Perceptual Learning Style Modalities: Comparing Latino, Black, and Caucasian Adults

Nicolle Chantelle Hardy
University of South Florida, nicolle.hardy@gmail.com

Follow this and additional works at: http://scholarcommons.usf.edu/etd
Part of the Adult and Continuing Education and Teaching Commons, Curriculum and Instruction Commons, and the Educational Assessment, Evaluation, and Research Commons

Scholar Commons Citation
Hardy, Nicolle Chantelle, "Perceptual Learning Style Modalities: Comparing Latino, Black, and Caucasian Adults" (2017). Graduate Theses and Dissertations.
http://scholarcommons.usf.edu/etd/6854

This Dissertation is brought to you for free and open access by the Graduate School at Scholar Commons. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of Scholar Commons. For more information, please contact scholarcommons@usf.edu.
Perceptual Learning Style Modalities: Comparing Latino, Black, and Caucasian Adults

by

Nicolle Chantelle’ Hardy

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy In Curriculum and Instruction with an emphasis in Adult Education Department of Leadership, Counseling, Adult, Career and Higher Education College of Education University of South Florida

Major Professor: Waynne B. James, Ed.D. Celeste Fenton, Ph.D. Jeffery D. Kromrey, Ph.D. William H. Young, Ed.D.

Date of Approval: March 30, 2017

Keywords: Adult Education, Multi Modal Paired Associates Learning Test, MMPALT, Hispanic, African American

Copyright © 2017, Nicolle Chantelle’ Hardy
Dedication

Emerson Campbell Hardy III, this was all possible because of you.
Acknowledgements

My entire doctoral committee provided such support and input to my study and I thank each of you for serving. Thank you to Dr. Jeffery Kromrey, who provided invaluable input towards the statistical portion of my study and the interpretation of the data. I thank Dr. William Young, who served on my committee while being the major professor to his own candidates. Thank you to Dr. Celeste Fenton, for being kind and supportive throughout a process that can take so much to complete. Lastly, a sincere thank you to Dr. Waynne James who spent countless hours working with me and encouraging me to be the best I could be. Her way of silently pushing me is the reason I am even in a position to write this. She is truly the definition of an outstanding major professor and I will never forget the dedication she shows each and every one of her students.

This study would never have been possible without one very special person, my husband, Emerson Campbell Hardy III. All of the emotional support you provided was more than anyone could have ever asked for, never leaving my side at any point. To all my friends, especially Carrie who always provided words of support and comfort, I thank you all. To my father, mother, and sister, I love you and thank you for always loving me. To my Lord and Savior, Jesus Christ, I noticed every cardinal you placed in my path to let me know you were with me the entire time. I lastly thank my sweet puppies, ChrisMiss and Faith. You both knew exactly when to be by my side to get me through another day. It takes a village to go through a dissertation process and I am humbled by all of the love and support I received.
# Table of Contents

List of Tables........................................................................................................ iii

Abstract................................................................................................................... v

Chapter 1 Introduction............................................................................................. 1
  Statement of the Problem....................................................................................... 3
  Purpose of the Study ............................................................................................ 3
  Research Questions .............................................................................................. 5
  Significance of Study ........................................................................................... 6
  Conceptual Framework ......................................................................................... 7
  Limitations ........................................................................................................... 8
  Definition of Terms .............................................................................................. 9
  Organization of Study ......................................................................................... 10

Chapter 2 Review of the Literature........................................................................ 11
  Adult Learning ..................................................................................................... 11
  Learning Styles .................................................................................................... 15
  MMPALT Development ...................................................................................... 17
  Race/Ethnicity ..................................................................................................... 19
  Age ....................................................................................................................... 20
  Education ............................................................................................................ 21
  Gender ................................................................................................................ 22
  Summary ............................................................................................................. 23

Chapter 3 Methods................................................................................................ 24
  Research Questions .............................................................................................. 24
  Population and Sample ....................................................................................... 25
  Instrumentation ................................................................................................... 25
    Multi-Modal Paired Associates Learning Test .................................................. 26
    Changes to MMPALT IV Administration ....................................................... 28
    Validity ............................................................................................................. 28
    Reliability ........................................................................................................ 29
    Demographic Form ........................................................................................... 29
  Data Collection Procedures .............................................................................. 30
    Location ........................................................................................................... 32
  Data Analysis ...................................................................................................... 32
  Variables ............................................................................................................. 34
Chapter 4 Findings ....................................................................................................................35
  Participant Demographics .....................................................................................................35
  Profiles of Participant MMPALT IV Scores .........................................................................37
  Observations ..........................................................................................................................51

Chapter 5 Summary, Conclusions, Implications, and Recommendations ......................53
  Summary of the Study ...........................................................................................................53
  Conclusions ..........................................................................................................................54
  Implications ............................................................................................................................55
  Recommendations ................................................................................................................56
    Recommendations for Instrument Usage and Administration ........................................56
    Recommendations for Further Research .......................................................................58

References .................................................................................................................................59

Appendices ...............................................................................................................................64
  Appendix A MMPALT II Sample Test .................................................................................65
  Appendix B IRB Approval Letter ..........................................................................................82
  Appendix C MMPALT IV Research Demographic Questionnaire .....................................84
  Appendix D Informed Consent to Participate in Research ..................................................86
  Appendix E MMPALT Sample Answer Form ....................................................................89

About the Author ....................................................................................................................... End Page
List of Tables

Table 1: Knowles (1980) Process Elements Comparing Pedagogical and Andragogical ..........................................................12
Table 2: Cronbach’s Coefficient Alpha of MMPALT III Sub-test Studies ....29
Table 3: Participant Demographic Characteristics..........................36
Table 4: Perceptual Modality Mean Sub-test Scores and Standard Deviations for All Participants ..................................................37
Table 5: Visual Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity ......................38
Table 6: ANOVA Summary Table for the Visual Perceptual Modality ........40
Table 7: Print Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity ..........................40
Table 8: ANOVA Summary Table for the Print Perceptual Modality ..........41
Table 9: Aural Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity .........................42
Table 10: ANOVA Summary Table for the Aural Perceptual Modality .......43
Table 11: Interactive Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity ....................44
Table 12: ANOVA Summary Table for the Interactive Perceptual Modality ..........................................................45
Table 13: Haptic Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity ......................46
Table 14: ANOVA Summary Table for the Haptic Perceptual Modality ......47
Table 15: Kinesthetic Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity ....................47
Table 16: ANOVA Summary Table for the Kinesthetic Perceptual Modality ..........................................................48
Table 17: Olfactory Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity .......................49

Table 18: ANOVA Summary Table for the Olfactory Perceptual Modality .....50
Abstract

The purpose of this study was to compare the individual learning modalities of Latino, Black, and Caucasian males and females with at least some college education utilizing the Multi-modal Paired Associates Learning Test IV (MMPALT IV). Using the MMPALT IV, 20 participants from each of the three race/ethnicities above the age of 40 were measured in each of the seven perceptual modalities: Visual, Print, Aural, Interactive, Haptic, Kinesthetic, and Olfactory. The MMPALT IV is a performance-based test, which measures a person’s capacity to acquire information through each of the seven learning channels.

ANOVA tests (2 x 3) with a follow-up Tukey test were used with race/ethnicity and gender identified as independent variables. The dependent variable was the individual perceptual modality sub-test scores. This study presented four research questions that addressed the following: the strongest modality profile for the participants, identifiable patterns of perceptual modalities within and between the groups, gender differences between learning styles, and consistencies for race/ethnicity with respect to gender. Statistically significant differences were found only in the Kinesthetic sub-test involving Latino participants, where they scored higher than both Black and Caucasians. The three highest scoring modalities for the Latino participants were Visual, Print, and Haptic; whereas the Black participants were Visual, Interactive, and Print. Caucasian participants scored highest on Visual, Print, and Interactive.
Males and females responded similarly. All race/ethnicities responded similarly to previous MMPALT research with the exception of Kinesthetic where Latino’s performed better than Caucasians and Blacks. Implications for practice would include the incorporation of more interactive activities in a learning environment. Based on the results of this research, instructors may benefit from paying closer attention to kinesthetic activities for Latino students in a learning environment and not over relying on just traditional methods of teaching. This study was exploratory and was necessary to validate the current revisions to the MMAPLT IV. Future research could include modifying some of the subtests for more variation between test items, including more warm-up exercises to reduce any possible disorientation, adding other languages other than English, and testing other race/ethnicities.
Chapter 1

Introduction

Learning and learning styles are important for adults of all race/ethnicities. These areas should be explored when designing curriculum for adults in order to determine if race/ethnicities like Latino, Black, and Caucasian have different learning styles that need to be addressed in a learning context. It may be necessary to understand if differences exist between various demographics within a learning audience and may not be limited to a dichotomy between teaching children and adults. Adult learning is built upon the theory of *andragogy*, is defined as the art and science of helping adults learn (Knowles, 1980). Therefore, this academic concept does not allow for any discrimination whether it be towards race/ethnicity or any other demographic as adults achieve a more independent learning experience through this practice. While classroom facilitators are responsible for maintaining control over their environment, they must also be sensitive to the learning needs of their audience where race/ethnicity is concerned.

Setting the environment in order to maximize the learning experience for the adult is partially based on how each student learns individually. The importance of facilitators is to make certain the learning environment is functional and safe. A silent consideration for setting the climate and/or environment is taking into account the various race/ethnicities that will form the audience. The United States has a changing
population involving various ethnicities. According to the 2010 United States Census results, Latino populations have nearly doubled in size across most areas of the country since the 1990 US Census. Although the Black population has experienced relatively little increase in growth in the past 20 years, the Caucasian population has shown a decrease of 8% (US Census, 2012). The decrease is mostly accounted for by the increased Latino population. In other words, the Black population has remained stable over the last 20 years while Latinos have increased and Caucasians have decreased in the total percentages of the population. As the United States continues to become more diverse, so does the need for research on minority groups within the context of learning styles.

An important factor of educating adults properly is identifying a learner's strongest method of perceptual input. Often, when facilitators are designing curriculum they do not take into account the specific way adults learn (Knowles, 1980). There are various ways to identify an individual's learning style. The Multi-Modal Paired Associates Learning Test (MMPALT) IV is a learning style testing instrument that can identify the individual's dominant perceptual modality. As with previous versions, the MMPALT IV measures the dominant learning style of the adult learner (ISLR, 2013). Since classrooms and corporate training facilities consist of a multi-cultural atmosphere, facilitators need to exhibit a level of commitment when designing their curriculum. One can ask, “With the varying degree of race/ethnicities, how do learning styles affect the adult learner?” Specifically, is there a statistical relationship between male and female Latino, Black, and Caucasian adult learners with differing learning styles? Adult educators may oversimplify adults as being independent, mature learners
without considering the possibility that more specific needs exist across variables like race/ethnicity, gender, and education level. If a threat exists to comprehension of educational material with respect to race/ethnicity, gender, and education level, then every effort should be made to eliminate it. Given the low level of learning style research conducted on minority adults, especially Latinos and Blacks with some college exposure, it is necessary to gather as much data as possible to properly document if a relationship exists between race/ethnicity and learning style modalities (Williams, 2000).

Statement of the Problem

Several research studies exist that compare the preferred learning style of adult learners using previous versions of the MMPALT (Reno, 1997; Ryder, 1992; Williams, 2000). Race/ethnicity in these previous studies has been partially addressed, but not fully explored. There has been a lack of research on the preferred perceptual learning style modalities that compares male and female Latino, Black, and Caucasian adult learners who have at least some college exposure. The current version of the Multi-Modal Paired Associates Learning Test (MMPALT IV) isolates each perceptual learning modality to deliver specific results of an individual's learning preference. The revised version of the MMPALT had not been used to compare groups of Latino, Black, and Caucasian male and females with some college exposure.

Purpose of the Study

In a pedagogical classroom, the individual learners are guided and directed by the facilitator. In an andragogical classroom, the learners take control of their own learning. Knowles (1980) believed that adult learners could capitalize on their individual learning experience if they were fully aware of their learning style. According to
Knowles, examining the perceptual senses on an individual basis could provide better overall group comprehension. Individual adult learners often have an innate readiness to learn and more often than not are self-directed learners. Lindeman (1926) believed the prior learning experiences are the resource of highest value for adults. Individuals may learn better when they are provided conscious awareness of their sensory strengths and their weaknesses.

With more people immigrating to the United States, race/ethnicity issues continue to become more important with each passing year. With America’s population becoming more diverse, multi-cultural classrooms should be considered when facilitators are designing curriculum (U.S. Census, 2012). Past research involving previous versions of the MMPALT examined various race/ethnicities and genders. Williams (2000) examined 30 African American female adults, 30 Hispanic female adults, and 30 European American female adults using the MMPALT III. All ages ranged from 20 to 55+. Williams found that the Hispanic and European American groups favored the Interactive modality, whereas the African American group showed a primary preference for the Visual modality with the Interactive modality following behind. Williams concluded that as age increased, the MMPALT III sub-test scores decreased. The results of Williams’ study were in line with previous research findings (Reno, 1997) that used the MMPALT, MMPALT II, and MMPALT III versions. Williams concluded that race/ethnicity groups had differences within their individual learning style modalities. On the other hand, Smith (1996) found that there was no significant difference in dominant perceptual modalities between Black and White male inmates.
In the last 15 years, there had been little research conducted with various MMPALT versions on male and female adults with differing race/ethnicity with individuals who have at least some college exposure. The MMPALT IV version had not been tested using the variables of race/ethnicity, gender, and at least some college exposure. Educational level is important because higher educational opportunities have become more readily available for adult learners. According to Royer (2003), online learning is becoming increasingly popular and colleges across the country are seeing rises in enrollment due to courses being offered online. Due to the high availability of online and on-campus learning opportunities, more adults are seeking some college education (Straumsheim, 2014). With all the opportunities now available for adult learners, educational level is a variable that needs exploration.

The purpose of this study was to compare the individual learning modalities of Latino, Black, and Caucasian males and females with at least some college exposure utilizing the MMPALT IV. The variables that were examined are race/ethnicity and gender.

**Research Questions**

The following research questions were developed in order to conduct this research:

1. What is the learning style modality pattern for the participants as measured by the MMPALT IV?
2. Do identifiable patterns of perceptual modalities exist within and between Latino, Black, and Caucasian adult learners?
3. Is there a difference in learning style modalities between males and females who have some college exposure?

4. Are the gender differences consistent across race/ethnicity?

**Significance of Study**

United States corporations and classrooms have a changing population involving various race/ethnicities. The overall percentages of Latino and Caucasian populations have changed over the last 20 years with Blacks remaining stable. Academia and corporate America educational settings have diverse audiences with disparate learning needs. Curriculum designed around one learning style may not be the best fit for all individuals in the classroom. Properly helping learners to identify their strongest method of perceptual channels via sensory input should enhance their learning experience. The MMPALT approach may be an effective method for identifying the dominant perceptual modalities across learners. Due to the lack of research involving the MMPALT IV and the relationships of race/ethnicity and learning style, research needs to be conducted to determine if significant relationships exist.

Previous research has shown that age and educational level play a role in an individual’s modality sub-test scores. James and Galbraith (1984) conducted a study of the MMPALT II and the Perceptual Modality Preference Survey (PMPS) involving 319 adult men and women. The results found that the older age group had mean scores that were significantly lower than those of young adults. Additionally, participants with higher educational levels had higher mean scores than those with some high school and high school graduate education.
Reno (1997) conducted a study that examined the MMPALT III by using age, gender, and educational level of native speaking Spanish and English adult learners with either a high school education or a college education. The Aural sub-test scores showed that there was a difference between native English and Spanish speaking adults on how they acquire aural information on a short-term memory basis. The importance of this study was to determine if there was a relationship between race/ethnicity and dominant learning modalities in Latino, Black, and Caucasian male and female adult learners.

**Conceptual Framework**

A definitive way of sizing up a learner’s style of how material is comprehended should be evaluated in today’s modern day classroom. If a problem exists to hinder or enhance comprehension of educational material with respect to race/ethnicity, gender, and education level, then every effort must be made to modify it through instructional design. Keefe (1989) stated that the processes of attention, perception, and memory were key to an individual being able to retrieve information.

The learning style of adults is comprised of cognitive functions (Cherry, 1981, French, 1975; Gilley, 1976; Keefe, 1987; Kolb, 1976; Witkin, Moore, & Goodenough, 1977; Myers, 2000; Reno, 1997; Williams, 2000; Witte, 1999), affective style (Messick, 1976), environment, and perceptual preferences (Dunn & Price, 1978; Garger, 1984; James & Blank, 1991a, 1990; Keefe, 1987; Myers, 2000). These three components of learning styles are cognitive, affective, and physiological (James & Maher, 2004, Keefe, 1987; Thomson, 1998). While much attention has focused on the cognitive and affective domains of learning styles testing, more information is needed in the
perceptual realm. Two tests that address the affective dimension are the Myers-Briggs Type Indicator (1999) and the Keirsey Temperament Sorter (1998a). The MMPALT IV is comprised of seven sub-tests which measure seven independent learning perceptual modalities. The tests summarize a person’s ability to take in information from the external world using 10 unique test items of stimulus-response pairs for each modality (Galbraith & James, 1987). The participants rely on their short-term memory ability to accurately recall information that was presented earlier. Based on the numbers of successfully recalled pairs, a raw score which determines the overall rank order of their modalities. If students want to better their performance in education, they a clear understanding of the application of the processes and the information processing theory might help.

Limitations

The Latino, Black, and Caucasian participants of this study were gathered from various professional organizations, educational institutions, and workplaces in the Tampa/Saint Petersburg, Florida geographic area through convenience sampling. Some of the findings may not be generalizable to other race/ethnicities as well as populations involving education below college. The subjects had a wide variety of educational backgrounds from various institutions, which included at least two years of college exposure to the successful completion of higher educational degrees. There was no process in place to accurately verify the participants’ educational backgrounds and race/ethnicity. The truthfulness of participants may have threatened internal validity.
Before selected participants were exposed to the MMPALT IV, they were vetted using a questionnaire to identify their race/ethnicity, gender, and educational level. The research study definitions of race/ethnicity and educational level were defined on the questionnaire. A concern of this study involved situations where participants did not have parents of homogenous ethnicity. Having a clearly defined race/ethnic helped the accurate gathering of the empirical data.

**Definition of Terms**

The following operational definitions used in this study were explained in order to establish clarification.

**Adult:** Any individual over 40 years of age. This age was chosen to conform with previous studies relating age and perceptual modality.

**Black:** Self-identified as African American or Black. Both parents needed to be of Black or African American descent.

**Caucasian:** Self-identified as Caucasian or White. Both parents needed to be of Caucasian or White descent.

**Latino:** Self-identified as Latino(a) or Hispanic background. Both parents needed to be of Latino(a) or Hispanic descent. The difference in the two terms is based primarily on previous historical use. Both parents needed to be identified as Latino(a).

**Learner:** A person engaged in or expressing an interest in the acquisition of new skills or knowledge (Cherry, 1981).

**Learning Style:** "The ways individual learners react to the overall learning environment and its various elements." (James & Blank, 1991b, p. 20).

**MMPALT IV (Multi-Modal Paired Associates Learning Test 4th revision):** A series of seven tasks, each of which measures a participant's success in using a specific perceptual modality as a learning tool.

**Perceptual Modality:** "The manner in which an individual extracts information from the environment through the senses" (James & Blank, 1991a, p. 20). The seven perceptual elements discussed below were identified by French (1975). Competence in each element were assessed by one of the seven MMPALT IV sub-tests.
1. **Print (P):** An element of perceptual modality that refers to reading as a means of obtaining information.

2. **Aural (A):** An element of perceptual modality that refers to listening as a means of obtaining information.

3. **Interactive (I):** An element of perceptual modality that refers to verbalization and small group conversations as a means of obtaining information.

4. **Visual (V):** An element of perceptual modality that refers to observation as a means of obtaining information.

5. **Haptic (H):** An element of perceptual modality that refers to handling and manipulation of objects as a means of obtaining information.

6. **Kinesthetic (K):** An element of perceptual modality that uses large muscle movement as a means of obtaining information.

7. **Olfactory (O):** An element of perceptual modality that uses smells as a means of obtaining information.

**Some College Exposure:** Completion and passing of at least two years or more at an accredited collegiate institution.

**Organization of Study**

Chapter 1 outlines the study, presents the problem, purpose, research questions, significance of the study, conceptual framework, limitations, definition of terms, and organization of the study. Chapter 2 is the review of related literature concerning adult learning, learning styles, MMPALT development, race/ethnicity, age, education, gender, and a summary. Chapter 3 presents the methods that will be used in the study, which includes the research questions, instrumentation, data collection procedures, location, and the analysis of data. Chapter 4 discusses the findings, participant demographics, profiles of participant MMPALT IV scores of the study, and observations. Chapter 5 includes the summary, conclusions, implications, and recommendations.
Chapter 2

Review of the Literature

The purpose of this study was to compare the individual learning modalities of Latino, Black, and Caucasian males and females with at least some level of college education utilizing the MMPALT IV. This chapter examines literature for this study in the areas of adult learning; learning styles; MMPALT development; and perceptual modalities in regard to race/ethnicity, gender, age, and education level; and summary.

Adult Learning

Knowles, a well known adult educator and author of the 1980 book, *The Modern Practice of Adult Education: From Pedagogy to Andragogy*, defines andragogy, as the “art and science of helping adults learn” (p. 43). In order to fully comprehend the adult learning concept the learner has to have an understanding of its opposite; pedagogical learning. Pedagogy is defined as “the art and science of teaching children” (p. 40). While Knowles further distinguishes the concepts of adult and child learning from one another, it may benefit learners to understand these concepts by exploring the processes and assumptions of Knowles regarding pedagogy and andragogy. Knowles outlined six assumptions in his model which were made up of two parts: pedagogy and andragogy. When Knowles completed his outline of the assumptions, he explained the seven process elements which help clarify the differences between pedagogy and andragogy. Knowles expounded the process elements in chart form which
demonstrated the key points in both the pedagogical and andragogical parts of his model. Table 1 outlines Knowles’ processes and assumptions.

Table 1

Knowles (1980) Process Elements Comparing Pedagogical and Andragogical

<table>
<thead>
<tr>
<th>Process Element</th>
<th>Pedagogical Part</th>
<th>Andragogical Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate</td>
<td>Cold, low trust, competitive, tense</td>
<td>Warm, relaxed, trusting, peer building relationships are going on</td>
</tr>
<tr>
<td>Planning</td>
<td>Primarily by the teacher</td>
<td>Mutual by learners and facilitator</td>
</tr>
<tr>
<td>Diagnosis of Needs</td>
<td>Primarily by the teacher</td>
<td>Mutual assessment</td>
</tr>
<tr>
<td>Setting Objectives</td>
<td>Primarily by the teacher</td>
<td>Mutual through negotiation and consensus</td>
</tr>
<tr>
<td>Designing Learning Plans</td>
<td>By the teacher through course syllabus. Logical sequence</td>
<td>Learning Contracts the sequence is based on readiness</td>
</tr>
<tr>
<td>Learning Activities</td>
<td>Assigned Readings</td>
<td>Independent Study or Experimental techniques</td>
</tr>
<tr>
<td>Evaluation / Re-diagnosis of Needs</td>
<td>By teacher through course grades</td>
<td>A collaboration of evidence on the learner is gathered by the teacher and other experts and then an overall evaluation is completed</td>
</tr>
</tbody>
</table>

Knowles outlined the concepts of the learner in six categories.

1. **Concept of the Learner.** In the pedagogical part, the concept of the learner is described as a learner who has a dependent personality. This is the exact opposite in the andragogical part. The learner in the andragogical part is independent and self directed.

2. **Role of the Learner's Experience.** In the pedagogical part, the learner has little or no experience. The teacher in this model brings the experience and teaches to the students. The resources are built upon in this section. Life experience is
what is key in the andragogical part. The learners in this section pull from their life experiences and their resources and the teacher uses these life experiences in the classroom to help people learn.

3. **Readiness to Learn.** Age level and curriculum are uniform throughout the pedagogical part. In elementary school, students move to the next grade level as a whole and are introduced to curriculum that coincides with that particular grade level. Everyone is learning the exact same thing and everyone is in the same age group. Maturity is what is focused on in the andragogical part. There can be a wide variety of ages in the classroom where the andragogical part is present. The learners pursue their quest of learning when they have matured and they are ready to learn something new.

4. **Time and Learning.** Differences are seen in the two parts of the model where time is concerned. In the pedagogical part, the learner has no concept of time. In other words, there is no value placed on time since there appears to be an unlimited amount of time. The andragogical part is drastically different. Adult learners balance a multitude of social roles; therefore, their time is very limited and very valuable.

5. **Orientation to Learning.** The pedagogical part views the orientation to learning as very subject centered. There is usually a delayed application of the material that is being learned. Immediate application of material is a must in the andragogical part. The learner learns the task or problem and immediately begins putting the material into practice.
6. Motivation. External rewards and punishments are used in the pedagogical part while internal rewards and curiosity are utilized in the andragogical part. Parents reward a child’s good grade with money or a trip to the movies. Adult learners are rewarded through their self worth. Adult are self motivating.

The process elements Knowles described may help the learner to understand the differences that occur within each part of the model. In the pedagogical part, increased structure is utilized and almost everything is planned and executed by the teacher. In the andragogical part, a much more relaxed environment is used where the learners and teachers work together to enhance the learning experience. Knowles made it clear why each model was appropriate and defined the differences of the assumptions and process elements (Knowles, Holton, Swanson, 2011).

Lindeman wrote in his book, *The Meaning of Adult Education in the United States* “the highest value of resource in adult education is the learning experience” (1926, p. 6). Learning and lifelong learning must be an effective experience for the student in order for the productive transfer of knowledge. Understanding the process of human intelligence allows educators to be more effective as well. Sternberg’s definition of human intelligence is a “mental activity directed toward purposive adaptation to, selection and shaping of, real-world environments relevant to one’s life” (Sternberg, 1985, p. 45). Simply put, intelligence is the measure of how well a person deals with environmental change over their lifetime. Lifelong learning is no different in that it is a process that also takes into account the lifespan of the learner (James & Blank, 1991b).
Learning Styles

Galbraith's 2004 book, *Adult Learning Methods: A Guide for Effective Instruction*, addresses the importance of being able to identify an adult's specific learning style. Ideally, most facilitators should strive to design curriculum to teach to an individual's specific learning style. Arriving at the goal can be challenging. Learning styles is a concept in adult education that has gained worldwide acceptance from adult educators (Dekker, Lee, Howard-Jones, & Jolles, 2012). Reiner and Willingham (2010) state that there are three claims to learning styles that are correct: "Learners are different from each other, these differences affect their performance, and teachers should take these differences into account"; "Students differ in their interests"; "Students differ in their background knowledge" (p. 33).

Three dimensions have been identified when discussing learning styles: cognitive, affective, and physiological (James & Maher, 2004). Cognitive dimensions of learning styles is information that is assessed through information-processing (Galbraith, 2004). Examples of instruments utilized to identify cognitive learning styles in this category are: Gregorc's Style Indicator (1999) and Kolb's Learning Style Inventory (1999). Galbraith concluded that, while these tests are helpful, it is difficult for them to provide a complete representation for the specific individual learning style.

The affective dimension of learning styles deals with the individual's specific personality type (James & Blank, 1993). Two tests that address this dimension are the Myers-Briggs Type Indicator (MBTI) (1999) and the Keirsey Temperament Sorter (1998a). The MBTI (1999) and Keirsey (1998a) are self-report questionnaires that allow people to identify with a series of forced-choice items that reflect the participant's
personal style, which helps them to understand themselves and how they adapt to their personal, academic, and occupational environments. The MBTI and Keirsey are based on the findings of Jung, who identified people using eight categories: extroverts, introverts, intuitive, sensors, thinkers, feelers, judgers, and perceivers. When individuals become more aware of both their strength and weaknesses, they have potential to become more efficient in their personal, academic, and occupational environments. However, a concern with these instruments is that they are self-report measures where the participant may consciously supersede their natural response tendencies with choice or traits more favored by others in society. Despite the popularity of these tests, the reliability has been debated (Pittenger, 1993).

Perception plays a crucial role in the learning process. Without the ability to take in, store, and accurately recall relevant information, the need to measure cognitive styles and understand the learner’s needs would cease all together in a learning environment. Wingfield (1921), one of the first researchers to study sensory awareness (or perception), emphasized sensory awareness as a function of selective attention. He concluded that learning takes place when a person focuses on the relevant stimulus and filters out the extraneous stimuli in the current moment. This process of selective attention is what allows an individual to limit the amount of incoming information to present a realistic amount of data to the short-term memory. Wingfield stated that perception is both limited incapacity and duration, which may help to present sensory overload.

French (1975), in his original theory of perceptual modalities, identified seven modality channels. Gilley (1976), in developing the first version of the MMPALT, only
used six of the modalities. Cherry (1981) added the seventh perceptual modality to the second version of the MMPALT. The seven individual forms of sensory inputs are as follows:

1. Print (written words),
2. Visual (pictures),
3. Aural (listening),
4. Interactive (verbalized conversation),
5. Haptic (touching objects),
6. Kinesthetic (movements), and
7. Olfactory (smells).

**MMPALT Development**

French (1975a) identified the perceptual elements of learning styles, which would eventually form the Multi Modal Paired Associates Learning Test (MMPALT). This came in the form of a paper outlining the instructional process while addressing a variety of personal styles which he believed to be part of the teaching/learning process. He addressed possible causes for the differing academic achievement levels. French assumed that there were individual dependencies involving possibly more than one channel of sensory input:

Among the human variables which must be considered in the teaching-learning process is the variable of "personal style". Learning style... If we assume that every human being has his own personal learning style and the styles are somehow related to our dependence upon one or another sensory-input process, the resultant, theoretical list of styles available might look like this: Print Oriented, Aural, Oral (Interactive), Visual, Tactile [Haptic], Motor [Kinesthetic], Olfactory. (French, n.d.)
Like French, Gilley (1975/1976) was looking for a way to confirm the presence of the very styles French was addressing. Gilley aimed to measure these perceptual abilities by creating sets of paired associate tests. The goals of these tests were developed to target an individual’s perceptual strength, while also considering any possible relationship involving perceptual strength with scholastic achievement. Another area of interest for Gilley was a specific demographic element that involved gender, race/ethnicity, and I.Q. Gilley developed a test for each of French’s styles, excluding “Olfactory” which eventually became the original form of the MMPALT instrument. This instrument was based on the concept of paired items of mental association (Adams, 1976).

Galbraith discussed the importance of learning styles in, Adult Learning Methods: A Guide for Effective Instruction (2004). He stated, “it begins with a learning instrument” (p. 123). Cherry, a graduate student of French, began studying learning styles and it was his research that lead to the development of the second edition of the Multi-Modal Paired Associates Learning Test.

Cherry (1981), who added the Olfactory sub-test, used the revised MMAPLT to test a population of 96 adults ranging from ages 19 to 68 across 31 states. All of the adults had education ranging between the 8th grade to advanced degrees. He observed that there were measurable variations in the perceptual learning styles and that the most dominant style was Visual followed by Haptic. These findings supported Gilley's previous results, where the participants consisted only of third graders. However, the observed variations were explainable by age, education, maturity, and experience. Cherry also improved the measurability of the sub-test by increasing the
number of associated pairs to 10 for each modality. Cherry additionally improved the MMPALT’s ease of scoring by simply requiring a tally of the correct number of successful pairings which ranged from 0 to 10. This test became known as the MMPALT II which Cherry used to measure the performance of adults.

Previous MMPALT variables researched have been race/ethnicity, age, education level, and gender. Specific research studies have addressed a wide variety of variables. Race/ethnicity was a variable in several previous studies using a different MMPALT version. The variables of education level and gender were either controlled for or are being investigated now that the MMPALT IV version is available. Previous research studies are discussed in more detail below.

Race/Ethnicity. Reno (1997) performed a study that involved 80 participants, which included any individual over the age of 18. Reno (1997) found that native English speakers, on average, obtained higher Kinesthetic, Visual, and Print scores compared to native Spanish speakers. Native Spanish speakers scored higher in Olfactory mean scores. Additionally based on the native Spanish speakers’ scores, the findings suggested that the Interactive modality could be the most efficient way to learn new material, whereas the same would hold true for Visual activities with native English speakers. The overall rank order of the sub-tests did not indicate a pattern of strengths when comparing groups, although native Spanish speakers had a stronger preference for Interactive and Visual respectively, whereas native English speakers showed a preference for Visual and Aural respectively. Both native English speaking and native Spanish speaking participants showed no differences from one another for the Haptic modality as this was the second most popular modality for both groups.
Williams (2000) conducted a study using the MMPALT III that involved 90 female participants, which included three proportionate groups of race/ethnicities: Hispanic Americans, European Americans, and African Americans. The age range included two evenly distributed age brackets: ages 20 to 30 and ages 50 and older. All participants had at least a bachelor’s degree or master’s degree. Williams found that there were similarities with Visual and Interactive sub-tests across all three race/ethnicity groups, but the Hispanic American scored significantly higher on the Olfactory modality. Additionally, the data suggested that there were differences in perceptual modalities based on age. In the younger age group scores were generally higher for Print, Aural, Visual, and Haptic. The rank order of the modalities for Hispanic Americans and European Americans were identical. Olfactory was the lowest ranking in all three groups. African Americans scored higher in the Visual modality.

Smith (1996) conducted a study using the MMPALT II that involved 48 male participants, that included four groups of inmates all below a seventh grade education: Black males with a learning disability, Black males without a learning disability, White males with a learning disability, and White males without a learning disability. The age range was limited from ages 18 to 24 years. Smith found that there were no differences between the dominant perceptual modalities of Black and White functionally illiterate male correctional education students. Additionally, no significant differences were found between dominant perceptual modalities of learning disabled and non-learning disabled participants.

Age. Brown (1984) conducted a study using the MMPALT II that included four groups involving academic exposure: under 12 years of education, 12 years of
education, some college, and four years of college. This included only individuals between 61 to 84 years of age. The findings showed that the Olfactory modality scores were not strong across the entire group, whereas the Visual modality was both the strongest and most varied of the modality scores. While Brown measured gender, he did not take into account race/ethnicity.

James and Galbraith (1984) found 319 participants in five of the seven MMPALT II modalities who showed significant differences in the Print, Aural, Haptic, Kinesthetic, and Visual sub-tests for age and education. However, no interactions were found between age and education. They found that age possessed an indirect relationship with the sub-test scores. In other words, as age increased, scores decreased. The overall order for the sub-tests between the two groups was similar to one another. Haptic sub-test ranked second for the group 20-59 years, but fifth for the 60 and older crowd.

**Education.** James and Galbraith (1987) investigated the education level of the same 319 participants with varying degrees of education ranging from some high school experience to graduate degrees using the MMPALT II. They found that students with less than a high school diploma ranked highest in the Visual sub-test with the rest of the rank order being almost identical for all five groups. There were significant differences in both education and age without significant interaction between the two. This indicates that, as the amount of education increases, there are significantly higher modality scores for all sub-tests excluding the Olfactory sub-test. Galbraith and James’ (1987) research on the relationship between education level and perceptual learning styles focused more on the physiological aspect of learning. Using the MMPALT II, 319
adult male and females were tested based on five educational groups, which included participants with some high school all the way to a graduate degree. Galbraith and James found that all participants ranked highest in the Visual sub-test. In addition, they found as the level of education level increased there were significantly higher scores on all sub-tests with the exception of the Olfactory sub-test. Additionally, the rank order across all five education groups did not differ except Haptic and Interactive were reversed for high school graduates and some college education.

**Gender.** Various early studies found that differences based on gender did not exist. Some of these earlier studies were conducted with the MMPALT II. James and Blank (1993) conducted research using the Learning Styles Inventory (LSI) to investigate the relationship between the strongest and weakest learning styles of 324 students with a postsecondary education level, most of whom were high school graduates or individuals with some college exposure between 20-40 years of age. Another purpose was to examine if any differences existed between learning styles with respect to age, education level, and gender. The LSI, which focuses mainly on the cognitive dimension of learning, also takes into account the physiological and affective areas as well. This test utilizes 45 items rated on a four-point scale ranging from 1 = Least Like Me to 4 = Most Like Me which break down into nine constructs: five cognitive information processing, two social interaction preferences, and finally two preferences allowing participants to express themselves. Nearly 60% of all participants reported a major Auditory-Visual-Kinesthetic (AVK) preference. The AVK subscale represents a person’s preference for combined functioning during a learning process. The other four cognitive information-processing constructs measured either auditory or visual ability by
isolating numeric and language formats. The AVK sub-scale returned the highest mean score of 33.45% over all other sub-scales. The second highest cognitive processing sub-scale was Visual Numerical at 31.2% with a mean score of 29.37%. While few significant differences were identified, males had significantly lower Visual Numerical sub-scores than females. The research suggests that a simultaneous combination of Visual, Auditory, and Kinesthetic stimuli may be more effective for learning with most students.


Summary

The literature reviewed for this study examined adult learning, learning styles, MMPALT development, and perceptual modalities in regard to race/ethnicity, gender, and education level. Due to the lack of research regarding Latino, Black, and Caucasian males and females with some level of college education utilizing the MMPALT IV, this study attempted to fill the gap in relation to race/ethnicity, while controlling for education and addressing gender with the more recent version of the MMPALT.
Chapter 3

Methods

The purpose of this study was to identify and compare the individual learning modalities of Latino, Black, and Caucasian males and females with at least some college exposure utilizing the MMPALT IV. An additional aim was to contribute to the base of research for the MMPALT perceptual learning modalities. This research utilized a quantitative correlation design. This chapter states the research questions, the population and sample, instrumentation, data collection procedures, location, and data analysis.

Research Questions

Four research questions were used to guide this study.

1. What is the learning style modality pattern for the participants as measured by the MMPALT IV?

2. Do identifiable patterns of perceptual modalities exist within and between Latino, Black, and Caucasian adult learners?

3. Is there a difference in learning style modalities between males and females who have some college exposure?

4. Are the gender differences consistent across race/ethnicity?
Population and Sample

The Latino, Black, and Caucasian participants of this study were gathered from various professional organizations, educational institutions, and workplaces of the Tampa/St. Petersburg, Florida geographic area utilizing the snowball sampling method. This sampling technique from Glass and Hopkins (1996) helped identify additional participants from previously identified participants from those who had already participated in the study. The subjects had similar educational backgrounds from institutions which varied from some college exposure to the successful completion of higher educational degrees. The G*Power analysis software determined that a minimum of 48 participants were needed for the accuracy of the study. The final sample exceeded the requirement for 80% confidence levels around the means.

The sample size was consistent with prior MMPALT studies. The study included 10 male and 10 female Latinos; 10 male and 10 female Blacks; 11 male and 10 female Caucasians. However, one Caucasian male was unable to complete all seven modalities; therefore, his scores were omitted from the analysis of data.

Instrumentation

The MMPALT is a learning styles instrument that measures the perceptual learning modality of adults. The MMPALT IV was utilized in this research study. See Appendix A for a sample of the non copyrighted MMPALT II instrument.

All participants completed a demographic questionnaire form. In an effort to correctly place participants in the correct categories, additional race/ethnicity questions were added. See Appendix B for a copy of the demographic form.
Multi-Modal Paired Associates Learning Test. The MMPALT IV is an instrument that measures the recall of paired information, or Paired Associates, using the seven established perceptual modalities. The objective of this assessment was to determine which modality, or modalities, individuals predominately used to extract information from their surroundings. The MMPALT IV is a revision of the MMPALT III (Cherry, 1981) and the MMPALT (Gilley, 1975). Cherry’s MMPALT II added the Olfactory sub-test which included adults as test subjects. Most of the previous research was conducted using the MMPALT III, which has, some revisions to individual measurement items and procedures. The MMPALT IV was revised by the Institute for Learning Styles Research and made available in the new format in 2013. Due to a gap in coordination between the University of Tennessee (UT) and Oklahoma State University (OSU) doctoral students during the early 1980s, the items utilized in each sub-test varied. This issue was addressed when faculty and students or other interested individuals gathered at UT to standardize the individual sub-tests. As a result of this meeting, the Institute for Learning Styles Research (ILSR) was created and the MMPALT III items were standardized. As time passed and research was conducted, members of the ISLR determined there was a need to standardize and simplify both the administration process and the test instrument. The MMPALT IV was the result of this process (W. James, personal communication, June 13, 2016).

The seven ways of gathering sensory information include.

Print—This perceptual modality focuses on reading as a means of gathering information through the use of the written word on paper; common and nonsense words are presented in pairs by the test administrator.
Aural—This perceptual modality focuses on listening as a means of gathering information as a series of pairs is read aloud during the test administration.

Visual—This perceptual modality focuses on observation as a means of gathering information as a series of paired symbols are presented by the test administrator.

Haptic—This perceptual modality focuses on touch and manipulation as a means of gathering information as paired objects are presented by the test administrator. Participants are blindfolded for this sub-test.

Interactive—This perceptual modality focuses on verbalization as a means of gathering information from a verbal presentation. Participants are asked to verbally repeat each pair of common and nonsense words. They are then asked to verbally explain how they will remember the pair.

Kinesthetic—This perceptual modality focuses on physical movement of muscles as a means of gathering information using a series of paired movements presented by the test administrator.

Olfactory—This perceptual modality focuses on smell as a means of gathering information using a series of unique paired aromas presented by the test administrator one at a time.

See Appendix A for examples of sub-tests.

A trained tester who had been certified to administer the MMPALT IV was physically present to administer the instrument. The participants required a pencil and paper which was provided by the tester. Ten unique pairs of items were administered per modality. The tester did not repeat the items and only allowed for a specific time for
the participant to respond to each item. Once completed, the tester then tallied the responses for each modality to determine the strongest modality/modalities an individual predominately relied on to acquire sensory information. Modality scores range from 0 to 10 and the participant's highest score is relative to the participant’s overall performance across all seven modalities.

**Changes to MMPALT IV Administration.** Changes were made to the MMPALT IV from the previous version, the MMPALT III. The Aural sub-test was standardized using a recorded script. Some Kinesthetic movements were changed. The directions suggested using a pencil to guide the participants movements; however, that did not work and the administrators substituted or caution that they would be touching the participant’s arms, legs, and waist if necessary. The Olfactory sub-test used essential oils and some of the scents were changed. In the Haptic sub-test, 3 items were substituted based on easy availability during the kit construction. However, during pre-testing and training, it became obvious that the replacement items were too similar, so items that were more consistent with the original items were substituted. Visual, Print, and Interactive sub-tests, remained the same. The changes to this version (compared to previous versions), was approved by the training administrator who has had 35 years working with the various versions of the MMPALT.

**Validity.** Reno (1997) stated, during a review of the MMPALT II studies, evidence indicated the validity of scores obtained from this instrument. These findings supported French’s 1975 hypothesis of seven individual perceptual modalities. Additionally, the Visual modality was the most frequent dominant modality, where other mean scores and modality rank orders differ predictably by age and education level,
which included adults whose age is above 65 years and education level below a Bachelor’s degree. The MMPALT III is a revision of the MMPALT II and did not threaten the validity of the instrument (Williams, 2000).

**Reliability.** The reliability of the MMPALT II was documented by James and Blank (1991a). Their study looked at 480 adults aged 19 to 86 years. The scores for reliability were ranked Visual $r = .87$; Print $r = .85$; Aural $r = .80$; Haptic $r = .74$; Olfactory $r = .73$; Kinesthetic $r = .67$; and Interactive $r = .65$ (Myers, 2000). The reliability numbers of the MMPALT III across three published dissertations are detailed in Table 2.

Table 2

*Cronbach’s Coefficient Alpha of MMPALT III Sub-test Studies*

<table>
<thead>
<tr>
<th>MMPALT III Sub-Tests</th>
<th>Print $r$</th>
<th>Aural $r$</th>
<th>Visual $r$</th>
<th>Interactive $r$</th>
<th>Haptic $r$</th>
<th>Kinesthetic $r$</th>
<th>Olfactory $r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reno (1997)</td>
<td>.74</td>
<td>.76</td>
<td>.80</td>
<td>.79</td>
<td>.77</td>
<td>.54</td>
<td>.39</td>
</tr>
<tr>
<td>(N = 80)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Witte (1999)</td>
<td>.77</td>
<td>.67</td>
<td>.71</td>
<td>.74</td>
<td>.70</td>
<td>.65</td>
<td>.55</td>
</tr>
<tr>
<td>(N = 80)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roberts (1999)</td>
<td>.74</td>
<td>.80</td>
<td>.77</td>
<td>.74</td>
<td>.80</td>
<td>.65</td>
<td>.79</td>
</tr>
<tr>
<td>(N = 72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Demographic form.** Participation in this Institutional Review Board (IRB) approved study was strictly voluntary. See copy of IRB approval in Appendix B. All participants successfully completed a brief demographic questionnaire that properly identified their age, gender, race/ethnicity, and educational level (Appendix C). In an effort to correctly place participants in the proper demographic category, additional
race/ethnicity questions were added. All race/ethnicities required that both parents be of the same descent.

**Data Collection Procedures**

Before the MMPALT IV was administered, all participants successfully completed a brief demographic questionnaire previously mentioned (Appendix C). Once proper vetting was verified, the participants were given a copy of the University of South Florida Informed Waiver of Consent. See a copy of the waiver in Appendix D. Participants were allowed to keep a copy of the Informed Waiver of Consent. The participants were placed in a secure, safe room where there were few obstacles for test administration. A certified MMPALT IV testing facilitator went through the approved MMPALT IV instructions and sample test before the test began. So participants had a complete understanding of how the MMPALT IV test functioned, a sample MMPALT IV pre-test was given by the test administrator by reading a series of pairs of common and nonsense words. Once the participant had a complete understanding of the MMPALT IV testing methods, the test began.

The Print, Aural, and Visual sub-tests were administered in a group setting when necessary. The Print test took approximately 10 to 12 minutes to administer. Participants recorded their scores in pencil on the MMPALT IV test answer form. See Appendix E for the first page of the answer form. The Print test was presented visually as 10 pairs of common and nonsense words by the test administrator. The Visual sub-test was also administered to the participants in a group setting. Ten pairs of recognizable and abstract images were shown to the participants followed by the stimulus items only. The Visual sub-test also took 10 to 12 minutes to complete. The
Aural sub-test was also presented to participants in a group setting. The test administrator played the Aural sub-test directions for the 10 pairs of common and nonsense words to the participant. The Aural sub-test also took 10 to 12 minutes to complete. The Haptic, Interactive, Kinesthetic, and Olfactory sub-tests all were presented to each participant individually. The Haptic sub-test required participants to be blind folded. Ten objects were presented in pairs (recognizable and abstract items). Participant then recalled the recognizable object once presented with the abstract item in a different order then originally presented. The Haptic sub-test took between 12 to 15 minutes to administer. The Interactive sub-test was presented to the participants by verbalizing 10 pairs of common and nonsense words and explaining how they would remember that pair of words. The participants were to recall the words when the nonsense word was presented in a different order. The Interactive sub-test took about 12 to 15 minutes to administer. The Kinesthetic sub-test was presented to the blind-folded participant in a series of paired movements. The test administrator constantly had one hand on each participant in an effort for the person to feel safe throughout the administration of the sub-test. A series of 10 paired movements was presented through demonstration and the participants verbally specified or performed the movement that was paired with the first movement. As before, the items for recall were presented with the first movement in a different order then originally presented. The Kinesthetic sub-test took between 15 and 20 minutes to administer. The Olfactory sub-test was presented by the test administer to each blind-folded participant. The participant was asked to smell a series of paired aromas; the administrator had to be sure that the participant could identify the second aroma. The participant had to recall the aroma that
was paired with the first aroma. The Olfactory sub-test took between 12 to 15 minutes to administer.

No other participants were allowed in the testing environment in an effort to protect the validity of the study. The test was administered in its entirety before the participant left the testing location.

**Location.** The location for the administration of the instrument used was the University of South Florida Tampa campus. The set up of the room addressed lighting, temperature, privacy, and noise level. The lightning was adequate and consistent for all participants and was checked prior to testing. The temperature for the testing site ranged from 72 and 77 degrees Fahrenheit. Noise levels were controlled through external signage posted throughout hallways in addition to closed testing doors. When present, all windows of the testing environments were covered by use of paper, blinds, or drapery to guarantee the privacy of the participant and to avoid any external light that might compromise the testing process.

**Data Analysis**

The purpose of this study was to identify and compare the individual learning modalities of Latino, Black, and Caucasian males and females with some level of college exposure utilizing the MMPALT IV in the Tampa/Saint Petersburg, Florida geographic area. This quantitative research utilized ANOVA tests to compare the mean score differences between race/ethnicity and gender using the SAS software. A variety of descriptive statistics were used including standard deviations, means, medians, and modes. The categorical, independent variables of race/ethnicity and gender were not randomly assigned or manipulated. The Analysis of Variance (ANOVA) was used to
determine whether significant differences existed between the MMPALT IV modalities and the independent variables.

Each of the participant’s scores on the individual MMPALT IV modalities represents a dependant variable. The modalities in order are: Print, Aural, Visual, Interactive, Haptic, Kinesthetic, and Olfactory.

A brief explanation of the data analysis follows each research question below.

1. What is the learning style modality pattern for the participants as measured by the MMPALT IV?

   This question was answered by collecting MMPALT IV data from a sample of Latino, Black, and Caucasian participants from the Tampa/St. Petersburg geographical area. The collected data from the individual seven sub-tests were entered into SAS software using ANOVA tests. Results were then analyzed to see if there were any interactions within or between groups. These data were then compared against prior MMPALT research studies.

2. Do identifiable patterns of perceptual modalities exist within and between Latino, Black, and Caucasian adult learners?

3. Is there a difference in learning style modalities between male and female Latino, Black, and Caucasian who have some college exposure?

4. Are the gender differences consistent across race/ethnicity?

   Questions 2, 3, and 4 were answered by using a factorial ANOVA to identify differences between the race/ethnicity groups. Once data were inputted into SAS, they were reviewed to determine if there are any interactions within or between the various groups. These data were then compared against prior MMPALT research studies. A
Tukey multi-comparison procedure test was used in order to determine which pair-wise comparisons were significant.

**Variables**

The dependent variable was the scores from the MMPALT instrument. The independent variables were race/ethnicity and gender. Race/ethnicity consisted of Latino, Black, and Caucasian. Gender was documented as male or female. An analysis of variance (ANOVA) was performed to determine if race/ethnicity and gender varied by the MMPALT IV modalities.

This research study was conducted using proper data collection techniques. All test subjects were properly vetted through the use of the approved demographic questionnaire. Once all data were collected, appropriate statistical techniques were used to analyze the data. These data were analyzed against each identified research question to determine if there was any significance to the results of the questions being investigated. Although, there has been research conducted using previous versions of the MMAPLT, there was little to no research conducted that examined the variables of gender and race/ethnicity using the current version MMPALT IV. This study attempted to determine if there was any relationship between these variables and to what extent.
Chapter 4

Findings

The purpose of this study was to compare the individual learning modalities of Latino, Black, and Caucasian males and females with at least some college exposure utilizing the MMPALT IV. In order to determine whether the perceptual modality strengths differed between race/ethnicity and gender, four research questions were investigated and this chapter displays a summary of the statistics from each of the seven sub-tests. The parts of this chapter include participant demographics, profiles of participants MMPALT IV scores, and observations.

Participant Demographics

Information regarding age, gender, and education level was obtained from the demographic form. No identifiable participant information was obtained. All participants were provided with a waiver of informed consent (Appendix C).

This study compared three groups of male and female adults over the age of 40 years who were distributed as Latino, Black, and Caucasian. There were a total of 61 participants who were distributed as 10 Latino males, 10 Latino females, 10 Black males, 10 Black females, 11 Caucasian males, and 10 Caucasian females. Only 60 participants were used in the data analysis due to one Caucasian male not being able to complete the test in its entirety. All participants were English-speaking. There were 33 (54.1%) participants who were between the ages of 40 and 45 years. There were 23
(37.7%) participants who were between the ages of 46 and 50 years. Five participants (8.2%) were aged 51 years and above. A total of three participants (4.9%) had some college exposure, but did not complete the degree. Fifty-two participants (85.2%) had Bachelor’s Degrees and six participants (9.9%) had Masters Degrees. See Table 3 for the demographic characteristics of the participants.

Table 3

Participant Demographic Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30</td>
<td>51</td>
</tr>
<tr>
<td>Female</td>
<td>30</td>
<td>49</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td>20</td>
<td>32.7</td>
</tr>
<tr>
<td>Caucasian</td>
<td>20</td>
<td>34.6</td>
</tr>
<tr>
<td>Black</td>
<td>20</td>
<td>32.7</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-45</td>
<td>33</td>
<td>54.1</td>
</tr>
<tr>
<td>46-50</td>
<td>23</td>
<td>37.7</td>
</tr>
<tr>
<td>51+</td>
<td>4</td>
<td>8.2</td>
</tr>
<tr>
<td>Education Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some college/no degree</td>
<td>3</td>
<td>4.9</td>
</tr>
<tr>
<td>Bachelors Degree</td>
<td>51</td>
<td>85.2</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>6</td>
<td>9.9</td>
</tr>
</tbody>
</table>

$N = 60$
Profiles of Participant MMPALT IV Scores

The results of the data are divided by the seven respective perceptual modalities: Visual, Print, Aural, Interactive, Haptic, Kinesthetic, and Olfactory. Mean differences were analyzed separately by both gender and race/ethnicity. See Table 4 for the overall profiles of the participant MMPALT IV scores.

Table 4

Perceptual Modality Mean Sub-test Scores and Standard Deviations for All Participants

<table>
<thead>
<tr>
<th>Sub-test</th>
<th>Mean</th>
<th>95% CI</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>7.39</td>
<td>6.94</td>
<td>7.90</td>
</tr>
<tr>
<td>Print</td>
<td>6.29</td>
<td>5.72</td>
<td>6.82</td>
</tr>
<tr>
<td>Aural</td>
<td>5.23</td>
<td>4.81</td>
<td>5.76</td>
</tr>
<tr>
<td>Interactive</td>
<td>6.23</td>
<td>5.63</td>
<td>6.74</td>
</tr>
<tr>
<td>Haptic</td>
<td>5.89</td>
<td>5.40</td>
<td>6.52</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>1.54</td>
<td>1.18</td>
<td>1.83</td>
</tr>
<tr>
<td>Olfactory</td>
<td>.77</td>
<td>.56</td>
<td>.97</td>
</tr>
</tbody>
</table>

N = 60
Note. CI = 95%

Visual had an overall mean of 7.39 and an overall standard deviation of 1.92. Print was similar with an overall mean of 6.29 and an overall standard deviation of 2.02. Aural had an overall mean of 5.23 and an overall standard deviation of 1.77. Interactive had an overall mean of 6.23 and an overall standard deviation of 2.15 which was very
close to Haptic, which had an overall mean of 5.89 and an identical overall standard deviation of 2.15. Kinesthetic had an overall mean of 1.54 and an overall standard deviation of 1.11. Olfactory stood out with an overall mean of .77 and an overall standard deviation of .79. The preliminary analysis of data consisted of the descriptive statistics of each of the MMPALT IV sub-tests.

The sub-test results for Visual for all genders are depicted in Table 5 below.

### Table 5

**Visual Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity**

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Latino</td>
<td>7.41</td>
<td>.78</td>
<td>7.60</td>
</tr>
<tr>
<td>Black</td>
<td>7.40</td>
<td>2.12</td>
<td>7.30</td>
</tr>
<tr>
<td>Caucasian</td>
<td>7.90</td>
<td>1.79</td>
<td>6.82</td>
</tr>
<tr>
<td>Total</td>
<td>7.57</td>
<td></td>
<td>7.24</td>
</tr>
</tbody>
</table>

$N = 60$

The sub-group female Latino (FL) had a mean of 7.41 and a standard deviation of .78 for Visual. Similarly, the sub-group female Black (FB) had a mean of 7.40 and a standard deviation of 2.12. The sub-group female Caucasian (FC) had a mean of 7.90 and a standard deviation of 1.79. The sub-group of male Latino (ML) had a mean of 7.60 and the lowest standard deviation of 1.07 for all sub-groups.
The sub-group of male Black (MB) had a mean of 7.30 and the highest standard deviation of 2.63 of all sub-groups. The sub-group male Caucasian (MC) had a mean of 6.82 and a standard deviation of 2.14. The total mean for the race/ethnicity, Latino was 7.50 while the total for Blacks was 7.35 and Caucasians was 7.36. The total mean for females was 7.57 and 7.24 for males. The Visual perceptual modality ranked first with an overall mean of 7.40 for all participants.

Appropriate statistical testing was utilized to determine the comparison of the individual learning modalities of Latino, Black, and Caucasian males and females with some college exposure utilizing the MMPALT IV. ANOVA tests (2 x 3) were used for each of the seven sub-tests to determine if there were interactions between gender and race/ethnicity. Follow-up Tukey Studentized Range tests were then applied to the data. These descriptive statistics provided the researcher with the appropriate data to examine each research question.

The data for each modality were separated into categories of gender, race/ethnicity, gender by race/ethnicity, error, and corrected total. For Visual, there were no significant main effects for gender, race/ethnicity, or the interaction of gender and race/ethnicity. The p values were .52, .96, and .56 respectively.

The total df was five for each sub-test with an error of 55 and a corrected total of 60. The df was broken down to df of 1 for gender, df of 2 for race, and a df of 2 for gender by race. The F values varied as expected between the various sub-tests. For Visual, the F values were .42, .04, .59 respectively. Table 6 displays the ANOVA results for the Visual perceptual modality.
Table 6

ANOVA Summary Table for the Visual Perceptual Modality

<table>
<thead>
<tr>
<th>Modality</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>1.63</td>
<td>1.63</td>
<td>.42</td>
<td>.52</td>
</tr>
<tr>
<td>Race</td>
<td>2</td>
<td>.28</td>
<td>.14</td>
<td>.04</td>
<td>.96</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>2</td>
<td>4.63</td>
<td>2.31</td>
<td>.59</td>
<td>.56</td>
</tr>
<tr>
<td>Error</td>
<td>55</td>
<td>215.84</td>
<td>3.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>60</td>
<td>222.56</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 60 *p < .05

The scores for the perceptual modality, Print are outlined in Table 7.

Table 7

Print Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female</th>
<th></th>
<th>Male</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gender</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td></td>
<td>5.40</td>
<td>1.65</td>
<td></td>
<td>6.00</td>
</tr>
<tr>
<td>Black</td>
<td>Female</td>
<td>6.10</td>
<td>1.85</td>
<td></td>
<td>6.00</td>
</tr>
<tr>
<td>Caucasian</td>
<td>Female</td>
<td>6.50</td>
<td>2.27</td>
<td></td>
<td>7.64</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>6.00</td>
<td>6.55</td>
<td></td>
<td>6.27</td>
</tr>
</tbody>
</table>

N = 60

Latino females had the lowest overall means of any of the sub-groups with a score of 5.40 and a standard deviation of 1.65. Black females had an overall mean of
6.0 and a standard deviation of 1.85. The highest overall means for females was seen in the race/ethnicity, Caucasian, with a score of 6.50 and a standard deviation of 2.27.

Latino males had a mean of 6.00 and a standard deviation of 2.05. The Black males scored similarly with a mean of 6.00 and a standard deviation of 2.67. However, the Caucasian male sub-group scored the highest with a mean of 7.64 and a standard deviation of 1.63. The overall mean for females was 6.00, while the males had a mean of 6.55. Latinos had the lowest overall means for the Visual perceptual modality with a score of 5.70. The overall mean for Blacks was 6.00, however, the highest score from the race/ethnicity was a mean of 7.07 for Caucasian. The overall mean for Print was 6.27 which ranked second out of the seven perceptual modalities.

Table 8 displays the ANOVA results for the Print perceptual modality sub-test.

Table 8
ANOVA Summary Table for the Print Perceptual Modality

<table>
<thead>
<tr>
<th>Modality</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>4.53</td>
<td>4.53</td>
<td>1.08</td>
<td>.30</td>
</tr>
<tr>
<td>Race</td>
<td>2</td>
<td>20.80</td>
<td>10.40</td>
<td>2.48</td>
<td>.09</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>2</td>
<td>3.92</td>
<td>1.96</td>
<td>.47</td>
<td>.62</td>
</tr>
<tr>
<td>Error</td>
<td>55</td>
<td>230.35</td>
<td>4.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>60</td>
<td>260.69</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( N = 60 \quad *p < .05 \)

As with Visual, there were no significant differences for the main effects. For Print, there were no significant interactions for gender, race/ethnicity, or the interaction
of gender and race/ethnicity. The \( p \) values were .30, .09, and .62 respectively. The \( F \) values were 1.08, 2.48, and .47.

Table 9 depicts the results for the Aural perceptual modality for both male and females.

Table 9

*Aural Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity*

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Latino</td>
<td>4.50</td>
<td>1.27</td>
<td>5.60</td>
</tr>
<tr>
<td>Black</td>
<td>6.10</td>
<td>2.23</td>
<td>5.30</td>
</tr>
<tr>
<td>Caucasian</td>
<td>4.50</td>
<td>1.96</td>
<td>5.36</td>
</tr>
<tr>
<td>Total</td>
<td>5.03</td>
<td>5.42</td>
<td>5.23</td>
</tr>
</tbody>
</table>

\( N = 60 \)

Latino and Caucasian females produced the lowest scores with a mean of 4.50. Latino females had a standard deviation of 1.27 while Caucasian females had a standard deviation of 1.96. Black females produced the highest score for females in this sub-group with a mean of 6.10 and a standard deviation of 2.23.

The male Latinos had a mean of 5.60 and a standard deviation of 1.90. The Black males had the lowest score in this sub-group with a mean of 5.30 and a standard deviation of 1.77. Caucasian males were the second lowest with a mean of 5.36 and a standard deviation of 1.50. The females were lower than the males with an overall
mean of 5.03, while the males had an overall mean of 5.42. The Latino race/ethnicity had an overall mean of 5.05 while the Black race/ethnicity had the highest overall mean with a score of 5.70. The Caucasians had the lowest overall mean with a score of 4.93. The Aural sub-group had an overall mean of 5.23 which was the fifth highest of any of the perceptual modalities.

The Aural sub-test results showed no significant differences for the main effect. The $p$ values were .40, .35, and .20. $F$ values were .71, 1.08, and 1.67. Table 10 outlines the ANOVA results for the Aural sub-test. For Aural, there were no significant interactions for gender, race/ethnicity, or the interaction of gender and race/ethnicity.

Table 10

<table>
<thead>
<tr>
<th>Modality</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aural</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>2.29</td>
<td>2.20</td>
<td>.71</td>
<td>.40</td>
</tr>
<tr>
<td>Race</td>
<td>2</td>
<td>6.92</td>
<td>3.46</td>
<td>1.08</td>
<td>.35</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>2</td>
<td>10.77</td>
<td>5.39</td>
<td>1.67</td>
<td>.20</td>
</tr>
<tr>
<td>Error</td>
<td>55</td>
<td>176.95</td>
<td>3.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>60</td>
<td>196.79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$N = 60 * p < .05$

The Interactive perceptual modality produced results that were the third highest of any of the seven modalities with an overall mean of 6.23. The females scored higher than males in this modality with an overall mean of 6.30. The males had an overall mean of 6.17. Table 11 outlines the results of this sub-group.
Table 11

Interactive Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Gender</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td>Total</td>
<td>5.60</td>
<td>6.40</td>
<td>6.00</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2.12</td>
<td>2.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>Total</td>
<td>6.10</td>
<td>6.20</td>
<td>6.15</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2.38</td>
<td>1.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>Total</td>
<td>7.20</td>
<td>5.91</td>
<td>6.56</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2.35</td>
<td>1.92</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N = 60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Latino females had a mean of 5.60 and a standard deviation of 2.12. Black females had a mean of 6.10 and a standard deviation of 2.38. The highest scoring race/ethnicity for this sub-group came from the Caucasian females with a mean of 7.20 and a standard deviation of 2.35.

For the males, Latino males had the highest scores with a mean of 6.40 and a standard deviation 2.17. The Black males had a mean of 6.20 and a standard deviation 1.93. Unlike the Caucasian females, the Caucasian males were the lowest scoring with a mean of 5.91 and a standard deviation of 1.92. The overall mean for Latinos was 6.00, which was the lowest of all three race/ethnicities. The overall mean for Blacks was 6.15, while the over mean for Caucasians was 6.56.

Table 12 displays the ANOVA results for the Interactive perceptual modality sub-test. As with all the previous modalities, there were no significant main effects for this
sub-test. For Interactive, there were no significant interactions for gender, race/ethnicity, or the interaction of gender and race/ethnicity. The $p$ values were .81, .69, and .29 respectively. The $F$ values were .06, .37, and 1.26.

Table 12

ANOVA Summary Table for the Interactive Perceptual Modality

<table>
<thead>
<tr>
<th>Modality</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>.26</td>
<td>.26</td>
<td>.06</td>
<td>.81</td>
</tr>
<tr>
<td>Race</td>
<td>2</td>
<td>3.38</td>
<td>1.69</td>
<td>.37</td>
<td>.69</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>2</td>
<td>11.64</td>
<td>5.82</td>
<td>1.26</td>
<td>.29</td>
</tr>
<tr>
<td>Error</td>
<td>55</td>
<td>235.81</td>
<td>4.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>60</td>
<td>268.79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$N = 60 \ *p < .05$

The Haptic modality ranked fourth out of the seven perceptual modalities. Females and males were similar in results, with females being slightly higher with an overall mean of 5.93.

Latino females had a mean of 6.30 and a standard deviation of 1.70. Black females scoring the lowest had a mean of 5.70 and a standard deviation of 1.95. Caucasian females had the highest scores with a mean of 5.80 and a standard deviation of 2.39.

Latino males had a mean of 5.60 and a standard deviation of 2.22. The highest scores came from Black males with a mean of 7.00 and a standard deviation of 2.31, while the lowest scores came from Caucasian males with a mean of 5.00 and a
standard deviation of 2.32. The Haptic results are outlined in Table 13 and produced an overall mean of 5.89.

Table 13

*Haptic Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity*

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ $SD$</td>
<td>$M$ $SD$</td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td>6.30 1.70</td>
<td>5.60 2.22</td>
<td>5.95</td>
</tr>
<tr>
<td>Black</td>
<td>5.70 1.95</td>
<td>7.00 2.31</td>
<td>6.35</td>
</tr>
<tr>
<td>Caucasian</td>
<td>5.80 2.39</td>
<td>5.00 2.32</td>
<td>5.40</td>
</tr>
<tr>
<td>Total</td>
<td>5.93</td>
<td>5.87</td>
<td>5.89</td>
</tr>
</tbody>
</table>

*N = 60*

Overall, Latinos had a mean of 5.95, while Blacks had a mean of 6.35 and Caucasians had a mean of 5.40, respectively. For Haptic, there were no significant main effects for gender or race/ethnicity. Additionally, there was no significant interaction for gender and race/ethnicity. The $p$ values for the Latino race/ethnicity were .90, .38, and .23 and the $F$ values were .01, .99, and 1.51 respectively. Latinos were the only race/ethnicity out of the three groups that had a top score in the Haptic perceptual modality test. Table 14, of the findings, shows the ANOVA results for the Haptic perceptual modality test.
Table 14

ANOVA Summary Table for the Haptic Perceptual Modality

<table>
<thead>
<tr>
<th></th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haptic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>.07</td>
<td>.07</td>
<td>.01</td>
<td>.90</td>
</tr>
<tr>
<td>Race</td>
<td>2</td>
<td>9.33</td>
<td>4.67</td>
<td>.99</td>
<td>.38</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>2</td>
<td>14.16</td>
<td>7.08</td>
<td>1.51</td>
<td>.23</td>
</tr>
<tr>
<td>Error</td>
<td>55</td>
<td>258.20</td>
<td>4.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>60</td>
<td>282.20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 60 *p < .05

The Kinesthetic results, with an overall ranking of sixth and an overall mean of 1.54, are outlined in Table 15.

Table 15

Kinesthetic Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Latino</td>
<td>2.30</td>
<td>1.34</td>
<td>2.30</td>
</tr>
<tr>
<td>Black</td>
<td>.70</td>
<td>.67</td>
<td>1.70</td>
</tr>
<tr>
<td>Caucasian</td>
<td>1.30</td>
<td>.95</td>
<td>1.00</td>
</tr>
<tr>
<td>Total</td>
<td>1.43</td>
<td>1.67</td>
<td>1.54</td>
</tr>
</tbody>
</table>

N = 60
Males were stronger than females in this modality with an overall mean of 1.67. Females had an overall mean of 1.43. Latino females had a mean of 2.30 and a standard deviation of 1.34. They were the highest scoring sub-group of the female gender. Black females had a mean of .70 and a standard deviation of .67. Caucasian females had a mean of 1.30 and a standard deviation of .95. Latino males were the highest scoring of the males with a mean of 2.30 and a standard deviation of 1.16. Black males had a mean of 1.70 and a standard deviation of 1.25. Caucasian males were the lowest scoring of the males with a mean of 1.00 and a standard deviation of 1.26. Latinos overall ranked first with an overall mean of 2.30. Blacks had an overall mean of 1.20 with Caucasians falling slightly behind with an overall mean of 1.15.

Table 16 shows the ANOVA results for the Kinesthetic perceptual modality sub-test.

Table 16

ANOVA Summary Table for the Kinesthetic Perceptual Modality

<table>
<thead>
<tr>
<th>Modality</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1</td>
<td>.83</td>
<td>.83</td>
<td>.65</td>
<td>.42</td>
</tr>
<tr>
<td>Race</td>
<td>2</td>
<td>17.05</td>
<td>8.53</td>
<td>6.65</td>
<td>.001</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>2</td>
<td>4.70</td>
<td>2.35</td>
<td>1.83</td>
<td>.17</td>
</tr>
<tr>
<td>Error</td>
<td>55</td>
<td>70.50</td>
<td>1.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>60</td>
<td>93.15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*N = 60* *p < .05

The Kinesthetic sub-test showed there was no significant interaction for gender, which had a *p value of .42. There was also no interaction for gender by race/ethnicity,
which had a value of $p = 0.17$. However, there was a main effect for race/ethnicity which had a value of $p < 0.001$. This was the only significant interaction observed in the data. For Kinesthetic, the $F$ values were 0.65, 6.65, and 1.83 respectively.

The lowest ranking perceptual modality was Olfactory with an overall mean of 0.79. Latinos as a whole ranked the highest with a mean of 1.10. The overall mean included with a female mean 0.80 and a male mean of 0.75. Black females had a mean of 0.60 and a standard deviation of 0.70, while Black males had a mean of 0.60 and a standard deviation of 0.84. The Black race/ethnicity was the lowest scoring of all three race/ethnicities with a mean of 0.60. Caucasian females had a mean of 0.60 and a standard deviation of 0.84. Caucasian males scored a little higher than females with a mean of 0.64 and a standard deviation of 0.67. Table 17 below, outlines the results for the Olfactory sub-test.

Table 17

<p>| Olfactory Perceptual Modality Mean Sub-test Scores and Standard Deviations by Gender and Race/Ethnicity |
|-------------------------------------------------|-------------------------------------------------|-----------------|-----------------|-----------------|
| Race/Ethnicity | Female | Male | Total |</p>
<table>
<thead>
<tr>
<th>Gender</th>
<th>$M$</th>
<th>$SD$</th>
<th>$M$</th>
<th>$SD$</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latino</td>
<td>1.20</td>
<td>1.03</td>
<td>1.00</td>
<td>.67</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>.60</td>
<td>.70</td>
<td>.60</td>
<td>.84</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>.60</td>
<td>.84</td>
<td>.64</td>
<td>.67</td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.80</td>
<td>.75</td>
<td>.79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$N = 60$
The Olfactory sub-test showed no significant differences for the main and interaction effects. Table 18 shows the ANOVA results for the Olfactory perceptual modality sub-test.

Table 18

ANOVA Summary Table for the Olfactory Perceptual Modality

<table>
<thead>
<tr>
<th>Modality</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1</td>
<td>.05</td>
<td>.05</td>
<td>.07</td>
<td>.79</td>
</tr>
<tr>
<td>Race</td>
<td>2</td>
<td>3.24</td>
<td>1.62</td>
<td>2.52</td>
<td>.09</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>2</td>
<td>.16</td>
<td>.08</td>
<td>.13</td>
<td>.88</td>
</tr>
<tr>
<td>Error</td>
<td>55</td>
<td>35.35</td>
<td>.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>60</td>
<td>38.79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 60 *p < .05

For Olfactory, there were no significant interactions for gender, race/ethnicity, or the interaction of gender and race/ethnicity. The p values were .79, .09, and .88 respectively. For Olfactory, the F values were .07, 2.52, and .13 respectively.

A Tukey Studentized Range (HSD) post-hoc test was utilized for each perceptual modality. The modality, Kinesthetic, showed significance with an alpha of .05, error degrees of freedom of 55, and an error mean square of 1.28. This study provided data about male and female race/ethnicity in relation to their respective learning styles. The Tukey test for Kinesthetic showed pair-wise comparison significance between the race/ethnicity of Latinos and Blacks and Latinos and Caucasian. There was no significant difference between the race/ethnicities of Blacks and Caucasians.
Observations

This section describes information that was observed during administration of the MMPALT IV, not related to the collected data from the sub-tests. Various things observed during the gathering of the data related to the actual administration of the seven sub-tests. In one instance, a 60-year old White male was tested. When the Kinesthetic modality test introductory directions were being read aloud to the participant, he advised the test administrator that he had vertigo and could not participate in that sub-test. While he was able to participate in the six other sub-tests, it was decided that an additional White male would be tested to obtain the needed number of participants. His scores were not included in the final data analysis as he was not able to complete all sub-tests. There was no place on the demographic test form that asked the participant of potential medical conditions that might affect the administration of any of the sub-tests.

One participant, who said she had come from a social hour, created awareness over the possible need to request participants not to drink or wear perfume/cologne during the testing situation and to add this information to the pre-instructions section when seeking participants. The data collected in this situation were used in the study as she was able to properly complete each sub-test.

The sub-tests of Visual, Print, Aural, Haptic, and Interactive were administrated without any issues.

The sub-test Olfactory had serious issues with the identification of the smells containing mint. There were three similar mint aromas that were all too similar. The
smells of peppermint, wintergreen, and spearmint were so similar in nature that none of the study participants could distinguish between them.

During the preparation of administering the test, the test administrators practiced the administration of the test on four test subjects. These individuals were not included in the data results of the study and were only utilized for practice. When the participants were given the smell of lemon and orange, the oils had become so weak that they were replaced prior to the formal testing of participants. It was observed during the testing of the participants that they were able to identify these smells. The smell of cinnamon was also identified as a difficult aroma during the preparation phase of the study. The cinnamon oil was replaced with cinnamon sticks. During the test administration of the participants, they were able to identify the cinnamon aroma. Anise was another oil that was identified as a difficult smell and the oil was replaced prior to formal testing with a newly purchased anise oil.

Many difficulties were observed during the preparation phase of the Kinesthetic test. All four participants during the preparation phase had difficulty with the test. It was identified that the pre-test questionnaire did not ask the participants if they have any physical limitations that would limit them from completing the test.
Chapter 5

Summary, Conclusions, Implications, and Recommendations

The purpose of this study was to identify and compare the individual learning modalities of Latino, Black, and Caucasian males and females with at least some college exposure utilizing the MMPALT IV. This chapter discusses the summary of the study, conclusions, implications, and recommendations for instrument usage and future research.

Summary of the Study

Given the low level of research conducted on minority adults, especially Latinos and Blacks with some college exposure, concerning learning styles, it was necessary to gather data to properly document if a relationship existed. Four research questions were examined to determine if there was a significance difference between the various race/ethnicities and gender. The variables that were examined were race/ethnicity and gender. Using the MMPALT IV, 61 participants were tested to determine their dominant perceptual modality. The participants included 10 Latino males, 10 Latino females, 10 Black males, 10 Black females, 11 Caucasian males, and 10 Caucasian females. However, because one of the Caucasian males was unable to complete all seven sub-tests, data analysis used only 60 participants. Before testing commenced, participants were asked to complete a demographic form, which identified their education level and race/ethnicity. Testing was provided by a certified MMPALT IV administrator and the
collected data were analyzed through $t$ tests and ANOVA tests with the Tukey test used for follow-up test when significance was found.

The following research questions were developed in order to conduct this research:

1. What is the learning style modality pattern for the participants as measured by the MMPALT IV?

2. Do identifiable patterns of perceptual modalities exist within and between Latino, Black, and Caucasian adult learners?

3. Is there a difference in learning style modalities between males and females who have at least some college exposure?

4. Are the gender differences consistent across race/ethnicity?

Conclusions

The conclusions that accrued from this study are presented below.

As a group, the participants in this study were strongest in Visual and lowest in Olfactory; which was consistent with previous versions of the MMPALT.

The majority of Blacks and Caucasians scored highest on the Visual perceptual modality sub-test. Most Latinos, however, scored highest in Kinesthetic. The results for the race/ethnicity, Latinos, in the Kinesthetic sub-test were the most relevant finding of the study, and in keeping with Latinos being unique in other studies.

In regard to gender, males and females in this study performed similarly across all of the sub-tests. This was in keeping with previous research on the previous versions of the MMPALT. Regardless of race/ethnicity, performance by gender was similar.
The race/ethnicity of Black and Caucasian, regardless of gender, performed similarly across all modality sub-tests. Latinos, regardless of gender, performed higher than Blacks or Caucasians in the sub-tests.

Implications

Participants in this study spanned across three different race/ethnicities: Latino, Black, and Caucasian.

The results of this study could be used to help a variety of industries in the private or public sector by assisting the educator or trainer in designing curriculum that caters to the learning style of the audience.

Additional stakeholders that might benefit from the results of this study include, but are not limited to, higher education, corporate learning and development and human resource divisions, adult education facilitators, state agencies and licensing bureaus, and learners and students. If a training class is being conducted and the audience will have a predominantly Black race/ethnicity, the facilitator might have more success with the teaching method if it was geared to a more visual delivery.

Another key stakeholder that might benefit from the results of this study are marketers and sales staff. If marketers and sales staff were aware of the audience they were targeting ahead of time, presentations in the dominant modalities of the target population might be easier to comprehend.

Based on the results of this research, instructors may benefit from paying closer attention to kinesthetic activities for Latino students in a learning environment and not over relying on just traditional methods of teaching. Latinos, both male and female, favored the Kinesthetic perceptual modality. An example where this information might
be useful would be an auto factory in Latin America. Assembly-line environments are hands-on work function; therefore, training using the Kinesthetic modality might produce better results. A corporate trainer who delivered a Kinesthetic training module might have higher comprehension then if the training was delivered aurally or visually. Public and private educational facilities might benefit from the results of this study because certain demographical regions can have higher populations of one particular race/ethnicity.

Given that traditional teaching methods do not always consider the learners dominant learning modality, it may beneficial to simultaneously include other perceptual modalities in the learning exercises being planned by educators and/or trainers.

It is unclear if the study results would have any benefits to an older age group or people with no college education; however, with the ever changing technological landscape it might be beneficial to review the results of the study while preparing a learning or training module.

**Recommendations**

The recommendations for the study are discussed in two sections; recommendations for instrument usage and administration and recommendations for future research.

**Recommendations for instrument usage and administration.** During the preparation phase of the study, several areas were identified in the MMPALT IV that needed revision. Vetting requirements of participants may be necessary to help improve testing results. Asking participants if they smoke would help determine if the participant would be a validity risk to a future study. Before testing would begin it would
also be helpful to ask participants to not wear any perfumes, colognes, after shaves, body sprays, or any other fragrance that would distract from the Olfactory portion of the MMPALT. Asking participants if they had any learning or physical disabilities might be useful information as well as instructing them to not drink or use any substances that might detract from the results of any study.

The Aural sub-test audio track needs to be re-mastered with higher amplitude. It was discovered that there was no consideration for participants who had a hearing disability. Increasing the amplitude of the original recording may allow individuals with mild to moderate hearing loss to participate in a future research study.

The Kinesthetic test was difficult with the majority of participants. More warm up demonstrations should be included to prevent any unnecessary disorientation during the administration of the MMPALT IV. Designing a sit down version of the Kinesthetic test would allow participants who experience vertigo or other physical disabilities to participate.

The Olfactory test needed more differentiation between the mint family of scents. The MMPALT IV currently uses the scents of wintergreen, peppermint, and spearmint. These three scents were so similar in nature that study participants were unable to determine which was which. Conducting focus groups to determine which scents could be substituted may be beneficial for future research studies. Requiring a brief exposure to coffee beans between each set of Olfactory smells may also help improve the accuracy of the recall and may also isolate the Olfactory learning modality.
This study helped determine that future research is needed across other race/ethnicities, age populations, and people with learning and physical disabilities. Additional research could provide and compare these areas where deficits exist.

**Recommendations for further research.** This area covers recommendations for instrument usage and administration and recommendation for further research. Additional research might test Asian and Native American participants. In reviewing the prior MMPALT literature, it was discovered that little to no research existed on these race/ethnicities. Another population that could be explored would be adults with disabilities (learning and physical).

Prior MMPALT studies regardless of version, have explored adults of various race/ethnicities and third grade children. This study was exploratory and was necessary to validate the current revisions to the MMAPLT IV. Future research could include modifying some of the sub-tests for more variation between test items, including more warm-up exercises to reduce any possible disorientation, and adding other languages other than English. Based on the current research body for the MMPALT IV, research involving high school students and high school graduates with no college might provide important data regarding dominant learning style modalities. The Kinesthetic sub-test could be expanded to include sitting for people with trouble balancing and even alternative movements that involve body parts other than just the limbs for those that have amputations or deformities. Future research on the Latino race/ethnicity might be beneficial due to the Kinesthetic results of this study and previous MMPALT research.

Lastly, future studies might look at culture as well as race/ethnicity and if participant’s culture might play a role in their dominant learning style modality.
References


Appendices
Appendix A MMPALT II Sample Test

Coordinators

OUTLINE FOR MEASUREMENT PROCEDURES

INTRODUCTION

1. Explain the measurement (testing) procedures.

YOU ARE ABOUT TO BE MEASURED TO DETERMINE YOUR STRONGEST LEARNING
STYLE OR STYLES. SOMETIME AFTER THE MEASUREMENTS ARE COMPLETED, YOU WILL
RECEIVE A REPORT IDENTIFYING YOUR STRENGTHS AND WEAKNESSES AS A LEARNER.
THIS INFORMATION CAN HELP YOU IN FUTURE LEARNING SITUATIONS.

THE MEASUREMENTS WILL BE CONDUCTED AT FIVE DIFFERENT LOCATIONS.
THREE TESTS (PRINT, AURAL, VISUAL) WILL BE CONDUCTED HERE. AFTER
FINISHING HERE, YOU WILL BE SENT TO EACH OF FOUR OTHER STATIONS WHERE
(people, teachers, etc.) WILL HELP YOU TAKE THE TESTS.

BEFORE DOING ANYTHING FURTHER WE NEED TO DIVIDE YOU INTO GROUPS TO
MAKE IT EASIER TO DIRECT YOU TO TEST STATIONS. (Divide subjects into
groups of 4 or more as planned for in station organization).

IN EACH OF THE 7 TESTS, YOU WILL FIRST BE PRESENTED 10 PAIRS OF
THINGS: WORDS, PICTURES, AROMAS, OBJECTS, ETC. THE FIRST THING PRESENTED
TO YOU IN EACH PAIR IS CALLED THE STIMULUS, THE SECOND THE RESPONSE.
(Show demonstration pairs and point out stimulus member and response
member.) AFTER ALL 10 PAIRS HAVE BEEN PRESENTED TO YOU, THE EVALUATOR
WILL THEN PRESENT YOU ONLY THE STIMULUS MEMBER OF EACH PAIR IN A DIFFERENT
ORDER THAN YOU EXAMINED THEM ORIGINALLY. YOUR TASK WILL BE TO IDENTIFY
FROM MEMORY THE RESPONSE MEMBER WITH WHICH EACH STIMULUS MEMBER WAS
ORIGINALLY PAIRED. (Demonstrate this test procedure.)

REMEMBER, THERE IS NO PASSING OR FAILING ANY OF THE TESTS. WE ARE
SIMPLY TRYING TO FIND YOUR STRENGTHS AND WEAKNESSES SO YOU CAN BECOME
BETTER ABLE TO BUILD ON THE STRENGTHS AND IMPROVE IN WEAK AREAS.

SPECIFIC PROCEDURES FOR EACH TEST WILL BE GIVEN TO YOU BY THE
EVALUATOR AT EACH STATION.

DO YOU HAVE ANY QUESTIONS?
ADMINISTERING THE MMPI-III

I. Evaluators

The MMPI-III requires a minimum of five test administrators. These five administrators are deployed as indicated below:

Evaluator #1:  a) Introduces test and test procedures.
   b) Administers print, aural and visual group test.
      (At least two of the other evaluators assist in the
group testing.)
   c) Serves as coordinator for testing of individuals
      by evaluators 2, 3, 4, 5.

Evaluator #2:  Administers the interactive test.
Evaluator #3:  Administers the haptic test.
Evaluator #4:  Administers the kinesthetic test.
Evaluator #5:  Administers the olfactory test.

NOTE: Administration of the individual tests is smoothest when two (2)
evaluators are assigned to each individual station.

II. Stations

Five stations are required for testing. They should be quiet rooms or
areas free from noise and distraction. No two stations should be placed
in the same room. The five stations will be used as follows:

Station #1  a) Introduction to the testing procedures,
           b) Group test administration (print, aural, visual),
           c) Coordinating point for subjects.

Station #2:  Interactive test
Station #3:  Haptic test
Station #4:  Kinesthetic test
Station #5:  Olfactory test

Stations should be set up by the test administrators before test time in
accordance with directions for each test to insure a smooth test
procedure.
III. Organization of Subjects

A. As many as 40 subjects can be introduced to the testing process and administered the group tests (print, aural, visual) at one time in Station #1. However, it is preferable to have smaller groups.

B. After completing the introduction and group testing at Station #1, organize subjects into groups of four and schedule the groups to begin testing in individual test stations (2-3) at one hour intervals.

NOTE: If multiple sets of tests and evaluators are used in individual test stations, groups can be enlarged accordingly.

C. Administration of each test requires no more than 15 minutes. At 15 minute intervals, subjects swap stations until each person in a group of four has completed the four individual tests (interactive, haptic, kinesthetic, olfactory). Subjects need to be told at each station by the evaluator where to go next. A coordinator should be available to direct lost or misdirected subjects.

D. Each set of test materials contains explicit directions for organizing the test station and administering that particular test.
OUTLINE FOR INTRODUCING THE CONCEPT OF LEARNING STYLES

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

1. Develop the following points.
   - Each person in the world is different from all others.
   - One of the differences in each of us is how we learn.
   - Those differences might be in how we receive, process, store, 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
     - Olfactory
   - Each person should learn more about his/her own learning styles.
   - By using our best style we can learn better.
   - By knowing our weaknesses we can improve on them.

2. Allow and encourage subject questions and discussion.

3. Proceed to measurement procedures introduction.
ROLE OF THE COORDINATOR

1. Coordinate total testing process.
2. Introduce learning style concepts and test procedures.
3. Conduct print, aural and visual tests at Station #1.
4. Coordinate movement of subjects, groups and individuals from station to station.
5. Assist "lost" subjects.
6. Keep subjects moving from station to station. This may mean changing original schedule and traffic plan, if some evaluators consistently finish before others.
7. Minimize noise and distractions in testing area(s).
8. Collect response sheets from each station.
9. Coordinate preparation of reports on individual students.
10. Coordinate dissemination of test information.
STATION #1
INTRODUCTION AND GROUP TESTS
(PRINT, AURAL, VISUAL)

REQUIREMENTS:

PEOPLE: 2 trained evaluators

EQUIPMENT: 1 35 mm Kodak Carousel Slide projector
1 projection screen
1 audiotape cassette recorder

MMPIAT-II MATERIALS: Tray of slides (Print, Visual Tests)
Audio-cassette (Aural Test)
Demonstration materials: wooden block and baseball,
two vials, blindfold
Pencils
Response Sheets: Print, Aural, Visual

PROCEDURES:

A. INTRODUCTION: 1) Welcome subjects
2) Introduce concept of learning styles
3) Explain and demonstrate measurement procedures
4) Organize test groups (groups of 4)
5) Respond to Questions

B. PRINT TEST: 1) Be sure subjects can all see screen clearly
2) Distribute response sheets (face down) and pencils
3) Give directions and show sample pair
4) Display stimulus/response pairs at 7 second intervals
5) Instruct subjects to turn response sheets over and
   pick up pencils
6) 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..."
7) Collect response sheets
NOTE: Pairings and sequence of stimulus/response pairs should be as follows:
Sample: hez/sister

| 1 | biv/cat | 6 | cyc/horse |
| 2 | ceg/party | 7 | kay/rain |
| 3 | puq/name | 8 | wug/robin |
| 4 | dup/bed | 9 | lez/paper |
| 5 | xib/box | 10 | nyn/cuat |

Sequence for stimulus only display:

| 1 | dup |
| 2 | cyc |
| 3 | key |
| 4 | biv |
| 5 | xib |
| 6 | nyn |
| 7 | ceg |
| 8 | lez |
| 9 | puq |
| 10 | wug |

C. AURAL TEST: 1) Be sure subjects can all hear audiotape well.

2) Distribute response sheets face down.

3) Give directions for the test and demonstrate stimulus/response pair.

4) Play audiotape containing stimulus/response pairs.

5) Instruct subjects to turn response sheets over and prepare to respond.

6) Play audiotape containing stimulus member only (2nd section of audiotape).

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

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

Sequence for stimulus only presentation:

| 1 | poh |
| 2 | omp |
| 3 | jus |
| 4 | von |
| 5 | tud |
| 6 | mng |
| 7 | und |
| 8 | sul |
| 9 | kiv |
| 10 | roz |

D. VISUAL TEST: 1) Be sure subjects can all see the screen well.

2) Distribute response sheets (face down).

3) Give directions and show sample pair.
4) Display stimulus/response pairs at 2 second intervals.

5) Instruct subjects to turn response sheets over and prepare to respond.

6) Announce number of response and display each stimulus member for 10 seconds. (For example: "Number one (ten seconds), etc..."

7) Collect answer sheets and pencils.

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

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

Sequence for stimulus only display:

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

DISMISSAL: 1) Be sure subjects have their group assignments.

2) Direct subject groups to next location(s).
STATION #2
INTERACTIVE TEST

REQUIREMENTS:

PEOPLE: 1-2 trained evaluators

EQUIPMENT: This document and response sheets.

PROCEDURES:

1. Seat subject where he/she is at the same level and face to face with primary evaluator. If a secondary evaluator is used, he/she should sit on one side and prepare to score the responses. Scoring must be accomplished without distracting or prompting the subject.

2. Try to put the subject at ease, but do not waste too much time in pleasantries.

3. Assure subject that procedures are identical to those already encountered in the group tests and give him/her directions for the test:

EVALUATOR: 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 TO SUPPLY THE COMMON WORD WHICH WAS PAIRED WITH EACH. DO YOU UNDERSTAND THE PROCEDURE?

4. 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 as necessary until 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 subject to respond to question.)

(Do not comment on subject's reply.)

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

1) red/wind
2) fail/soot
3) ces/ball
4) hez/Christmas
5) sci/fire
6) pew/floor
7) chin/egg
8) jec/dog
9) toe/milk
10) zon/toy

5. 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.)

NOTE: Sequence for stimulus only presentation:

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

6. Primary or secondary evaluator completes scoring without reporting results to subject.

7. Be sure subject's correct name or number is on the score sheet.

8. Instruct subject to move to his/her next station or return to the coordinator for reassignment.
STATION #3
HAPTIC TEST

REQUIREMENTS:

PEOPLE: 1-2 trained evaluators

EQUIPMENT: Small desk or table
Box of 20 stimulus/response items
Blindfold
Response sheets

PROCEDURES:

1. Arrange items on table and cover before subject enters.
2. Seat subject across table from 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.
3. Try to put the subject at ease, but do not waste too much time on pleasantries.
4. Assure subject that procedures are the same as for all of the other tests and give him/her directions as follows:
   EVALUATOR: IN A MOMENT YOU WILL BE BLINDFOLDED. THEN 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 ONLY THE STIMULUS OR NONSENSE ITEMS AND ASK YOU TO IDENTIFY THE COMMON ITEM WHICH WAS PAIRED WITH EACH. DO YOU UNDERSTAND THE PROCEDURE?
5. Blindfold subject and uncover items on the table.
6. Place stimulus member of each pair in subject's left hand; then place corresponding response item in subject's right hand. Allow the subject 2 seconds to handle both objects, then take them from him/her and repeat the procedure with the next pair of items. Be sure subject can identify the common item. He/she will have to name it later.
7. After presenting all ten stimulus/response pairs, instruct the subject that the test is about to begin.
8. Place each stimulus member in the subject's left hand and ask him/her to identify the paired response item:
   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.)

9. Score is kept without reporting results to the subject.

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

1) carpet/light bulb
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 shaped wood/yoyo
9) plastic golf ball/padlock
10) door knob/drinking glass

Sequence for stimulus only presentation:

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

10. Be sure that subject's correct name or number is on response sheet.

11. Instruct subject to move to his/her next station or to return to coordinator for reassignment.
STATION #4
KINESMODIC TEST

REQUIREMENTS:

PEOPLE: 1-2 Trained evaluators

EQUIPMENT: This document
blindfold
response sheet

PROCEDURES:

1. Seat subject for a few minutes 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 the subject.

2. Try to put the subject at ease, but do not waste too much time on pleasantries.

3. Assure subject that procedures are the same as for all other tests and give him/her directions as follows:

   EVALUATOR: 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 TO KEEP YOU STEADY 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?

4. Blindfold the subject;

5. Move subject through the 10 stimulus/response pairs. As necessary, use the following spoken directions:

   THE FIRST MOVEMENT IS (STIMULUS). IT IS PAIRED WITH (RESPONSE)

   Start each movement by gently placing your hands on the subject's 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.

6. Move the subject through the various stimulus movements and allow 10 seconds for the subject to respond by performing or describing the paired movements. It may be necessary to say:

   THIS MOVEMENT IS (STIMULUS). WHAT WAS IT PAIRED WITH?
7. Score responses without reporting results to the subject.

8. Be sure that the subject’s correct name or number is on the response sheet.

9. Instruct subject to move to his/her next station or to return to coordinator for reassignment.

NOTE: Pairings and sequence pairs should be as follows:

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

Sequence for stimulus only presentation:

1) Stand on one leg
2) Get on hands and knees
3) With right arm, draw circle in air
4) Cross arms over head
5) Hands on hips
6) Move diagonally across room and return
7) Clasp hands above head then lower to sides
8) Left arm above head
9) Twist body in circle
10) Rotate left arm
STATION #5

Olfactory Test

Requirements:

People: 1-2 trained evaluators

Equipment: Small desk or table
Aroma vials or bottles (20)
Blindfold
Response sheets

Procedures:

1. Arrange aroma bottles on table and cover.

2. Seat subject across table from 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.

3. Try to put the subject at ease, but do not waste too much time on pleasantries.

4. Assure subject that procedures are the same as for all other tests and give him/her directions as follows:

   Evaluator: 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 not be identified. The second bottle contains a common aroma, and I will identify it for you. 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?

5. Blindfold the subject.

6. 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.

7. Present subject with 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 one of the abstract aromas; what was it paired with?
8. Score responses without reporting results to the subject.

9. Be sure subject’s correct name or number is on the response sheet.

10. Instruct subject to move to his/her next station or to return to coordinator for reassignment.

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

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

Sequence for stimulus only presentation:

1) Vanilla (#2)
2) Raspberry (#4)
3) Maple (#9)
4) Banana (#8)
5) Cherry (#1)
6) Almond (#3)
7) Pineapple (#5)
8) Rum (#7)
9) Brandy (#6)
10) Wintergreen (#10)
May 14, 2016

Dr. Waynne James  
Professor, Adult Education Program  
University of South Florida  
4202 E. Fowler Avenue  
Tampa, Florida  33620

Dear Dr. James,

The purpose of this letter is to authorize the use of the Multi-Modal Paired Associates Learning Test II procedures and scripts for research, data collection, and analysis by you and your doctoral students. The Institute for Learning Styles Research organization benefits from your efforts and looks forward to hearing about the results of any studies.

We appreciate your willingness to share your research. Please give me a call at (334) 844-3078 work if there are any questions or if additional information is needed.

Sincerely,

Maria Martinez Witte, Ed.D.  
President, Institute for Learning Styles Research
Appendix B IRB Approval Letter

September 23, 2016

Nicolle Hardy  
Teaching and Learning  
Tampa, FL 33612

RE: Exempt Certification
IRB#: Pro00027572
Title: Perceptual Learning Styles Modalities: Comparing Latino, Black, and Caucasian Adults

Dear Ms. Hardy:

On 9/23/2016, the Institutional Review Board (IRB) determined that your research meets criteria for exemption from the federal regulations as outlined by 45CFR46.101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, or reputation.

As the principal investigator for this study, it is your responsibility to ensure that this research is conducted as outlined in your application and consistent with the ethical principles outlined in the Belmont Report and with USF HRPP policies and procedures.

Please note, as per USF HRPP Policy, once the Exempt determination is made, the application is closed in ARC. Any proposed or anticipated changes to the study design that was previously declared exempt from IRB review must be submitted to the IRB as a new study prior to initiation of the change. However, administrative changes, including changes in research personnel, do not warrant an amendment or new application.

Given the determination of exemption, this application is being closed in ARC. This does not limit your ability to conduct your research project.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have
any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board
Appendix C MMPALT IV Research Demographic Questionnaire

MMPALT IV Research Demographic Questionnaire

Please provide the requested information for each question by either checking the appropriate box corresponding to your response or writing in your answer where requested. If clarification for any question is needed, please ask test administrator.

1. Date of Birth______________________

2. Indicate your gender? Male_____ Female____ Other____

3. Indicate your race/ethnicity:
   - Black/African American___
   - Latino/Hispanic___
   - White/Caucasian___
   - American Indian/Native American___
   - Asian___
   - Other (please specify)_______________________________________

4. What is your mother’s race/ethnicity?
   - Black/African American___
   - Latino/Hispanic___
   - White/Caucasian___
   - American Indian/Native American___
   - Asian___
   - Other (please specify)_______________________________________

5. What is your father’s race/ethnicity?
   - Black / African American___
   - Latino / Hispanic___
   - White / Caucasian___
   - American Indian / Native American___
   - Asian___
   - Other (please specify)_______________________________________
6. What was your highest grade or level of education you completed?

7. Have you completed any college course work? Yes___ No___
Informed Consent to Participate in Research

Information to Consider Before Taking Part in this Research Study

Pro # 00027572

Researchers at the University of South Florida (USF) study many topics. To do this, we need the help of people who agree to take part in a research study. This form tells you about this research study. We are asking you to take part in a research study that is called: **Perceptual Learning Styles Modalities: Comparing Latino, Black, and Caucasian Adults**. The person who is in charge of this research study is Nicolle C Hardy. This person is called the Principal Investigator.

**Purpose of the Study**

The purpose of this study is to:

- Explore the relationship with learning styles and race/ethnicity.
- This study is being conducted to help determine the dominant learning style perceptual modality amongst adult learners.

**Why are you being asked to take part?**

We are asking you to take part in this research study because you are one of the three race/ethnicities being examined who has completed some college and are over the age of 40.

**Study Procedures**

If you take part in this study, you will be asked to:

- Complete the MMPALT IV test
  - This will take 70 to 90 minutes of your time to complete and will be administered by a certified MMPALT test administrator. The
administrator will be Nicolle C Hardy or Campbell Hardy. The test will test 7 learning style modalities using paired objects. Test answers are recorded by pencil by the test administrator. No portion of the test is videotaped or recorded by any type of a recording device.
  o The test will be administered at the USF Tampa campus.
  o The time the test will be administered will be at a time that is convenient for you.

  - The collection of data will take place during the 2016 fall semester.

Alternatives / Voluntary Participation / Withdrawal

You do not have to participate in this research study.

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study. Decision to participate or not to participate will not affect your student status or course grade.

Benefits and Risks

You will receive no benefit(s) by participating in this research study.

This research is considered to be minimal risk.

Compensation

We will not pay you for the time you volunteer while being in this study.

Privacy and Confidentiality

We will keep your study records private and confidential. Certain people may need to see your study records. By law, anyone who looks at your records must keep them completely confidential. The only people who will be allowed to see these records are:

  - The research team, including the Principal Investigator, study coordinator, research nurses, and all other research staff
  - Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.
• The USF Institutional Review Board (IRB) and its related staff who have oversight responsibilities for this study, staff in the USF Office of Research and Innovation, USF Division of Research Integrity and Compliance, and other USF offices who oversee this research.

Contact Information

If you have any questions about your rights as a research participant, please contact the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu. If you have questions regarding the research, please contact the Principal Investigator Nicolle C Hardy at 813-362-9900.

We may publish what we learn from this study. If we do, we will not let anyone know your name. We will not publish anything else that would let people know who you are. You can print a copy of this consent form for your records.

I freely give my consent to take part in this study. I understand that by proceeding with this survey that I am agreeing to take part in research and I am 18 years of age or older.
Appendix E MMPALT Sample Answer Form
About the Author

Nicolle Hardy spent over twenty years in the insurance industry adjusting insurance claims and after years of training adjusters she decided to make adult education a full time career. Securing a Master's and Doctoral degree in Curriculum and Instruction with an emphasis in Adult Education, she now looks to the future where learning and development can be her full time passion. Nicolle enjoys a life with her husband Campbell, and her special soul puppy, ChrisMiss aka The Tree. After a small break recovering from the demands of graduate school at the University of South Florida, Nicolle looks forward to once again enjoying the hobbies of running, writing, yoga, and plant based cooking. Being a melanoma survivor it is only fitting she chooses to end the about the author segment of her dissertation reminding everyone to wear hats, sunscreen, and get yearly checkups with your doctor.