpening)

CHAPTER VI

DISCUSSION

The two major endeavors in the present study were: (1) to trace the development of cognitive controls through old age, an age range in which it has not been sufficiently investigated before; and (2) to assess the effect of these structures on the coping skills of individuals in old age.

The cognitive controls investigated were leveling-sharpening, scanning, and constricted-flexible control. Coping skills were defined in terms of life satisfaction, and negatively in terms of depression.

The Life Span Development of
Cognitive Controls
(Hypotheses 1 and 2)

Earlier studies have found trends toward dedifferentiation in performance with increasing age for the cognitive controls of constricted-flexible control (Comalli et al., 1962), and for leveling-sharpening (Warren & Staines, 1974). These findings were corroborated in the present study for all leveling-sharpening subtests and for the constricted-flexible control, and were established for color naming (referential competence). Of the scanning subtests (as measured conventionally by the Scattered-Scanning Tests), only two subscores, the number correct score (SST 3a) and the total distance (SST 3c) score, changed significantly with age. However, using a new method of computation for the

SST ratios, in which the effect of the motor tempo was being lessened by employing the square root of the MTT rather than the raw MTT in the formula, differences in the resulting means of the scanning ratios in the two age groups were relatively larger and were in the direction of dedifferentiation as was the case in the other cognitive controls. The comparison is shown below. The significance level of the difference cannot be established, since no ANOVA or t-test was employed to assess the significance of the difference. The new method of scoring was conceived after the ANOVA and other analyses had been accomplished.

Variables	Mean Group 1	Mean Group 1
SST 3e (old scoring)	2.76	2.65
NEWSST 3e (new scoring)	1.01	0.85
SST 3f	20.28	20.51
NEWSST 3f	7.47	6.51

Thus, the study has proven a significant difference in performance on three cognitive control tests in the two ages studied here; the difference shows more leveling, more rigid control manifested in a more marked proneness to interference, a narrower and more passive way of scanning the environment, and a slower rate of color naming in the older age group.

Vocabulary level was found to be significantly lower in the older age group, but for reasons of a considerable difference in the cultural level and ethnic background of the two groups, conclusions must be interpreted with caution.

The cause of the trend found in cognitive control change cannot be assessed from this study; one can only speculate about possible factors that affect the cognitive control functioning with increasing age. Two such factors suggest themselves.

1. Schaie (1958) found three types of rigidities to increase significantly at different points of adulthood: "motor cognitive rigidity" (an individual's ability to shift from one activity to another), from age 26-30 on, "personality-perceptual rigidity" (a person's ability to adjust to new surroundings and to change cognitive patterns) from age 41-45 on, and "psychomotor speed" (an individual's rate of emission of familiar cognitive responses) from age 31-35 on.

In a follow-up cross-sequential study (Schaie & Struthers, 1968) seven years after the Schaie study to examine longitudinally changes in rigidity in individuals, only one type of rigidity, the "psychomotor speed" dimension, was found to increase significantly with age. Schaie and Struthers (1968) suggested that the other increases in rigidity were reflections of "increased environmental opportunity and/or genetic changes" (p. 671) in cohort groups.

While all three rigidity types may be implicated in decline in cognitive control functioning, the loss in

psychomotor speed appeals on rational grounds as especially apt to account for cognitive control decline. Schaie (1958) defined this rigidity as implying an "efficiency in coping with familiar situations requiring rapid response and quick thinking" (p. 4). In leveling-sharpening, a slowing in psychomotor speed may hinder the older person, in contrast to a younger one, in finding the appropriate change in the pictures in the allotted time.

One of the demands on the performer in high performance on the Scattered Scanning Test is a vigorous side-to-side (or up-and-down) movement of the eyes while his task is at the same time to isolate perceptually the appropriate geometric figures to be marked. These functions, too, suggest a proneness to a decline in "rapid response and quick thinking." Rate of eye movement per se may be slowed down in old age.

The interference task of the constricted-flexible control as well as the color naming task suggest the requirement for "rapid response and quick thinking" in the face of interfering stimuli and in producing the name of a color or object viewed in the picture.

2. A general lessening of responsiveness to external stimuli in old age, known as "disengagement" (Maddox & Eisdorfer, 1962; Havighurst et al., 1968), could be viewed as an additional explanatory variable in the decline of cognitive control functioning with increasing age. The above has been viewed as adaptive. Disengagement does not

need to be seen as independent of an increase in rigidity; the latter may be a step in the process of disengagement and may have adaptive implications (Labouvie-Vief, 1977, 1980). Zimberg and Kaufman (1978) see regression as a necessity to maintain homeostatic balance in old age. Isolation and withdrawal of attention are seen as actions that permit the individual to deal with one thing at a time.

The results of the present study, juxtaposed to earlier studies by Santostefano (1978) and Lemieux (1965) show a U-shaped curve, peaking at the fifth grade level in all Scattered Scanning Test subscores and decreasing from that period on through old age.

Comalli et al. (1962) showed a U-shaped progression in the interference task of the constricted-flexible control, peaking in the 25-34 age group (see Table 5 above). The referential competence scores in the same study produced a U-shaped curve peaking in the 35-44 age group. In the present study, lower performance in the older group is shown as would be expected by extrapolation, but the scores in the present study do not match those of Comalli et al. (1962), for reasons explained in the Results section.

Comalli et al. (1962) alert the reader to the fact that a similarity in the scores of children and older adults need not indicate a similarity in process. The above authors exemplify this statement by pinpointing different strategies used by children and older adults; whereas some children would lessen interference by "pointing [at the word]

rhythmically, accentuating the material," some of the older adults would be "pointing verbally by preceding each response with "that is a," which is a less concrete behavior.

In the present population, both physical and verbal pointing was found to be used across both groups. It was observed that as the interference accumulated over several rows of reading against the interfering stimulus, many of the subjects seemed to reach a point of being blocked in reading the color. Some subjects at that point began pointing at the words rhythmically. This object focused movement seemed to provide the kinaesthetic feedback (an organizing, encoding aid as was theorized by Bucci and Freedman, 1978, p. 30) that appeared to facilitate the further production of color naming.

In general, although there were significant score differences related to age, the behavior during testing was not observed to differ drastically in the different age groups. Subjects of all ages appeared to be involved and somewhat tense during their performances; most of them were apologetic about errors. A number of subjects in the younger group were observed to seemingly give up on finding changes in the changing pictures of the LSHT or LSAT, while quite a number of older subjects persisted in finding changes to the end.

The developmental course of other variables across the two age groups, as measured by a two-way ANOVA, showed depression scores increasing significantly in older age,

while life satisfaction scores were seen decreasing but to a non-significant degree. Havinghurst et al. (1968) found no appreciable decline in life satisfaction over age, believing that the Life Satisfaction Rating Scale (on which the present LSIA was based);

. . . is not limited to feelings of satisfaction with one's present situation. Two of the five components, Resolution or Fortitude, and Congruence between desired and achieved goals, are based upon a person's attitude toward his life as a whole . . . [a person] may be depressed or apathetic at the time of the interview and still be given fairly high LSR ratings if he accepts resolutely . . . that which life has been for him and if he feels that he has achieved his personal goal in life. (p. 168)

(See Chapter IV, Instruments) for more details on the Life Satisfaction Index.)

Verbal intelligence was found to be lower in the older age group. The testing of relative stability of verbal intelligence in individuals was not applicable here because of the difference in the educational level of the two groups. (The educational means were 4.92 in group 1, and 3.42 in group 2, where a rating of 3 was given to 7-9 grades, 4 to 10-12 grades, and 5 to 12 grades to 2 years of college.)

Although more of the subjects in the younger age group were foreign born (62% vs. 54%), the cultural level of the older group was lower. An obvious cohort effect seemed to be operating in the present sample.

Although some efforts had been made in the past to clarify the relationship between intellectual abilities and cognitive controls (Gardner et al., 1960; Santostefano, 1978),

very little clear conceptual clarification has been achieved. Santostefano proposed (p. 62) that "cognitive controls are unique strategies implicated in processing information contained in all tasks that make up intelligence scales."

On embarking on the study of the relationship between intellectual abilities and cognitive controls, Gardner et al. (1960) were stimulated by some earlier findings and by Gardner and Murphy's (1947) emphasis upon "functional relations between differentiated subsystems" (Gardner et al., 1960, p. 11).

There is further need to conceptualize whether cognitive control tests are indeed distinct from intelligence tests in emphasizing the freedom to impose one's cognitive tendency and unique orientation on the task, or whether, like the tests of ability, cognitive control tasks emphasize skill and minimize freedom. Santostefano (1978) found the WISC and cognitive control tasks to measure different aspects or levels of cognitive functioning. Gardner et al. (1960) concluded that cognitive controls and intellectual abilities may relate to a common set of basic cognitive variables.

The extant cognitive control tests, at least the ones used here, are not optimal in emphasizing the freedom for expressing one's unique cognitive tendency; they elicit from the subject the need to perform accurately. This was gleaned from many remarks made during the testing, e.g., "Am I doing right?" In spite of this, the results of this

study lead one to agree with Gardner et al. (1960) that cognitive controls are distinct dimensions related to abilities by some higher order cognitive variable.

Homogeneity of
Cognitive Control Performance
(Additional Finding 2)

Homogeneity in an individual's cognitive control performance denotes a tendency for a high scorer in one cognitive control principle to score relatively high in other cognitive controls, and vice versa (high = relatively differentiated).

In earlier studies the performance on individual cognitive control tasks was found to be fairly homogeneous in normal children (Santostefano, 1978), but independent in the younger adults (aged 17-39) investigated by Gardner et al. (1959) and progressively more homogeneous with increasing age in the present two age groups. In the older age group of the present study (Table 12) the correlations among various cognitive control principles were positive and high.

Santostefano (1978) contends (see Chapter II, Cognitive Controls and Adaptation) that each cognitive response is an adaptation and readaptation, and that the individual at times needs to shift to an earlier and at other times to a more differentiated level of cognitive control functioning for optimal adaptiveness.

The environmental demands for multiple and varied interactions and adjustments are the greatest in the time of

adolescence (the identity crisis, Erikson, 1968) and following this, in the time of the individual's adaptation to a career and marriage, i.e., in young adulthood. If Santostefano's contention is correct, then at such times of bustling activity and dramatic adjustments, a flexible and varied pattern of cognitive control functioning must be most adaptive. It would seem that in adolescence and young adulthood, cognitive controls are to a great extent under the control of environmental factors, more so than under that of endowment though, of course, the characteristics of the person put their stamp on the final performance.

Old age, too, is characterized by extensive changes, but these, for the most part, occur in the direction of lessened involvement. A reduced pattern of interactions is noted, e.g., in the present sample, social interaction decreased $p = 0.02$, and psychological involvement $p = 0.005$ between middle and old age. The shifts required by the environment may be painful but are more stable than the ones at an earlier age. Consequently, toward old age the cognitive control patterns gradually stabilize into a schema, which is more in line with one's cognitive, perceptual and affective endowments (to the extent that these have an effect on cognitive controls) than with largely environmental demands as was the case at an earlier age.

In view of the above speculation, how can we reconcile the relatively homogeneous cognitive control configurations of normal children with their quite dynamic

interactions in their everyday lives? It would seem from the findings on this issue that a child may not yet have acquired that configuration which is imposed by the environment's organization of stimulation on the individual. This may develop in the course of life experiences, perhaps at a more autonomous stage in life than in the early part of childhood. In a child, the personality organization may still be, to a large extent, influenced by natural endowment, as it will again become in old age.

Santostefano's (1978) finding that orphaned and brain-damaged children differ in their scanning and constricted-flexible control configurations from normal children, that their cognitive control scores were less homogeneous in unique ways relative to their unique problems in dealing with their environment, lends support to the above speculation.

Cognitive Controls and Adaptation (Hypotheses 3a to 3c)

The second major endeavor of the present study, after charting the life-span development of cognitive controls, was to identify additional factors to social interaction influencing adaptation in old age. These factors were tentatively identified as personality variables in the form of cognitive controls.

Earlier studies on adaptation in the aged have for the most part employed older subjects alone, and comparisons to younger subjects were not carried out.

In previous studies, a strong variable was identified in optimal aging, namely, social involvement. In the activity theory that employed social involvement as a major construct it was held that "the older person who ages optimally is the person who stays active and who manages to resist the shrinkage of his social world" (Havinghurst et al., 1968, p. 161).

In the preliminary step of the present analysis, social involvement was found to correlate significantly with all three cognitive controls in the 43-89 age range (across middle and old age). This finding lent support to a hypothesized direct personality-social involvement relationship. However, broken down into separate middle and older age groups, no cognitive control variables correlated significantly with social involvement in the middle aged group, and in the older group only scanning and interference correlated significantly with social involvement, while leveling-sharpening showed a trend toward significance.

The findings seem to indicate that while the individual in the "executive" or "responsible" middle age (see p. 72 above) is still active and physically mobile, the extent of social interaction is dictated by life's demands. Although the range across individuals in social involvement is sizable even in this younger group (the mean of a combined social interaction and psychological involvement score was 7.47, minimum 5.50, maximum 10.80), the level seems to be determined more by environmental than by personality

factors, at least in terms of the present usage of cognitive control performance in the two groups that cannot be adequately accounted for.

This finding is similar to that with respect to homogeneity of cognitive controls. There, too, a strong environmental press was seen in a younger adult age.

In older age, where the forces pressing toward disengagement are great, the individual who maintains relatively high levels of social involvement is believed to do so because his habitual level of vigor and activity, manifested in the cognitive control performance, induces him to seek interaction. In this group, too, the range of social involvement was found to be extensive, with a mean of 6.75, a minimum of 3.00 and a maximum of 9.05. Yet the levels of correlation between the cognitive controls and social involvement in the older group seemed to implicate a cognitive-activity interaction, as was hypothesized.

Dolen (1980) posited a reverse order in the cognition-social interaction chain in her work with the elderly. Basing her research in a Piagetian framework according to which advanced states of cognitive functioning proceed through a child's interaction with the environment, and in which complex social relations lead to more complex cognitions, Dolen implied a relationship for an aged population where more extensive social engagement leads to better social cognition.

The above work employed three social cognitive

constructs: a person's concepts of people, interpersonal problem-solving, and coordinating multiple points of view.

Even though the above constructs may fall into a different category than the cognitive control constructs that the present study investigated, it would seem that the Piagetian construction of the chain of development applies to an age in the lifespan when the cognitive schemata are in the process of being developed, i.e., to childhood. Once the individual acquires the advanced forms of cognition (formal operations or hypothetico-deductive thinking), these are assumed to exert a motive force of their own.

Motivation and cognitive structures are not separate entities but are, rather, different sides of the same thing. In other words, every cognitive structure can be said to embody its own dynamic. Once a structure is present, utilizing it becomes a need which is satisfied through exercise, or in non-Piagetian terms, through function pleasure. Accordingly, cognitive structures do not need to be energized by drives, appetites, or other extraneous motivators since they are self motivating. (David Elkind in Piaget, 1968, p. XIV)

Translating the above into social interactional terms, we could speculate that the individual with a developed operational form of cognitive pattern (given the appropriate emotional makeup) is propelled to seek the kind of interaction fitting for him by the equilibrium principle (Piaget, 1968).

Now, it may be true that there exists a high correlation between social interaction and cognitive structures in the elderly; one should nevertheless be able to see this

correlation as a mutually synergizing interaction of a cognitive given and a fitting choice of social stimulation selected by the individual. The "cognitive given is never static and closed, [it is] always mobile and open. Each new level of mental equilibrium prepares for a new disequilibrium" (Piaget, 1968, p. XIII). Thus, social interaction may change the existing cognitive structures, which in turn may reach out for a different stimulation.

In terms of programs for the elderly, we should expect the environment to be prepared to offer opportunities for such suitable social interaction, even when the individual is disabled or otherwise unable to find social outlets for himself.

In keeping with the above formulation, it is suggested here that cognitive controls, once established as habitual patterns, exert a press on the individual for individually appropriate stimulation. The findings in the present study seem to lend support to this notion in the scanning control, in constricted-flexible control, and marginally in leveling-sharpening.

The second step in the investigation of cognitive controls and adaptation consisted in correlations among the cognitive controls and Life Satisfaction and Depression scores and multiple regression analyses examining the potential contributions of social involvement, individual cognitive controls and their cross-products to life satisfaction or to depression.

In the older group all correlations between life adjustment scores and all the cognitive control scores were significant, but did not reach significance for any of the above variables in the younger group.

In the regression analyses, where the Life Satisfaction Index (LSIA) scores were regressed on social involvement and cognitive control scores, social involvement appeared to have taken up a great portion of the variance. In the older group only, the leveling-sharpening scores were the only cognitive control scores that contributed to the variance significantly. In contrast, the depression scores, when regressed on the same variables, seemed more sensitive to the cognitive controls. The social involvement scores contributed somewhat less variance (albeit still highly significant), while three cognitive control variables contributed significant variance.

Whether the above was a function of the depression instrument or depression as a construct, is hard to tell.

Although the authors did not say it in these terms, it was noted above that the LSIA was found by its authors to measure an attitude toward life more than a state of well-being.

One has the impression, for example, that many of the positively keyed items sound more like expressions of an ego ideal than a statement of one's presently experienced affective state. Items such as "these are the best years of my life," "I am just as happy as when I was younger,"

seem to be too global, even though they tap the components selected by the authors to represent life satisfaction. Dressing the items into more concrete terms might elicit an affective response differentiating more finely among individuals of different ages and degrees of well-being. What the study endeavored to assess was the individual's concrete sense of satisfaction with his life (or the opposite) rather than a philosophy of life. The latter is of course expected to influence the aged person's acceptance of what life has to offer him, but it seems that the LSIA elicited to a large degree an elaborated, idealized, cognitive attitude, rather than a genuine affective response related to his present life.

There are some known problems in using self-inventories to measure personality traits. One is the risk of obtaining the responses chosen by the subject for social desirability (Nunnally, 1967). Another major problem with self-inventories is a semantic one, as was the case in the present study where people interpreted some of the questions differently (see Appendix K). For the above reasons, the results pertaining to life satisfaction should be viewed with reservations.

Although the depression scale is also a self-inventory, and thus prone to the same biases, it proved to be a more satisfactory instrument in the present study. It seems that the Depression Scale is more concrete in its wording and less prone to equivocation. As to social

desirability, except for item 6 on the scale ("I still enjoy sex"), subjects responded more freely and spontaneously on answering the questions, perhaps because the answers did not entail philosophizing.

Neugarten et al. (1961) obtained means of 12.4, SD 4.4 on life satisfaction. Adams (1969) obtained means of 12.5, SD 3.6 in subjects 65-80+. In the present sample, the mean life satisfaction was 12.28, SD 4.98 for the 63-89 age sample. The similarity in these findings is noteworthy.

In the regression analysis for the entire sample, employing life satisfaction as a dependent variable, age was significant in explaining life satisfaction.

"Explain" in this paper in the context of regression analysis is to be understood as "predict." More precisely, the term denotes a significant relationship between an independent and a dependent variable, where in fact the causal sequence is not known.

Social involvement as a factor on life satisfaction was highly significant in the whole sample and the subgroups, corroborating earlier findings (Havinghurst et al., 1968; Maddox & Eisdorfer, 1962).

Of the cognitive controls, none explained life satisfaction in the entire age range, while in the separate age groups one cognitive control was significant in each age group, but a different one in each; scanning in middle age, and leveling-sharpening in older age. None of the cross-products, which were posited as the agreement term in the

personality-environmental fit, explained life satisfaction over and above that which could be predicted from social involvement and/or the individual cognitive controls mentioned.

The depression instrument used in the study reflected more effectively the influence of cognitive controls on depression, but only in the entire age range and in old age. In the middle age range, none of the variables which were entered into the multiple regression equations were significant: neither social involvement, cognitive controls, nor the agreement variables, i.e., the cross-products.

It emerged that depression as was measured here is not meaningful as an index of coping in middle age. The reason for this may be that depression may have different characteristics at that age than in old age. Whenever depression occurs in a middle aged person it is a unique, individual manifestation of either serious environmental causes, of a personality flaw, or severe illness. Some developmental events at times cause acute depression in the middle age: for example, the climactery in women or a diminished sense of virility and a loss of power in men. This contrasts with depression in old age, where it has been noted to constitute a serious, ubiquitous, phenomenon (Zimberg & Kaufman, 1978).

Although the Depression Scale as an instrument of adaptation was used with reservation and no evidence of widespread depression was expected for the present sample, the instrument did pick up differences in the two age groups:

the group means on the depression scores were 0.39 in the younger group and 0.44 in the older group ($p = 0.03$). Ten subjects in the older group and six in the younger one reached depression scores above 0.50, the pathological level. Zung's (1965) depressed group scored a mean of 0.74 and his control group a mean of 0.33.

In old age, depression emerged to be a sensitive variable for adaptation. Social involvement was highly significant as a predictor ($F = 19.10$), and leveling-sharpening and interference (constricted-flexible control) of the cognitive controls, and the cross-product of social involvement and interference were significant to a lesser degree ($p < 0.01$ to 0.05 , respectively). The direction of the above relationships was as follows: the higher the social involvement score, the lower the depression score; the higher the leveling-sharpening score, the lower the depression score; the higher the interference score (the more interference), the higher the depression.

In the entire age range, age, social involvement, and interference and its cross-product with social involvement accounted for a significant degree of variance in depression, while leveling-sharpening showed a trend in that direction.

Thus, although one of the hypothesized cognitive controls, namely, scanning, explained adaptation only in the younger age group, and only in life satisfaction, leveling-sharpening, added to the explanatory power of life

satisfaction and depression, and constricted-flexible control and leveling-sharpening to that of depression beyond what could be predicted from social involvement alone. The scanning test used here showed some weaknesses for use in the adult and aged population (as was noted above) and the absence from the results of the hypothesized scanning control as a significant predictor of life adjustment may either be an artifact of the present instrument or the construct may not have an influence on depression.

The tendency of the entire old age group toward increased proneness to interference, and increased leveling of new information to the known old experiences, was demonstrated (see Chapter V, Hypotheses 1 and 2).

It was noted above (Chapter II, Aging) that in old age, higher distractibility to subjectively "irrelevant" information leads to difficulty in responding to an increased amount of information (Birren, 1970) and results in loss of self-esteem.

The present investigation corroborated in a controlled study the above clinical and research findings: the results indicated that within the range of reduced cognitive control functioning due to old age, the elderly person who in the process of attending to a problem at hand can effectively resist interference from intruding stimuli (both from without and from within himself) will be less prone to depression than his more distractible counterpart. This was demonstrated with the interference task of the constricted-flexible control.

Depression may be expected to result from confusion due to proneness to interference, too. This confusion may be a cause in a defective message-processing function thought to be a factor in depression. To illustrate this relationship, the interference task presents to the subject a message in the form of a color or object to be read, with a built-in interference. The subject whose performance is slow may be manifesting difficulties in the processing of the overt message because of distraction by the interfering stimulus. In a typical case of that nature, subject number 104 found it outright difficult to get back to the task of naming the color (rather than reading the printed word) even after repeated reminders by the experimenter to name the color. The subject scored 2 SDs above the mean (speed) on the interference task, while his depression score was 1.855 SDs above the mean.

In leveling-sharpening, the individual who is able to construct distinct memory images and maintain these over time, appears to manifest a more general alertness in discerning new events. Consequently, such a person may enjoy richer experiences than a leveling person who approaches life with boredom. This is speculation. So is the notion that reminiscing, shown to be functional in reinstating self-esteem in the older individual, is facilitated by maintaining clear images of the past, distinct from present events. Thus, although the act of reminiscing in itself looks like leveling of present information to old one, this act is

shown to be adaptive and may be facilitated by relative sharpening. Again, this causal relationship between sharpening and adaptation, as are all causal inferences in this paper, is only speculative.

The study demonstrated that sharpeners attain higher life satisfaction and lower depression scores.

The Leveling-Sharpening House Test and the Stroop Color Word Tests proved to be reliable indices in detecting the above personality characteristics. The latter test has a proven record with populations of all ages; the LSHT, however, has not been used on older adults before, and proved here to be pleasant to administer and discriminative of the construct.

A comment on the LSHT is in place here. It was observed that subjects who were more impulsive performed more poorly on the LSHT than the more reflective subjects. Some subjects made the experimenter rush to turn the pages, not taking the allotted time to look for possible changes. It may be fruitful to test the leveling-sharpening construct against reflectiveness-impulsivity, even though Santostefano (1978, p. 209) cited a study with the LSHT and an instrument of impulsivity in which no significant correlation was found.

Contrary to expectations based on Bucci and Freedman's (1978, 1980) findings in their limited study, referential competence did not contribute significantly to depression in the present study. One possible reason for this was given above (see p. 110).

The important and novel finding in the present investigation was the confirmation of the tentatively formulated hypothesis that the fit between environmental opportunity and personality will produce better adaptation. The agreement variable of constricted-flexible control and social involvement added significantly to the variance in depression in old age. The meaning of this finding is that the disposition to resist interference in cognitive tasks, combined with a chance (or disposition) to interact socially and psychologically, appear to be good indications in old age, beyond what the individual cognitive control or SOCI would predict. The sign of the Beta weight of the cross-product (in the opposite direction from that of the component variables) indicates how the agreement variable differs from linear additivity of the components, i.e., the ceiling of the high cross-product Beta weight is lower than would be the linearly added Beta weights of the single high component scores (SOCI and interference), while the floor of the low cross-product scores is higher than that of the linearly added Beta weights of the low component scores. This may mean that subjects with high scores in both social involvement and constricted-flexible control (low interference subjects) do not quite reach the low depression scores, and the subjects with low scores in both variables do not reach the depths of depression which would be predicted from their individual SOCI and cognitive control scores. The agreement term attenuates the depression levels.

With regard to the hypothesized relationship between the agreement term and adaptation (namely, that high cognition control-high SOCI and low-low leads to better adaptation than high-low or low-high) was not confirmed. A high-high leads to adaptation and a low-low will still yield scores of deeper depression than the high scorers in the cognitive control and SOCI variables, but the low-low will be less depressed than was predicted from single scores. These findings should be viewed as tentative.

From the regression analysis that was carried out, no curvilinear relationship could be detected, and no test of curvilinearity was carried out to see whether the cross-products of the low scores might yield high satisfaction, as was predicted.

Additional Findings

The constricted-flexible control proved its usefulness as a variable in coping with old age (hypothesis 4).

Contrary to expectations, verbal intelligence did correlate highly with some of the cognitive controls: with constricted-flexible control and with leveling-sharpening in the entire group, and with leveling-sharpening in groups 1 and 2. Verbal intelligence thus may have a common source of variance with resistance to interference and the ability to maintain distinct and stable images, at least in middle and older age (hypothesis 6).

The correlation between verbal intelligence and depression is added proof of the relationship between cognition and affect (Beck, 1971).

It is of interest to note that in a simple correlation with life satisfaction, most of the subscores of scanning, all of the leveling-sharpening subscores, and the interference score correlated significantly with life satisfaction in old age (additional finding 1a).

The effect of aging on intelligence has been dealt with in the literature. Labouvie-Vief (1977, 1980), among others, advanced the notion that in old age, other functions than intelligence may replace skills that were filled by intelligence in youth. There was no direct way of measuring this conjecture in the present sample. For one, both groups were of advanced age, and no special coping variable was employed. Tentatively, the correlation between life satisfaction and negatively depression and verbal intelligence on one hand, and cognitive controls as alternate personality variables to intelligence on the other hand, were used to assess Labouvie-Vief's hypothesized change over age.

Of interest in this matter is the finding that life satisfaction correlated with all three cognitive controls in the older groups, while only with one cognitive control in the middle aged group. It appears that cognitive controls are more important factors in life adjustment in the elderly than in middle age, but whether cognitive controls replace intelligence in old age could not be determined.

It would be of interest to investigate cognitive controls against some life adjustment variable which is relevant in young age to compare the meaning of cognitive

controls across the lifespan. Santostefano's (1978) Parachute and Hospital Studies were a good beginning in this direction.

The finding in the present study of highly similar scores in cognitive controls in the male and female subjects of the sample contrasts with that of Gardner et al. (1959), where male subjects loaded on different cognitive controls than females. The scores in referential competence, life satisfaction, depression, and education as assessed by t-tests yielded highly similar scores as well (additional findings 5).

Implications for Prevention, Treatment and Research

The value of the present study partially resides in increased knowledge about an aspect of personality (cognitive controls) as this relates to lifespan development and to coping in old age.

After we have analyzed the data, what deductions of practical value can we draw from the present findings that might contribute to planning of programs for the elderly?

The lifespan developmental course in three cognitive controls and in referential competence has been established here, corroborating findings of earlier researchers. The course of development is in the direction of lesser differentiation. Based on the above, and on some earlier findings of the adaptive nature of such "regression," it should be expected that an aging person should be deploying attention

and should process information in a less efficient way from the point of view of the younger person but in a more economical way from the adaptive viewpoint of the elderly person. Specifically, an individual will process fewer bits of information in a unit time with less attending vigor than he did at an earlier age. Furthermore, the same person will be less likely to maintain distinct memory images of past events and contrast these to new information impinging upon his sensory organs. Similarly, it will be more difficult for the older person to resist interfering stimuli while attending to a cognitive task.

The amount of attention to be deployed in various tasks will be diminished, but this shortcoming will be counteracted by the narrowing of the range of interest both in terms of concrete visual and auditory space to be covered as well as, abstractly, in the range of social interests.

Secondly, certain cognitive controls within their reduced range in old age have been found to account for a degree of variance in life adaptation (as measured by life satisfaction and depression), which had not been explained by social involvement. The latter had been definitively identified in earlier studies as a powerful variable in adaptation in the aged. The specific cognitive controls with implications for adaptation were leveling-sharpening for higher life satisfaction and leveling-sharpening and constricted-flexible control for the lessening of depression.

Augmenting the effect of the cognitive control variable on adaptation, a personality-environmental fit in the form of a leveling-sharpening social involvement cross-product was conceptualized and found effective. The latter was found to predict depression beyond that allowed by the addition of the individual components of the product.

The present study did not show how cognitive functioning diminishes with age within individuals. It only showed that within the group of individuals measured here, the range of cognitive controls was quite large. This may be due to a large distribution of cognitive controls across individuals or a sign of differential regressive development within individuals. It is quite plausible that certain environmental or physical factors can be instrumental in promoting or retarding this "regression" and, therefore, that the rate of regression varies greatly across individuals.

Dolen (1980) has shown a significant social interaction-social cognition correlation. While one may have reservations about accepting a direct cause-effect relationship in the form: social interaction leads to social cognition, it is another thing to see that broader and/or more intensive social interactions in old age might promote the maintenance of the individual's established form of cognitive controls, or, inversely, might prevent a relative regression of cognitive controls within the individual. This notion is similar to the "enriched environment" concept in early childhood, that is believed to enhance cognitive and emotional growth.

What are the implications of the above for progress aimed at the elderly?

1. It seems important, as Dolen (1980) implied, that the elderly be provided with the opportunity to interact socially. Agencies, which are entrusted with the planning of programs, need to reach out to the individuals, whether in group settings or confined to their homes. Care must be given that the degree of interaction is to be optimally suited to the individual's characteristic cognitive makeup and this has to be determined by the individual. Botwinick (1973) stated that those who are striving, ambitious and achievement-oriented, those to whom aging is a threat, fare poorly in withdrawal. To them, it is maintained here, a high level of social interaction needs to be made available. "Another type is one who is dependent and passive, moderately satisfied with low activity . . . this type was probably always this way" (Botwinick, 1973). This latter type may be the low cognitive control person, who needs to know that a social outlet is available and perhaps needs some encouragement to a mild level of activity in order not to regress excessively. Each of the above types may require different types of education and/or cognitive therapy procedures, which will be discussed below.

2. Once it is understood that the elderly, as a group, have a reduced capacity to process cognitive stimulation of maximal complexity, and indeed a reduced need for it, those in the position of handling information and entertainment

would do well to take cognizance of this fact. In practical terms, information is to be imparted at a tempo and level of complexity geared to the processing capacity of the age group to which it is directed. This is to be done equally in one-to-one verbal interactions, in verbal group-addresses as in printed communications.

The optimal spacing of information directed to the elderly is important. Often the inability of the older person to carry out cognitive tasks (understand and solve problems, for example) is mislabeled as "signs of senility," or as diminishing of intelligence. This may lead to stigma and to the reduction of self-esteem in the elderly person. According to the present findings it is the cognitive control processes which are of importance in coping tasks that lead to life satisfaction and lessened depression in old age. The person must not be overwhelmed with "interference" in the form of crowding of information, which is why an optimal spacing of information is required. Under ideal conditions the older individual will not be flustered with unrealistic demands of the environment; at the same time he will not be forgotten, but will be continually stimulated at appropriate levels of complexity. Under such conditions, the older individual will be motivated to reach out and engage in activity which will in turn stimulate personal growth, even in old age (see passage on motivation, pp. 50-52 above).

Birren and Woodruff (1973) feel that education is one of the important ways a society can intervene to optimize

development, not only of social roles but of all aspects of cognitive and affective behavior.

Birren and Woodruff (1973) ask that psychologists be willing to go beyond merely providing ideas; they must be willing to translate psychological ideas into educational terms. Educational status and cognitive functioning is significantly related to decline in functioning in the aged. One goal might be to stimulate interest in learning as a process; rather than teaching content, the concern may be "metalearning," conceptual model-building, information use, problem-solving skills, intrinsic vs. extrinsic motivation.

In line with the above, Santostefano's cognitive therapy with children might be extended to adults (young and old), in order to enhance lagging levels of cognitive control functioning, or in some cases reverse cognitive control levels to optimal performance. Under cognitive control therapy the person learns first by imitation and then by internalization to derive pleasure, "from engaging information for the sake of activity itself" (Santostefano, 1978, p. 58) and hopefully learns to seek more complex activity relative to the level sought earlier. This provides a continuous model for individual growth even in the face of biological setbacks.

This leads into the implication of this study for future research.

The present study employed a simple measurement of the subjects in a cross-sectional design. It might be useful

to examine shifts of cognitive controls in older individuals under stress and no-stress conditions, similar to what Santostefano investigated in the Parachute and Hospital Studies (Santostefano, 1978, pp. 373-374). A criterion adaptation variable relevant to the subjects studied ought to be used as was used in the above studies.

These investigations might be able to tell us whether indeed "plasticity" (the flexible use of various levels of cognitive controls) may better explain adaptation to life than the use of the habitual, characteristic level, used for all occasions. This information would further contribute to the clarification of the conditions under which cognitive control shifts occur in individuals, which Wachtel (1972) called for.

A further topic for investigation might be the relationship of reflectivity-impulsiveness to leveling-sharpening. This was indicated in the behavior of the present subjects on the leveling-sharpening tasks.

A videotaped study of older subjects' performance on some cognitive controls, particularly interference type of tasks, might show the effect of hand movement on the processing of information in the elderly (Bucci & Freedman, 1978). Finally, similar studies as the present ones might look at other cognitive controls in old age and relate them to extrinsic criteria of adaptations.

The involvement of cognitive controls in life satisfaction and in depression shows indirectly the implication of

affect on the above constructs. It would be of interest to assess specifically the role of affect on cognitive controls, employing measures of affectivity along with measures of cognitive controls and adaptation.

Since social atmosphere was demonstrated to be significant in the cognitive controls, investigating siblings with presumed similar social environments before they are subjected to the influences of the outside environment might be of benefit.

Summary

A final note can be provided on the significance of cognitive control research and on research in aging.

A lag in cognitive control research has been noted for the past several years, especially as it relates to its manifestations in the elderly and with respect to its utility in real life adaptation, despite the fact that cognitive control principles have been conceptualized as modes of coping or adaptation, or as fundamental ways in which an individual goes about to organize his personal world.

The results of this investigation gave reason to believe that the cognitive control principles are a worthwhile area to be studied. There are several reasons for this belief: cognitive control principles were shown to have an integrative quality in the mental life of the individual that spans activity-passivity, learning, memory, and presumably affect.

Secondly, with the findings of a strong relationship in the elderly between levels of cognitive control performance and a subjective assessment of adaptation, the area is wide open for the exploration of specific ways in which this relationship comes about, especially in aging, where a sizable relationship has been found among the constructs.

It was shown that because of the potent effect of social interaction and cognitive factors, age alone ought not to be used as a primary explanatory factor in the decline in functioning without considering other factors that may effect these changes.

Yet in our desire to be charitable and to undo the age-long effects of biased stigmatizing judgments with respect to the elderly, we must not swing to the other extreme with the pendulum and blind ourselves to the fact that "normal" wear and tear (physiological, physical, and environmental) does take its toll on the cognitive functioning in old age. These considerations should guide the preventive and reconstructive efforts aimed at the elderly.

Because of the noted positive effect of higher relative levels of cognitive control functioning in the elderly, the research area is also open to explore ways of prevention of serious decline and the rehabilitation of those who suffered inordinate negative changes in their cognitive functions, due to physical causes or to neglect.

There is room in research for the refinement of the extant measures and for the development of new ones for the

various control principles, to be used on special populations such as the elderly and the handicapped.

Appendix A

Assurance of Confidentiality -- All information you give will be held in strict confidence, will be used only by persons engaged in and for the purpose of the study, and will not be disclosed or released to others for any purpose. Your name, address and other identifying information will not be used.

Face Sheet

Respondent's number _____

Respondent's initials _____

1. How old are you? _____ What is your birthdate _____
(month-day-year)

2. Sex: Put a check in front of your answer like this: ☒ _____

_____ male

_____ female

3. Were you born in the United States?

_____ yes

_____ no

4. Years of school completed

_____ 0 to 3 years

_____ 4 to 6 years

_____ 7 to 9 years

_____ 10 to 12 years

_____ 2 years of college

_____ received college degree

5. What is or what was your occupation? _____

6. In comparing yourself with other people you have known, in general have you most of your life been

_____ healthy

_____ more healthy

_____ fairly healthy

_____ less healthy

_____ least healthy

THANK YOU FOR YOUR COOPERATION

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APPENDIX K

COMMENTS ON THE INSTRUMENTS EMPLOYED

Overall, the tests proved useful and reliable (to the extent that this was being tested). They were not too difficult to administer.

The Leveling-Sharpening House Test (LSHT) proved to be eminently suited for use on a middle aged and elderly population as it had been on children. The content of the LSHT was a familiar and serene one, and held the attention of the subjects throughout. In contrast, the content of the Leveling-Sharpening Aggression Test (LSAT) was not familiar to most of the subjects in the study. It consisted of two fighting cowboys in traditional garb, and the subjects for the most part appeared not to identify with the characters in the picture. The pictures were more complex than in the LSHT and changes were harder to detect, e.g., parts of the clothes changed in minute ways, or structural parts of the building in the background changed so unobtrusively that very few subjects detected the change. It was surprising to find that the LSHT and LSAT showed significant correlations in all but the First Stop subscore.

A picture of a robbery in progress might be more appropriate as a stimulus to test aggressive impulses as they affect cognitive controls in an older population. For the scoring of the LSHT and LSAT the option of a single combined scoring method, which would nevertheless tap the underlying

elements of the construct, should be considered. It might serve a useful purpose especially in correlational studies where multiple variables are employed for comparisons. In such cases, dealing with multiple scores becomes unwieldy.

The Scattered Scanning Test (SST) in its present form of administration was found to be of diminished utility in an elderly population. For one, the raw motor tempo in the formula (see p. 115 above) exerted an inordinately strong effect on the score. Secondly, the multiple scores made comparisons unwieldy and therefore, as in the LSHT, a combined score, tapping all elements of the construct is suggested.

The administration of SST was cumbersome and was found to be subject to measurement error. While the experimenter on a separate test sheet followed the subjects' path in marking the symbols, he had to watch the clock for the 30 seconds to pass. The test appeals on theoretical and rational grounds, and seems to tap the hypothesized elements of the construct of scanning. However, some improvements in eliminating the administrative and scoring difficulties would enhance the value of the instrument.

For example, the use of a small mechanical stamping device with a moving counter with which the subject stamps the consecutive geometric figures in the SST sheet would automatically indicate the path of the scan and would leave the experimenter free to time and observe the subject. It would eliminate some guessing with respect to the true path in cases where the subject is especially fast.

The Life Satisfaction Index (LSI) was discussed above. Adams (1969) suggested the deletion of items #11 (I feel my age but it doesn't bother me) and #20 (In spite of what people say, the lot of the average man is getting worse, not better). In the present study, too, the two items were found by subjects to be puzzling. Adams' (1969) criticism seems justified. The observation with respect to the ideological, rather than affective, nature of the items seems to be more critical and needs to be taken into consideration in future studies where an affective state regarding an immediate situation will be the aim of the study.

The Social Involvement Questionnaire (SIQ) and the Psychological Involvement Measure (PIM) seemed adequate. So was the Verbal Test (VT) even though it could not be administered to all subjects because of the different language backgrounds of a part of the subjects. For the same reason, the test could not be used as a valid index of intelligence in the present population.

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