

THE DETERMINATION OF ADULT LEARNING STYLES
OF UNITED STATES COAST GUARD PERSONNEL

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Scope of Study: The purpose of the study was to measure learning styles of U.S. Coast Guard Institute Personnel. Instruments used to conduct this measure were the Multi-Modal Paired Associates Learning Test II (MMPALT II) and the Perceptual Modality Preference Survey (PMPS). The population of this study was limited to 45 volunteers assigned to the U.S. Coast Guard Institute. Measurements were conducted between June 1 and October 6, 1983. Answers to five specific questions were sought in this study: What are the preferred learning styles of this population? Do subjects exhibit any perceptual learning style characteristics or patterns of characteristics in common with each other? Do self-assessed learning styles show positive correlation with actual measurements of the same style? Are there significant differences between officers, enlisted and civilian personnel? and are there significant differences between sex, education or age? Score, ranks and means were figured for each style on each instrument. Analysis of variance and a t test were used to test significance. Correlation coefficients were computed by the Pearson r method.

Findings and Conclusions: An examination of the scores obtained on the MMPALT II and PMPS by the subjects of this study revealed that no two subjects had identical scores or rank-order patterns. Similar results on previous studies led to the conclusion that the seven learning styles under investigation existed in this population. The preferred learning style for this sample was visual; interactive was second. There were no characteristics or patterns of characteristics in common within this sample. No meaningful correlations existed between the two instruments. There were no significant differences between officer, enlisted, or civilian personnel on MMPALT II scores. No significant differences appeared in the sample between males and females, for the four age groups, or the six education groups for seven learning styles on both the MMPALT II and the PMPS.

ADVISER'S APPROVAL: _____

PREFACE

Much of this study was conducted concurrently by six other students: Jack Akins, Billie Russell, Linda Rice, Bill Brown, Walter Lucas, and Evelyn Stewart. The study was coordinated and under the direction of Dr. Wayne B. James, Associate Professor, School of Occupational and Adult Education, Oklahoma State University. The group also worked closely with Dr. Russell L. French, a Professor at the University of Tennessee and Dr. Clarence E. Cherry, Jr., an Instructor with the Tennessee Air National Guard.

Parts of these studies may be similar due to the close association of this group of students while conducting research and collecting data.

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CHAPTER I

INTRODUCTION

According to French (1982a) psychological and educational models have been developed to determine individual differences, but these models are seldom in agreement. Psychologists tend to look at the neurological functions while educators tend to consider the learning environment and student reactions in this environment. Both approaches have resulted in a common concern for learning style as a major difference among learners.

According to Cherry (1982) the concept of personal learning style implies that each individual possesses a unique way of learning. Knowledge of an individual's best learning style for the acquisition of knowledge or for the accomplishment of a specific project will assist both the individual and the educator of the future.

French (1975) conceptualized seven perceptual modality elements which were reported in 1975. Investigation had been hampered by a relative lack of appropriate measurement instruments before this (French 1982a).

Gilley (1975) reported that evidence suggests individuals possess personal learning styles and he further speculated that there could also be a personal teaching style. It seemed highly probable to him that the style used to receive and process information could also serve as the style used to transmit information. A need existed to measure

Learning styles.

According to London (1976) the subjective type systems suggest limited validity. The objective-type systems are time consuming, complicated and have been applied to limited populations. Scarbrough (1977) concluded that investigation into learning style preference had been hampered by the lack of appropriate instruments.

French (1975) and Gilley (1975) developed a suitable instrument for measuring perceptual learning styles. French originally conceptualized the seven following styles: aural, haptic, interactive, kinesthetic, olfactory, print, and visual. Gilley first measured six of these styles in 1975 with a population of third grade children. This instrument was called the "Multi-Modal Paired Associates Learning Test (MMPALT)."

Cherry revised the MMPALT and developed a self-investigating instrument called the Perceptual Modality Preference Survey (PMPS). Both instruments were used with an adult population in his study and the results of each study were correlated with each other.

Cherry recommended extended research with adults concerning learning styles. He felt the limited scope of his study as to the number and types of subjects precluded generalizations to other adults or to specific subgroups of adult populations. His conclusion that "Adult educators need the skills and tools to provide a valid diagnosis of each student's needs and each student's learning styles uniqueness" (Cherry, 1981, p. 113) supports his recommendation and the need for further study. Replication of the MMPALT with subjects of different age, socioeconomic, ethnic and geographic backgrounds is needed to increase the data base and further validate the instruments used by

Cherry.

Statement of the Problem

Personnel of the U.S. Coast Guard Institute are trained to teach Coast Guard personnel world-wide by correspondence study. Determination of Institute personnel's preferred learning styles will enhance their training and their ability to teach others. Personnel of the Institute have never been a part of a formal study to determine learning styles.

Purpose of the Study

The purpose of this study was to measure the learning styles of U.S. Coast Guard Institute personnel. This unique adult population was selected to add results to the research base created by Cherry's (1981) study.

Specifically, answers to the following questions were sought in completing this study.

1. What are the preferred learning styles, measured by the MMPALT, of U.S. Coast Guard Institute Personnel?
2. Do U.S. Coast Guard Institute personnel exhibit any perceptual learning style characteristics or patterns of characteristics in common with each other?
3. Do conclusions of self-assessed perceptual modalities of learning style show positive correlation with actual measurements of the same style?
4. Are there significant differences in this sample between officers, enlisted personnel and civilian personnel?
5. Are there significant differences in this sample related to sex, education or age?

Significance of the Study

While the need for adult education continues to increase, traditional education programs tend to treat all learners the same. The same styles of learning are presented to groups without consideration for individual differences. Adult learning is an individual activity and is accomplished best when it is self-planned (Tough, 1979). Lindeman (1926) concluded in his text, The Meaning of Adult Education that adult learning was best satisfied when consideration was given to such areas as individual needs and interests, life situations, past experiences, self concept and individual differences.

Knowles (1978) presented an andragogical model for adult learning and contrasted it with pedagogy (child learning) which was presented as traditional education. Knowles (1980) pointed out that the traditionalist charges full responsibility to the teacher for the learning process. However, current adult education trends place an emphasis on self-directed, facilitated learning and redefines the role of the teacher as a facilitator of self learning and a resource for self-directed learners. Knowles identified the andragogical model as "nontraditional" study and makes the assumption that a teacher cannot really teach in the sense of making a person learn, but can only help another person learn.

This study examined measurement procedures of perceptual modality styles and added to the data produced by Cherry. This expanded data base can be used to increase educators' awareness of individual learning styles and promote facilitation of individuality. Treating of individual learning differences this way can improve both learning and teaching.

Assumptions of the Study

The following assumptions were made for the study:

1. The adult learners in this study were self-directed, self-motivated and volunteered to participate in this study through natural curiosity and a desire to improve learning results individually.
2. Responses to the PMPS reflected each subject's subjective opinion of his or her own perceptual modality learning style.
3. The revised MMPALT objectively measured individual differences in modality of learning style.
4. This study focused on measurements of the individual learning styles of self-directed adults, not groups. So, the use of volunteer subjects did not distort or damage the findings.
5. Self-awareness and instructor awareness of student learning styles will influence the teacher-learning process.

Scope and Limitations of the Study

The following limitations apply to this study:

1. The population of this study was limited to volunteers from the 130 individuals assigned to the United States Coast Guard Institute.
2. All measurements were conducted between June 1, 1983 and October 6, 1983.
3. The MMPALT II revised by Cherry makes use of a paired associates testing procedure. This technique may not measure all the factors that make up this individual's perceptual

learning style.

4. The level of difficulty across the seven elements of learning style on the MMPALT-II may not be perfectly balanced (Cherry, 1981). What is difficult to one person may not be difficult for another.
5. All subjects were members of the same organization as the researcher. Great care was taken to eliminate any researcher influence concerning individual results. A set format was followed with each subject.

Definition of Terms

The following selected terms were used in this study:

Achievement: Achievement is broadly defined to include experience, self-direction, and general level of maturity for application to this study.

Adult: A person over 18 years of age and employed for the benefit of earning a living.

Andragogy: The art and science of helping adults learn (Knowles, 1978).

Coast Guard Personnel: A group of Officers, Warrant Officers, Enlisted men and women and Civilians assigned to the U.S. Coast Guard Institute.

Learner: An individual who is involved in acquiring new skills or knowledge.

Learning Styles: Differences individuals have in relating or interacting with the environment when learning (Cherry, 1981).

Pedagogy: The art and science of teaching children (Knowles, 1979).

Multi-Modal Paired Associates Learning Test (MMPALT I): A six-set paired associates learning test designed to rank order the perceptual modality strengths and weaknesses of each subject through objective measurement (Cherry, 1981).

Perceptual Modality of Learning Styles: The techniques an individual uses when learning by gathering information and knowledge from the environment using the five senses. The seven perceptual style elements identified by French and researched by Cherry were the basis for investigation in this study. Those seven perceptual style elements are:

1. Aural (A): Information gathered primarily through listening.
2. Haptic (H): Information gathered primarily through touching and/or holding.
3. Interactive (I): Information gathered primarily through discussion and talking to others.
4. Kinesthetic (K): Information gathered primarily through performance or engaging in body movements.
5. Olfactory (O): Information gathered primarily through the sense of smell.
6. Print (P): Information gathered primarily through printed materials.
7. Visual (V): Information gathered primarily through seeing pictures, images, objects, symbols and activities (Cherry, 1981, p. 16).

Perceptual Modality Preference Survey (PMPS): An instrument consisting of 42 questions designed to survey each subject's intuitive perception of perceptual learning style and report the rank order of

these styles (Cherry, 1981).

Revised Multi-Modal Paired Associates Learning Test (MMPALT II):

A seven-set paired associates learning test designed to rank order the perceptual modality and strengths and weaknesses of each subject through objective measurement. The original instrument was revised by Cherry for his study and the olfactory style was added.

Trigram: A nonsense word formed from three letters, used as a stimulus in the print, aural, and interactive sections of the MMPALT II.

Organization of the Study

Chapter I introduces the study, states the problem under investigation, identifies the purpose of the study, presents the study questions, discusses the significance of the study, discusses limitations and assumptions of the study, and defines special terms used in the study.

Chapter II conducts a review of the literature relative to learning, learning styles, individual learning differences, elements of perceptual learning styles and measurement of differences in learning.

Chapter III outlines methodology of the study in detail. Included is information concerning selection of subjects, development of the MMPALT II and the PMPS, procedures used in testing individual subjects, procedures used to collect data and analysis of the data.

Chapter IV deals with findings of the study in the form of individual results on the MMPALT II and the PMPS.

Chapter V summarizes findings of this study, makes concluding remarks, and presents recommendations for practice and further research.

CHAPTER II

REVIEW OF RELATIVE LITERATURE

The literature is presented in six sections of information relative to the central theme of the study. The sections are presented as follows:

1. Background,
2. Individual learning differences,
3. Elements of learning styles,
4. Measurement of individual learning styles,
5. Results of investigations,
6. Summary.

Background

According to French (1982a) humans seek to improve themselves or their society by increasing their skills, their knowledge or their sensitivity. Groups, institutions or individuals who try to assist this process must take into consideration many differences. Some of these differences are auditory and visual activity, body adaptation, and mental capacity or cognitive ability. French (1982a) went on to say much has been written about the cognitive process and learning ability. One of the first systematic studies of adult learning abilities was made by Thorndike (1935) during the 1920's.

Most of the material about the cognitive process that relates to

personal learning style was produced in the field of psychology and focuses on human internal reaction to stimuli and external behavior reactions. French (1981) and Cherry (1981) reported that human learners are purposeful actors when learning, not reactors, but research with this focus is very limited.

Because individual differences in acquiring knowledge exists there is a need for instruction directed at individual differences. Educators in nearly every field recognize the need and its relationship to learning styles. As a vocational educator, Bjorkquist (1971) said: "Teachers are increasingly becoming managers of the learning process rather than dispensers of knowledge and are being challenged to individualize their instruction to account for variability." (p. 8).

Griffin (1974), a community college educator, wrote: "If a community college is truly committed to the idea of individualized learning, it must make a concerted effort to discern the learning style preference of each student" (p. 76). McKenny presented a model for humans processing information and related the model to individual differences. In discussing the model he implied that individuals develop conscious strategies and unconscious habits for absorbing information. McKenny said:

Human information processing is composed of two general modes of behavior: First, communicating with the environment to obtain data and to return data to other people. Second, organizing data received to bring relevant experience to bear to make useful predictions. Man's information processing is essentially cognitive process of communicating with the world and manipulating information that comes to him (Martens, 1975, p. 5).

Eluik-Nakonechny (1976), a second language educator said:

Individualized learning is one of the current educational trends. This approach is an answer to the differences found among students in terms of their abilities and disabilities,

learning styles, objectives and interests (p. 106).

Goldstein reported the Personal Construct Theory of Kelly:

Man is not simply a stimulus-reponse organism who reacts automatically to environmental stimuli. Rejecting the implied human quiescence of this model, in which man's natural state is one of inactivity until goaded by stimulus, Kelly argued that man is actively involved in cognitively organizing the world around him: the essence of man's activity is his forecasting of events. The individual makes predictions about what will occur and modifies his ideas based on the outcome of these predictions. Kelly termed these ideas constructs. A basic notion of Kelly's formulation is that man is capable of representing the environment, not merely responding to it, and that differing representations lead to different behaviors (1978, p. 104).

Individual Learning Differences

Before 1942 learning style was connected to teaching style. The style most favored by a traditional teacher was assumed to be the best style for all students in any class. In the early 1940's some theorists began looking at individual differences with more interest.

As early as 1939, Lowenfield's research (1945) led him to write about a distinction which is true for creative types. After observing a group of partially blind students, he rejected the theory that all learners have the same perception. He discovered that some would attempt to use their limited sight while others would not. This led him to theorize that some individuals are visually oriented while others are haptically oriented.

Gagne viewed learning as a simple stimulus and response relationship. He reported an unvarying relationship between stimulus and response. Stimulus and no response was changed by learning to stimulus and a learned response. Gagne also viewed all animals (including the human animal) as close equals in learning style. In discussing learning

situation elements, Gagne (1965) wrote:

- First there is a learner, who is a human being. (It would be possible for the learner to be an animal, but that is another story.) For the events considered here the most important parts of the learner are his senses, his central nervous system, and his muscles. Events in his environment affect the learner's senses, and start chains of nervous impulses that are organized by his central nervous system, specifically, his brain. This nervous activity occurs in certain sequences and patterns that alter the nature of the organizing process itself, and this effect is exhibited as learning. Finally, the nervous activity is translated into action that may be observed as the movement of muscles in executing responses of various sorts (p. 6).

His views about learning led him to make generalizations about teaching. Gagne (1975) wrote: "The individual learns simple things first, then more and more complex things; while all this is happening, he is also growing older" (p. 175).

It appears that Gagne changed his views shortly after 1965. In 1967 he edited Learning and Individual Differences and implied that learning is an individual matter. Gagne was seriously questioning earlier research related to learning styles by 1970. In reporting the status of learning research, Gagne theorized:

As a field of endeavor, research on how human beings learn and remember is in a state of great ferment today. Many changes have taken place, and are still taking place, in the conception of what human learning is and how it occurs. Perhaps the most general description that can be made of these changes is that investigators are shifting from what may be called a connection-ist (the view of learning to an information processing view). From an older view which held that learning is a matter of establishing connections between stimuli and responses, we are moving rapidly to acceptance of a view that stimuli are processed in quite a number of different ways by the human central nervous system, and that understanding learning is a matter of figuring out how these various processes operate (1970, p. 468).

Gagne's early view that learning style applied to all animals was countered by Forgas (1966). Gagne's view clearly separates the human learner from lower animals. He identified extraction of information

from the environment, or perception, as the most important difference between learners in his summary of learning and individual differences.

Forgus (1966) wrote:

I have decided to place the process of perception within the context of man's general need to adapt to his environment if he is to cope effectively with the demands of life.

Perception, learning, and thinking have traditionally been referred to as the cognitive processes since they all deal, to some extent, with the problem of knowledge. Perception can generally be defined as the process by which an organism receives or extracts certain information about the environment. Learning is defined as the process by which this information is acquired through experience and becomes part of the organism's storage of facts (pp. 1-2).

Both Gagne and Lowenfield considered the senses as important aspects of individual learning and differences.

Early psychologists in the nineteenth century used to make distinctions between what they called "sensation" on the one hand and "perception" on the other. "Sensation" was thought of as some locally and specifically determined procedure in the receptive system of the organism, whereas "perception" referred to what was centrally picked up from the "sensory materials." The opinion of the irrelevance of this distinction is nowadays shared by most psychologists. Here the term "perception" will be preferred despite its ambiguity. Such a term probably makes it easier to consider the alternatives of "objective" or "subjective," or better of "external" and "internal" determinants of our experienced life space (von Fieandt, 1977, p. 8).

The focus on each subject in this study as a purposeful actor in acquiring knowledge is supported by this internal/external division of perception.

Elements of Learning Differences

Research of learning style reveals a conflict of terminology. The term cognitive style continues to appear and is often used interchangeably with the term learning style, Cherry (1981) reports:

During the winter quarter of 1980, a group of potential learning style researchers at The University of Tennessee, Knoxville met weekly to discuss the general thrust and results of past research in the area of personal learning style. It was decided that the most logical and appropriate overall term for this field of study was "Learning Style". Additionally, secondary levels of the pattern were labeled "Modalities." The original four modalities identified were: Perceptual, Cognitive, Emotional, and Social (p. 26).

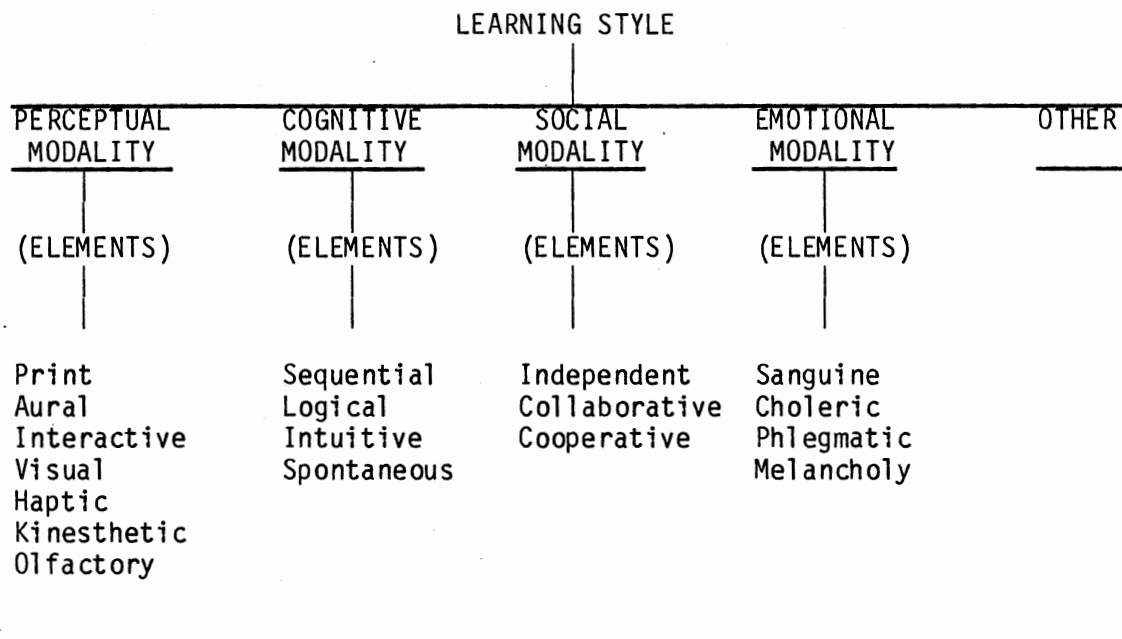
Figure 1 is a current reflection of these categories. Identification of these modalities is suitable for comparison of past learning style terminology and areas of human learning activity. This includes: (1) information extracted by the senses; (2) information processed mentally; (3) social interaction that affects individual learning processes, and (4) information influenced by feelings, attitudes and personality factors that build and apply individual knowledge. As Figure 1 indicates, there may be other modalities to add to learning styles that are not being considered at this time.

The concepts presented in Figure 1 are partially supported by the Forgas (1966) model of learning and thinking:

. . . the three cognitive processes are closely inter-related and difficult to separate in practical situations . . . at the beginning of this process, learning and thinking either are nonexistent or operate at a low level. . . where information extraction requires more active effort on the part of the organism, learning and thinking play an increasingly important role . . . thus we consider learning and thinking as events or processes which aid in the extraction of information (pp. 3-4).

Forgas pointed out that learning and thinking involve emotion and social activity, thus this model can be closely related to the four modalities of the University of Tennessee group:

Within the pattern of terms, The University of Tennessee group labeled the tertiary level elements. The terms previously used to identify individual learning style differences were arranged as elements under the four modalities to produce a logical pattern of communication. Example: The visual element of the perceptual modality of learning style;



Source: French, Russell, L., Handout, (1982b)

Figure 1. Modalities and Elements of Learning Style

the field dependent-field independent element of the cognitive modality of learning style; the impulsive-reflective element of the emotional modality of learning style; or the collaborative vs. independent element of the social modality of learning style (Cherry, 1981, p. 18).

A number of researchers have investigated a variety of style elements. Oen (1973) prepared a cross-referenced matrix of 62 style elements presented by 18 authors. Better than two-thirds (13) of the authors failed to define elements in common with other members of the group. Only seven of the 62 elements were used by more than one of the authors. Elements reported by Oen included: visual; oral aural; physical/tactile; perceptual/conceptual; auditory; olfactory; and kinesthetic. These are identical, or very similar, to the styles with which this study was concerned; however, few of his specific guidelines were applied to this study. Research by most of the groups on which Oen reports was directed toward application of their findings with little attention to areas such as validity of the measurement instruments.

This study focused on the perceptual modality elements conceptualized by French (1975) and investigated by Gilley (1978) and Cherry (1981). The elements were: print, aural, interactive, visual, olfactory, haptic, and kinesthetic.

In 1975, French theorized that each learner has an individual orientation or preference in one or more of the sensory-intake styles. He encouraged teachers to observe learner activities in the various modes, identify each learner's orientation, and develop instructional strategies to match the student's learning style. French also suggested that extensive research was needed to produce effective measurement instruments (Cherry, 1981, p. 29).

Gilley (1978) tested and validated six of French's elements by developing and using the MMPALT. The six elements were: print, aural,

interactive, visual, haptic, and kinesthetic. Gilley found that third grade students possessed individual differences in perceptual learning style. The two most dominant styles were haptic and visual. Gilley reported that the six elements could be measured validly and reliably with third grade students using the MMPALT.

Several authors have reported on the visual, haptic, kinesthetic and aural learning styles. Riessman (1962) identified seven characteristics of deprived children in The Culturally Deprived Child. He suggested that one characteristic was that deprived children were "physical rather than aural" (p. 73). Lovenfield (1945) tested over 1100 subjects and reported 47 percent were visual, 23 percent were haptic with only 30 percent unidentifiable. Barbe and Milone (1981) reported visual, auditory and auditory and kinesthetic learning styles in Educational Leadership:

The most frequent modality strengths are visual or mixed; each accounts for about 30 percent of the population (although mixed modality strengths are more frequent among adults than children). About 24 percent of the population are auditory, and the remaining 15 percent are kinesthetic.

Primary grade children are more auditory than visual, and are least well developed kinesthetically. Between kindergarten and sixth grade, however, a modality shift occurs. Vision becomes the dominant modality, and kinesthesia overtakes audition.

Sometime between the late elementary grades and adulthood another shift occurs. Vision remains the dominant modality, but audition becomes more important than kinesthesia (p. 378).

It would appear that style preferences do change with individual learners. Keefe (1970, p. 127) disagreed with one of the conclusions of Barbe and Milone: "Perceptual preference seems to evolve for most students from psychomotor (tactile/kinesthetic) to visual and aural as the learner matures."

There was less research available for the print, olfactory, and interactive styles; however, some authors included these styles in self-report measurement systems. Hill (1976) included olfactory and savory styles under the heading "qualitative symbols." Both print and visual consideration were included in the Dunn and Dunn (1978) report; however, this was also a self-report measurement system.

Previous use of the elements used in this study included application to several skills and caused inconsistencies in measurement techniques. Some examples of these were: (1) The printed word has been used to measure the visual style, and (2) Some researchers mix speaking and listening skills to measure the aural learning style. Gilley and Cherry's studies were the only studies that objectively measured the interactive style. Cherry's study was the only study found that objectively measured the olfactory style. The visual style was the most researched style, but most reported studies centered on the cognitive processes. Many of the terms such as haptic, kinesthetic, and tactile have been used interchangeably. This caused much confusion when attempting to correlate past results with new research (Cherry 1981). Although all these contradictions exist, it was apparent that the seven style elements measured in this study do exist in individual learners and there is need for extensive study of these styles with individual learners.

Measurement of Individual Learning Styles

Most of the validated subjective and objective measurements of differences in individual learning styles have derived from the field of psychology (French 1982a). These measurements tend to focus on

mental processing on the cognitive modality, however some of this information provided limited guidance for this study.

Lowenfeld, 1948 (cited in Ragan, 1979) developed several cognitive style tests that focused on visual and haptic elements. His testing was based on distinctions between visual and haptic:

Whereas the visual has the ability to see a whole, break it up and see its component details, and then resynthesize the details back into a whole; the haptic is unable to do this.

Whereas the visual tends to react to stimuli as a spectator and to "see" experiences, the haptic tends to react emotionally, to "feel" stimuli, and place self into the situation.

Whereas the visual has the tendency and ability to visualize and integrate tactile and partial experiences, the haptic has neither this tendency nor ability.

Whereas the visual has the ability to maintain visual imagery mentally, the haptic is unable to do this (p. 21).

Ragan (1979) reported that the materials Lowenfeld used to measure style elements were kept simple enough to minimize mental imagery and emotional reaction. Cherry (1981) reported this was an important implication for designing his study.

Hill and associates (1976) used a number of instruments to measure individual differences. Several studies have supported the validity of Hill's measurements for determining learning style preferences, but some were critical. Sailor (1978) concluded that Hill's involvement appeared to include a number of variables which seemed to be of little value in assessing cognitive style and that a number of variables should be eliminated. Sheriff (1978) reported that Hill's instrument is not a measure of discrete variables. London (1976) suggests that Hill's instrument received structural and psychometric modifications. Cogan (1976) reported Hill's instrument as a self-report instrument and

not a psychometric instrument.

The Embedded-Figure Test has also been used to measure auditory, visual and tactile elements of "cognitive style." Ragan (1979) reported that these tests were found to be influenced by subject's intellectual ability. Rohwer and Ammon (1971) pointed out that testing with paired-associates requires verbatim responses and that Jensen classified these as the lowest level of ability. Revisions made by Cherry (1981) in the MMPALT resulted from this need to minimize the intellectual and cognitive ability impact on test results. This was the rationalization for the ten-item clusters and the simplified scoring procedure.

According to Ragan (1979) Golden in 1975 developed a group application of the Stroop Color-Word Test that required written responses. The results were found to be very reliable. This information, recommendations of Gilly, and recommendations of Cherry were used to establish response procedures used in the print, aural, and visual elements of the MMPALT II.

The "Learning Styles Questionnaire," developed by Dunn and Dunn (1978) was designed to be used by teachers to determine individual student learning style for setting classroom activities. Although this instrument relies on teacher observations it is a self-report instrument. The validity of self-reporting was a question for this study. Cherry's (1981) intent was to examine the correlation between self-reporting as measured by the PMPS and objective measurement of the MMPALT II of individual learning.

Results of Investigations

Reports of valid instruments were not common. Gilley (1978) and Cherry (1981) were the primary sources for this study.

Gilley's study was concerned with a population of 24 third grade students: 12-high achievers and 12 low achievers, as determined by standard achievement test. Both high and low achievers demonstrated primary strengths in the haptic style and secondary strengths in the visual style. Rank-order findings for Gilley's study were:

High Achievers	Low Achievers
1. Haptic	1. Haptic
2. Visual	2. Visual
3. Aural	3. Kinesthetic
4. Print	4. Aural
5. Kinesthetic	5. Kinesthetic
6. Interactive	6. Interactive

(Gilley, 1975, p. 80).

Figure 2. Gilley's Rank-Order Findings

Cherry studied a population of 96 adults who ranged in age from 19 through 68 years and represented an education range from eighth grade to advanced degrees. Primary strengths were demonstrated in the visual style and secondary strengths were demonstrated in the haptic style. Rank order findings for Cherry's study were:

1. Visual
2. Haptic
3. Aural
4. Interactive
5. Print
6. Kinesthetic
7. Olfactory

(Cherry, 1981, p. 83).

Figure 3. Cherry's Rank-Order Findings

Rank-ordered results of measured styles are significant but emphasis is placed on primary style by researchers as the primary style appears to have significant implications for teaching strategy. Barbe and Milone (1981) reported that primary grade school children were strongest in the auditory style. However, they also found that the visual style was the strongest for sixth grade students and adults. Earlier Lowenfeld (1945) also reported that the primary style for adults is visual. Riesman (1962) studied deprived children and reported they were strongest in physical styles (Kinesthetic/Haptic) and should be taught in these styles. The limited research that has been accomplished has resulted in varied results and supported the need for further study in this area.

Research completed on self-reporting instruments has also resulted in varied results. Griggs and Brice (cited in Keefe, 1979) collected data on 170 students from the seventh, eighth and ninth grades. The instruments used included the Stanford Achievement Tests and the Dunn, Dunn and Brice Learning Styles Inventory. Griggs and Brice concluded that non-gifted students perceived the auditory learning style as their best style of learning.

Dunn, Dunn and Brice (as cited in Keefe, 1979) concluded after

extensive use of their learning style inventory that:

. . . we are finding that the majority of the students tested are not auditory learners, . . . It appears that many students are tactual and/or kinesthetic learners. The tendency to learn through the latter two senses appears to decrease with maturity but at least one-third of each high school sample tested exhibited such predispositions (p. 53).

Keefe (1979) summarized his study of self-reporting research by inferring that younger students are primarily psychomotor (Kinesthetic) learners and adults are primarily visual or aural learners.

Summary

The need for individualized instruction is based upon the assumptions that individuals possess a variety of learning differences and that self knowledge and instructor awareness of individual learning styles will enhance the teaching-learning process. Sensory intake or perception are among the primary differences. The individual's primary way of extracting information from the environment is the perceptual modality. This review included seven elements in the perceptual modality and the terminology for learning style research. The literature revealed that past studies of individual differences have focused primarily on internal cognitive processes or self-reporting instruments. A major question for study was the value and validity of subjective self-reporting instruments compared to objective measurements. Review of studies using empirical measurement approaches and self-reporting devices gave direction to this investigation and provided sources for comparison of findings. Literature concerning the specific concepts of individual learning style differences was limited, thus related psychological literature was used in this study. However, the fact that research was limited gave support to the need for further study.

CHAPTER III

METHODOLOGY

The purpose of the study was to measure the learning styles of U.S. Coast Guard Institute personnel. This chapter includes: (1) subject selection, (2) a description of the instrument, (3) the revised MMPALT, (4) materials required for the MMPALT, (5) testing procedures, (6) PMPS administration, (7) data collection, and (8) analysis.

Subject Selection

Subjects used in this study were personnel assigned to the United States Coast Guard Institute. This study had the approval and support of the commanding officer of the Institute. See Appendix A for a copy of the Commanding Officer's Letter.

Primary Missions of the Institute include:

Operate the Coast Guard's non-resident training program. This includes our rating courses, many special subject courses, and audio visual packages. We have about 50,000 students with over 18,000 graduations per year.

Prepare, distribute, and process the enlisted advancement and warrant officers selection examinations. Over 9,000 enlisted examinations were administered in FY 82.

Prepare and process exams for Merchant Marine licenses. In FY 82, over 7,000 candidates were examined for Merchant Marine licenses ranging from 3rd mate through Master and 3rd Assistant Engineer to Chief Engineer. The Merchant Vessel Division also develops examinations for unlicensed personnel such as able bodied seamen and qualified members of the engine department. Towing vessel and small passenger vessel operator exams are also developed by MVP.

Perform research in examination and other personnel procedures (USCGI Pamphlet No. N00001, 1982, p. 1).

Approximately 130 persons are assigned to the Institute; 30 are officers or warrant officers, 24 are civilian. The remaining personnel are enlisted with over two-thirds in the grade of Chief Petty Officer with 15 to 26 years in service. This is a group of professionals who produce correspondence courses and promotion examinations for adults. Institute personnel were informed in small groups about the study and encouraged to volunteer to help increase the data base for learning style information and to personally discover their best learning styles. Volunteers were listed and scheduled for testing on a day best suited to them.

The Instruments

The MMPALT was developed by Gilley (1975) and French (1975). The test contained six elements of perceptual modality measurement. The test required several hours to administer and did not contain tests for the olfactory learning style.

The MMPALT II is a refined and revised version of the original. It is the result of intensive research by Cherry using French's (1975) and Gilley's (1975) instrument. Testing procedures were developed to shorten test administration time and to measure strengths and weaknesses of individual learners in seven perceptual learning modalities. Style elements measured included aural, haptic, interactive, kinesthetic, olfactory, print, and visual. Measurement results were reported in a strongest to weakest rank-ordering of each style.

The PMPS, a self-report questionnaire, was developed by Cherry (1981) for his project. The object of the questionnaire was to secure

individuals' intuitive assessment of their strengths and weaknesses in seven perceptual learning styles.

The Revised MMPALT

The MMPALT used the paired-associates testing procedure (Gilley, 1975). The test measured subjects' ability to discriminate and recall information in six perceptual styles. Cherry (1981) felt this approach was valid, but investigation of the instrument led him to conclude that the modifications suggested by Gilley were necessary.

1. In order to save time, increase control, and reduce subject fatigue, reduce each style element measurement from 4 sets of 5 stimulus response pairs and 10 trials to 1 set of 10 stimulus-response pairs and 1 trial.
2. When possible, use 35MM slides, tape recordings and written response sheets to allow group testing in certain style elements (e.g., 35MM slides and written responses in the print and visual element measurement; tape recordings and written responses in the aural element measurements).
3. Instead of introducing and practicing each measurement on an individual basis with each subject, develop a procedure for introducing all measurement procedures to groups of subjects.
4. When developing the olfactory pairs or replacing any old pairs, retain the basic concept of the stimulus member being the more abstract and the response member the more common.
5. When presenting stimulus-reponse pairs to the subjects, maintain a consistent spacing of 5-7 seconds between each pair; when receiving responses, adjust timing to the uniqueness of each element being measured, but keep that time in approximately 10 seconds between stimulus presentation and response record (Cherry, 1981, pp. 40-41).

Considering these recommendations and considerable research with French, Gilley, and Cherry, 11 stimulus-response pairs were selected for measuring the seven perceptual modality elements. One of these stimulus-response pairs in each style was used in an introduction

briefing. The remaining 10 were used in the test. The seven sections of the MMPALT are discussed in more detail below. Measurement procedures for each learning style are described:

Aural

This measurement consisted of subjects listening to trigram and common noun pairs played on a cassette recorder. Upon hearing a trigram again, the subjects were asked to recall the common noun that had previously accompanied that trigram. Cherry used the same 10 pairs of trigrams that Gilley used in his research. The word "pairs" were recorded on a cassette tape which was used for presentations so that dialects and/or pronunciation differences would not vary among subjects and influence results. The recall test was also taped using the same voice. A table of random numbers was used to select the order for the recall tape. The time sequences established by Gilley were used by Cherry. A copy of the tape was used in this study.

Haptic

Each subject was blindfolded for this measurement which consisted of handling pairs of abstract and common objects. The original items used for the MMPALT were not available. Cherry collected approximately 50 items using the original outline for this style. A number of people helped Cherry classify these items. They were blindfolded and asked to identify the items. The 10 items identified most often were considered common. The 10 items identified the least number of times were considered abstract. The abstract items were used as stimulus objects and the common items were used as response objects. The items were

paired and sequenced for test presentation by random selection. All items were arranged in a closed box for the measurement. The evaluator used a script to conduct the test for this style. Three of the abstract items were similar to stimulus objects and four of the response objects were identical to common items on the original list for the MMPALT.

Interactive

This style was concerned with the ability of the learner to acquire knowledge by questions and discussion. Gilley used three sets of trigrams and common noun pairs. Two of these sets were used by Cherry with the exception of one common noun which also described a picture used in the visual style measurement. This word was replaced by one from the third set which was not used.

Procedures for the MMPALT required subjects to repeat both words twice. This simple repetition procedure was revised by Cherry. He required each subject to repeat each word pair, answer a question about the words and also recall the paired common noun upon hearing a trigram stimulus.

Presentation sequence used on the original measurement for this style was also used by Cherry but the recall test sequence was re-established using a random number table. A script was devised to guide the evaluator's presentation of the materials and the recall test.

Kinesthetic

Subjects were directed to do body movements in pairs. Then they were guided through the first movement of a pair and asked to recall the second movement by description or performance. Cherry used the

original pair established for the MMPALT but changed the response test stimuli to random order selection and added a script for the evaluation.

Olfactory

This learning style related to the subject's ability to learn from the environment through the sense of smell. Cherry developed the measurement materials used for this style in the revised test. This style was not measured on the original instrument. Measurement materials were selected using the same criteria used in developing the other six measurements. This consisted of the following:

1. Stimulus and response items were presented to the subject for the style element (sense of smell) being tested.
2. Stimulus items were abstract.
3. Response items of each pair will be common items.

Volunteers were used to classify the scents used. The scents identified the least number of times were classified abstract and those identified most often were classified common.

Twenty identical containers with screw on/off caps were used to prevent the possibility of the smell being identified by the size and shape of a container. The containers were marked with code labels but were kept in a closed box until the subjects were blindfolded for the test. Instructions were provided for the evaluation.

Print

This measurement was accomplished by having subjects view pairs of trigrams and common nouns on a screen and then recalling the correct

common noun when a trigram was reshown. The word pairs used by Gilley were used in the revised test with the exception of one common noun that was duplicated. It was replaced by a common noun from a third set not used in the revision.

Slides were prepared for each trigram and each common noun. Lower case letters and standard type were used with black letters projected on an off-white background to resemble printed words. Two slide projectors were used to project trigrams on the upper half of a screen and common words on the lower half of the screen. Subjects sat five to eight feet from the screen. Slides were shown by two overlapping projected images during the original presentation. Then randomly selected trigrams were projected to facilitate recall. One slide projector was used with all slides in this study.

Visual

This style was measured by presenting pairs of abstract symbols and common object pictures on a screen followed by presenting just the abstract symbols and asking subjects to recall the appropriate common object.

Gilley's original outline was used to design and produce slides for this measurement. Abstract symbols and common objects are displayed on a blue background. Abstract symbol slides were placed in slidetrays using a table of random numbers. The procedure previously discussed concerning the measurement of the print style was the procedure also used for the measurement of this style.

MMPALT Materials

French conducted a two-day seminar in Oklahoma City in November,

1982. Each participant was administered all seven parts of the test. Then each participant practiced giving the test to fellow seminar attendees until French felt each was proficient. Developers granted permission for reproduction, of the kit. A copy of the permission letter is reproduced in Appendix B.

This researcher reproduced the slides for the print test, gathered materials for the olfactory measurement, and gathered several of the items used in the haptic measurement. Slides delivered with French's kit that were designed to be used in the print measurement had a redish background. This writer reproduced the slides with a light blue background. French suggested this change and indicated future production kits will reflect this change. Fifteen of the extracts used for the olfactory measurement were obtained from Watkins products. The remaining extracts and oils were obtained from gourmet food stores and pharmacies. Appendix C indicates each aroma, product name and source. Fluids were placed on cottonballs placed in medicine bottles with screw-type caps. The caps were numbered. Each bottle was labeled indicating the aroma and number. The labels were color banded to indicate stimulus group and recall group bottles. Remaining items required to complete kits were reproduced, collected or purchased by other seminar participants. A list of kit items may be found in Appendix D. The test required a quiet, comfortable room equipped with a table and chairs to accommodate the investigator and subject, a carousel slide projector, projection screen, cassette tape player and a complete MMPALT II test kit.

Testing Procedures

The print, aural and visual elements can be conducted in small group settings. The other four elements must be tested individually. This researcher elected to conduct all seven tests on an individual basis dealing with one subject per measurement. All seven learning styles were measured in a continuous session with each subject.

Each subject was greeted and given an introduction to learning style measurement by the researcher: A copy of this introduction may be found in Appendix D. Each subject filled out a Subjects' Record Form. A copy of this form may be found in Appendix E. This was followed by a question and answer period. It was pointed out at this time that each subject should do as well as possible, but that this was not a pass/fail test, merely an instrument to detect the best learning style for each participant. This was done to reduce anxiety and promote individual motivation.

Identical processes were used to measure each style element. Each subject was presented 10 timed stimulus response pairs. This was followed by a randomly selected presentation of the stimulus member of each pair and each subject was allowed a timed period to identify the correct response member of the stimulus presented. Specific procedures for each style varied for the style being measured as follows:

Aural

This measurement consisted of the subject listening to a recorded tape. A pair consisting of a spoken trigram was followed by a common noun in a sample trial. This was followed by 10 pairs. Following this, the trigrams were repeated randomly and the subject was

asked to write the appropriate common noun on an Aural Response Sheet. A copy of this form may be found in Appendix F. Subjects were allowed a maximum of 10 seconds to respond to each item.

Haptic

Materials used in this measurement were kept in a closed box until subjects were prepared for testing. This consisted of blindfolding subjects. The investigator quizzed each subject to assure they were completely blindfolded. Pairs of abstract and common objects were handed to subjects. They were allowed seven seconds to feel and become familiar with each of the objects. If, during this time period, the subject failed to identify the common object, the investigator identified the object verbally. Following 10 trials, the subject was handed the abstract objects randomly and asked to recall the common object of the pair. The investigator recorded the responses on a Haptic Check Sheet. Ten seconds were allowed for each response.

Interactive

Measurement in this style required the subject to explain how pairs of trigrams and common nouns might be remembered. Subjects were blindfolded during this measurement. The investigator used the following procedure:

Investigator: "The nonsense word in this pair is --, and the common word is --. Please repeat both words."

Subject responds: "--, --."

Investigator: "How will you remember this pair of words?"
(Seven seconds allowed for reply).

Investigator: "The nonsense word is --; what was --paired with?" (10 seconds allowed for reply).

The investigator recorded the results on an Interactive Check Sheet.

Kinesthetic

This measurement consisted of subjects being directed and guided through pairs of body movements. Great care was taken to assure the safety of each subject as these movements were accomplished with the subject blindfolded. Upon completion of 10 pairs, the subject was guided and directed through the first movement of a randomly selected pair, then asked to recall the second movement of the pair by describing or performing the movement. The investigator recorded the correct or incorrect response on a Kinesthetic Check Sheet.

Olfactory

Twenty glass bottles with screw-on caps, filled with a cotton ball saturated with chemicals that produced various scents were used for this measurement. These bottles were concealed in the test kit box until subjects were blindfolded. This was accomplished because the bottles were labeled with the name of the scent and a number and the cap was marked with a number matching the bottle.

The bottles were lined up in two rows. The investigator removed a cap from the first (number one) bottle, handed it to the subject and said "This is the first aroma of this pair." The subject sniffed the bottle for a few seconds and returned it to the investigator. The second bottle was handed to the subject after the investigator had removed the cap. The investigator said "This is the second aroma in

this pair." The investigator stated the name of the second aroma if the subject failed to identify it. The second bottle was returned to the investigator, the bottles were stored with caps secure and the next pair was processed in the same manner until 10 pairs were presented. Following this the investigator conducted the recall test. Each stimulus bottle was presented in randomized order to the subject. The subject was allowed to sniff the aroma for 10 seconds and asked to state the name of the appropriate response scent. The investigator recorded the results on a check sheet for olfactory style.

Print

This style was measured by having the subjects view 10 slides displaying pairs projected on a screen for seven seconds. The pairs consisted of a trigram and a common noun. After the 10 pairs were presented, the stimulus (trigram) was presented randomly and the subjects were asked to respond by recalling the appropriate common noun and entering it with a pencil on a response form by the appropriate number. As the investigator projected each stimulus on the screen, he announced the number on the response sheet. Subjects were allowed 10 seconds to see each trigram and record a response.

Visual

This style was also measured by having subjects review 10 slides. This set consisted of pairs of abstract symbols matched with a common object picture. Subjects were shown 10 pairs followed by a random presentation of the stimulus objects (symbols) and asked to respond by recalling and writing the appropriate common object name on a Visual

Response Sheet. Subjects were allowed to see each pair slide for seven seconds. The stimulus slides were displayed for 10 seconds.

Each subject received a report on the results of his/her performance on the MMPALT II and the PMPS upon completion of all measurements. The report covered the score on each of the seven learning style measurements and a review of the PMPS results. This self assessment was contrasted with results on the style measurements.

The PMPS

This survey was developed by Cherry (1981) to accompany the MMPALT. The purpose was to provide information on subjects' opinions concerning strengths and weaknesses in the seven perceptual modality elements. This self report is compared with the results of the revised MMPALT II. The survey consists of 42 questions with one neutral, two positive and two negative response options. Four of these response options have an element of time reference: (1) always, (2) usually, (3) seldom, and (4) never. The neutral response is: (5) do not mark. See Appendix D for a copy of the PMPS.

The PMPS was used in this study without modification in an attempt to increase the data base created by Cherry's study. The PMPS was also administered the same, with half the subjects completing the survey before the MMPALT II and half completing after the MMPALT II was administered. Survey procedures are found in Appendix D.

Subjects were given a verbal explanation of the survey. Then they were given a copy of the survey, an answer sheet, and pencil. The investigator answered all questions subjects asked during administration of the survey, but answers were controlled so that

survey responses were not affected by any input from the investigator.

Data Collection

Upon completing subject measurements, the collected data consisted of a score sheet for the PMPS, a score sheet for each of the seven measurements for the MMPALT II and a personal data sheet for each subject. The investigator inspected all documents to assure they were complete and accurate before subjects left the testing area. Half the subjects completed the PMPS before the MMPALT II. All score sheets were checked before the investigator discussed the results with each subject. The other half of the subjects completed the PMPS after the MMPALT II. Their score sheets were checked while they were completing the PMPS. The PMPS score sheet was checked and then results were reviewed with each subject.

Analysis of the Data

Demographic characteristics of the subjects in this study were investigated for significant differences by sex, age and education. Groups of Officers, Enlisted and Civilian personnel were compared. Rank order findings were established for both instruments on each subject. Relative total scores were computed for the study population by style on both instruments. Finally, correlation categories were computed for each subject in relation to each style for self-assessment and actual measurement of the learning style.

A Pearson r correlation formula was used to calculate the results.

The formula used was:

$$r = \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2} \sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

Figure 4, Pearson r correlation formula (Bartz 2, 1981, p. 381)

Determination of correlation strength was:

<u>Relationship</u>		Coefficient
Very high	=	.80 or above
Strong	=	.60 to .80
Moderate	=	.40 to .60
Low	=	.20 to .40
Very low	=	.20 or less

Figure 5 Correlation Coefficients Scheme (Bartz, 1981, p. 202).

CHAPTER IV

ANALYSIS OF DATA

INTRODUCTION

Adult Educators have been challenged to provide adult learners with the help needed to plan and conduct learning experiences. Learning style assessment is a means of providing this help. In this study, individual learning styles were determined using performance results on the MMPALT II and self perceptions resulting from the PMPS. Both instruments were hand scored by the researcher but computer resources were used to rank-order both the MMPALT II and PMPS results and calculate correlations between the two ranks and scores.

Though group data was secondary in importance, group data was investigated for significant differences. Computer resources were used to identify differences in three primary groups: officers, enlisted personnel and civilian personnel. Group rank - order and correlations were calculated for the three groups. Subjects were also divided into groups by sex, education level and age to determine significant differences.

Data for both individuals and groups were combined into summary tables and are included in this report. Appendix G contains the individual data table and Appendix H contains the group data tables.

Demographic characteristics of the subjects and the five study questions outlined in Chapter I were the basis for organizing this

chapter and for analysis of collected data.

Section II includes an overview of the demographic characteristics of the subjects used in this study. Data resulting from scores on the PMPS and MMPALT II measurements are applied to the remaining sections of this Chapter. The MMPALT II is an objective measurement revealing each subject's strengths and weaknesses in the seven perceptual learning styles at the time of measurement. The PMPS questionnaire was designed to identify each subject's assessment of personal learning styles.

In section III, MMPALT II data were used to determine the actual perceptual learning style for each of the subjects who participated in the study. This information was used to address the first study question: What are the preferred learning styles of U.S. Coast Guard Institute Personnel? Cherry (1981) concluded from the data obtained from the revised MMPALT that no two subjects had identical scores or score patterns. Only two subjects had indicated rank order alignments, and their scores were not identical. It was assumed that similar results would reveal the preferred learning styles of the subjects in this study.

In section IV, frequency of rank-order data was investigated to determine an answer to the second study question: Do U.S. Coast Guard personnel exhibit any perceptual learning style characteristics or patterns of characteristics in common with each other? It was assumed that variability in rank-order ranges and comparison of these ranges were directly related to this question.

MMPALT II and PMPS data were used in Section V to answer study question number three: Do the conclusions of self-assessed perceptual

modalities of learning style show correlation with actual measurement of the same style? Correlations are reported in each learning style for both instruments on each subject.

Section VI addresses study question number four: Are there significant differences in the sample between officers, enlisted personnel and civilian personnel? An analyses of variance was used to reflect the differences in this sample.

Section VIII addresses study question numbers five: Are there significant differences in the sample between sex, education level, or age? Both analysis of variance and t test were used as the statistical tool for determining these differences.

The final section in this chapter deals with the researcher's observations that were noted during testing and summarized for the purpose of this report.

Demographic Characteristics

The sample for this study consisted of 45 subjects assigned to the U.S. Coast Guard Institute in Oklahoma City, Oklahoma. This population was divided into three groups. Group one consisted of 19 officers or warrant officers. Group two consisted of 16 enlisted personnel and group three had 10 civilians. Subjects ranged in age from 20 to 53 years old and averaged 33. Ranks ranged from Seaman Apprentice (E-2) to Captain (O-7) and GS-4 to GS-13 in the civilian grades. There were 33 males and 12 females with both sexes represented in all three groups.

The sample also included 33 married personnel, eight female and 25 male and 12 singles, four female and eight male. Education level

ranged from some high school to the Doctor of Philosophy level with the average having some college. Income ranged from less than \$10,000 to over \$50,000 per year with the average less than \$30,000. Sixteen of the subjects reported two contributors to total income.

One to three children were reported by 27 of the subjects averaging 1.15 children per subject with the average child in the 6-12 age group. Twenty-five of the subjects reported they smoked and the remaining 20 reported they did not smoke. Subjects reported 23 different states as their home state. States involved and the number of subjects by state are shown in Figure 6. Demographic data may be found in Table I.

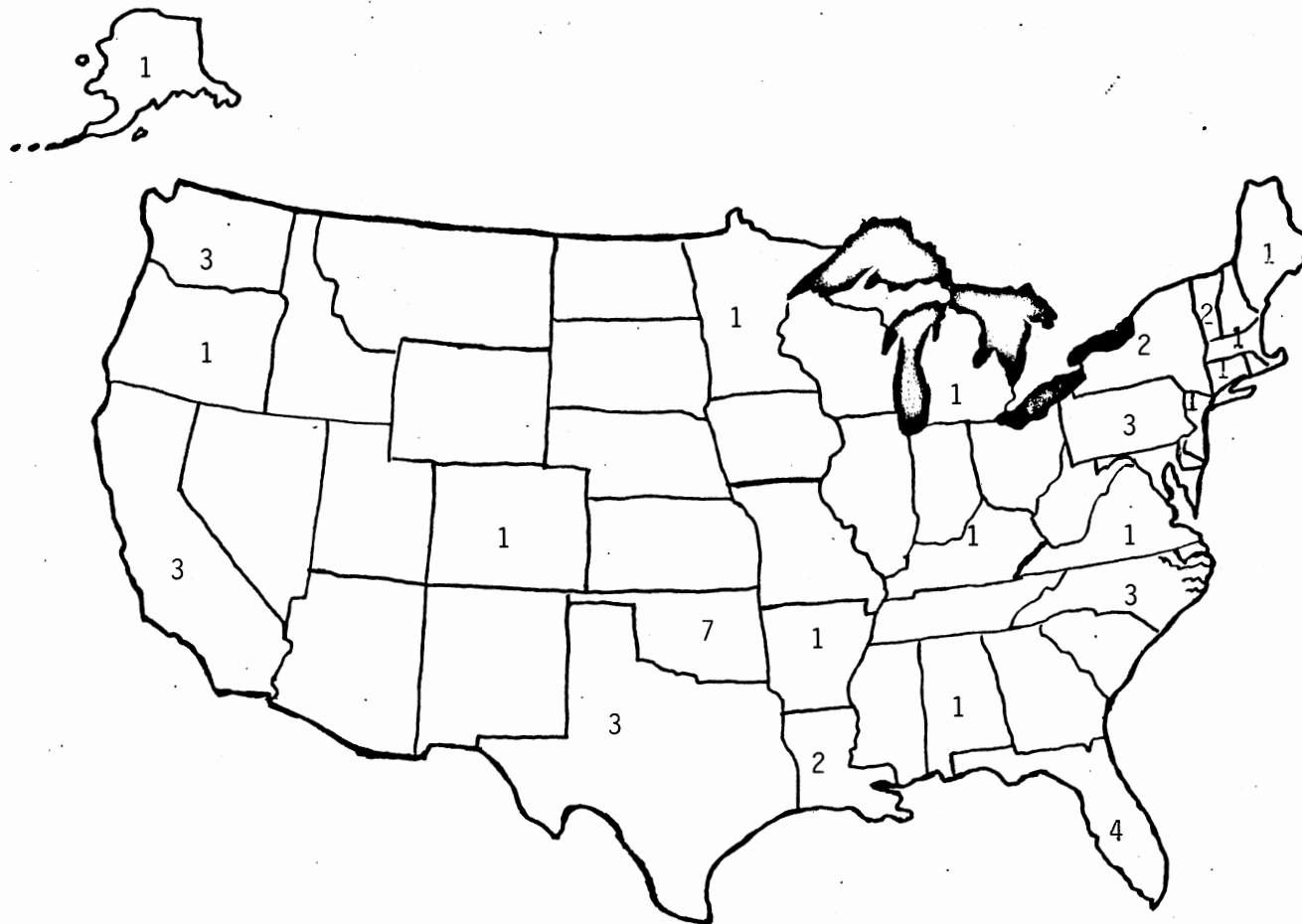
Measured Learning Styles

Volunteer subjects were processed between June 1 and October 15, 1983 in the researcher's office. Care was given to assure that the same procedures and techniques were maintained with each subject.

A visual comparison of the MMPALT II scores obtained from all subjects by score and style is provided in Table II.

A visual comparison of the rank-order formed by these scores is presented in Table III.

Highest scores were registered for the visual style which averaged 7.09. Scores recorded for this style ranged from zero to 10 with a spread of 11. The second best average was registered for the interactive style which averaged 6.13. The range was one to 10 with a spread of 10 for the interactive style and the haptic style which was the third best style with an average score of 5.51. The fourth style was print with an average score of 4.46 and range of one to nine with a spread of nine. The aural style was the fifth ranked style with an average score of



Home State	Subjects
AK	1
AL	1
CA	3
CO	1
CT	1
FL	4
GA	1
LA	2
MA	1
ME	1
MI	1
MN	1
NC	3
NJ	1
NY	2
OK	7
OR	1
PA	3
TX	3
VA	1
VT	2
WA	3
WV	1
23	45

Figure 6. Home States of U.S. Coast Guard Institute Study Subjects

4.36, range of zero to nine, and a spread of 10. The sixth ranked style was kinesthetic with an average score of 3.89, range of zero to eight and a spread of nine. The lowest registered score was for the olfactory style which ranked last at seventh. The olfactory style had scores that ranged from zero to five with a spread of six.

Results indicate that the preferred style for the sample is the visual learning style with the interactive learning style second.

Frequency of Rank-Order Data (PMPS)

Rank-order data for the PMPS is grouped by rank-order and style for the entire population in Table IV. Investigation reveals that no two individuals recorded identical scores across all seven styles. It appears that a majority of this sample felt the print style was strongest and the olfactory style weakest but this is the extent of commonality with 45 variances within this range.

Correlation of Self-Assessed and Measured Learning Styles

PMPS and MMPALT scores and rank orders were used to calculate a correlation between the MMPALT II style scores and the PMPS style scores. Low or very low correlation between MMPALT II scores by style and PMPS scores by style are indicated in Table V. The relationship between MMPALT II ranks and PMPS ranks is shown in Table VI indicating low or very low correlation. No meaningful correlation existed between the two instruments.

TABLE II
 SUMMARY OF PERCEPTUAL LEARNING STYLE SCORES OF U.S.
 COAST GUARD INSTITUTE PERSONNEL AS MEASURED BY
 THE MMPALT II TEST

Scores	STYLES						
	Print N	Avral N	Inter- active N	Visual N	Haptic N	Kines- ethic N	Olfac- tory N
0	0	1	0	1	0	1	11
1	3	6	2	0	2	3	20
2	8	6	0	1	3	7	8
3	4	4	2	4	4	10	3
4	8	5	11	1	6	7	2
5	7	6	8	4	10	7	1
6	7	3	1	3	6	6	0
7	5	9	7	5	4	3	0
8	1	3	3	9	3	1	0
9	2	2	5	7	4	0	0
10	0	0	6	10	3	0	0
Range	1-9	0-9	1-10	0-10	1-10	0-8	0-5
Spread	9	10	10	11	10	9	6
Mean	4.46	4.36	6.13	7.09	5.51	3.89	1.29

TABLE III
 SUMMARY OF PERCEPTUAL LEARNING STYLE RANK-ORDER
 OF U.S. COAST GUARD INSTITUTE PERSONNEL
 AS MEASURED BY THE MMPALT II

Rank Order	STYLES						
	Print N	Aural N	Inter- active N	Visual N	Haptic N	Kines- ethic N	Olfac- tory N
1			14	20	1	3	
1.5			3	2	2		
2	3	5	8	9	10	3	
2.5	1	2	3	3	3		
3	8	7	5	2	7	1	
3.5	2	2	3	1	5	3	
4	4	5	4	2	5	5	1
4.5	5	6	2	1	4	5	
5	7	7	1	2	4	4	1
5.5	7	2	1		2	5	1
6	8	5	1	1		10	1
6.5		2		1	2	5	8
7		2		1		1	33

TABLE IV
 SUMMARY OF PMPS RANK-ORDERS OF U.S. COAST
 GUARD INSTITUTE PERSONNEL

Rank Order	STYLES						
	Print N	Aural N	Inter- active N	Visual N	Haptic N	Kines- ethic N	Olfac- tory N
1	15	2	8	5	2	10	
1.5	2		1	3			
2	10	2	16	5	3	3	
2.5		1	1	1	1		
3	4	10	7	10	5	9	
3.5							
4	8	16	4	7	4	4	
4.5	1	1					
5	3	8	7	8	13	5	
5.5							
6	2	5	1	6	15	10	5
6.5							
7					2	4	40

TABLE V
CORRELATION OF MMPALT II STYLE RANKS WITH
PMPS RANKS OF THE SAME STYLE

PMPS RANKS	MMPALT II RANKS STYLE						
	P*	A	I	V	H	K	O
P*	.037 very low						
A		.065 low					
I			.319 very low				
V				.202 very low			
H					.074 very low		
K					very low	.074	
O						very low	.027

*P = Print

H = Haptic

A = Aural

K = Kinesthetic

I = Interactive

O = Olfactory

V = Visual

TABLE VI
CORRELATION OF MMPALT II STYLE SCORES WITH
PMPS SCORES OF THE SAME STYLE

PMPS SCORES	MMPALT II SCORES STYLE						
	P*	A	I	V	H	K	O
P*	.052 very low						
A		.220 low					
I			.083 very low				
V				.197 very low			
H					.009 very low		
K						very low .060	
O							very low .005

*P = Print

H = Haptic

A = Aural

K = Kinesthetic

I = Interactive

O = Olfactory

V = Visual

Group Differences

Analysis of variance tests were used to investigate the differences between groups. The 45 subjects consisted of three distinct groups: officers (16), enlisted personnel (19), and civilian personnel (10). Results of ANOVA tests of MMPALT II styles scores for officers, enlisted, and civilian personnel are presented in Table VII. Results of ANOVA tests on PMPS style scores for officer, enlisted, and civilian personnel are presented in Table VIII. No significant differences occurred at the .05 level in these tests.

Sex, Age, and Education Differences

T tests were used to determine significant differences between the learning style scores by sex measured by the MMPALT II and the PMPS. Hartley's F max was calculated by the computer as a check on equality of variance. If variances were not equal, the computer adjusted for these differences by adjusting the degree of freedom and calculated value. The results of the t test for sex comparison on the MMPALT II Style scores are presented in Table IX. There are no significant differences beyond the .05 level for any of the t tests.

The results of the t test by sex comparison on the PMPS style scores are presented in Table X. No significant differences at the .05 level resulted from these tests through means for both male and female subjects ranged very close in comparison with the MMPALT II scores for the same subject grouping.

Age groups consisted of four groups: age group 20-28 had 28 subjects, age groups 29-38 had 12 subjects, age groups 39-49 had 13 subjects and age group 50 and above had two subjects. Results of the

TABLE VII
RESULTS OF ANOVA TESTS ON MMPALT II STYLE SCORES
FOR OFFICERS, ENLISTED, AND CIVILIAN PERSONNEL

Style	Source	df	SS	MS	F
Print	Between groups	2	11.78	5.89	1.20
	Within groups	42	<u>206.80</u>	4.92	
	Total	44	<u>218.58</u>		
Aural	Between groups	2	190.82	95.41	1.90
	Within groups	42	<u>2114.38</u>	50.34	
	Total	44	<u>2305.20</u>		
Interactive	Between Groups	2	24.96	12.48	.92
	Within groups	42	<u>568.82</u>	13.54	
	Total	44	<u>593.78</u>		
Visual	Between groups	2	172.42	86.21	.88
	Within groups	42	<u>4092.37</u>	97.43	
	Total	44	<u>4264.80</u>		
Haptic	Between groups	2	2.26	1.13	.18
	Within groups	42	<u>256.94</u>	6.12	
	Total	44	<u>259.00</u>		
Kinesthetic	Between groups	2	14.15	7.08	2.11
	Within groups	42	<u>140.83</u>	3.35	
	Total	44	<u>154.98</u>		
Olfactory	Between groups	2	2.41	1.20	.83
	Within groups	42	<u>61.24</u>	1.46	
	Total	44	<u>63.65</u>		

TABLE VIII
RESULTS OF ANOVA TESTS ON PMPS STYLE SCORES FOR OFFICERS,
ENLISTED, AND CIVILIAN PERSONNEL

Style	Source	df	SS	MS	F
Print	Between groups	2	190.41	95.20	.72
	Within groups	42	<u>5530.17</u>	131.67	
	Total	44	<u>5720.58</u>		
Aural	Between groups	2	238.70	119.35	1.76
	Within groups	42	<u>2852.94</u>	69.92	
	Total	44	<u>3091.64</u>		
Interactive	Between Groups	2	20.64	10.30	.14
	Within groups	42	<u>3014.18</u>	71.76	
	Total	44	<u>3034.80</u>		
Visual	Between groups	2	113.41	56.70	.64
	Within groups	42	<u>3718.90</u>	88.54	
	Total	44	<u>3832.31</u>		
Haptic	Between groups	2	48.06	24.03	.20
	Within groups	42	<u>5125.14</u>	122.03	
	Total	44	<u>5173.20</u>		
Kinesthetic	Between groups	2	1094.48	547.24	3.02
	Within groups	42	<u>7611.83</u>	181.23	
	Total	44	<u>8706.31</u>		
Olfactory	Between groups	2	183.05	91.53	.26
	Within groups	42	<u>2762.19</u>	65.77	
	Total	44	<u>2945.44</u>		

TABLE IX
RESULTS OF t TEST ON MMPALT II STYLE SCORES BY SEX

Style	Sex	N	M	SD	t
Print	Female	12	4.50	1.83	0.219
	Male	33	4.33	2.38	
Aural	Female	12	4.83	2.12	-0.546*
	Male	33	5.69	8.38	
Interactive	Female	12	4.83	2.52	0.242
	Male	33	6.70	4.40	
Visual	Female	12	6.66	2.42	-1.255*
	Male	33	9.30	11.37	
Haptic	Female	12	5.50	2.20	0.055
	Male	33	5.45	2.54	
Kinesthetic	Female	12	4.42	1.83	0.945
	Male	33	3.82	1.89	
Olfactory	Female	12	1.50	1.17	.631
	Male	33	1.24	1.23	

* Corrected t test for unequal variance.

TABLE X
RESULTS OF t TEST ON PMPS STYLE SCORES BY SEX

Style	Sex	N	M	SD	t
Print	Female	12	12.17	11.74	-0.004
	Male	33	12.18	11.46	
Aural	Female	12	0.25	8.75	-1.182
	Male	33	3.58	8.20	
Interactive	Female	12	8.00	8.95	-.289
	Male	33	8.82	8.19	
Visual	Female	12	2.25	9.55	-1.308
	Male	33	6.33	9.16	
Haptic	Female	12	-5.92	9.50	-0.388
	Male	33	-4.48	11.40	
Kinesthetic	Female	12	10.67	12.00	2.572
	Male	33	-0.82	13.65	
Olfactory	Female	12	-24.17	8.77	0.266
	Male	33	-24.91	8.09	

ANOVA tests on MMPALT II style scores are presented in Table XI. Results for ANOVA test on PMPS style scores for the same age group are presented in Table XII. No significant differences at the .05 level were reported for these data.

Education groups consisted of six groups: Group 1 (some high school) had one member, group 2 (high school diploma) had 10 members, group 3 (some college) had 15 members, group 4 (Bachelor degree) had 11 members, group 5 (Masters degree) had seven members and group 6 (Doctor degree) had one member. Results of ANOVA tests on the MMPALT II style scores for education groups are presented in Table XIII. Results of ANOVA tests on the PMPS style scores for education groups are presented in Table XIV. No significant differences at the .05 level were obtained from these tests. A summary of PMPS and MMPALT II sources and rank orders are presented in Table XV, Appendix G.

Observations

The 45 subjects who took part in this study were all assigned to the United States Coast Guard Institute and involved in some aspect of producing correspondence courses for Coast Guard enlisted ratings, and Servicewide examinations for promotion qualifications.

The officer and civilian groups had most of the higher education degrees. However, no significant differences between groups or even between education groups were found.

Marital status did not appear to have any observable effect on learning styles nor did income or parenthood.

One left-handed subject insisted in reversing the haptic procedures and asked that the stimulus be placed in the opposite hand from normal and the response placed in the other.

TABLE XI

RESULTS OF ANOVA TESTS ON MMPALT II STYLE
SCORES BY AGE GROUPS

Style	Source	df	SS	MS	F
Print	Between groups	3	12.24	4.08	.81
	Within groups	41	206.34	5.02	
	Total	44	<u>218.58</u>		
Aural	Between groups	3	195.01	65.00	1.26
	Within groups	41	2110.19	51.47	
	Total	44	<u>2305.20</u>		
Interactive	Between Groups	3	28.08	9.36	.68
	Within groups	41	565.70	13.80	
	Total	44	<u>593.78</u>		
Visual	Between groups	3	317.77	105.92	1.10
	Within groups	42	3947.03	96.27	
	Total	44	<u>4264.80</u>		
Haptic	Between groups	3	7.17	2.39	.39
	Within groups	41	252.03	6.15	
	Total	44	<u>259.20</u>		
Kinesthetic	Between groups	3	7.37	2.46	.68
	Within groups	41	147.60	3.60	
	Total	44	<u>154.97</u>		
Olfactory	Between groups	3	1.68	.56	.37
	Within groups	41	61.96	1.51	
	Total	44	<u>63.64</u>		

TABLE XII
RESULTS OF ANOVA TESTS ON PMPS STYLE SCORES
BY AGE GROUPS

Style	Source	df	SS	MS	F
Print	Between groups	3	527.83	175.94	1.39
	Within groups	41	<u>5192.75</u>	126.65	
	Total	44	<u>5720.58</u>		
Aural	Between groups	3	94.35	31.45	.43
	Within groups	41	<u>2997.30</u>	73.10	
	Total	44	<u>3091.65</u>		
Interactive	Between Groups	3	385.92	128.63	1.99
	Within groups	41	<u>2648.88</u>	64.61	
	Total	44	<u>3034.80</u>		
Visual	Between groups	3	321.37	107.12	1.25
	Within groups	42	<u>3510.94</u>	85.63	
	Total	44	<u>3832.31</u>		
Haptic	Between groups	3	368.03	122.68	1.05
	Within groups	41	<u>4805.17</u>	117.20	
	Total	44	<u>5173.20</u>		
Kinesthetic	Between groups	3	1010.35	336.78	1.79
	Within groups	41	<u>7695.96</u>	187.71	
	Total	44	<u>8706.31</u>		
Olfactory	Between groups	3	381.32	127.11	2.03
	Within groups	41	<u>2663.92</u>	62.53	
	Total	44	<u>2945.24</u>		

TABLE XIII
RESULTS OF ANOVA TESTS ON MMPALT II STYLE
SCORES BY EDUCATION GROUPS

Style	Source	df	SS	MS	F
Print	Between groups	5	10.36	2.07	.39
	Within groups	39	<u>208.22</u>	5.34	
	Total	44	<u>218.58</u>		
Aural	Between groups	5	258.82	51.76	.99
	Within groups	39	<u>2046.38</u>	52.47	
	Total	44	<u>2305.20</u>		
Interactive	Between Groups	5	110.58	22.12	1.78
	Within groups	39	<u>483.20</u>	12.39	
	Total	44	<u>593.78</u>		
Visual	Between groups	5	278.16	55.63	.54
	Within groups	39	<u>3986.64</u>	102.22	
	Total	44	<u>4264.80</u>		
Haptic	Between groups	5	21.43	4.29	.70
	Within groups	39	<u>237.77</u>	6.10	
	Total	44	<u>259.20</u>		
Kinesthetic	Between groups	5	23.78	4.76	1.41
	Within groups	39	<u>131.20</u>	3.36	
	Total	44	<u>154.98</u>		
Olfactory	Between groups	5	5.12	1.02	.68
	Within groups	39	<u>58.53</u>	1.50	
	Total	44	<u>63.65</u>		

TABLE XIV
RESULTS OF ANOVA TESTS ON PMPS STYLE SCORES
BY EDUCATION GROUPS

Style	Source	df	SS	MS	F
Print	Between groups	5	691.11	138.22	1.07
	Within groups	39	<u>5029.46</u>	128.96	
	Total	44	<u>5720.57</u>		
Aural	Between groups	5	299.71	59.94	.84
	Within groups	39	<u>2791.94</u>	71.59	
	Total	44	<u>3091.65</u>		
Interactive	Between Groups	5	168.58	33.72	.46
	Within groups	39	<u>2866.22</u>	73.49	
	Total	44	<u>3034.80</u>		
Visual	Between groups	5	612.99	122.60	1.49
	Within groups	39	<u>3219.32</u>	82.55	
	Total	44	<u>3832.31</u>		
Haptic	Between groups	5	156.23	31.25	.24
	Within groups	39	<u>5016.97</u>	128.64	
	Total	44	<u>5173.20</u>		
Kinesthetic	Between groups	5	525.24	105.05	.50
	Within groups	39	<u>8181.07</u>	209.77	
	Total	44	<u>8706.31</u>		
Olfactory	Between groups	5	370.12	74.02	1.12
	Within groups	39	<u>2575.12</u>	66.03	
	Total	44	<u>2945.24</u>		

One subject said he was hard of hearing in one ear so placed himself where all sound favored his good ear. There was no observable difference in his performance. The aural style was scored in the normal range for that style for this group of subjects. No other hearing problems were noted.

Instructions were presented in the exact same manner to each student. Styles were also presented in the same order. This researcher felt that the first learning style presented was an extension of the indoctrination for some subjects and that they really did not understand the procedures before completing this exercise.

Several subjects reported sinus problems that may have affected the results of the olfactory style exercise. In addition, nearly half of the subjects were smokers and this may have contributed to the low performance in this style for this group.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter is divided into three sections. A summary of the study is presented in the first section. Conclusion to the study questions are presented in the second section and recommendations for further research and future practice are presented in section three.

Summary

The purpose of this study was to measure the learning styles of U.S. Coast Guard Institute personnel. The population of this study consisted of 45 volunteers assigned to the U.S. Coast Guard Institute. Measurements were conducted between June 1 and October 6, 1983.

The MMPALT was developed by Gilley (1975) and French (1975) and revised by Cherry (1981). The MMPALT II, used in this study, contained seven elements of perceptual modality measurement. These elements were print, aural, interactive, visual, haptic, kinesthetic, and olfactory styles. Cherry (1981) also developed the PMPS, a self-report questionnaire for use with the MMPALT II.

Demographic characteristics of the subjects were investigated for significant differences by sex, age, and education. Groups of officers, enlisted, and civilian personnel were compared. Rank-order findings were established for both instruments on each subject. Relative total scores

were computed for this study population by style on both instruments. Finally, correlation coefficients were computed for each subject in relation to each style for self-assessment and actual measurement of learning styles. Statistical data for this study were computed by the Oklahoma State University Computer Center.

Conclusions

The conclusions of this study were related to the five study questions outlined under the purpose of the study in Chapter I. Gilley (1975) assumed that individuals receive and process information differently. Gilley substantiated his assumptions with his graphed findings which showed that no two children had the same rank-ordered alignment of styles. He concluded that the six learning styles under investigation in his study did exist as sensory-input learning styles. Cherry (1981) concluded for these same reasons that the same styles and an additional style, olfactory, existed in the adult population of his study. An examination of the scores obtained on the MMPALT II by the subjects of this study also revealed that no two subjects had identical scores or rank-order patterns. Results similar to the Cherry and Gilley studies led this researcher to conclude that the seven learning styles also existed in this sample population.

The visual learning style was the preferred learning style of most subjects who participated in this study. The average score for this style was 7.09 out of a possible 10. Information presented in Table II revealed that 31 of the subjects scored seven or better. The second highest style was interactive with an average score of 6.13 but only 14 of the subjects scored seven or better in this style. The only style

that registered similar agreement, as was evident for the visual style, was the olfactory style. However, this was a negative agreement. The number of subjects scoring three or less was 42 for the olfactory style. An average score of 1.29 per subject made it the seventh ranked style. The haptic style was third, print was fourth, aural was fifth and kinesthetic was sixth. Research question number one was: What are the preferred learning styles, as measured by the MMPALT II, for U.S. Coast Guard Institute personnel? Results indicated the preferred style for the sample was the visual learning style with the interactive learning style second.

Research question number two was: Do U.S. Coast Guard Institute personnel exhibit any perceptual learning style characteristics or patterns of characteristics in common with each other? A majority of the subjects in this study ranked the print style as their strongest and the olfactory style as the weakest but this is the extent of commonality with 45 variances within the study. It is concluded that this population does not share characteristics or patterns in common with each other.

The third question was: Do conclusions of self-assessed perceptual modalities of learning style show correlations with actual measurements of the same style? Low or very low correlation existed between MMPALT II scores and PMPS scores by style. Low or very low correlation also existed between MMPALT II ranks and PMPS ranks. It must be concluded that no meaningful correlation existed between the two instruments.

Results of the ANOVA tests on MMPALT II style scores and PMPS style scores indicated no significant differences occurred at the .05 level in response to the fourth research question which was: Are there

significant differences in this sample between officer, enlisted personnel, and civilian personnel? It is concluded that status and position have nothing to do with learning style strengths.

The fifth question was: Are there significant differences in the sample between sex, education level, or age? A t test for variances by sex and an analysis of variance for the four age groups and six education groups indicated no significant differences for all seven styles on both the MMPALT II and the PMPS. It is concluded that for the subjects in this study these variables were not significant.

Recommendations

Recommendations for practice at the U.S. Coast Guard Institute are: Personnel use the findings on the MMPALT II for future learning endeavors by using their strongest style when possible and by working to improve weaker styles.

Personnel should ignore the results found on the PMPS as there was little correlation with self-assessment measured by this questionnaire and actual learning style as measured by the MMPALT II.

The Institute's Course and Examination Division Training Committee should consider planning future training programs that increase the use of visual and interactive learning styles as primary learning strategies.

Recommendations for further research include:

1. Techniques should be developed to apply specific learning styles to facilitator or teacher methods.
2. Additional studies should be conducted with various populations of adults to increase the data base, to increase the validity of

the MMPALT II, and to standardize the test procedures and test kit.

3. A questionnaire should be developed that will match backgrounds with preferred learning styles to determine if preferred learning styles are influenced by environment or experience.
4. Future studies might investigate left-handedness versus right-handedness and their effect on learning style preference.

Recommendations for future test use and/or modification include:

1. Styles should be rotated in order of presentation to subjects so that one style is not presented first each time.
2. Use of the PMPS should be abandoned. There was little to no correlation of this instrument with the MMPALT II.
3. The olfactory learning style should be considered for further investigation. There is limited use for this information for adult learning, most life-long-learning programs and self-directed learning projects. The limited application to most adult learning situations indicates this style should be considered for selective use in future investigations.

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APPENDIXES

APPENDIX A

LETTER OF APPROVAL, COMMANDING OFFICER

U.S. COAST GUARD INSTITUTE

August 1, 1983

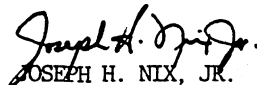
To: Commanding Officer, Coast Guard Institute
 From: Joseph H. Nix, Jr.
 Subj: Measurement of Individual Learning Styles

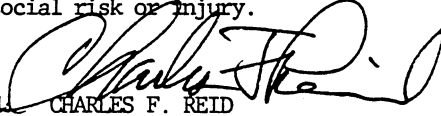
Request I be authorized to invite Institute personnel to participate in a learning style study. As part of my graduate studies at Oklahoma State University, I am conducting measurements of individual learning styles. The project will allow me to complete my doctoral studies and will also benefit subjects. The personal information provided by results can help subjects in future learning situations.

You may wonder why learning styles should be measured. Some people are left-handed, others are right-handed. They all have different ways of learning. Some learn best by reading, touching, seeing or hearing; others learn best by talking with friends, actively doing things or even smelling things. The measurement of learning styles is not a matter of finding good or bad, or determining pass or fail; it is a matter of discovering individual differences. When a student's style is measured, he or she can use the measurement results to plan and conduct his/her individual learning projects.

The measurement program will be conducted by providing participants with an explanation of the concept of learning styles and an introduction to the measurement procedures. Each participant will receive seven practical measurements and complete a written survey. For the practical measurement, participants will be asked to remember pairs of words, pictures, objects, smells or movements. The number of pairs remembered will indicate the participant's strengths in each of seven learning styles: print, aural, interactive, visual, haptic, kinesthetic, and olfactory. The written survey asks the participant's opinion on various methods of learning. A summary of those opinions indicates participant's preferred method for learning.

Participation is on a voluntary basis and individuals may withdraw from the project at anytime. Individual privacy will be fully protected. Names will not be used in reported results. Data will be collected during lunch breaks and off-duty time. Subjects will not be subjected to any physical, psychological, social risk or injury.


 JOSEPH H. NIX, JR.

Approved: 
 CHARLES F. REID
 Captain, U.S. Coast Guard
 Commanding Officer
 Coast Guard Institute

APPENDIX B

LETTER OF PERMISSION TO REPRODUCE THE
MMPALT II



Robert L. McElrath
COMMISSIONER

TENNESSEE
STATE DEPARTMENT OF EDUCATION
100 CORDELL HULL BUILDING
NASHVILLE 37219

November 23, 1983

Dr. Wayne James
Occupational and Adult Education
406 Classroom Building
Oklahoma State University
Stillwater, Oklahoma 74074

Dear Wayne:

I am writing to confirm that you have permission of the authors of The MMPACT-II Learning Style Test, to administer the tests, and use the results in a series of doctoral dissertations to be conducted at Oklahoma State University. We are pleased that you are furthering our research. We shall look forward to obtaining the results of your research.

Cordially,

A handwritten signature in cursive script, reading "Russ French", is written over a horizontal line.

Russell L. French

For the Authors: Russell L. French and Edwin Cherry

RLF:clh

APPENDIX C

SOURCE OF EXTRACTS AND OILS USED FOR THE
OLFACTORY LEARNING STYLE MEASUREMENT

SOURCES OF EXTRACTS AND OILS USED FOR THE
OLFACTORY LEARNING STYLE MEASUREMENT

1.	Cherry	Watkins Inc., Winona, MN.
2.	Vanilla	Watkins
3.	Almond	Watkins
4.	Raspberry	Watkins
5.	Pineapple	Watkins
6.	Brandy	Crown Colony Safeway
7.	Rum	Watkins
8.	Banana	Watkins
9.	Maple	Watkins
10.	Wintergreen	McKesson Laboratories Dublin, CA
11.	Peppermint	Watkins
12.	Strawberry	Watkins
13.	Orange	Watkins
14.	Butter	Watkins
15.	Chocolate	Watkins
16.	Coconut	Watkins
17.	Anise (Licorice)	Wagner Ivyland, PA
18.	Cloves	Hunco Laboratory, Texarkana, TX
19.	Lemon	Watkins
20.	Cinnamon	Sucker Shapers, Salt Lake City, UT.

APPENDIX D

ORGANIZATIONAL AND OPERATIONAL PROCEDURES
FOR THE MMPALT AND THE PMPS

OVERVIEW FOR THE RESEARCHER TO
CONDUCT THE MMPALT AND PMPS

1. Review checklist and assure all equipment is in place and operational.
2. Greet subject and give Introduction (see outline)
3. Have subject complete Subject's Record form.
4. Odd-numbered subjects will complete the PMPS before competing the MMPALT (see procedures).
5. Administer the MMPALT (follow procedures for 7 parts).
6. Even-numbered subjects will complete the PMPS after completing MMPALT.
7. Hand score the PMPS.
8. Score the MMPALT and complete Subject's Record form.
9. Complete Check Sheet H and deviver to subject. (Be sure to answer any questions the subject has.)

CHECKLIST FOR THE RESEARCHER TO MAKE PREPARATIONS
FOR ADMINISTERING THE MMPALT-II

1. General:
 - One or two trained evaluators
 - Quiet and comfortable room
 - Chairs for evaluator/s and subject
 - Desk or table
 - Subject's Record form
 - Pencils
2. Introduction:
 - Outline
 - 35mm carousel projector
 - Projector screen
 - Demonstration materials, wooden block, baseball, 2 bottles and blindfold
3. PMPS:
 - Instruction sheet and questions
 - Answer sheet
4. Print Test (P):
 - Instruction/outline
 - Slides (print test)
 - Response sheet "A"
 - Answer key "A"
5. Aural test (A):
 - Instruction/outline
 - Audiotape cassette recorder
 - Response sheet "B"
 - Answer key "B"
6. Visual test (V)
 - Instruction/outline
 - Slides (visual test)
 - Response sheet "C"
 - Answer key "C"

7. Interactive test (I) - Instructions/outline
- Response sheet "D"
8. Haptic test (H) - Instruction/outline
- Box of 20 stimulus/response items
- Blindfold
- Response sheet "E"
9. Kinesthetic test (K) - Instruction/outline
- Blindfold
- Response sheet "F"
10. Olfactory test (O) - Instructions/outline
- Blindfold
- Aroma bottles (20)
- Response sheet "G"
11. Conclusion - Check sheet "H"
- PMPS Worksheet

OUTLINE FOR THE RESEARCHER TO INTRODUCE LEARNING STYLE
MEASUREMENT EXERCISES TO INDIVIDUAL SUBJECTS

1. Introduction:

NOTE - The purpose of this introduction is to stimulate each subject's interest and enthusiasm toward learning more about their individual uniqueness as a learner. Adjust the presentation to each subject's apparent needs but do not use excessive detail.

YOUR ARE ABOUT TO COMPLETE SEVERAL LEARNING EXERCISES TO DETERMINE YOUR STRONGEST LEARNING STYLE OR STYLES. AFTER THE EXERCISES ARE COMPLETED, YOU WILL BE ADVISED AS TO YOUR STRENGTHS AND WEAKNESSES AS A LEARNER. KNOWLEDGE OF THIS INFORMATION CAN HELP YOU IN FUTURE LEARNING SITUATIONS.

1. Background (Develop the following points):

- EACH OF US ARE DIFFERENT FROM OTHERS
- ONE OF THE PRIMARY DIFFERENCES IS THE MANNER IN WHICH WE LEARN
- THIS MIGHT BE NOTED BY THE MANNER IN WHICH WE RECEIVE, PROCESS RETRIEVE, OR USE NEW KNOWLEDGE OR INFORMATION.
- ONE CONCEPT OF HOW WE RECEIVE KNOWLEDGE AND INFORMATION INCLUDES SEVEN LEARNING STYLES (Briefly explain each):
 - . PRINT
 - . AURAL
 - . INTERACTIVE
 - . VISUAL

- . HAPTIC
- . KINESTHETIC
- . OLAFACTORY
- EACH OF US SHOULD KNOW MORE ABOUT OUR INDIVIDUAL LEARNING STYLES.
- WE CAN LEARN BETTER BY USING OUR STRONGEST STYLE.

(Allow and encourage subject questions and discussion, then proceed to the exercise procedures.)

3. Measurement exercise procedures:

- IN EACH OF THE SEVEN EXERCISES, YOU WILL BE PRESENTED 10 PAIRS OF THINGS FIRST: WORDS, PICTURES, AROMAS, OBJECTS, ETC. THE FIRST ITEM PRESENTED TO YOU IN EACH PAIR IS CALLED THE STIMULUS, THE SECOND IS CALLED THE RESPONSE. (Show demonstration pairs and point out the stimulus item and the response item.) AFTER ALL 10 PAIRS HAVE BEEN PRESENTED TO YOU, I WILL PRESENT THE STIMULUS ITEM OF EACH PAIR IN A DIFFERENT ORDER FROM THE FIRST PRESENTATION. YOUR TASK WILL BE TO IDENTIFY THE RESPONSE ITEM FOR EACH PAIR FROM MEMORY. (Demonstrate a sample procedure.)
- REMEMBER THERE IS NO PASSING OR FAILING OF THESE EXERCISES. WE ARE SIMPLY TRYING TO FIND YOU STRENGTHS AND WEAKNESSES SO YOU CAN BECOME BETTER ABLE TO BUILD ON THE STRENGTHS AND IMPROVE WEAK AREAS.
- SPECIFIC PROCEDURES WILL BE GIVEN TO YOU FOR EACH EXERCISE.
- DO YOU HAVE ANY QUESTIONS?

PERCEPTUAL MODALITY PREFERENCE SURVEY (PMPS)

This survey is designed to help you identify your style of learning. It specifically deals with how you best receive new information or knowledge. The results of this survey will help you plan your future learning experiences.

You will be responding to forty-two statements concerning how you learn best. This is not a test; there are no right or wrong answers. When making your responses, you should consider your past learning experiences and your own intuitions about your learning style.

The response choices are ALWAYS, USUALLY, SELDOM, and NEVER. The ALWAYS response indicates that the statement is a strong representation of your learning style preference. If the statement is a good way for you to learn, but not your most preferred, you should mark USUALLY. If the statement indicates a way you can learn, but you prefer other methods, mark your response as SELDOM. The NEVER response indicates that you reject the statement as a way for you to learn. If you feel completely neutral to a statement, do not mark a response.

The construction of the survey requires that you respond to all statements in the order presented. Therefore, do not omit responses or skip statements unless they are meant to be a neutral response. Do not go back over the statements.

1	2	3	4	5
ALWAYS	USUALLY	SELDOM	NEVER	DO NOT MARK

1. I can learn better by reading than by listening.
2. I can learn better by listening than by talking with others.
3. I can learn better by talking with others than by looking at things like movies and slides
4. I can learn better by looking at things like movies and slides than by touching or holding objects
5. I can learn better by touching or holding objects than by physically participating in activities such as sports or games.
6. I can learn better by physically participating in activities such as sports and games than by smelling things.
7. I can learn better by smelling things than by reading.
8. I can learn better by reading than talking with others.
9. I can learn better by talking with others than by touching or holding objects.
10. I can learn better by touching or holding objects than by smelling things.
11. I can learn better by smelling things than by listening.
12. I can learn better by listening than by looking at things like movies and slides.
13. I can learn better by looking at things like movies and slides than by physically participating in activities such as sports and games.
14. I can learn better by physically participating in activities such as sports and games than by reading.
15. I can learn better by reading than by looking at things like movies and slides.
16. I can learn better by looking at things like movies and slides than by smelling things.

1	2	3	4	5
ALWAYS	USUALLY	SELDOM	NEVER	DO NOT MARK

- | | | | | | |
|--|--------|---------|--------|-------|-------------|
| | 1 | 2 | 3 | 4 | 5 |
| | ALWAYS | USUALLY | SELDOM | NEVER | DO NOT MARK |
17. I can learn better by smelling things than by talking with others.
 18. I can learn better by talking with others than by physically participating in activities such as sports and games.
 19. I can learn better by physically participating in activities such as sports and games than by listening.
 20. I can learn better by listening than by touching or holding objects.
 21. I can learn better by touching holding objects than by reading.
 22. I can learn better by reading than by smelling things.
 23. I can learn better by smelling things than by physically participating in activities such as sports and games.
 24. I can learn better by physically participating in activities such as sports and games than by touching or holding objects.
 25. I can learn better by touching or holding objects than by looking at things like movies and slides.
 26. I can learn better by looking at things like movies and slides than by talking with others.
 27. I can learn better by talking with others than by listening.
 28. I can learn better by listening than by reading.
 29. I can learn better by reading than by physically participating in activities such as sports and games.
 30. I can learn better by physically participating in activities such as sports and games than by looking at things like movies and slides.
 31. I can learn better by looking at things like movies and slides than by listening.

	1	2	3	4	5
	ALWAYS	USUALLY	SELDOM	NEVER	DO NOT MARK

1	2	3	4	5
ALWAYS	USUALLY	SELDOM	NEVER	DO NOT MARK

32. I can learn better by listening than by smelling things.
33. I can learn better by smelling things than by touching or holding objects.
34. I can learn better by touching or holding objects than by talking with others.
35. I can learn by talking with others than by reading.
36. I can learn better by reading than by touching or holding objects.
37. I can learn better by touching or holding objects than by listening.
38. I can learn better by listening than by physically participating in activities such as sports and games.
39. I can learn better by physically participating in activities such as sports and games than by talking with others.
40. I can learn better by talking with others than by smelling things.
41. I can learn better smelling things than by looking at things like movies and slides.
42. I can learn better by looking at things like movies and slides than by reading.

1	2	3	4	5
ALWAYS	USUALLY	SELDOM	NEVER	DO NOT MARK

PERCEPTUAL MODALITY PREFERENCE SURVEY
SCORING SYSTEM

Each survey statement contains two contrasting perceptual modality elements. Each element is included in 12 different statements; 6 times in the primary or first position and 6 times in the secondary or last position. Each element can therefore, be scored 12 times. Then listed in the primary position, the element will be scored: Always = +4, Usually = +2, Seldom = -2, and Never = -4. When listed in the secondary position, the element will be scored: Always = -2, Usually = -1, Seldom = +1, and Never = +2. The maximum possible score range for any element is +36 to -36.

Print Element Statements:

Primary Position: 1, 8, 15, 23, 29, and 36.
Secondary Position: 7, 14, 21, 28, 35, and 42.

Aural Element Statements:

Primary Position: 2, 12, 20, 28, 32, and 38.
Secondary Position: 1, 11, 19, 27, 31, and 37.

Interactive Element Statements:

Primary Position: 3, 9, 18, 27, 35, and 40.
Secondary Position: 2, 8, 17, 26, 34, and 39.

Visual Element Statements:

Primary Position: 4, 13, 16, 26, 31, and 42.
Secondary Position: 3, 12, 15, 25, 30 and 41.

Haptic Element Statements:

Primary Position: 5, 10, 21, 25, 34, and 37.
Secondary Position: 4, 9, 20, 24, 33, and 36.

Kinesthetic Element Statements:

Primary Position: 6, 14, 19, 24, 30, and 39.
Secondary Position: 5, 13, 18, 23, 29, and 38.

Olfactory Element Statements:

Primary Position: 7, 11, 17, 23, 33, and 41.
Secondary Position: 6, 10, 16, 22, 32, and 40.

	1		2		3		4		5
	ALWAYS		USUALLY		SELDOM		NEVER		DO NOT MARK
1.	(1)	(2)	(3)	(4)					
2.	(1)	(2)	(3)	(4)					
3.	(1)	(2)	(3)	(4)					
4.	(1)	(2)	(3)	(4)					
5.	(1)	(2)	(3)	(4)					
6.	(1)	(2)	(3)	(4)					
7.	(1)	(2)	(3)	(4)					
8.	(1)	(2)	(3)	(4)					
9.	(1)	(2)	(3)	(4)					
10.	(1)	(2)	(3)	(4)					
11.	(1)	(2)	(3)	(4)					
12.	(1)	(2)	(3)	(4)					
13.	(1)	(2)	(3)	(4)					
14.	(1)	(2)	(3)	(4)					
15.	(1)	(2)	(3)	(4)					
16.	(1)	(2)	(3)	(4)					
17.	(1)	(2)	(3)	(4)					
18.	(1)	(2)	(3)	(4)					
19.	(1)	(2)	(3)	(4)					
20.	(1)	(2)	(3)	(4)					
21.	(1)	(2)	(3)	(4)					
22.	(1)	(2)	(3)	(4)					
23.	(1)	(2)	(3)	(4)					
24.	(1)	(2)	(3)	(4)					
25.	(1)	(2)	(3)	(4)					
26.	(1)	(2)	(3)	(4)					
27.	(1)	(2)	(3)	(4)					
28.	(1)	(2)	(3)	(4)					
29.	(1)	(2)	(3)	(4)					
30.	(1)	(2)	(3)	(4)					
31.	(1)	(2)	(3)	(4)					
32.	(1)	(2)	(3)	(4)					
33.	(1)	(2)	(3)	(4)					
34.	(1)	(2)	(3)	(4)					
35.	(1)	(2)	(3)	(4)					
36.	(1)	(2)	(3)	(4)					
37.	(1)	(2)	(3)	(4)					
38.	(1)	(2)	(3)	(4)					
39.	(1)	(2)	(3)	(4)					
40.	(1)	(2)	(3)	(4)					
41.	(1)	(2)	(3)	(4)					
42.	(1)	(2)	(3)	(4)					
	1		2		3		4		5
	ALWAYS		USUALLY		SELDOM		NEVER		DO NOT MARK

WORKSHEET FOR HAND-SCORING
PERCEPTUAL MODALITY PERFORMANCE SURVEY

Print:	Aural:	Interactive:
A 1 28	I 2 27	V 3 26
I 8 35	V 12 31	H 9 34
V 15 42	H 20 37	K 18 39
H 36 21	K 38 19	O 40 17
K 29 14	O 32 11	P 35 8
O 22__ 7__ =	P 28__ 1__ =	A 27__ 2__ =
Visual:	Haptic:	Kinesthetic:
H 4 25	K 5 24	O 6 23
K 13 30	O 10 33	P 14 29
O 16 41	P 21 36	A 19 38
P 42 15	A 37 20	I 39 18
A 31 12	I 34 9	V 30 13
I 26__ 3__ =	V 25 4__ =	H 24__ 5__ =

Olfactory:		Style:	Survey Results:		MMPALT Results:	
			Score:	Rank	Score:	Rank:
P 7	22	Print				
A 11	32	Aural				
I 17	40	Interactive				
V 41	16	Visual				
H 33	10	Haptic				
K 23__	6__	Kinesthetic				
		Olfactory				

Primary Position: Always +4, Usually +2, Seldom -2, Never -4

Secondary Position: Always -2, Usually -1, Seldom +1, Never +2

PROCEDURES FOR THE MULTIMODAL PAIRED
ASSOCIATES LEARNING TEST (MMPALt-II)

1. Print Test (P)
 - Be sure subjects can see the screen clearly.
 - Distribute response sheet A (face down) and pencil.
 - Give direction and show sample pair.
 - Display stimulus/response pairs at 7 second intervals.
 - Instruct subject to turn response sheet over and pick up pencil.
 - Announce number of response and display each stimulus slide for 10 seconds (For example: "Number one (wait 10 seconds), Number two (wait 10 seconds) etc...")
 - Collect response sheets.

FOR THIS EVALUATION, YOU WILL BE VIEWING PAIRS OF WORDS. THE FIRST WORD IN EACH PAIR IS A NONSENSE WORD (TRIAGRAM) AND THE SECOND IS A COMMON WORD. YOU SHOULD TRY TO REMEMBER THE COMMON WORD IN EACH PAIR AND RECOGNIZE WHICH NONSENSE WORD IT GOES WITH. AFTER YOU HAVE BEEN GIVEN ALL TEN PAIRS OF WORDS, YOU WILL SEE EACH NONSENSE WORD AGAIN. THEY WILL BE PRESENTED IN RANDOM ORDER, NOT IN THE SAME ORDER AS FIRST PRESENTED. YOU ARE TO WRITE THE COMMON WORD THAT IS APPROPRIATE FOR THE NONSENSE WORD ON THE RESPONSE SHEET.

Pairings and sequence of stimulus/response pairs should be as follows:

Sample: hez/sister

- | | |
|--------------|--------------|
| 1) biw/cat | 6) cyc/horse |
| 2) ceq/party | 7) koy/rain |
| 3) puq/name | 8) wup/robin |
| 4) dup/bed | 9) lez/paper |
| 5) xib/box | 10) nyh/coat |

NOW THAT YOU HAVE VIEWED ALL TEN PAIRS, I WILL CHECK YOUR RECALL. YOU WILL VIEW THE NONSENSE WORDS. YOU WILL HAVE TEN SECONDS TO WRITE THE APPROPRIATE COMMON WORD BY THE APPROPRIATE NUMBER.

Sequence for stimulus only display:

- | | |
|--------|---------|
| 1) dup | 6) nyh |
| 2) cyc | 7) ceq |
| 3) koy | 8) lez |
| 4) biw | 9) puq |
| 5) xib | 10) wug |

2. Aural Test (A)
 - Be sure subjects can hear audiotape well.
 - Distribute response sheet B (face down) and pencil.
 - Give directions for the test and demonstrate stimulus/response pair.

- Play audiotape containing stimulus/response pairs.
- Instruct subject to turn response sheet over and prepare to respond.
- Collect response sheet.

Script and instruction for tape:

FOR THIS EVALUATION, YOU WILL BE LISTENING TO PAIRS OF WORDS. THE FIRST WORD IN EACH PAIR IS A NONSENSE WORD AND THE SECOND IS A COMMON WORD. YOU SHOULD TRY TO REMEMBER THE COMMON WORD IN EACH PAIR AND RECOGNIZE WHICH NONSENSE WORD IT GOES WITH. AFTER YOU HAVE BEEN GIVEN ALL TEN PAIRS OF WORDS, YOU WILL THEN HEAR EACH NONSENSE WORD AGAIN BUT IN A DIFFERENT ORDER. YOU ARE TO THEN WRITE THE COMMON WORD THAT IS APPROPRIATE FOR THE NONSENSE WORD. LET'S BEGIN.

(Use the following style to present each pair.)

THE NONSENSE WORD IN THIS PAIR IS (Stimulus): (Stimulus) IS PAIRED WITH (Response). YOU ARE TO REMEMBER THAT (Stimulus) GOES WITH (Response).

(Pause three to five seconds between each pair.)

Pairing and sequence of stimulus/response pairs should be:

- | | |
|---------------|---------------|
| 1) vom/apple | 6) poh/leg |
| 2) und/baby | 7) omp/bread |
| 3) tud/kitten | 8) mog/table |
| 4) sul/shoe | 9) kiv/rabbit |
| 5) roz/duck | 10) jus/bird |

(Use the following for the response measurement tape.)

NOW THAT YOU HAVE RECEIVED ALL TEN PAIRS, WE'LL CHECK YOUR RECALL. YOU WILL BE GIVEN A NUMBER AND A NONSENSE WORD. YOU WILL HAVE TEN SECONDS TO WRITE THE APPROPRIATE COMMON WORD BY THE APPROPRIATE NUMBER.

(Use the following style for all stimulus words.)

Number (One, two etc.) IS (Stimulus). WHAT DID (Stimulus) GO WITH?

(Pause ten seconds after presenting each word.)

Sequence for stimulus only presentation:

- | | |
|--------|---------|
| 1) poh | 6) mog |
| 2) omp | 7) und |
| 3) jus | 8) sul |
| 4) vom | 9) kiv |
| 5) tud | 10) roz |

3. Visual Test (V) - Be sure subjects can see the screen well.
 - distribute response sheet C (face down) and pencil.

- give directions and show sample pair.
- display stimulus/response pair at 7 second intervals.
- Instruct subjects to turn response sheets over and prepare to respond,
- Announce number of response and display each stimulus member for 10 seconds. For example: "Number one (ten seconds), etc..."
- Collect answer sheet and pencil.

FOR THIS EVALUATION YOU WILL BE VIEWING PAIRS OF DRAWINGS. THE FIRST DRAWING IN EACH PAIR IS A SYMBOL AND THE SECOND IS A COMMON OBJECT. YOU SHOULD TRY TO REMEMBER THE COMMON OBJECT PICTURED IN EACH PAIR AND THE SYMBOL IS GOES WITH. AFTER YOU HAVE BEEN GIVEN ALL TEN PAIRS OF PICTURES, YOU WILL SEE EACH SYMBOL AGAIN. THEY WILL NOT BE PRESENTED IN THE SAME ORDER BUT WILL E PRESENTED IN RANDOM ORDER. YOU ARE TO WRITE THE NAME OF THE COMMON OBJECT THAT IS APPROPRIATED FOR THE SYMBOL ON THE RESPONSE SHEET.

Pairing and sequence of stimulus/response pairs should be as follows:

- | | |
|---------------------|------------------------------|
| 1) square/tree | 6) star/boat |
| 2) circle/hat | 7) oval/flower |
| 3) triangle/chair | 8) asterisk/umbrella |
| 4) rectangle/boot | 9) diamond/scissors |
| 5) plus sign/window | 10) infinity sign/eyeglasses |

NOW THAT YOU HAVE VIEWED ALL TEN PAIRS, I WILL CHECK YOUR RECALL. YOU WILL VIEW THE SYMBLOS. YOU WILL HAVE TEN SECONDS TO WRITE THE APPROPRIATE NAME OF THE COMMON OBJECT BY THE APPROPRIATE NUMBER.

Sequence for stimulus only display:

- | | |
|------------------|--------------|
| 1) asterisk | 6) oval |
| 2) circle | 7) diamond |
| 3) plus sign | 8) square |
| 4) rectangle | 9) star |
| 5) infinity sign | 10) triangle |

4. Interactive Test (I) -
- Seat subject where he/she is at the same level and face to face with the primary evaluator. If a secondary evaluator is used, he/she should sit to one side and prepare to score the responses. Scoring must be accomplished without distracting or prompting the subject.
 - Try to put the subject at ease, but do not wast too much time pleasantries.
 - Assure subject that procedures are identical to those already encountered in the previous tests and give him/her directions for the test:

IN A MOMENT YOU WILL BE BLINDFOLDED, THEN YOU WILL BE GIVEN TEN PAIRS OF WORDS. EACH PAIR CONTAINS A NONSENSE WORD AND A COMMON WORD. AFTER PRESENTING EACH PAIR, I SHALL GIVE YOU AN OPPORTUNITY TO TALK ABOUT HOW YOU INTEND TO REMEMBER THIS PAIRING. AFTER ALL TEN PAIRS OF WORDS HAVE BEEN PRESENTED AND YOU HAVE COMMENTED ON EACH, I SHALL PRESENT YOU ONLY THE STIMULUS OR NONSENSE WORDS AND ASK YOU ONLY STIMULUS OR NONSENSE WORDS AND ASK YOU TO SUPPLY THE COMMON WORD WHICH WAS PAIRED WITH EACH. DO YOU UNDERSTAND THE PROCEDURE?

- Present stimulus/response pairs using the following script:

THE NONSENSE WORD IN THIS PAIR IS (Stimulus), AND THE COMMON WORD IS (Response). PLEASE REPEAT BOTH WORDS. (Repeat this as necessary until the subject can say both words.)

HOW WILL YOU REMEMBER THIS PAIR OF WORDS? (You may need to prompt the subject to be sure that he/she will verbalize these words.)

- Allow ten 10 seconds for the subject to respond to question. (Do not comment on Subject's reply.)

Pairing and sequence of stimulus/response pairs should be:

1) zed/wind	6) pex/floor
2) fai/tooth	7) chi/egg
3) ces/ball	8) jec/dog
4) hex/christmas	9) toz/milk
5) sci/fire	10) zon/toy

- Present stimulus words and ask the subject to state response words. Use the following script:

THE NONSENSE WORD IS (Stimulus). WHAT WAS (Stimulus) PAIRED WITH? (Allow 10 seconds for the response.)

Sequence for stimulus only presentation:

1) hex	6) jec
2) zed	7) toz
3) sci	8) ces
4) chi	9) pex
5) fai	10) zon

- Primary or secondary evaluator (researcher) completes scoring without reporting results to subject on check sheet D.
 - Be sure subject's correct name or number is on the check sheet.
 - Instruct the subject to standby for the next test.
5. Haptic Test (H)
- Arrange items on table and cover before starting the test.
 - Seat subject across table from researcher. If a secondary evaluator is used, he/she should sit to one side and prepare to

score the responses. Scoring must be accomplished without distracting or prompting the subject.

- Try to put the subject at ease, but do not waste too much time on pleasantries.
- Assure the subject that procedures are the same as for all the other tests and give him/her the following instruction:

FOR THIS TEST YOU WILL BE BLINDFOLDED. I SHALL PRESENT YOU WITH TEN PAIRS OF ITEMS. EACH PAIR CONTAINS A NONSENSE ITEM AND A COMMON ITEM. NONE OF THE ITEMS WILL HURT YOU NOR FEEL TERRIBLE TO YOU. I SHALL ALWAYS PLACE THE NONSENSE ITEM OF EACH PAIR IN YOUR LEFT HAND, AND THE COMMON ITEM IN YOUR RIGHT HAND. FEEL THE TWO ITEMS IN EACH PAIR CAREFULLY SO THAT YOU WILL BE ABLE TO REMEMBER WHAT THINGS ARE ASSOCIATED WITH EACH OTHER. I WILL MAKE SURE THAT YOU CAN IDENTIFY THE COMMON ITEM. AFTER ALL TEN PAIRS HAVE BEEN PRESENTED, I SHALL PRESENT YOU WITH THE STIMULUS OR NONSENSE ITEM AND ASK YOU TO IDENTIFY THE COMMON ITEM WHICH WAS PAIRED WITH EACH. DO YOU UNDERSTAND THE PROCEDURE?

- Make sure subject is blindfolded, then uncover the items on the table.
- Place stimulus member of each pair in subject's left hand; then place corresponding response item in subject's right hand. allow the subject 7 seconds to handle both objects, the take them away from him/her and repeat the procedure with the next pair of items until all ten pairs are presented. Be sure the subject can identify the common item in each pair. He/she will have to name this item again, later.
- Instruct the subject that THE TEST IS TO BEGIN.
- Place each stimulus in the subjects left hand and ask him/her to identify the paired response item place in the right hand.

PLEASE NAME OR DESCRIBE THE OBJECT WITH WHICH THIS ITEM WAS PAIRED. Allow ten (10) seconds for the subject to reply. (Do not comment on the subject's reply.)

- Score is kept without reporting results to the subject on response sheet E.

Pairings and sequence of stimulu/response pairs should be:

- 1) carpet/lightbulb
- 2) rock/pencil
- 3) table leg/tennis ball
- 4) hose coupling/paint brush
- 5) wood rectangle/table fork
- 6) bushing/key ring
- 7) metal tube/scissors
- 8) odd shape wood/yo yo
- 9) plastic golf ball/padlock
- 10) door knob/drinking glass

Sequence for stimulus only presentation:

- | | |
|--------------------|-------------------|
| 1) carpet | 6) wood rectangle |
| 2) golf ball | 7) rock |
| 3) odd shaped wood | 8) door knob |
| 4) bushing | 9) metal tube |
| 5) table leg | 10) hose coupling |

- Be sure that subject's correct name or number is on the response sheet.
- Instruct subject to standby for next test.

6. Kinesthetic Test (K)

- Keep subject seated while explaining test. If a secondary evaluator is used, he/she should sit to one side and prepare to score the responses. Scoring must be accomplished without distracting or prompting subject.
- Try to put the subject at ease, but do not waste too much time on pleasantries.
- Assure the subject that the procedures are the same as for all other test and give him or her direction as follows:

THIS TEST INVOLVES BODY MOVEMENT: THERE WILL BE LIMITED SPOKEN DIRECTIONS DURING THIS PROCEDURE. FROM THIS (IDENTIFY) STARTING POINT, I'LL GUIDE AND DIRECT YOU THROUGH TEN PAIRS OF BODY MOVEMENTS. YOU WILL BE BLINDFOLDED: THEREFORE I'LL STAY CLOSE BY YOU AND PREVENT ANY ACCIDENTS. AFTER WE HAVE COMPLETED THE TEN PAIRS OF MOVEMENTS, I'LL GUIDE AND DIRECT YOU THROUGH THE FIRST MOVEMENT OF EACH PAIR. YOU ARE TO RESPOND BY PERFORMING OR DESCRIBING THE MOVEMENT WITH WHICH THE FIRST MOVEMENT WAS PAIRED. DO YOU UNDERSTAND THE PROCEDURE?

- Blindfold the subject.
- Move the subject through the 10 stimulus/response pairs. As necessary, use the following spoken direction:

THE FIRST MOVEMENT IS (Stimulus). IT IS PAIRED WITH (Response)

- Start each movement by gently placing your hands on the subjects shoulders. The various movements will require gentle movement of the subject's arms and legs. This must be accomplished without alarming the subject in any way. As necessary, you may use additional verbal directions, but those directions must not detract from the actual movements.
- Move the subject through the various stimulus movements and allow 10 seconds for the subject respond by performing or describing the paired movements. It may be necessary to say:

THIS MOVEMENT IS (Stimulus). WHAT WAS IT PAIRED WITH?

- Score responses without reporting results to subjects on response sheet F.
- Be sure that subject's correct name or number is on the response sheet.
- Instruct subject to standby for next test.

Pairings and sequence pairs should be as follows:

<u>STIMULUS</u>	<u>RESPONSE</u>
1) Move diagonally across room and back	1) Stoop
2) Stand on one leg	2) Raise both hands in air
3) Rotate left arm	3) Bend forward at waist
4) Hands on hips	4) Alternate raising both legs
5) Wrap left arm over head	5) Walk in circle
6) Clasp hands over head, then lower to sides	6) Take two step forward and return
7) Twist body in circle	7) Clasp hands in front of body
8) With right arm, draw a circle in the air	8) Stand with legs spread far apart
9) Cross arms over head	9) Clasp hands behind neck
10) Get on hands and knees	10) Stand at attention (rigid body position)

Sequence for stimulus only presentation:

- 1) Stand on one leg
- 2) Get on hands and knees
- 3) With right arm, draw a circle in the air
- 4) Cross arms over head
- 5) Hands on hips
- 6) Move diagonally across room and return
- 7) Clasp hands above head, then lower them to side
- 8) Left arm above head

- 9) Twist body in circle
- 10) Rotate left arm

7. Olfactory Test (O)
- Arrange aroma bottles by numbers and cover before starting the test.
 - Seat subject across table from primary evaluator (researcher). If a secondary evaluator is used, he/she should sit to one side and prepare to score responses. Scoring must be accomplished with distracting or prompting the subject.
 - Try to put the subject at ease, but do not waste too much time on pleasantries.
 - Assure subject that procedures are the same as for all other tests and give him/her direction as follows:

FOR THIS TEST YOU WILL BE BLINDFOLDED AND GIVEN BOTTLES CONTAINING DIFFERENT AROMAS. FIRST, YOU WILL BE PRESENTED WITH PAIRS OF AROMAS. THE FIRST BOTTLE OF EACH PAIR CONTAINS AN ABSTRACT AROMA WHICH WILL BE IDENTIFIED. THE SECOND BOTTLE CONTAINS A COMMON AROMA, AND I WILL NOT IDENTIFY IT FOR. YOUR TASK IS TO REMEMBER WHICH PAIRS OF AROMAS GO TOGETHER. AFTER EXAMINING ALL TEN PAIRS, YOU WILL BE GIVEN THE BOTTLE CONTAINING THE FIRST AROMA IN EACH PAIR. YOU ARE TO IDENTIFY THE NAME OF THE AROMA WITH WHICH IT WAS PAIRED. DO YOU UNDERSTAND THE PROCEDURE?

- Blindfold the subject.
- Present the stimulus/response pairs as follows:

THIS IS THE FIRST AROMA OF THIS PAIR. (Give bottle to subject; help him/her lift it to nose.) THIS IS THE SECOND AROMA OF THIS PAIR (Same procedure).

- Allow the subject 7 seconds to examine each pair of aromas.
- Then present subject with the stimulus member bottle of each pair and allow him/her 10 seconds to identify the appropriate response aroma. It may be necessary to say:

THIS IS ONE OF THE ABSTRACT AROMAS; WHAT WAS IT PAIRED WITH?

- Score responses without reporting the results to the subject on check sheet G.
- Be sure subject's correct name or number is on the response sheet.

- Instruct subject to remove blindfold and standby for a report on the results of the entire test issued on check sheet H.

Pairings and sequence of stimulus/response pairs should be:

- | | |
|-----------------|----------------------|
| 1) Cherry | 11) Peppermint |
| 2) Vanilla | 12) Strawberry |
| 3) Almond | 13) Orange |
| 4) Raspberry | 14) Butter |
| 5) Pineapple | 15) Chocolate |
| 6) Brandy | 16) Coconut |
| 7) Rum | 17) Anise (Licorice) |
| 8) Banana | 18) Cloves |
| 9) Maple | 19) Lemon |
| 10) Wintergreen | 20) Cinnamon |

Sequence for stimulus only presentation:

- | | |
|-------------------|-----------------------|
| 1) Vanilla (#2) | 6) Alomnd (#3) |
| 2) raspberry (#4) | 7) Pineapple (#5) |
| 3) Maple (#9) | 8) Rum (#7) |
| 4) Banana (#8) | 9) Brandy (#6) |
| 5) Cherry (#1) | 10) Wintergreen (#10) |

APPENDIX E

SUBJECTS' RECORD FORM

LEARNING STYLE STUDY- SUBJECTS' RECORD FORM

 NAME

 SUBJECT NUMBER

WHAT FIRM SO YOU WORK FOR? (ie FAA, USCG, GE, ETC) -----

HOW LONG HAVE YOU BEEN IN THIS JOB? _____ AGE _____

SEX _____

OCCUPATION OR PROFESSION _____

HOME STATE _____

EDUCATION (CIRCLE HISHEST NUMBER THAT APPLIES TO YOU)

- | | |
|-----------------------|------------------------------|
| 1. Grade 1-9 | Number of Service School or |
| 2. Some High School | Special Courses completed |
| 3. High Shool Diploma | of 40 hours or more duration |
| 4. Some College | |
| 5. Bachelor's Degree | SINGLE _____ |
| 6. Master's Degree | MARRIED _____ |
| 7. Doctor's Degree | |

TOTAL FAMILY INCOME

NUMBER OF CHILDRED

(SPECIFY NUMBER OF CONTRIBUTORS)

- | | |
|-----------------------|------------------------|
| 1. ___ below \$5,000 | 1. ___ None |
| 2. ___ below \$10,000 | 2. ___ Under 6 yrs old |
| 3. ___ below \$15,000 | 3. ___ 6 -12 yrs old |
| 4. ___ below \$20,000 | 4. ___ 12 - 17 yrs old |
| 5. ___ below \$25,000 | 5. ___ 18 - 22 yrs old |
| 6. ___ below \$30,000 | 6. ___ Over 22 yrs old |
| 7. ___ below \$40,000 | |
| 8. ___ below \$50,000 | |
| 9. ___ above \$50,000 | |

APPENDIX F

RESPONSE AND CHECK SHEETS FOR THE
MMPALT II AND THE PMPS

RESPONSE SHEET A
PRINT
LEARNING STYLE

SUBJECT NUMBER: _____

NONSENSE WORD
NUMBER:

COMMON WORD:

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

RESPONSE SHEET B
AURAL
LEARNING STYLE

SUBJECT NUMBER: _____

NONSENSE WORD
NUMBER:

COMMON WORD:

- | | |
|-----|-------|
| 1. | _____ |
| 2. | _____ |
| 3. | _____ |
| 4. | _____ |
| 5. | _____ |
| 6. | _____ |
| 7. | _____ |
| 8. | _____ |
| 9. | _____ |
| 10. | _____ |

RESPONSE SHEET C
VISUAL
LEARNING STYLE

SUBJECT NUMBER: _____

SYMBOL
NUMBER:

PICTURE

- | | |
|-----|-------|
| 1. | _____ |
| 2. | _____ |
| 3. | _____ |
| 4. | _____ |
| 5. | _____ |
| 6. | _____ |
| 7. | _____ |
| 8. | _____ |
| 9. | _____ |
| 10. | _____ |

CHECK SHEET D
INTERACTIVE
LEARNING STYLE

SUBJECT NUMBER: _____

NONSENSE WORD:	COMMON WORD:	SUBJECT CORRECT	RESPONSE INCORRECT
-------------------	-----------------	--------------------	-----------------------

hez

zed

sci

chi

fai

jec

toz

ces

pex

zon

TOTAL CORRECT: _____

RESPONSE SHEET E
HAPTIC
LEARNING STYLE

SUBJECT NUMBER: _____

STIMULUS MEMBER:	RESPONSE MEMBER:	SUBJECT CORRECT	RESPONSE INCORRECT
PIECE OF CARPET	LIGHT BULB		
PLASTIC GOLF BALL	PADLOCK		
ODD SHAPED PIECE OF WOOD	YO YO		
BUSHING	KEY RING		
TABLE LEG	TENNIS BALL		
WOODEN RECTANGLE	TABLE FORK		
ROCK	PENCIL		
DOOR KNOB	DRINKING GLASS		
METAL TUBE	SCISSORS		
HOSE COUPLING	PAINT BRUSH		

TOTAL CORRECT: _____

RESPONSE SHEET F
KINESTHETIC
LEARNING STYLE

SUBJECT NUMBER: _____

STIMULUS MEMBER:	RESPONSE MEMBER:	SUBJECT CORRECT	RESPONSE INCORRECT
STAND ON ONE LEG	HANDS IN AIR		
GET ON HANDS AND KNEES	STAND AT ATTENTION		
WITH RIGHT ARM, DRAW AN 'O' IN THE AIR	STAND SPREAD EAGLE		
CROSS ARMS OVER HEAD	HANDS BE- HIND HEAD		
HANDS ON HIPS	RAISE BOTH LEGS (ALT.)		
MOVE DIAGONALLY ACROSS ROOM AND RETURN	STOOP		
CLASP HANDS OVER HEAD, LOWER TO SIDE	TAKE TWO STEPS FWD AND RETURN		
LEFT ARM OVER HEAD	WALK IN A CIRCLE		
TWIST BODY IN CIRCLE	CLASP HANDS IN FRONT		
ROTATE LEFT ARM	BEND OVER FORWARD		

TOTAL CORRECT: _____

CHECK SHEET G
OLFACTORY
LEARNING STYLE

SUBJECT NUMBER: _____

STIMULUS NUMBER:	RESPONSE AROMA:	SUBJECT CORRECT	RESPONSE INCORRECT
2	STRAWBERRY		
4	BUTTER		
9	LEMON		
8	OIL OF CLOVES		
1	PEPPERMINT		
3	ORANGE		
5	CHOCOLATE		
7	LICORICE		
6	COCONUT		
10	CINNAMON		

TOTAL CORRECT: _____

CHECK SHEET H PARTICIPANTS REPORT

SUBJECT NUMBER: _____

Your individual survey and the learning style tests have been scored and your results are as follows:

<u>LEARNING STYLE</u>	<u>MMPALT SCORE</u>	<u>MMPALT RANK ORDER</u>	<u>PMPS RANK ORDER</u>
PRINT	_____	_____	_____
AURAL	_____	_____	_____
INTERACTIVE	_____	_____	_____
VISUAL	_____	_____	_____
HAPTIC	_____	_____	_____
KINESTHETIC	_____	_____	_____
OLFACTORY	_____	_____	_____

If these results are a true reflection of your strengths as a learner, the style ranked as #1 is your best method for studying and learning. You might consider using that style as much as possible, and, at the same time, attempt to improve your skills in weaker styles. Example: if aural is your #1 style, you learn best by listening. If print is your #7 style, this would be your weakest style and you should attempt to improve your reading skills.

THANK YOU VERY MUCH FOR BEING A PART OF THIS STUDY.

APPENDIX G

SUMMARY OF INDIVIDUAL SCORES AND RANKS
BY STYLE FOR THE MMPALT II AND PMPS

TABLE XV

SUMMARY OF INDIVIDUAL SUBJECT SCORES AND RANKS FOR MMPALT II AND PMPS

Subject Number	Instrument	SCORES, RANKS BY ELEMENT													
		Print		Aural		Interactive		Visual		Haptic		Kinesthetic		Olfactory	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
1	MMPALT	2	5	1	6	4	3.5	8	1	4	3.5	5	2	0	7
	PMPS	+18	1	+2	4	+12	2	-9	6	-4	5	+5	3	-19	7
2	MMPALT	1	6	7	2	10	1	5	4.5	6	3	5	4.5	0	7
	PMPS	+17	1	-12	6	+10	2	-4	5	0	4	+4	3	-14	7
3	MMPALT	5	3	5	3	5	3	3	7	4	5.5	6	1	4	5.5
	PMPS	+12	2	-12	6	+11	3	-4	5	+6	4	+26	1	-26	7
4	MMPALT	5	5.5	6	2	4	3.5	8	1	4	3.5	5	5.5	1	7
	PMPS	+22	1.5	0	4	-2	5	+22	1.5	-17	6	+9	3	-33	7
5	MMPALT	4	6	6	5	10	1.5	9	3	10	1.5	7	4	3	7
	PMPS	+34	1	-2	4	-8	5	+9	2	-10	6	+8	3	-29	7
6	MMPALT	5	6	7	4	9	2.5	10	1	9	2.5	6	5	1	7
	PMPS	+25	1	-17	3	+12	2	-1	4	-6	5	-13	6	-26	7
7	MMPALT	4	6	5	4.5	7	1.5	7	1.5	5	4.5	6	3	1	7
	PMPS	+18	2	-3	5	+3	4	+12	3	-19	6	+24	1	-33	7
8	MMPALT	2	4	2	4	4	1	2	4	3	2	1	6.5	1	6.5
	PMPS	+7	2	-5	5	0	4	-7	6	+6	3	+8	1	-15	7

TABLE XV
SUMMARY OF INDIVIDUAL SUBJECT SCORES AND RANKS FOR MMPALT II AND PMPS

Subject Number	Instrument	SCORES, RANKS BY ELEMENT													
		Print		Aural		Interactive		Visual		Haptic		Kinesthetic		Olfactory	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
9	MMPALT	2	3.5	1	5.5	5	1	3	2	1	5.5	2	3.5	0	7
	PMPS	+23	1	+1	4	+12	2	+7	3	-6	5	-12	6	-26	7
10	MMPALT	2	4	1	5	3	2	0	6.5	3	2	3	2	0	6.5
	PMPS	+15	2	+4	4	0	5	+12	3	-22	6	+17	1	-31	7
11	MMPALT	7	2	4	4.5	4	4.5	8	1	5	3	2	6.5	2	6.5
	PMPS	-3	4	-10	6	-4	5	+8	3	+10	2	+20	1	-21	7
12	MMPALT	6	2	4	5	5	3.5	10	1	5	3.5	2	6	1	7
	PMPS	+23	1	+6	3	+8	2	-4	4	-7	5	-9	7	-8	6
13	MMPALT	5	4.5	7	3	4	6	9	1.5	9	1.5	5	1	1	7
	PMPS	+17	1	-10	6	+16	2	0	4	-7	5	+3	3	-26	7
14	MMPALT	2	4.5	2	4.5	3	3	4	2	5	1	1	6.5	1	6.5
	PMPS	+17	2	+15	4	+18	1	+16	3	-3	5	-25	6	-32	7
15	MMPALT	6	3	7	2	5	4.5	9	1	5	4.5	4	6	2	7
	PMPS	+20	2	+2	4	-7	5	+22	1	-16	6	+7	3	-28	7
16	MMPALT	3	6	2	4	4	2	5	1	2	4	2	4	1	7
	PMPS	+19	1	+18	2	+7	3	-4	5	-9	6	+2	4	-16	7

TABLE XV

SUMMARY OF INDIVIDUAL SUBJECT SCORES AND RANKS FOR MMPALT II AND PMPS

Subject Number	Instrument	SCORES, RANKS BY ELEMENT													
		Print		Aural		Interactive		Visual		Haptic		Kinesthetic		Olfactory	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
17	MMPALT	7	3	8	2	9	1	6	4	5	5	5	6	2	7
	PMPS	+21	1	+4	3	+15	2	-2	4	-10	5	-14	7	-13	6
18	MMPALT	4	6	1	7	5	4	5	4	6	2	7	1	5	4
	PMPS	+17	1.5	+1	4	+11	3	+17	1.5	-17	6	-2	5	-25	7
19	MMPALT	7	3.5	7	3.5	9	1	8	2	5	5	3	6	1	7
	PMPS	-6	6	0	4	+13	2	-5	5	+3	3	+33	1	-36	7
20	MMPALT	3	5	3	5	4	2	3	5	4	2	4	2	1	7
	PMPS	+13	2	+12	3	+32	1	-5	5	-19	7	+4	4	-18	6
21	MMPALT	9	2.5	8	4	10	1	9	2.5	7	5.5	7	5.5	3	7
	PMPS	+31	1	+8	4	+12	2	+9	3	0	5	-12	6	-35	7
22	MMPALT	2	5	4	3	5	2	8	1	1	6.5	3	4	1	6.5
	PMPS	-9	5	-5	4	+12	1	+8	2	-12	7	+6	3	-10	6
23	MMPALT	4	6	6	4.5	7	3	10	1	8	2	6	4.5	2	7
	PMPS	+26	1	+1	5	+18	2	+7	4	+8	3	-17	6	-28	7
24	MMPALT	5	5.5	5	5.5	9	1	7	3	8	2	6	4	1	7
	PMPS	0	4	-4	5	+21	1	-6	6	+6	3	+10	2	-21	7

TABLE XV
SUMMARY OF INDIVIDUAL SUBJECT SCORES AND RANKS FOR MMPALT II AND PMPS

Subject Number	Instrument	SCORES, RANKS BY ELEMENT													
		Print		Aural		Interactive		Visual		Haptic		Kinesthetic		Olfactory	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
25	MMPALT	5	4.5	2	6.5	6	2.5	8	1	6	2.5	5	4.5	2	6.5
	PMPS	+10	3	0	4	+11	2	-9	6	-8	5	+29	1	-30	7
26	MMPALT	6	3	1	6.5	8	1	7	2	3	4.5	3	4.5	1	6.5
	PMPS	+6	4	+5	5	+14	2	+10	3	+19	1	-25	6	-32	7
27	MMPALT	4	4.5	5	3	7	1	9	2	4	4.5	3	6	1	7
	PMPS	+7	4	+5	5	+13	1	+9	2.5	+9	2.5	-5	6	-36	7
28	MMPALT	4	2	0	7	5	1	3	3.5	2	5	3	3.5	1	6
	PMPS	+18	1	+6	3	+12	2	-6	5	0	4	-16	7	-13	6
29	MMPALT	2	5.5	5	4	9	1	7	2.5	7	2.5	2	5.5	0	7
	PMPS	-3	5	+29	1	+2	3	+14	2	-25	6	0	4	-31	7
30	MMPALT	6	3	2	6	4	4	10	1.5	20	1.5	3	5	1	7
	PMPS	+18	1	0	4	+10	2	-8	6	-4	5	+4	3	-30	7
31	MMPALT	6	3	2	6	5	4	10	1	7	2	3	5	1	7
	PMPS	+18	1	-2	3	-10	2	-4	4	-10	6	-6	5	-14	7
32	MMPALT	2	5	1	6	5	2	5	1	3	3.5	3	3.5	2	7
	PMPS	+9	3	-7	5	+15	1.5	+15	1.5	-3	4	-13	6	-30	7

TABLE XV
SUMMARY OF INDIVIDUAL SUBJECT SCORES AND RANKS FOR MMPALT II AND PMPS

Subject Number	Instrument	SCORES, RANKS BY ELEMENT													
		Print		Aural		Interactive		Visual		Haptic		Kinesthetic		Olfactory	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
33	MMPALT	6	5.5	7	4	10	1	9	2	8	3	6	5.5	2	7
	PMPS	+8	2	+6	3	-2	5	+14	1	-8	6	0	4	-18	7
34	MMPALT	3	6	4	4.5	7	1	6	2	5	3	4	4.5	1	7
	PMPS	+21	1	-1	4	+9	3	+17	2	-3	5	-9	6	-35	7
35	MMPALT	5	4	3	6	7	2	8	1	6	3	4	5	1	7
	PMPS	+10	2	+2	4	+8	3	+12	1	-2	5	-6	6	-18	7
36	MMPALT	1	5.5	4	3	8	1	6	2	2	4	1	5.5	0	7
	PMPS	-2	4.5	-2	4.5	+10	2	+16	1	-12	6	+6	3	-16	7
37	MMPALT	4	5	7	2.5	7	2.5	10	1	6	4	2	6	0	7
	PMPS	+13	3	+15	2	+9	4	+17	1	-18	6	0	5	-35	7
38	MMPALT	4	5.5	7	3.5	8	2	9	1	7	3.5	4	5.5	0	7
	PMPS	+22	4	+9	3	+22	1	-3	5	-19	6	+12	2	-21	7
39	MMPALT	3	5	3	5	7	2	10	1	4	3	0	7	3	5
	PMPS	+10	3	+2	5	+12	1	+10	3	+10	3	-6	6	-14	7
40	MMPALT	6	3	7	2	4	5	8	1	5	4	3	6	1	7
	PMPS	-4	4	-12	6	-5	5	+4	3	-10	2	+16	1	-18	7

TABLE XV
SUMMARY OF INDIVIDUAL SUBJECT SCORES AND RANKS FOR MMPALT II AND PMPS

Subject Number	Instrument	SCORES, RANKS BY ELEMENT													
		Print		Aural		Interactive		Visual		Haptic		Kinesthetic		Olfactory	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
41	MMPALT	7	4	8	2.5	10	1	8	2.5	6	5	5	6	3	7
	PMPS	-5	5	+13	3	+23	1	+6	4	-19	6	+14	2	-35	7
42	MMPALT	8	3	5	5	7	4	10	1	9	2	4	6.5	4	6.5
	PMPS	-16	6	-12	4	0	3	-19	2	-6	5	+10	1	-25	7
43	MMPALT	9	4.5	9	4.5	20	2	10	2	10	2	8	6	0	7
	PMPS	+16	2	+17	1	+2	4	+6	3	-9	6	-3	5	-36	7
44	MMPALT	1	5.5	3	3	1	5.5	7	1	5	2	2	4	0	7
	PMPS	+3	4	+4	3	-3	6	-1	5	+13	2	+17	1	-33	7
45	MMPALT	7	5	9	3	9	3	10	1	9	3	5	6	2	7
	PMPS	+2	4	+8	2.5	+8	2.5	-8	6	+17	1	-2	5	-23	7

APPENDIX H

DEMOGRAPHIC DATA OF U.S. COAST GUARD
INSTITUTE PERSONNEL

TABLE XVI
 DEMOGRAPHIC DATA, U.S. COAST GUARD INSTITUTE PERSONNEL

Subject Number	Group Officer,		Age	Sex	Marital Status	Education Level	Income	Contri- butors	Child- ren	Smoke	Years in Job	Home State
	En.	Civ.										
1	3		51	M	M	6	7	1	2	N	20	OK
2	3		46	F	M	5	8	2	2	N	12	OK
3	3		30	F	M	4	8	2	1	N	3	OK
4	3		33	F	M	2	8	2	1	N	8	OK
5	3		41	F	M	5	7	2	0	N	18	OK
6	2		53	M	M	5	9	2	2	N	34	FL
7	3		36	F	M	4	8	2	1	N	10	OK
8	3		41	F	S	5	6	1	0	Y	7	LA
9	1		40	M	M	4	8	2	1	N	18	WA
10	2		41	M	S	3	6	1	0	N	20	FL
11	1		43	M	M	3	7	1	2	Y	21	FL
12	2		26	M	M	3	2	1	1	N	3	NY
13	1		35	M	M	3	9	2	3	N	16	TX
14	1		36	M	M	2	6	1	3	Y	21	NC
15	1		49	M	M	3	7	1	3	Y	26	WA
16	2		21	F	M	1	7	2	0	N	2	TX
17	1		28	M	M	5	7	2	0	N	5	CT
18	1		26	M	S	4	6	1	0	N	8	VT
19	1		23	F	S	4	4	1	0	Y	1	MA
20	1		28	M	S	3	4	1	0	Y	7	OK
21	1		42	M	M	5	9	2	2	N	20	PA
22	2		23	M	M	2	3	1	1	Y	5	NY
23	2		40	M	M	3	7	1	1	Y	20	WV
24	2		23	F	M	2	3	1	0	Y	5	CO
25	3		34	M	M	3	5	1	2	Y	16	FL
26	2		23	M	S	3	3	1	0	N	4	TX
27	1		41	M	M	3	7	1	2	Y	22	ME
28	2		40	M	M	2	6	1	3	Y	23	CA
29	2		38	M	M	2	5	1	1	Y	19	AL
30	2		28	M	M	3	5	2	0	Y	9	MI
31	2		21	F	M	2	5	2	0	N	2	MN
32	3		23	M	S	2	2	1	0	N	5	NC
33	1		27	M	S	4	6	1	0	N	7	CA
34	1		24	M	S	4	5	1	0	Y	5	VA
35	2		20	F	S	2	2	1	0	Y	1	PA
36	2		34	M	M	3	6	1	2	N	14	AK
37	1		38	M	M	4	8	1	3	Y	16	PA
38	1		27	M	M	3	6	2	3	N	7	LA
39	1		31	M	M	4	7	1	1	N	10	NJ
40	1		47	M	M	5	9	1	3	N	23	OR
41	3		37	F	S	3	4	1	1	Y	13	CO
42	2		25	M	M	2	5	2	2	Y	7	VT
43	1		34	M	M	4	7	2	3	N	10	CA
44	2		33	M	S	3	3	1	0	Y	14	NC
45	1		26	M	M	4	5	1	0	N	8	WA

<u>GROUPS</u>	<u>INCOME</u>
1. Officers and Warrant Officers	1. Below 5,000
2. Enlisted Personnel	2. Below 10,000
3. Civilian Personnel	3. Below 15,000
	4. Below 20,000
	5. Below 25,000
<u>EDUCATION</u>	6. Below 30,000
1. Some High School	7. Below 40,000
2. High School Diploma	8. Below 50,000
3. Some College	9. Above 50,000
4. Bachelor's Degree	
5. Master's Degree	
6. Doctor's Degree	

Figure 7: Key for Table XVI

VITA

Joseph Hanson Nix, Jr.

Candidate for the Degree of

Doctor of Education

Thesis: THE DETERMINATION OF ADULT LEARNING STYLES OF UNITED STATES
COAST GUARD PERSONNEL

Major Field: Occupational and Adult Education

Biographical:

Personal Data: Born in Columbus, Ohio, April 28, 1930, the son of Mr. and Mrs. Joseph Hanson Nix Sr. Married to the former Barbara Ann Davis of Las Vegas, Nevada October 7, 1950. They have two sons, Joseph Hanson Nix III, and John Howard Nix.

Education: Attended the University of Maryland 1955-57; received Bachelor of Science degree in Business Management from Florida State University in 1966; completed one year of graduate study in Guidance and Counseling at Chapman College 1967-69; received Master of Education in Counseling Psychology from Central State University in 1979; completed requirements for the Doctor of Education at Oklahoma State University in December, 1983.

Professional Experience: Instructor, Aviation Physiology, United States Air Force, 1948-74; Aviation Physiology Specialist, NASA, Houston, 1974-75; Instructor Physiology and Survival, Civil Aeromedical Institute, FAA 1975-82; Chief, Education Standards, Course and Examination Division, United States Coast Guard Institute, 1982-83.

Professional Organizations: Member, American Association for Adult and Continuing Education; Active member of the National Home Study Council; Member of the Steering Committee, Intra service Correspondence Exchange; Life Member, Alpha Kappa Psi; Member Phi Delta Kappa and Psi Chi honor societies.