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Perceptual Learning Styles Modalities Utilizing the Multimodal Paired Associates Learning Test: An Analysis of Latinos Born in Central and South America

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Perceptual Learning Styles Modalities Utilizing the Multimodal Paired Associates Learning Test: An Analysis of Latinos Born in Central and South America

by

Matias Ramirez

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
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Dedication

To my two amazing children, Martin and Sofia, my wife Theresa, and my mother and father, Marbeth and Mario.
Acknowledgments

There were so many people who helped me along the way to completing this journey that it is difficult to remember them all.

Completing this journey would not have been possible without the support of my loving wife, Theresa Ramirez and my children Martin and Sofia. Who else can say they had sat through PhD level lectures before they started high school. Additionally, my parents Marbeth and Mario encouraged me throughout this process. I can truly say I would not be here today without them. Friends and family who have helped me get here include my brother Tony, my mother-in-law Ledwina, Trevor, Dulce, Nicolle, and Campbell.

The journey started with Dr. William Young when I first called him to discuss the Adult Education MA program. He and I had such a good conversation that I stayed on for a PhD. Next would be my very first professor in the Adult Education program, Dr. Rosemary Closson. I still recall and use materials I developed in my Adult Learning class to this day. Dr. Jeffrey Kromrey somehow made statistics enjoyable. Also, I should thank all the other great staff and professors in USF’s College of Education who helped me realize this goal.

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Table of Contents

List of Tables ........................................................................................................ iii
List of Figures ........................................................................................................ v
Abstract ................................................................................................................ vi

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

Chapter 2 Review of Related Literature ............................................................... 11
  Adult Learning .................................................................................................... 11
  Human Resources Development ....................................................................... 12
  Learning Styles ................................................................................................ 14
  Cognitive .......................................................................................................... 16
  Affective .......................................................................................................... 18
  Perceptual ........................................................................................................ 19
  MMPALT .......................................................................................................... 19
  Validity and Reliability of MMPALT ............................................................... 21
  Previous Research Addressing Demographic Differences ......................... 23
  Critique of Learning Styles Research ............................................................ 24
  Summary .......................................................................................................... 25

Chapter 3 Methods ............................................................................................... 27
  Research Questions .......................................................................................... 27
  Population and Sample ..................................................................................... 27
  Instrumentation ................................................................................................ 29
  Multi-Modal Paired Associates Learning Test .................................................. 30
    Group Administered Test ................................................................................ 31
  Demographic Form ........................................................................................... 33
  Data Collection Procedures ............................................................................ 33
List of Tables

Table 1  Comparison of Cronbach’s Alpha with Previous MMPALT Studies...22
Table 2  Perceptual Modality Overall Mean Subtest Scores for all Participants Utilizing Previous Versions of the MMPALT ........................................23
Table 3  Perceptual Modality Overall Mean Subtest Scores and Standard Deviation for all Participants .........................................................39
Table 4  Print Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity ........................................40
Table 5  ANOVA Summary Table for the Print Modality ..................41
Table 6  Aural Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity .................................42
Table 7  ANOVA Summary Table for the Aural Modality ..................43
Table 8  Interactive Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity .................................43
Table 9  ANOVA Summary Table for the Interactive Modality .............44
Table 10 Visual Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity .................................45
Table 11 ANOVA Summary Table for the Visual Modality ..................46
Table 12 Haptic Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity .................................47
Table 13 ANOVA Summary Table for the Haptic Modality .................48
Table 14 Kinesthetic Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity .................................48
Table 15 ANOVA Summary Table for the Kinesthetic Modality .............49
Table 16  Olfactory Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity .................................................50

Table 17  ANOVA Summary Table for the Olfactory Modality.............................51
List of Figures

Figure 1  Visual Subtest Examples.................................................................32
Abstract

Businesses and Human Resources professionals face the ongoing challenge of continuously upskilling and developing employees. Changes to processes or procedures, changes in technology, changes in job functions, and updates or changes to compliance laws or regulations are all reasons that employees must attend and complete employer-developed training. This study utilized the updated Multimodal Paired Associates Learning Test, version four (MMPALT-IV) instrument to determine perceptual learning styles and to determine if there exists a measureable difference in Latinos perceptual learning styles.

The purpose of this study was to measure the perceptual learning styles of Latino adults from Central and South America utilizing the MMPALT-IV. The study compared Latinos born in either Central or South American to Caucasians born in the United States. The variables that were examined included gender, age, place of birth, and education level.

A convenience sample of 40 adults living in the Tampa Bay area was used. Of that population, 20 individuals (10 females, 10 males) born in either Central or South America were participants of the study; each completing the seven subtests for the MMPALT-IV. Additionally, 20 Caucasian individuals (10 females, 10 males) born in the United States participated in the study as a comparison group and completed the same seven subtests for the MMPALT-IV.
The results of this study indicate that there were no differences in preferred perceptual modalities based on race/ethnicity and gender, with the exception of the Kinesthetic where Latinos performed significantly higher than Caucasians. The implications for this study are broad ranging and can be applied to the corporate learning environment or any place adults spend time learning new knowledge, skills, or abilities.
Chapter 1
Introduction

In an ever changing business landscape, employees today are regarded as human capital. In filling business critical roles, organizations expect to cover the expenses of job-posting sites, hiring recruiters and potentially paying to flights and hotel stays for potential candidates for job interviews. With all these costs, many organizations can spend “between 100% and 300% of the replaced employee’s salary” (Harvard Business Review, 2015, p. 2). With so much at stake, retaining employees once they are hired has become a critical business function.

Onboarding, “the process of integrating new hires into a company’s workplace environment” (Laurano, 2010, p. 1), is the first opportunity an organization’s Human Resources Development (HRD) team has an opportunity to have an impact on a new hire. According to K. Kippen, Chief Learning Officer for Hilton Worldwide, “HRD plays a vital part in maintaining and retaining a human capital workforce” (personal communication, May 20, 2016).

During the onboarding process, many HRD professionals find that it is critical to understand how best to support ongoing growth and development for employees. To aid HRD professionals, many have turned to learning styles and personality instruments, such as Myers-Briggs Type Indicator, DiSC which stands for Dominance (D), Influence (I), Steadiness (S), and Conscientiousness (C) (Wiley, 2013, p. 4), and
Emergenetics (Browning, 2006), frequently used by Hilton, to assist them in developing employees and maintaining their work force.

In an attempt to assist HRD professionals, the Multimodal Paired Associates Learning Test (MMPALT) was developed to identify how to guide individuals to learn best through their perceptual or physiological senses. Knowledge of their preferred modalities can help guide both learners and HRD professions to determine which learning modality might be effective prior to developing new content (K. Kippen, personal communication, May 20, 2016).

But with unemployment rates in the U.S. at 4.9% for 2016 (Bureau of Labor Statistics Website, paragraph on Labor Force statistics from the current population survey), the U.S. has had to look beyond its borders to fill critical shortage needs.

In the 20 years since the North American Free Trade Agreement (NAFTA) was signed between Mexico, Canada, and the United States, market growth has climbed to a “$19 trillion regional market with some 470 million consumers” (Hills, 2014, p. 1).

Subsequent Free Trade Agreements (FTA) signed by the United States with Chili and Colombia, the development of the Trade Promotion Agreements (TPA) with both Panama and Peru, and the signing of the Central America Free Trade Agreement (CAFTA-DR) with Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and the Dominican Republic have opened up Central and South America to U.S. investors (Arbelez & Ruiz, 2012). The result has been that corporations and institutions in all sectors, from banking to agriculture, have taken advantage of relaxed tariffs. Additionally, Latin American countries have made it a priority to identify strategies to attract foreign direct investment (Arbelez & Ruiz, 2012).
This opening of borders and increase in trade has caused:

a shift of manufacturing away from what were once low-cost countries toward newer low-cost countries (reshoring) or closer to customer/consumer markets (nearshoring or homeshoring), where labor is readily available, the transportation infrastructure is well established, and the geopolitical environment is conducive to this change. (Tate, Ellram, Schoenherr, & Petersen, 2014, p. 2)

D. M. Vivas del Cueto, Vice-President and Head of Bilingual Instructional Design at Citibank, notes that “as globalization changes the landscape of business, an increasing number of companies and organizations will look to supplement their workforce with skilled employees who speak the native language of the country in which the corporation conducts business” (personal communication, May 30, 2016). Many employees hired specifically for their Spanish-speaking ability come from a variety of Central and South American countries. As D. M. Vivas del Cueto stated, “these transplanted employees often struggle in western-centric corporate-based human resource training and development environments where common delivery modalities are generally either instructor-led or web-based training” (personal communication, May 30, 2016).

Acknowledgement among HRD professionals, differences in learning styles has been long accepted as far back as 1983 when Gardner outlined his theory of multiple intelligences in his book, *Frames of Mind: The Theory of Multiple Intelligences* (1983). Issues arise when dealing with the practicality of designing content for large heterogeneous audiences with large differences in education, cultural, or social economic background. Often HRD professionals must rely on blanketed, shot-gun approaches to instructional design (ATD, 2015). By trying to find a single point or middle ground, this approach becomes even more challenging with the inclusion of a
global audience of learners. Translation into multiple languages can be challenging and costly depending on the expertise of the translator, translations may or may not be entirely accurate, (D. M. Vivas del Cueto, personal communication, May 30, 2016).

Utilizing data from the 2010 U.S. Census, it was noted that of the 308.7 million people residing in the United States, 16% (50.5 million people) identified themselves as Latino (Ennis, Vargas, & Albert, 2011). With a growing Latino population, U.S. businesses and industries will see an increase in employees from Central and South America. HRD professionals will need to be able to accommodate learners who may not closely match the learning preferences of employees born and raised in the United States. Moreover, as HRD professionals begin to see an influx of Central Americans and South Americans in their organizations, they will be faced with determining the best approach for training these individuals. Opportunities will arise when the HRD professional has to determine which learning modality will work best with these learners.

Currently, “most learning-styles taxonomies are ‘type’ theories: That is, they classify people into supposedly distinct groups, rather than assigning people graded scores on different dimensions” (Pashler, McDaniel, Rohrer, & Bjork, 2008, pp. 105-119). A frequently used tool by HRD professionals, the “Myers-Briggs Type Indicator (Myers, McCaulley, Quenk, & Hammer, 1998) model continues to be the most widely used personality model in management counseling” (Bergner, Davda, Culpin, & Rybnicek, 2016, p. 336). MBTI and other tools are used as resources by both the HRD professional and the employee. There may even be a drive or desire to understand learning type as it relates not only to how individuals prefer to acquire information but also in how one prefers to interact with others.
Large corporations like Hallmark have incorporated the Myers-Briggs instrument into their people management strategy (Overbo, 2010, p. 71), while American Express, IBM, Purdue, and AT&T all have used Herrmann Brain Dominance Instrument (HBDI) in their management training programs (Herrmann International, paragraph on partial client list). In fact it seems that there is an appeal to using such instruments and the success implementation in corporate learning programs of Myers–Briggs, HBDI, and DiSC have promoted the development of type-based learning style assessments in order to find simple solutions to identifying learner preferences.

Most of these instruments that type individuals, do not measure types or preferences in perceptual modalities. In understanding this limitation, the MMPALT is the only instrument used to measure in mode perceptual preferences for adults as “most learning styles have been investigated primarily from cognitive and affective aspects” (Galbraith & James, 1987, p. 27).

**Statement of the Problem**

There have been few studies conducted on Latinos to determine whether a perceptual-based preference exists. As a result, the consideration for ethnicity has rarely been explored by the researchers who have utilized older versions of the MMPALT with a few exceptions (Reno, 1997; Williams, 2000). The MMPALT IV has, thus far, not been used to compare these groups.

**Purpose of the Study**

Businesses and HR professionals face the ongoing challenge of continuously upskilling and developing employees. Changes to processes or procedures, changes in technology, changes in job functions, and updates or changes to compliance laws or
regulations are all reasons that employees must attend and complete employer-developed training. This study utilized the updated MMPALT-IV instrument to determine perceptual learning styles and determined if there exists a measureable difference in Latinos perceptual learning styles.

The purpose of this study was to measure the perceptual learning styles of Latino adults from Central and South America utilizing the MMPALT-IV. The study compared Latinos born in either Central or South American to Caucasians born in the United States. The variables that were examined included gender, age, place of birth, and education level.

**Research Questions**

The following questions were used to gather data for the purpose of this study:

1. What is the perceptual learning modalities profile of Latino learners and Caucasian learners?
2. What are the differences between the perceptual learning modalities of Latino learners and Caucasian learners?
3. Are there differences in perceptual learning modalities based on gender?

**Significance of the Study**

A growing Latino population in the United States is changing the workplace environment (Holvino, 2008) and “speaking English well is important to success in the U.S. labor market and to full participation in American society” (Carliner, 2000, p. 158). “Immigrants who speak little or no English have greater difficulty finding jobs, especially well paid jobs outside immigrant enclaves” (Carliner, 2000, p. 158) while U.S.-born Latinos tend to speak both Spanish and English. Language and cultural fluency among
newly arrived immigrants can be lacking. By understanding that there is a difference in how learners intake and process information, and by acknowledging that differences exist, HRD professionals can capitalize on greater efficiencies in the corporate classroom experience.

HRD professionals designing corporate training program content generally build materials suited to one, possibly two learning types. Content is generally built utilizing Microsoft PowerPoint when materials can be delivered in a live course setting. In virtual classrooms, the delivery can be varied, but will generally be laid out in the same format as PowerPoint, with each slide building on contextual information. Due to the limitations of the delivery method, content is built as text, graphics, and images. Data, in the form of graphs and charts, are used as visual stimulation.

According to K. Kippen, “HRD professionals focus on delivering content that is focused on job issues or tasks and do not take learning styles into consideration” (personal communication, May 20, 2016); therefore, considerations of learning styles can be a critical missing component in designing effective corporate learning solutions. Identification of learner preferences for both the learner and the HRD professional can promote learning effectiveness and learner retention. The MMPALT IV is an effective and efficient way to determine a learner’s modality preference.

“Each learner has preferred ways of perception, organization, and retention that are distinctive and consistent” (James & Maher, 2004, p. 123). Tapping into those preferred ways of perception is the outcome of the MMPALT-IV.

Previous MMPALT research studied has studied some ethnic groups. Reno (1997) examined the perceptual learning styles of 80 participants: 40 of whom were
native Spanish speakers and 40 of whom were native English speakers. She found that the Interactive modality was strongest among the Spanish-speaking population of the study while Visual was strongest for the English speakers.

Williams (2000) compared the learning styles modalities of 90 females: 30 African American, 30 Hispanic American, and 30 European American. She found that the Visual modality of perception was highest for African American women while the Interactive modality was highest for the Hispanic Americans and European Americans.

Both Williams and Reno used the MMPALT-III version. Since the release of the MMPALT-IV in 2013, little research has been conducted on learner preference using the variables of gender and ethnicity.

**Limitations of the Study**

For the purpose of this study, participants were required to self-identify as being native to a Central or South American county or being Caucasian. No reporting or verification was solicited to confirm the birth origins of participants in order to protect their privacy. Additional limitations arose from the sampling of the study. Limitations are listed below:

1. For the purpose of this study, Latinos from Central or South America were tested. The results cannot be generalized to any other ethnicities.

2. Participation in this study was on a voluntary basis and by invitation only.

**Delimitations of the Study**

The participants of this study were gathered in the Tampa Bay area in Florida and were convenient for the purpose of this study. Additionally, education level was controlled and all participants selected completed some college (completion of two or more years of college).
Definitions of Terms

The following operational term and definitions are used in this study. These definitions are provided in order to establish clarification.

**Adult**: Any individual over 18 – 45 years of age. This age was chosen to conform to previous studies relating age and perceptual modality and to restrict the age range based on previous research findings (W. James, personal communications, December 5, 2016).

**Corporate training programs**: Those training programs designed by the organizations to impart the requisite skills and competencies required to do the job (Singh, 2016).

**Human Resource Development (HRD)**: A broad array of activities undertaken in organizations intended to foster learning and to improve the performance of employees (Whitby, 2000).

**HRD Professional**: an educator working within an organization (Whitby, 2000).

**HRD Trainer**: An HRD professional who engages in program planning; this additional planning role distinguishes the trainer from the more limited traditional trainer's role (Whitby, 2000).

**Latino**: A person of Latino birth from Central or South America whose first language was Spanish or Portuguese. Synonymous with Hispanic.

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

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

**Perceptual Modality**: "The manner in which an individual extracts information from the environment through the senses" (James & Blank, 1991, p. 20). The seven perceptual elements discussed below were identified by French (1975). Competence in each element was assessed by one of the seven MMPALT IV subtests.

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 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: Completion and passing of at least two years of course credit at an accredited collegiate institution.

**Organization of the Study**

Chapter 1 outlined the format of the study as well as defined the problem, purpose, research questions, significance of the study, limitations, delimitations, definition of terms, and organization of the study. In Chapter 2, literature regarding adult learning, human resource development, learning styles, MMPALT, previous research addressing demographic difference, and a critique of learning styles research. Chapter 3 presents the methods that are used in the study, the research questions, the population and sample, instrumentation, data collection procedures, analysis of the data, and summary. Chapter 4 discusses the participant demographics, participant MMPALT IV scores, and observations. Chapter 5 includes the summary, conclusions, implications, and recommendations of the research.
Chapter 2
Review of Related Literature

The purpose of this study was to measure the perceptual learning styles of Latino adults from Central and South America utilizing the MMPALT-IV. The study compared Latinos born in either Central or South American to Caucasians born in the United States. The review of literature examines several research studies and documentation related to the study of adult learning, HRD, learning styles as well as the development of the MMPALT-IV, previous research addressing demographic differences, critique of learning styles research, and a summary.

Adult Learning

In 1980 Knowles redefined his adult learning model to account for the differences in the way children and adults learn. Adults, he pointed out, “see themselves increasingly as producers or doers” (Knowles, 1980, p. 45). As the direction of learning shifts from teacher-centric to learning-centric as individuals enter adulthood, expressed preferences for learning changes with adult needs and interests (Knowles, 1980).

Adult learners are a varied and unique population with different needs, wants, and desires. By grouping all adult learners into a few learning preferences and motivators, teachers or learning facilitators are unable to take into account diverse learning methods.

Acknowledgement that differences exist among adult learners, from motivation to learning preferences, provides context for how new information can and should be
presented to adults. It could be stated that learning is framed within the context of how “race, class, gender, power and oppression. . . shape the context in the first place and subsequently the learning that occurs” (Merriam, 2001, p. 96).

In essence, “people’s experiences differ and so do their brains” (Hill, 2001, p. 79). The uniqueness and diversity of adult individuals add the element of various and diverse learning styles. As Galbraith (1991) noted, “another dimension to understanding the diversity of the adult learner is to recognize the various learning styles that each individual brings to the educational encounter” (p. 19). These differences provide the foundation for the development and implementation of instruments designed to assist learners with understanding their learning styles or preferences.

**Human Resources Development**

At the junction of Adult Education, learning and development, and business functions resides the concept of HRD. Knowles was one of the first to describe this convergence and the process of HRD as somebody “decides in advance what knowledge or skill needs to be transmitted, arranges this body of content into logical units, selects the most efficient means for transmitting this content. . . and then develops a plan for presenting these content units in some sort of sequence” (Knowles, 1974, p. 116). Elias and Merriam (2005) described the role of HRD as a type of organizationally based Adult Education program where “employees are ‘trained’ to enhance their on-the-job performance” (p. 101).

More recently, Werner and Simone (2006) defined HRD as a “set of systematic and planned activities designed by an organization to provide its members with the
opportunities to learn necessary skills to meet current and future job demands” (p. 5).

To narrow down the scope of the HRD professional, their influence can be found in four areas of focus: “education to enter or re-enter the workforce, improving workplace performance, responding to changes that affect workforce effectiveness, and life transitions related to workforce participation” (Jacobs, 2006, p. 24). Adult Education therefore moves from the classroom and into the boardroom when businesses begin to plan strategically when, what, and how to focus on the developmental learning requirements of its workforce.

The HRD function in many organizations is the responsibility of an HRD manager. This person is often responsible for integrating the HRD function and programs with the “goals and strategies of the organization” (Werner & DiSimone, 2006, p. 18). As job functionalities change due to rapidly changing technologies, “the immediate and urgent issue facing most firms is bridging the multidimensional skills gap” (Rubin, 2013, p. 10). HRD professionals are faced with the fact that “many employees enter the workforce and are missing major skills they need, including technical skills, communication skills, and writing skills” (Shank, 2016, p. 5). This combination of an unskilled workforce and rapidly changing technology has proven to be a challenge for workforce skills content development. The challenge HRD professionals face is to bridge the skills or knowledge gap in order to move employees from unskilled to skilled employees.

The skills gap or the “difference between the skill requirements of available jobs and the skills possessed by job applicants” (Werner & DiSimone, 2006, p. 326) is the result of three factors:
(1) the skill level achieved by many high school and college graduates; (2) the growing number of racial minorities and non-English-speaking immigrants in the labor market (many of whom are concentrated in the worst-performing schools and school systems in the country); and (3) the increased sophistication of jobs due to increased reliance on information technology. (Werner & DiSimone, 2006, p. 326)

Defining the gap in learner knowledge and skills, therefore, is critical to the successful implementation of a learning program. Skill gaps, it could be stated, “represent the primary determining factor for firm-level training, and their misidentification is likely to lower competitiveness” (McGuinness & Ortiz, 2016, p. 275).

Boud described the discipline of workplace learning as the “site of intersecting interests, contested ideas, multiple forms of writing and rapidly evolving practice” (Boud, 1998, p. 11). Within the corporate HRD function, training and development teams focus on “changing or improving the knowledge, skills, and attitudes of individuals” Werner & DeSimone, 2006, p. 11).

Learning Styles

What is often noted as a fundamental issue of understanding learning styles is that “the terms learning style and cognitive style are, on some occasions, used interchangeably” (Cassidy, 2004, p. 420). The lack of clarity on definition combined with the fact that “there are over 80 models today that are used to ascertain learning styles” (Gilbert & Swainer, 2008, p. 32) can cause confusion. What can be agreed on is that learning is defined “as the acquisition of different types of knowledge through the assimilation of data via the five senses” (Cegielski, Hazen, & Rainer, 2011, p. 136).

As early as 1921, Jung described categories for different types of learner inputs, “two functions for perceiving—sensing and intuition—and two for making judgement—thinking and feeling” (Keefe & Ferrell, 1990, p. 57). In the 1950s, Bloom and his
associates developed and identified three domains of learning: cognitive, affective, and psychomotor. A general understanding is that learning takes place in different ways for learners and that learning and processing new knowledge, information, or skills is complex and dependent on expansion of intellectual skills.

Kolb first proposed differentiated learning styles in his book, *Experiential Learning* (1984) and focused on four modalities: concrete experience, abstract conceptualization, reflective observation, and active experimentation. In refining this theory, Eichmann, Kolb, and Kolb (2002) suggested, “integrated learning is a process involving a creative tension among the four learning modes that is responsive to contextual demands” (p. 4).

To further clarify the many facets of learning styles, James and Galbraith (1985) noted several learner modalities including: perceptual, cognitive, emotional, and environmental modalities. James and Blank (1993) moreover provided focus on the three major dimensions which are cognitive (information processing), affective (personality), and physiological (perceptual).

Indeed, as Kolb (1984) pointed out “to learn is not the special province of a single specialized realm of human functioning such as cognition or perception” (p. 43). Furthermore, James and Blank (1993) note that learning style is a broad term that includes cognitive, affective, and physiological dimensions.

Learning styles theory based on the work of Kolb (1984), Gilley and French (1976), Honey and Mumford (2006) to name a few have resulted in a variety of instruments. The challenge with such variety is understanding and determining which factors are measured and how each measure is defined in relationship to the results.
Though there is no single unifying theory of learning styles, what can generally be agreed upon is that there are three dimensions to learning styles: information processing [cognitive], affective, and physiological (James & Blank, 1993). Moreover, these learning styles components naturally evolved from earlier research precursors that included: personality theory, information processing, and aptitude treatment.

For the purpose of this paper, the following modalities were reviewed: cognitive, affective, and perceptual.

**Cognitive.** The concept of cognitive learning styles is that it relates to “information-processing habits representing the learner’s typical mode of perceiving, thinking, problem solving, and remembering” (James & Maher, 2004, p. 123). Keefe (1987) noted a difference between cognitive styles and intellectual abilities. Keefe described cognitive styles as a learner’s preferred way of “perception, organization, and retention that are distinctive and consistent” while noting that abilities are measures of “specific innate capacities and are value directional” (p. 7).

Instruments developed to measure cognitive styles were identified by James and Maher (2004). They include:

- *Gregorc Style Delineator*, (4th ed.). (Gregorc, 1999). Based on psychologically-formulated matrix of 40 descriptive words designed to identify and quantify 4 style characteristics. Can be purchased online at: http://gregorc.com/instrume.html


- *Herrmann Brain Dominance Instrument*. (1980). Evaluates and identifies the degree of preference one has for four thinking preferences. Instrument can be completed (fee required) at: http://www.herrmannsolutions.com/assessment/
• **Hemispheric Mode Indicator.** (McCarthy, 1986). Identifies four cognitive styles; applies the results in classroom through the 4Mat Curriculum system. Instrument can be completed (fee required) at: [http://4mat4business.com/index.php](http://4mat4business.com/index.php)

• **Learning Combination Inventory.** (Johnston & Dainton, 1996). Self-reporting; self-scoring; identifies the strength of four interactive learning patterns. Instrument can be completed (fee required) at: [http://www.letmelearn.org/](http://www.letmelearn.org/)

• **Learning Style Inventory 3.** (Kolb, 2005). Identifies four learning styles dimensions based on the experiential learning model. Instrument can be ordered (fee required) at: [http://www.haygroup.com/leadershipandtalentondemand/index.aspx](http://www.haygroup.com/leadershipandtalentondemand/index.aspx)

• **Sternberg-Wagner Thinking Styles Inventory.** (Sternberg, 1997). Identifies four forms of thinking based on a governmental model. Instrument and manual can be downloaded at: [http://www.csus.edu/indiv/j/jelinekd/edte%20226/inventories/msgthinkingstylesinventorymanual_19911.pdf](http://www.csus.edu/indiv/j/jelinekd/edte%20226/inventories/msgthinkingstylesinventorymanual_19911.pdf)

Kolb (1984) describes learning as a process and states that “ideas are not fixed and immutable elements of thought, but are formed and re-formed through experience” (p. 20). With the release of the Learning Style Inventory (LSI) in 1976, the LSI measures an individual’s preference for four unique models (Mainemelis, Boyatzis, & Kolb, 2002).

Gardner (1983) surmised that individuals may well learn best by learning in a style that takes advantage of their learning strengths in one of eight areas of Multiple-Intelligence (MI): linguistics, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, and naturalist-ecological. For those critics of multiple-intelligence theory, Gardner offered the explanation that MI “requires an interdisciplinary perspective, cultural sensitivity, and an interactionist-dynamic research methodology” (Gardner & Moran, 2006, p. 228).
Gregorc (1979) observed a duality in learning: that individuals will both learn through a concrete experience and through abstractions. In developing the Gregorc Style Delineator, Gregorc identified four cognitive learning patterns. Finally, Herrmann noted that the preferred modality for learning and knowing “is the one we are most likely to use when faced with the need to solve a problem or select a learning experience” (Herrmann, 1998, p. 17).

**Affective.** The definition of affective styles of learning provided by James and Maher (2004) is that they “encompass aspects of personality that are related to motivation, emotion” and valuing (p. 123). Vermunt (1996) described affective learning as activities that are “directed at coping with the feelings that arise during learning” (p. 26).

Several instruments have been identified by James and Maher (2004). They are:

- **Index of Learning Styles (ILS).** (Felder & Soloman, 2001.) Identifies four dimensions of personality preference. Available online at: http://www.engr.ncsu.edu/learningstyles/ilsweb.html

- **Learning Style Inventory.** (Silver, Hanson, & Strong, 1995.) Based on Jung’s model; identifies teaching/learning categories. Instrument can be completed (fee required) at: http://www.thoughtfulclassroom.com/index.php?act=assessment


Perhaps the best known affective learning styles instrument, the original Myers-Briggs Type Indicator (MBTI) was developed by Katherine Briggs and Isabel Briggs Myers. In developing the MBTI, the aim for Briggs and Myers “was to make the insights of type theory accessible to individuals and groups” (Myers, McCaulley, Quenk, & Hammer, 1998) based on the work of Jung.

**Perceptual.** The definition of perceptual style of learning “relates to the means through which information is extracted from the environment by the senses” (James & Galbraith, 1985, p. 20). Rani (2015) described students’ perceptual skills as being a primary factor in producing more effective response stimuli while learning.

Instruments identified by James and Blank are (1993):


Barbe and Milone (1981) pointed out the differences between modality strength and modality preferences. They noted that modalities strengths are not the same as modality preferences. Modality strengths, they reported, are “assessed through a task of some kind” while modality preferences are usually measured “by self-reports” (p. 378).

**MMPALT**

French (1975) developed a framework within which learners could intake and process information through the senses, which would eventually lead to the components
of the MMPALT. Within this framework, he identified seven perceptual learning styles and defined them with the following characteristics:

<table>
<thead>
<tr>
<th>Style</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print-Oriented</td>
<td>Dependency on reading and writing</td>
</tr>
<tr>
<td>Aural</td>
<td>A listener; doesn't say much</td>
</tr>
<tr>
<td>Oral (Interactive)</td>
<td>A talker; learns through discussion</td>
</tr>
<tr>
<td>Visual</td>
<td>Must have many visual stimuli and visual representations</td>
</tr>
<tr>
<td>Tactile [Haptic]</td>
<td>Has to touch everything and everyone</td>
</tr>
<tr>
<td>Motor [Kinesthethic]</td>
<td>Has to move about while learning anything</td>
</tr>
<tr>
<td>Olfactory</td>
<td>Learns through taste and smell.</td>
</tr>
</tbody>
</table>

In 1976 Gilley and French presented their paper, *Personal Learning Styles: Exploring the Individual's Sensory Input Processes* to the American Education Research Association, based on Gilley’s 1975 dissertation research. In it, they theorized and supported their belief that learners have six sensory input modes that could be tested. They were: visual, aural, haptic, interactive, print, and kinesthetic (1976). Gilley and French were able to develop the original MMPALT and felt this was an appropriate instrument to utilize as it had “wide acceptance and utilization [based on] the paired associates technique in the study of verbal learning” and it could be applied “to other modes of communication research” (Gilley & French, 1976, p. 4).

James and Maher (2004) noted that for adults, perceptual learning style instruments like the MMPALT can “help individuals understand what is needed to be effective learners and how to strategize when conditions are not ideal” (p. 137).
Learning styles, therefore, provide a starting point for self-reflection and better understanding of the mechanics of how individuals learn.

Cherry (1981) revised Gilley’s MMPALT version by adding the olfactory subtest and changing the number of items. This lead to the development, first of the MMPALT-R then MMPALT III and finally MMPALT IV. Over time, as students at Oklahoma State University (OSU) under W. James (personal communication, October 10, 2016) and students under R. French at the University of Tennessee used the MMPALT-R to collect data for their dissertations, some of the individual items were changed. For example, if a particular item was not available, a somewhat similar item replaced it. Through conversation with the professors and students utilizing the MMPALT-R, it became obvious that, in order for comparisons to be made across the various iterations of the content of the MMPALT-R, a unifying (or standardization) of the versions was necessary.

The recognition of these differences lead to a meeting at the University of Tennessee (UT) in Knoxville between interested individuals from UT, OSU, and USF. Based on that meeting the Institute for Learning Style Research (ILSR) was created (1996) (W. James, personal communication, October 10, 2016).

**Validity and reliability of MMPALT.** The validity and reliability of the Multi-Modal Paired Associates Learning Test III has been the subject of several studies and dissertations. James and Blank (1993) compiled the research on the MMPALT III and performed a thorough evaluation of the results.

In their article assessing a variety of instruments, James and Blank (1993) wrote that validity is a measurement that “encompasses the appropriateness, meaningfulness,
and usefulness of inferences made from test scores” (p. 49). Reliability, according to James and Blank, determines “whether the results of an instrument remain the same over time and can be measured in several alternative formats” (p. 50). Their research has shown that the MMPALT III is moderately rated for validity, two on a scale of one to three where one is low and three is high.

Research conducted by Roberts (1999), Reno (1997), and Witte (1998) show reliability of the MMPALT III using Cronbach’s Alpha. See Table 1 for the reliability values from the three studies.

Table 1

Comparison of Cronbach’s Alpha with Previous MMPALT III Studies

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Roberts $\alpha$</th>
<th>Reno $\alpha$</th>
<th>Witte $\alpha$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N = 72$</td>
<td>$N = 80$</td>
<td>$N = 80$</td>
</tr>
<tr>
<td>Print</td>
<td>.74</td>
<td>.74</td>
<td>.77</td>
</tr>
<tr>
<td>Aural</td>
<td>.79</td>
<td>.76</td>
<td>.67</td>
</tr>
<tr>
<td>Interactive</td>
<td>.76</td>
<td>.80</td>
<td>.71</td>
</tr>
<tr>
<td>Visual</td>
<td>.73</td>
<td>.79</td>
<td>.73</td>
</tr>
<tr>
<td>Haptic</td>
<td>.80</td>
<td>.77</td>
<td>.70</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>.65</td>
<td>.54</td>
<td>.64</td>
</tr>
<tr>
<td>Olfactory</td>
<td>.78</td>
<td>.39</td>
<td>.55</td>
</tr>
</tbody>
</table>

Table 2

Perceptual Modality Overall Mean Subtest Scores for All Participants Utilizing Previous Versions of the MMPALT

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Smith 1996&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Rank</th>
<th>Reno 1997&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Rank</th>
<th>Williams 2000&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Rank</th>
<th>D'Urso# 2001&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Rank</th>
<th>Hardy 2017&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>1.75</td>
<td>6</td>
<td>3.70</td>
<td>5</td>
<td>4.48</td>
<td>5</td>
<td>3.69</td>
<td>4</td>
<td>6.29</td>
<td>2</td>
</tr>
<tr>
<td>Aural</td>
<td>4.67</td>
<td>3</td>
<td>3.96</td>
<td>4</td>
<td>5.41</td>
<td>4</td>
<td>4.48</td>
<td>2</td>
<td>5.23</td>
<td>5</td>
</tr>
<tr>
<td>Interactive</td>
<td>5.40</td>
<td>1</td>
<td>4.73</td>
<td>2</td>
<td>7.21</td>
<td>1</td>
<td>3.72</td>
<td>3</td>
<td>6.23</td>
<td>3</td>
</tr>
<tr>
<td>Visual</td>
<td>4.92</td>
<td>2</td>
<td>4.68</td>
<td>3</td>
<td>6.89</td>
<td>2</td>
<td>6.08</td>
<td>1</td>
<td>7.39</td>
<td>1</td>
</tr>
<tr>
<td>Haptic</td>
<td>3.67</td>
<td>5</td>
<td>4.99</td>
<td>1</td>
<td>6.14</td>
<td>3</td>
<td></td>
<td></td>
<td>5.89</td>
<td>4</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>3.73</td>
<td>4</td>
<td>3.04</td>
<td>6</td>
<td>2.87</td>
<td>6</td>
<td></td>
<td></td>
<td>1.54</td>
<td>6</td>
</tr>
<tr>
<td>Olfactory</td>
<td>0.80</td>
<td>7</td>
<td>1.70</td>
<td>7</td>
<td>0.72</td>
<td>7</td>
<td></td>
<td></td>
<td>0.77</td>
<td>7</td>
</tr>
</tbody>
</table>

*Note.*  
<sup>a</sup> = MMPALT II;  
<sup>b</sup> = MMPALT III;  
<sup>c</sup> = MMAPLT IV.  
#Kuranda-D’Urso

Consistencies in scoring were observed in Kinesthetic and Olfactory generally being the lowest mean scored tests with the exception of Smith. Smith’s research focused on prisoners who scored below the seventh grade level on the Test of Adult Basic Education (TABE) and is the only study in this table to use the MMPALT II.

**Previous Research Addressing Demographic Differences**

Much of the research conducted with previous versions of the MMPALT has focused on age (Nix, 1983; Brown, 1984; Russell, 1984; Rice, 1984; Endres, 2000) or gender (Nix, 1983; Rice, 1984; Russell, 1984). While age and gender have been examined in previous research, little research has been conducted with a focus on ethnicity (Reno, 1997; Williams, 2000).
Reno (1997) utilized 80 subjects ranging from 18 to 70 years in age. Of the 80 subjects, 40 reported speaking English as their native language and 40 reported speaking Spanish as their native language. Using Pearson’s Product Moment Correlation procedures, Reno found that English speakers achieved higher scores on kinesthetic, visual, and print subtests while Spanish speakers outperformed English speakers on the olfactory subtest.

Williams (2000) utilized data from 90 female subjects between the ages of 20 and 55. Of the 90 subjects, Williams (2000) identified three race/ethnic subgroups. 30 subjects identified themselves as African American, 30 subjects identified themselves as European American, and 30 subjects identified themselves as Hispanic. Results of testing found similarities across all three race/ethnic groups on the visual and interactive subtests.

**Critique of Learning Styles Research**

While ample research and support for existence of and validity and reliability for perceptual learning preferences has been outlined here, critics such as Rohrer and Pashler (2012) and Bergsteiner, Avery, and Neumann (2010) often overlook the legitimacy of various learning styles instruments in favor of the practical usage of learning styles research in a classroom setting. These authors point to weaknesses in the various instruments used, or the validity or reliability of studies using those instruments.

For additional criticisms, Santo (2006) points out the lack of standard definition of learning styles, then quotes Grasha’s definition as a “simply an individual’s preferred way of learning” (Santo, 2006, p. 73). Santo continues by stating that “proponents of
learning styles claim that they influence a student’s ability to participate successfully in an online course” (p. 74), but offers no support to back that claim.

Cassidy (2004) also highlights the misperception and confusion associated with the terms learning style, cognitive style, and learning strategy. He further points out the lack of clarity on whether a learning style is stable over a given period of time or whether a learning style can change with a given experience.

Coffield, Moseley, Hall, and Ecclestone (2004) identified 71 models of learning styles. The lack of agreement on basic terms, and the vast number of models can add to the disagreement and uncertainty of the efficacy of learning styles research. But what is being described in this research report is not the best modality in which to facilitate classroom learning, nor how best to design learning content to match a learning style. What is being suggested by this research is that an individual equipped with a certain score on a subtests, may take advantage of that knowledge of a preferred perceptual modality should the opportunity present itself.

**Summary**

This literature review examined research related to adult learning, HRD, learning styles, (cognitive, affective, and perceptual), the history and development of the MMPALT, the validity and reliability of the MMPALT, and a critique of learning styles research.

As discussed, the subject of learning styles is full of misperceptions. Lack of clarity on basic definitions, standards for when and where learning styles should be considered in instructional design, and lack of clarity on what it means for facilitators of adult learning has added to the confusion. This study focused on one instrument, with
demonstrated and proven validity and reliability, and focused on an underrepresented demographic in the related literature.
Chapter 3

Methods

The purpose of this study was to measure the perceptual learning styles of Latino adults from Central and South America utilizing the MMPALT-IV. The study compared Latinos born in either Central or South American to Caucasians born in the United States. The content of this chapter covers the study’s research questions, population and sample, instrumentation, data collection procedures, data analysis, and a summary.

Research Questions

The following questions were developed for the purpose of this study:

1. What is the perceptual learning modalities profile of Latino learners and Caucasian learners?

2. What are the differences between the perceptual learning modalities of Latino learners and Caucasian learners?

3. Are there differences in perceptual learning modalities based on gender?

Population and Sample

Both the Latinos and Caucasians selected to participate in this study resided in Florida; specifically from the Tampa Bay area. With the recent total of the U.S. population at 16% and growing, the Latino (identified as Hispanic by the Census Bureau) population grew by 2.2% between July 2014 and 2015 (Ennis, Vargas, & Albert, 2011).
Participants of this study had a variety of professional and personal backgrounds; however, all participants had completed at least two years of course work at the college or university level. James and Blank (1991) noted “significant differences between subtest means of the educational levels with Tukey’s Studentized Range Test for multiple comparisons” (p. 17). Based on their findings, the obvious differences for almost all subtests in relation to education level were between participants who had not completed high school or participants who had only completed high school and the participants who had completed some college or higher levels of education.

All participants were required to have a basic understanding of English in order to complete the subtests. In addition, native language spoken was not considered as multiple languages are spoken throughout Central and South America.

Participants self-selected as Latino were born in a Central or South American country. Participants self-selected as Caucasian were born in the United States. Sample size was estimated to be a minimum of 20 Latinos and 20 Caucasians in this study with power analysis being employed to correctly determine the sample size.

For the purpose of this study, the sample was defined by gender, age, place of birth, and education level. Social-economic status was not gathered nor was race. Additionally, as this was a sample of convenience, only adults were used in the sample of this study.

For the purposes of this study, an adult was defined as an individual over the age of 18. No individual younger than 18 years of age was tested. Participants must have completed at least two years of college or university course work. Primary language could be Spanish, but the basic understanding of English was required in
order to complete the MMPALT-IV subtests. Finally, the University of Texas, Latin American Network Information Center (2015) has defined the following countries as Central and South American. Participants in this study had to identify themselves as being born in one of the following countries:

<table>
<thead>
<tr>
<th>Central America</th>
<th>South America</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belize</td>
<td>Argentina</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>Bolivia</td>
</tr>
<tr>
<td>El Salvador</td>
<td>Brazil</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Chile</td>
</tr>
<tr>
<td>Honduras</td>
<td>Colombia</td>
</tr>
<tr>
<td>Mexico</td>
<td>Ecuador</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>French Guiana</td>
</tr>
<tr>
<td>Panama</td>
<td>Guyana</td>
</tr>
<tr>
<td></td>
<td>Paraguay</td>
</tr>
<tr>
<td></td>
<td>Peru</td>
</tr>
<tr>
<td></td>
<td>Suriname</td>
</tr>
<tr>
<td></td>
<td>Uruguay</td>
</tr>
<tr>
<td></td>
<td>Venezuela.</td>
</tr>
</tbody>
</table>

This study used a convenience sampling and the estimated sample size was a minimum of 40 subjects. Based on the G* power and effect size analysis utilized to determine a sample size, a minimum of 26 subjects was required. Given the effect size, a smaller sample size could be used; therefore the effect size was selected at .25. The alpha error was selected at .05 and power at .95.

**Instrumentation**

According to the ILSR, the MMPALT instrument is a “performance test that measures recall of paired information in each of the seven perceptual modalities” (Institute for Learning Styles Research, paragraph on Multi-Modal Paired Associates Learning Test). The MMPALT-IV, updated in 2013, was utilized for this study.
Furthermore, all participants were required to complete a demographic form to confirm place of birth, age, and educational background.

**Multi-Modal Paired Associates Learning Test (MMPALT-IV).** The Multi-Modal Paired Associates Learning Test, fourth version (MMPALT-IV) was utilized to measure participants’ perceptual learning styles. Following the original work of French (1975) and Gilley (1975), the MMPALT has undergone several iterations. Cherry (1981) revised the MMPALT framework and developed the MMPALT-II. James and French (1996) supervised the revision of the MMPALT II. Based on input from individuals associated with the ILSR conducting research in perceptual learning styles, the MMPALT III was developed. The most recent updates to the MMPALT-IV in 2013 were the digitalization of files and formats which resulted in the current version. The specific changes are detailed in Chapter 2.

The original MMPALT instrument was first developed by Gilley and French (1976) because of the “wide acceptance and utilization of the paired associate technique” (p. 5). In the current iteration, the seven perceptual learning modalities as noted by the ILSR (2013) are:

1. **Print:** A person who is print oriented often learns well through reading and writing.
2. **Aural:** A person who is aurally oriented generally learns well through listening.
3. **Interactive:** Individuals who learn well through verbalization usually are interactive learners.
4. **Visual:** A person who is visually oriented learns well through visual stimuli and visual representations.
5. **Haptic:** Individuals who learn well through the sense of touch are generally haptic learners.
6. **Kinesthetic:** A person who is kinesthetically oriented learns well while moving.
7. **Olfactory:** Individuals who learn well through the senses of smell and taste are olfactory learners.
Certification by a member of the ILSR must be obtained in order to administer the MMPALT-IV. The researcher for this study obtained certification as an administrator of the MMPALT-IV from the ILSR. Administrators, once certified, must be physically present when the MMPALT-IV is administered to test participants.

The MMPALT-IV consists of seven subtests, one for each perceptual modality. “Each subtest is similar in structure, scoring, and time frame” (Reno, 1997, p. 56). An explanation of the administration of the MMPALT-IV follows below. For additional information, see Appendix A for a copy of the MMPALT-II instructional booklet which is no longer the recognized version. Also see Appendix B for the permission letter to use the MMPALT-II version.

**Group administered test.** Three subtests (Print, Aural, and Visual) have been designed to be administered individually or in a group session. Both the Visual and Print versions of the subtests were updated in 2013 and utilize Microsoft's PowerPoint application; therefore, a computer running Microsoft Office, a large monitor or a projector, and a screen were required. The Aural test also takes advantage of computer-based delivery and a .wav file has been supplied by the ILSR; recorded by a professional voice-over actor with a nonspecific American accent. For delivery of the Aural subtest, a set of computer speakers were employed to ensure that all participants could hear the questions.

Samples for each of the seven subtests were provided to the participant prior to administration of each test. The images below in Figure 1 are the examples of the items for the visual subtest. To see subtests examples, refer to Appendix A.
In this example, the unfamiliar image on the left is matched to the image on the right. Participants had seven seconds to view the slide and recall that these two images go together. The participants were then provided only the item on the left and were asked to identify the item it was paired with. Since this was the sample item, only one pair was presented. Subsequently, the actual 10 pairs of items were presented.

Once the test administrator had shown all 10 items in each subtest, the participants were shown the unfamiliar item, presented in a different order, and were asked to write the name of the familiar item. All subsequent subtests followed a similar format and examples can be reviewed in Appendix A.

Each participant was provided a standard MMPALT-IV answer booklet and pencil by the test administrator. See Appendix C for a sample page of the answer booklet. Once testing began, each modality subtest containing the 10 unique items were only presented once in the mandated order as prescribed by ILSR. Participant responded to the first item of each pair previously presented on the test booklet by writing the item it was paired with. Scoring was completed by the administrator at the conclusion of testing.

Upon completion of all subtests, the administrator scored each modality and provided the participants with their results along with the interpretation of their learning.
style preferences. Preference is determined by reviewing and ranking the performance on the seven perceptual learning modalities from a potential high score of 10 to a potential low score of 0 (with 10 being the highest score and 0 being the lowest scores possible).

**Demographic Form.** Participation in this study was voluntary and all volunteers were required to provide demographic information to identify their gender, ethnicity, age, and country of birth. See Appendix D for a copy of the demographic form. Any additional questions asked by the testing administrator were completed for research purposes only.

**Data Collection Procedures**

Data were collected at the successful conclusion of the administration of each subsection of the MMPALT IV. For each of the seven perceptual learning styles identified in the MMPALT IV (Print, Aural, Interactive, Visual, Haptic, Kinesthetic, and Olfactory), there are associated subtests to measure the participant’s perceptual preference. The development of the MMPALT and subsequent versions stems from the original MMPALT developers’ desire to “focus on the subject’s ability to receive and process information via the specific modality being investigated” (Gilley & French, 1976, p. 4,). To reduce the possibility of “confounding learning variables, each subtest was designed to use only one perceptual modality at a time” (Kuranda-D'Urso, 2001, p. 46).

The data gathered from each subtest were compiled along with the study participant’s background information including place of birth, gender, education level, and age. All participants completed a demographic survey prior to being administered the MMPALT-IV. Once completed, each participant was screened and vetted to meet
the criteria for selection. Participants were directed to a previously designated room for testing and administration of the MMPALT-IV tests facilitated by an ILSR certified administrator.

Prior to receiving instruction for the seven subtests, each participant was provided instructions and examples on how to complete the test. Should the participant have questions, the administrator answered those questions ensuring that the participant understood the MMPALT-IV testing method and instructions. All seven tests were completed by the participants during the testing cycle.

**Location.** Location sites were selected to ensure a reasonable amount of safety, security, and convenience for participants. Considerations for temperature, privacy, noise, lighting, and room size were reflected in the selection of rooms used for the delivery of the MMPALT-IV for this study.

**Data Analysis**

The purpose of this study was to measure the perceptual learning styles of Latino adults from Central and South America utilizing the MMPALT-IV. The study compared Latinos born in either Central or South American to Caucasians born in the United States. The variables that were examined included gender, place of birth, and education level. Education was used as a controlled variable to ensure similar level of education attainment since previous research had shown that education level was a variable with significant difference occurring primarily at the high school and non-high school levels.

This was a quantitative research study and relied on a statistical analysis for analysis of variance (ANOVA) comparison of results based on place of birth, gender,
and mean scores of each MMPALT-IV subtest. In addition, each score on the individual MMALT-IV subtest was a dependent variable.

Once collected, the data were analyzed by the researcher taking into account the research questions:

1. What is the perceptual learning modalities profile of Latino learners and Caucasian learners?
2. What are the differences between the perceptual learning modalities of Latino learners and Caucasian learners?
3. Are there differences in perceptual learning modalities based on gender?

Upon successful completion of the administration of each MMPALT-IV subtests, data collected from the Latino and Caucasian subjects were analyzed by means of SAS software using two-way ANOVAs. Furthermore, results were analyzed to determine any additional interactions among these two groups.

This research study was conducted using the ILSR guidelines and techniques when conducting the MMPALT-IV subtests to ensure the safety and privacy of research participants. In addition, all data collection and analysis followed strict guidelines during the review of research information. Previous research conducted on similar populations compared some college and higher levels of education. Hardy (2017) researched perceptual modality comparisons between Latino, Caucasians, and Blacks.

Variables. The dependent variables for the purpose of this study were the final scores from each of the subtests of the MMPALT IV: visual, print, aural, interactive, haptic, olfactory, and kinesthetic which are continuous variables. Independent variables were the study participants’ gender and ethnicity.
As this study was a cross-sectional survey, data analysis consisted of calculating

descriptive statistics such as mean, median, mode, and inferential statistics such as \( t \)
tests and ANOVAS. Careful consideration was taken with sampling as the
representativeness of a sample size was more important than the sample’s size (Ary,
Jacobs, Razavieh, & Sorensen, 2006).

**Summary of Methods**

For the purpose of this study, all testing research utilizing the MMPALT-IV was

carried out in a safe environment and adhered to the requirements outlined by the
University of South Florida, the USF College of Education, and the ILSR.

Descriptive statistics were applied to measure the results of data collected during
this study to determine if a relationship existed in the results of the MMPALT-IV subtests
when accounting for ethnicity, age, and educational background.
Chapter 4

Findings

The purpose of this study was to measure the perceptual learning styles of Latino adults from Central and South America utilizing the MMPALT-IV. The study compared Latinos born in either Central or South American to Caucasians born in the United States. The variables examined were gender, age, place of birth, and education level. The following questions were used to gather data for the purpose of this study:

1. What is the perceptual learning modalities profile of Latino learners and Caucasian learners?
2. What are the differences between the perceptual learning modalities of Latino learners and Caucasian learners?
3. Are there differences in perceptual learning modalities based on gender?

The content of this chapter covers the study’s findings to these three research questions and the variables that were examined including: perceptual learning modalities of Latino learners, differences in perceptual learning modalities between Latinos and Caucasians, and differences in learning modalities based on gender. This chapter includes participant demographics, results by research questions, and observations.
Participant Demographics

This study compared two groups of adults; those born in Central or South America and Caucasians born in the United States. The participants were between the ages of 18 and 45 years and must have completed at least two years of college prior to partaking in this study.

The Central and South American adults participating in this study were recruited from several sources including business associates, former colleagues, and friends and family members of those participating in the study. Demographic information was collected prior to the administration of the MMPALT subtests to insure that the participants met the age, home birth country, and educational requirements.

This study compared the Central and South American group to the Caucasian group with a total of 40 participants. Of the Central and South American group, 10 were male and 10 were female and of the Caucasian group 10 were male and 10 were female.

All participants were between the ages of 18-45 years. English was the primary language for all Caucasians, while Spanish was the primary language for 19 of the Latinos, although one Latino’s primary language was Portuguese (Brazilian).

Participant MMPALT IV Scores

All seven subtests for the MMPALT IV were used to measure participants for this study. The data collected for the seven subtests (Print, Aural, Interactive, Visual, Haptic, Kinesthetic, and Olfactory) were analyzed for both race/ethnicity and gender. See Table 3 for the overall means, confidence intervals, and standard deviations of participant MMPALT IV scores for each subtest.
Table 3

Perceptual Modality Overall Mean Subtest Scores and Standard Deviations for All Participants

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Mean</th>
<th>95% CI</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>6.27</td>
<td>5.72</td>
<td>6.82</td>
</tr>
<tr>
<td>Aural</td>
<td>5.29</td>
<td>4.82</td>
<td>5.76</td>
</tr>
<tr>
<td>Interactive</td>
<td>6.19</td>
<td>5.63</td>
<td>6.74</td>
</tr>
<tr>
<td>Visual</td>
<td>7.42</td>
<td>6.94</td>
<td>7.90</td>
</tr>
<tr>
<td>Haptic</td>
<td>5.65</td>
<td>5.41</td>
<td>6.52</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>1.51</td>
<td>1.18</td>
<td>1.83</td>
</tr>
<tr>
<td>Olfactory</td>
<td>0.77</td>
<td>0.55</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Note. CI = Confidence Interval. N = 40

Print had an overall mean of 6.27 and an overall standard deviation of 2.12.
Aural had an overall mean of 5.29 and an overall standard deviation of 1.81. Interactive had an overall mean of 6.19 and an overall standard deviation of 2.12. The Visual subtest results were the highest overall mean of 7.42 and an overall standard deviation of 1.84. Haptic had an overall mean of 5.65 and the overall largest standard deviation of 2.15. Kinesthetic had an overall mean of 1.51 and a nearly similar overall standard deviation to visual with 1.25. And finally, Olfactory had an overall mean of 0.77 and an identical overall standard deviation of 0.80.
The mean and standard deviations for the Print subtest for all race/ethnicity and gender participants is listed in Table 4.

Table 4

*Print Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity*

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female M</th>
<th>SD</th>
<th>Male M</th>
<th>SD</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latino</td>
<td>6.20</td>
<td>1.75</td>
<td>5.80</td>
<td>2.29</td>
<td>6.00</td>
</tr>
<tr>
<td>Caucasian</td>
<td>6.50</td>
<td>2.27</td>
<td>7.50</td>
<td>1.65</td>
<td>7.00</td>
</tr>
<tr>
<td>Total</td>
<td>6.35</td>
<td>2.75</td>
<td>6.65</td>
<td>1.65</td>
<td>6.50</td>
</tr>
</tbody>
</table>

N = 40

The subtests mean score for Female/Latino was 6.20 and the standard deviation was 1.75. Similarly, the subtest mean score for Female/Caucasian was 6.50; the standard deviation was 2.27. The subtest mean score for Male/Latino was 5.80 and the standard deviation was 2.29. The subtests mean score for Male/Caucasian was the highest at 7.50 and had the lowest standard deviation of 1.65.

The total mean for both female and male Latinos was 6.00 while the total mean for female and male Caucasian was 7.00. The total mean for both Latino and Caucasian females was 6.35, while the total mean for both Latino and Caucasian males was slightly higher at 6.65. The overall total mean for both males and females and Latino and Caucasian participants for the Print Perceptual Modality was 6.50, which was the second highest overall total mean.
The statistical comparison of Latino females and males to Caucasian females and males employed an ANOVA test. Table 5 below presents the ANOVA summary table for the print perceptual modality.

Table 5

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>0.90</td>
<td>0.90</td>
<td>0.22</td>
<td>0.64</td>
</tr>
<tr>
<td>Race(^a)</td>
<td>1</td>
<td>10.00</td>
<td>10.00</td>
<td>2.46</td>
<td>0.13</td>
</tr>
<tr>
<td>Gender x Race(^a)</td>
<td>1</td>
<td>4.90</td>
<td>4.90</td>
<td>1.21</td>
<td>0.28</td>
</tr>
<tr>
<td>Error</td>
<td>36</td>
<td>146.20</td>
<td>4.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>39</td>
<td>162.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note \(^a\) = Race/Ethnicity, \(^*p > .05\), \(N = 40\)

In reviewing the ANOVA table for Print in Table 5, there were no significant differences for race, gender, or their interaction. The \(p\) value for gender was 0.64 and race was 0.13. The \(p\) value for gender by race was 0.13. Race and gender \(p\) value was 0.28. The sum of squares for gender was 0.90 and for race was 10.00. Sum of squares for gender and race combined was 4.90. The error rate for the sum of squares was 146.20 and the corrected total for the sum of squares was 162.00.
Table 6

Aural Modality Subtest Mean Scores and Standard Deviations by Gender and Race/Ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female</th>
<th>Male</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Latino</td>
<td>4.70</td>
<td>1.16</td>
<td>5.40</td>
</tr>
<tr>
<td>Caucasian</td>
<td>4.50</td>
<td>1.96</td>
<td>5.70</td>
</tr>
<tr>
<td>Total</td>
<td>4.60</td>
<td>5.55</td>
<td>5.08</td>
</tr>
</tbody>
</table>

N = 40

The Aural subtest scores for means and standard deviations are found in Table 6. Latino females had a mean score of 4.70 and a standard deviation of 1.16. Latino males had a mean score of 5.40 and a standard deviation of 2.01. The total mean for both Latino females and males was 5.05.

Similar to Latino females, Caucasian female mean score was just slightly lower, at 4.50 with a standard deviation of 1.16. Caucasian males scored slightly higher than Latino males with a mean score of 5.70 and a standard deviation of 1.06.

The total mean for Latino and Caucasian females was 4.60 and total mean for Latino and Caucasian males was higher on the Aural subtest than total mean score for females with a 5.55. Overall total mean for the Aural subtest was a 5.08.

Table 7 summarizes the ANOVA results for the Aural subtest. The p value for gender was 0.07, for race was 0.92, and for the gender/race interaction with the p value was 0.63. There were no significant differences for race or gender.
Table 7

ANOVA Summary Table for the Aural 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>Aural</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>9.03</td>
<td>9.03</td>
<td>3.49</td>
<td>0.07</td>
</tr>
<tr>
<td>Race(^a)</td>
<td>1</td>
<td>0.03</td>
<td>0.03</td>
<td>0.01</td>
<td>0.92</td>
</tr>
<tr>
<td>Gender x Race(^a)</td>
<td>1</td>
<td>0.63</td>
<td>0.63</td>
<td>0.24</td>
<td>0.63</td>
</tr>
<tr>
<td>Error</td>
<td>36</td>
<td>93.10</td>
<td>2.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>39</td>
<td>102.78</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note \(^a\) = Race/Ethnicity; *p > .05, N = 40

Table 8 presents the Interactive perceptual modality subtest mean scores and standard deviations.

Table 8

Interactive Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Gender</th>
<th>Female Mean</th>
<th>Female SD</th>
<th>Male Mean</th>
<th>Male SD</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latino</td>
<td>Female</td>
<td>5.70</td>
<td>2.00</td>
<td>6.10</td>
<td>1.56</td>
<td>5.90</td>
</tr>
<tr>
<td>Caucasian</td>
<td>Female</td>
<td>7.20</td>
<td>1.99</td>
<td>5.80</td>
<td>2.35</td>
<td>6.50</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6.45</td>
<td>5.95</td>
<td>6.20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 40
Latino female mean score for the Interactive subtest was a 5.70 with a standard deviation of 2.00. Caucasian females scored higher on the Interactive subtest with a mean score of 7.20 and a standard deviation of 1.99. The Latino male mean score was 6.10 with a standard deviation of 1.56 and the Caucasian male mean score was slightly lower with a score of 5.80 and a standard deviation of 2.35.

The total mean score for both Latino and Caucasian females was 6.45 and the total mean score for Latino and Caucasian males was 5.95. The total mean score for Latinos was 5.90 and the total mean score for Caucasian was 6.50. Overall total mean for Interactive was 6.20, slightly less than overall total mean for the Print subtest.

Table 9 provides the scores for the Interactive perceptual modality subtest ANOVA. The F value for gender was 0.62 and race was 0.90. The F value for gender and race was 2.02. There were no significant differences based on p values for gender p = (0.43) and race p = (0.35) and the gender/race interaction p = 0.16

Table 9

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>2.50</td>
<td>2.50</td>
<td>0.62</td>
<td>0.43</td>
</tr>
<tr>
<td>Race</td>
<td>1</td>
<td>3.60</td>
<td>3.60</td>
<td>0.90</td>
<td>0.35</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>1</td>
<td>8.10</td>
<td>8.10</td>
<td>2.02</td>
<td>0.16</td>
</tr>
<tr>
<td>Error</td>
<td>36</td>
<td>144.20</td>
<td>4.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>39</td>
<td>158.40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note a = Race/Ethnicity, *p > .05, N = 40
Table 10 displays the results of the Visual perceptual modality subtest means and standard deviations by gender and race/ethnicity. The Visual subtest provided the highest scores for both females and males across both Latino and Caucasian populations. Latino female mean score for the Visual subtest was 7.60 with a standard deviation of 1.65. Nearly similar were the scores for Latino males with a mean score of 8.00 and a standard deviation of 1.05.

Caucasian females scored slightly higher than Latino females with a mean score of 7.90 and a standard deviation of 1.79. Caucasian males had a mean score of 6.70 and a standard deviation of 2.21. Total mean score for Latino females and males was 7.80, and total mean score for Caucasian females and males was 7.30.

Additionally, the Latino and Caucasian female mean score was 7.75, while the combined mean score for Latino and Caucasian males was 7.35. The combined total mean score for all participants for the Visual subtest was 7.55, highest among all subtests.

Table 10

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Gender</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>M</td>
<td>SD</td>
<td>Male</td>
<td>M</td>
</tr>
<tr>
<td>Latino</td>
<td></td>
<td>7.60</td>
<td>1.65</td>
<td>8.00</td>
<td>1.05</td>
</tr>
<tr>
<td>Caucasian</td>
<td></td>
<td>7.90</td>
<td>1.79</td>
<td>6.70</td>
<td>2.21</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>7.75</td>
<td>1.79</td>
<td>7.35</td>
<td>2.21</td>
</tr>
</tbody>
</table>

N = 40
Table 11 illustrates the ANOVA summary for the Visual perceptual modality.

There was no significant difference in p value for gender with a p value 0.47 or race with a p value of 0.37. The p value for the gender/race interaction was 0.15. The critical value, F for gender was 0.54 and race was 0.84. Gender by race was F(1,1) = 2.15, p < 0.15.

Table 11

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>1.60</td>
<td>1.60</td>
<td>0.54</td>
<td>0.47</td>
</tr>
<tr>
<td>Race</td>
<td>1</td>
<td>2.50</td>
<td>2.50</td>
<td>0.84</td>
<td>0.37</td>
</tr>
<tr>
<td>Gender x Race</td>
<td>1</td>
<td>6.40</td>
<td>6.40</td>
<td>2.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Error</td>
<td>36</td>
<td>107.40</td>
<td>2.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>39</td>
<td>117.90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note a = Race/Ethnicity, *p > .05, N = 40

Table 12 provides the Haptic modality subtest results by mean and standard deviation. Latino female and male mean scores were 6.20 and 5.40 respectively. Latino females had a standard deviation of 1.83 and Latino male standard deviation result was 2.00. The total mean for Latino females and males was 5.80.

Similarly, the Caucasian female mean score for the Haptic subtest was 5.80 with a standard deviation of 2.27. The Caucasian male mean score was 5.20 and the standard deviation was 2.22. The total mean for all Caucasians was 5.50. The total mean score for both Latino and Caucasian females was 6.00 and total mean for both
Latino and Caucasian males was 5.30. The overall total mean for the Haptic Perceptual Modality Subtest was 5.65.

Table 12

*Haptic Perceptual Modality Mean Subtest 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 Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td>Female</td>
<td>6.20</td>
<td>1.83</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>5.40</td>
<td>2.00</td>
<td>5.80</td>
</tr>
<tr>
<td>Caucasian</td>
<td>Female</td>
<td>5.80</td>
<td>2.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>5.20</td>
<td>2.22</td>
<td>5.50</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>6.00</td>
<td>5.30</td>
<td>5.65</td>
</tr>
</tbody>
</table>

*N = 40*

Table 13 presents the ANOVA summary for the Haptic perceptual modality. The critical value $F$ for gender was 1.01 and the critical value for race was 0.18. The gender and race interaction $F$ was 0.02. There was no significant difference in the $p$ value for gender, race, or gender by race. The gender $p$ value for the Haptic subtest was 0.32, the $p$ value for race was 0.67, and the $F$ value for both gender by race was $F(1,1) = 0.89$ $p < .89$.

The scores for the Kinesthetic perceptual modality subtest means and standard deviations are presented in Table 14. For Latino females, the mean score was 2.90 and the standard deviation was 2.47. Latino male mean score for the Haptic subtest was 2.00 and the standard deviation was 1.95. The total mean for the Haptic subtest for both Latino females and males was 2.45.
Table 13

**ANOVA Summary Table for the Haptic 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>Haptic Gender</td>
<td>1</td>
<td>4.90</td>
<td>4.90</td>
<td>1.01</td>
<td>0.32</td>
</tr>
<tr>
<td>Race a</td>
<td>1</td>
<td>0.90</td>
<td>0.90</td>
<td>0.18</td>
<td>0.67</td>
</tr>
<tr>
<td>Gender x Race a</td>
<td>1</td>
<td>0.10</td>
<td>0.10</td>
<td>0.02</td>
<td>0.89</td>
</tr>
<tr>
<td>Error</td>
<td>36</td>
<td>175.20</td>
<td>4.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>39</td>
<td>181.10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note a = Race/Ethnicity, *p > .05, N = 40

Scoring slightly lower on the Kinesthetic subtest, the Caucasian female mean score was 1.30 and the standard deviation was 0.90. Caucasian male mean score for the Kinesthetic subtest was 1.00 and the standard deviation was 1.26. Combined, Caucasian females and males mean score was somewhat lower than that of the combined score for Latinos at 1.15.

Table 14

**Kinesthetic Perceptual Modality Mean Subtest Scores and Standard Deviations by Gender and Race/Ethnicity**

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female</th>
<th>Male</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Latino</td>
<td>2.90</td>
<td>2.47</td>
<td>2.00</td>
</tr>
<tr>
<td>Caucasian</td>
<td>1.30</td>
<td>0.90</td>
<td>1.00</td>
</tr>
<tr>
<td>Total</td>
<td>2.10</td>
<td>1.50</td>
<td>1.80</td>
</tr>
</tbody>
</table>

*N = 40*
The total combined mean score for both Latino females and Caucasian females on the Kinesthetic subtest was 2.10 which was only slightly higher than the combined mean score for Latino and Caucasian males at 1.50. The combined total mean for Latino males and females and Caucasian males and females for the subtest was 1.80.

Table 15 details the ANOVA summary table for the Kinesthetic perceptual modality. The $p$ value for gender was 0.26, while race showed significant difference of $p = 0.02$. The total for the gender/race interaction was 0.57. The critical value $F$ for gender was 1.34 and race was 6.27. The gender by race interaction $F(1,1) = 0.38, p < .57$ was not significant.

With one individual scoring extremely high on the Kinesthetic subtest, there were concerns that the individual’s score may have skewed the results, leading to the finding of a significant difference by race/ethnicity. The results were calculated without the outliers individual’s high score to verify the accuracy of the significant findings for race/ethnicity. Without that individual’s score included, there was still a significant difference in race/ethnicity, $F(1,1) = 5.4, p < .02$.

Table 15

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>Kinesthetic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>3.60</td>
<td>3.60</td>
<td>1.34</td>
<td>0.26</td>
</tr>
<tr>
<td>Race$^a$</td>
<td>1</td>
<td>16.90</td>
<td>16.90</td>
<td>6.27</td>
<td>0.02*</td>
</tr>
<tr>
<td>Gender x Race$^a$</td>
<td>1</td>
<td>0.90</td>
<td>0.90</td>
<td>0.33</td>
<td>0.57</td>
</tr>
<tr>
<td>Error</td>
<td>36</td>
<td>97.00</td>
<td>2.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>39</td>
<td>118.40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note $^a$ = Race/Ethnicity, $^*p > .05$, $N = 40$
Table 16 displays the results of the Olfactory perceptual modality means and standard deviations for the subtest scores. Overall scores for the Olfactory subtest were the lowest for both Latino females and males and Caucasian females and males. Latino males and Caucasian males had similar mean scores, but Latino females scored slightly higher than Caucasian females.

The mean score for Latino females for the Olfactory subtest was a 1.20 with a standard deviation of 0.79. The Latino males mean score was 0.80 and the standard deviation was 0.79.

The total mean for Latino females and males was 1.00 and total mean for Caucasian females and males was 0.55. The total mean for all females was 0.90 and the total mean for all males was 0.65. The overall total mean for the Olfactory subtest was 0.77.

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Female</th>
<th>Male</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Latino</td>
<td>1.20</td>
<td>0.79</td>
<td>0.80</td>
</tr>
<tr>
<td>Caucasian</td>
<td>0.60</td>
<td>0.80</td>
<td>0.50</td>
</tr>
<tr>
<td>Total</td>
<td>0.90</td>
<td>0.65</td>
<td></td>
</tr>
</tbody>
</table>

$N = 40$
Table 17 displays the ANOVA for the Olfactory perceptual modality. The critical value $F$ value for gender was $F(1,1) = 1.12$, $p < .36$ and race was 3.63. The gender/race interaction $F$ value combined was 0.40. The $p$ value for gender did not show significance at 0.30 while the $p$ value for race was 0.06. In addition, the gender/race interaction was not significant.

Table 17

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>0.63</td>
<td>0.63</td>
<td>1.12</td>
<td>0.30</td>
</tr>
<tr>
<td>Race$^a$</td>
<td>1</td>
<td>2.03</td>
<td>2.03</td>
<td>3.63</td>
<td>0.06</td>
</tr>
<tr>
<td>Gender x Race$^a$</td>
<td>1</td>
<td>0.23</td>
<td>0.23</td>
<td>0.40</td>
<td>0.53</td>
</tr>
<tr>
<td>Error</td>
<td>36</td>
<td>20.10</td>
<td>0.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>39</td>
<td>22.98</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note $^a$ = Race/Ethnicity, *$p > .05$, $N = 40$

For the research question, what is the perceptual learning modalities profile of Latino learners and Caucasian learners, Latinos ranked highest to lowest in the following order: Visual, Print, Interactive, Haptic, Aural, Kinesthetic, and Olfactory. Caucasians ranked highest to lowest in the following order: Print, Visual, Interactive, Haptic, Aural, Kinesthetic, and Olfactory. In reviewing the findings for all seven subtests, the Visual modality subtest had the highest mean scores for both males and females and Latinos and Caucasians. The lowest mean scores for both males and females and Latinos and Caucasians were found in the Olfactory modality subtest. In addressing the second research question, what are the differences between the perceptual learning modalities of Latino learners and Caucasian learners, there
were no significant difference found for race/ethnicity with the exception of the Kinesthetic modality subtest with Latinos scoring significantly higher than Caucasians.

Findings for the third research question, are there differences in perceptual learning modalities based on gender, demonstrated that there were no significant differences based on gender.

Observations

Overall, participants in this study were interested in the topic and willing to participate in the testing. Noted here were the highlights of the testing process for the seven MMPALT IV subtests. One participant from Brazil performed well in nearly every subtest and surprisingly scored a very high 9 on the Kinesthetic subtest.

After completion of all subtests, she was asked if she had studied dance or any martial arts. Her reply was, “I don’t need to study dance, I’m from Brazil” indicating that all Brazilians know how to dance. Additionally, she felt that when the test administrator kept his hand on her shoulder to help her maintain her balance that it was distracting and she requested that his hand be removed. Due to safety concerns, the test administrator kept his hand on her shoulder, but used a lighter touch.

A gentleman during the Kinesthetic subtests informed the test administrator that he had lower back problems and shoulder pain; however, he wanted to proceed with the test. It was agreed that at any point, should he feel pain or discomfort, he would notify the test administrator immediately and the testing would stop. In spite of not having the full range of motion with his arm and shoulder, he was able to complete the entire subtest with no undue pain or discomfort.
Adding a question to the demographic questionnaire regarding any recent surgeries, allergies, on any medical history that may cause problems with any other subtest might help avoid testing issues in future studies.

During the administration of the Olfactory test, on the same day, two participants claimed opposite reactions to the scents: one participant (a female) stated that the scents used were too strong, while another participant (also a female) claimed the scents were not strong enough. The scents were refreshed on that day prior to use for testing. The subject who reported that the scents were not strong enough was tested prior to the subject who reported that the scents were too strong. Additionally, the subject who reported that the scents were not strong enough observed that nearly every scent smelled like “dirt.” When asked for clarity, she noted that the scents either had no smell or smelled vaguely of soil. She was also unable to identify several of the control scents.

The Olfactory subtest elicited more comments than any other subtest; participants appeared to find the olfactory subtest more frustrating, with more emotional responses.

The Print, Aural, Interactive, Visual, and Haptic subtests were performed with little to issue. One participant noted that the prerecorded voice reciting the Aural subtest did not speak with an American accent. A second participant during the Interactive subtest repeated his responses partially in Spanish and partially in English. Ultimately, when administering the Interactive subtest, knowledge of a second language is unnecessary as the response from the subject is for the subtest only.
Chapter 5

Summary, Conclusions, Implications, and Recommendations

The purpose of this study was to measure the perceptual learning styles of Latino adults from Central and South America utilizing the MMPALT-IV. The study compared Latinos born in either Central or South American to Caucasians born in the United States.

The researcher examined the results of the seven subtests developed for the MMALT-IV by the Institute for Learning Styles research and used statistical analysis to interpret the findings. This chapter includes a summary of the research study and includes conclusions, implications of the findings and results, and recommendations for improvements to the MMPALT-IV and recommendations for further research.

Summary of the Study

Previous studies and research on perceptual learning modality preferences made use of earlier iterations of the MMPALT. With updates to several subtests in the MMPALT-IV, an examination of these new delivery modalities was in order. In addition, there has been little research or examination of Latino subjects born in either Central or South America. For the purpose of this study, the following research questions were developed:

1. What is the perceptual learning modalities profile of Latino learners and Caucasian learners?
2. What are the differences between the perceptual learning modalities of Latino learners and Caucasian learners?

3. Are there differences in perceptual learning modalities based on gender?

The research was conducted with 20 Latinos and 20 Caucasians from the Tampa Bay area. Participation in this study was voluntary and no compensation was provided to study subjects for their participation in this research. All participants were required to complete a demographic form for the purpose of data collection for this study.

The researcher conducting the administration of the MMPALT-IV subtests were certified by a member of the ILSR to deliver the subtests safely and within guidelines for each of the MMPALT subtests. In addition, the research team was required to provide participants with an Informed Consent form detailing the purpose of the study, the study procedures, and the study’s privacy and confidentiality statement.

One of the criteria of the study was that participants were required to self-identify as being native to a Central or South American country or to being a Caucasian born in the U.S. Those Latinos from Central or South American where not limited by race; however, no Black Latinos were subjects in this research. Additionally, previous comparison studies and research had been conducted on Blacks and Caucasians born in the U.S.; therefore, the researcher for this study did not attempt to recreate prior studies.

No verification was required in order to protect the participant’s privacy. In addition, participation in this study was voluntary and participants were selected from the Tampa Bay area by using snowball sampling. Variables for this study were the final scores from the MMPALT subtests which included: visual, print, aural, interactive,
haptic, olfactory, and kinesthetic sections. Independent variables were the study participants' gender and race/ethnicity.

**Conclusions**

This purpose of this study was to examine the results of the MMPALT IV for Latinos and Caucasians. The results of this study show both similarities and differences within groups based on race/ethnicity and gender.

The first research question, what is the perceptual learning modalities profile of Latino learners and Caucasian learners, lead to the differences based on race/ethnicity on the Kinesthetic subtest. The profiles of Latinos and Caucasians were similar with a slight variation between the Print scores where Caucasians scored higher.

The only difference between rank order for Latinos and Caucasians was in the reversal of the first and second ranked subtests. All other subtests were the same in rank. For Latino learners and Caucasian learners the only unique results for race/ethnicity was on the Kinesthetic perceptual subtest. The Kinesthetic subtest differences were a reversal of order (print and visual).

Latinos performed better on the Kinesthetic subset, even when the individual who scored extremely high on the subtest was removed. Latinos appear to be more Kinesthetic learners than Caucasians. This was similar to results found by Hardy (2017).

Generally Latino females had the best results on the Haptic, Kinesthetic, and Olfactory subtests. Caucasian males had the highest results on the Print, Aural, and Interactive subtests. Latino males had the highest results on the Visual subtests.
Females, both Latino and Caucasian, had the highest results on five of the seven subtests; however, there was no significance.

**Implications**

The implications of practical use from this research can be found in almost any type of educational or learning setting and are not strictly limited to job function or corporate-based learning. As previously noted, the low unemployment rate in the United States has created a growing workforce dependent on foreign-born workers. Foreign-born men who have lived in the United States for at least six or more years have an employment rate that exceeds 90%, which is nearly equal to that of their U.S. born counterparts. As the rise in foreign-born workers increases, so too does the challenge for HRD professions to complete skills or job training in as short a time as possible. “Finding paid employment is not a major problem for U.S. immigrants” (Duncan & Trejo, 2008, p. 5).

Based on this study and previous studies, there appears to be some differences for Latinos compared to other ethnic populations. Both this study and the research by Hardy (2017) found significant differences in the Kinesthetic subtests. Although this research did not find significant Olfactory differences, Williams (2000) did find significant differences in the Olfactory subtests for her Hispanic sample. Perhaps the Olfactory subtest has the potential for identifying cultural differences.

Since there were some differences between Latino and Caucasians and females and males as demonstrated in this study in terms of perceptual modality preferences, understanding on the part of the HRD professional and the workplace learner on how an employee best learns and perceives information can help learners develop the
necessary strategies to help them learn more quickly. By reducing learning times and bridging the performance gaps, employers should see improvements in speed of mastery of knowledge, skills, and abilities required to perform work related tasks by paying attention to the learning deliver system. “During work-based learning trainees become better at performing skilled tasks in a particular occupation and their productivity increases” (Kis, 2016, p. 6).

For the employee, knowledge that they have a strong preference for print or aural inputs could lead them to find articles to read or to listen to podcasts to increase their knowledge of a job-related function. For the HRD professional, understanding that training content based entirely on slides with no interactive conversation or content developed with only graphics or flow-charts is not the most effective way for all learners to learn.

Shorter learning time can also decrease learning seat time and return the employees back to their job tasks or functions more quickly. This learning turn around could have positive effects on a company’s bottom line by increasing the return on investment (ROI) for a particular learning intervention.

HRD professionals may not have the time or resources to test every learner in a corporate environment, but they can and should take into account that learners have preferences for how they process information. Building a one-size-fits-all solution may be exactly what is needed when training large groups of employees on the latest compliance requirements; however, when the expectation is that the learning will have an effect on the overall bottom-line of the corporation, more attention should be paid to how learners processes this new information. Shorter seat time with multiple content
pieces, each in a variety of modalities, can be more effective and more interesting to the learner.

As established through this research, Latinos and Caucasians, and females and males all scored somewhat similarly on the Aural, Visual, and Haptic subtests but there were differences for Print, Interactive, Kinesthetic, and Olfactory. A focused approach combining Print, Aural, Visual and Interactive content would seem to be the best approach to learning.

**Recommendations**

There are two sections for recommendations from this research: recommendations for improvements to the MMPALT IV instrument and recommendations for further research.

**Recommendations for improvements to the MMPALT IV.** When testing individuals whose native language is not English, it would be helpful for the individual administering the test to have some knowledge of that group’s primary language. In particular, when conducting the Olfactory subtest, some of the scents in the control group were not easily recognized by the Latino population, because they are known as something else in Spanish. Furthermore, those participants, who felt more comfortable speaking Spanish, tended to use Spanish during the Interactive subtest.

Moreover, when conducting the Olfactory subtest, it would be prudent to screen participants for any signs of a cold or allergies as this seemed to be an issue in identifying scents for at least one participant.

When developing the Demographic Questionnaire, one additional question to consider would be if the participant had recently had surgery or any physical limitations
on movement. In one instance, a participant had back surgery nine months prior to participating in this study and his range of movement was limited. He was able to complete the Kinesthetic subtest; however, this should be a consideration in further research.

**Recommendations for further research.** This research focused on gender and Latinos born in Central or South America as compared to Caucasians born in the U.S. There has been previous research on Caucasians and Blacks as well as Latinos born in the United States. In conducting this research, only one Latino from Brazil was tested and she outscored all other research participants. No other research on individuals from Brazil has been undertaken, which may have provided additional data on the differences in Latino languages or culture.

In addition, males tend to score higher in both Print and Aural modalities, both of which are the primary features of a PowerPoint-based lecture or presentation. There is an opportunity to develop further research on which presentation styles favor females or males and which components serve gender and race/ethnicities equally.

Research on workers by job functionality could prove useful. An analytic comparison of professional office and administrative workers to factory, farm, or laborers could show differences in perceptual modality preferences. An auto mechanic may score higher on the Haptic subtest than a management consultant, but would their scores be higher than that of a plastic surgeon? At the same, time research could show that an insurance appraiser may score high on Visual subtest, while someone who has a technical phone support position might score high on the Aural subtest.
Since this study controlled for education, additional research based on education is recommended. In previous studies, Smith (1996) focused on participants below a seventh grade level. For the purposes of this research, it was necessary for participants to have some college education. Mean scores based on education level vary greatly and research based on education could be useful for further research.

In preparation for test administration, one Filipino individual was tested as practice. While that individual’s scores were not included in this research, the results were similar to those individuals born in Central or South America. The lack of research on native born Asians or Pacific Islanders, possibly Filipinos, may be considered for further research. Filipinos might be an interesting demographic to consider since Spanish has influenced much of the culture and language of the Philippines. Since Latinos have had significant differences in previous studies, investigating the similarities across cultures might reveal additional information.

Furthermore, this research focused on participants for whom English was not their first language. Results on the Print and Aural subtests were interesting enough to warrant further research based on the participant's first language particularly Portuguese.

On-line learning content, whether video webinars or eLearning would be a subject to consider in relation to perceptual preferences for learners and learning environments. Would there be a difference in content retention when a webinar is delivered as a telephone conference with no slides for individuals with a higher preference for Aural than for Visual? Conversely, an eLearning developed with
graphics and text only may show higher content retention rates for individuals with higher Visual and Print preferences than any other preferences.

Finally, with high interactive scores for both Latino and Caucasian females, additional research could focus on the increased use of interactive conversation-driven content in the learning environment.
References


Appendices
Appendix A: MMPALT II Instruction Booklet

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 MMPALT-II

I. Evaluators

The MMPALT-II 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.
Appendix A (Continued)

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 (2-5) 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.
Appendix A (Continued)

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.
Appendix A (Continued)

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
MMPLAT-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 2 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
Appendix A (Continued)

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

Sample: hez/sister

1) biv/cat 6) cyc/horse
2) ceq/party 7) koy/rain
3) pug/name 8) wuq/robin
4) dup/bed 9) lez/paper
5) xib/box 10) nyh/coat

Sequence for stimulus only display:

1) dup 6) nyh
2) cyc 7) ceg
3) koy 8) lez
4) biv 9) puq
5) xib 10) wuq

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 audiostream).

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

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

Sequence for stimulus only presentation:

1) poh 6) mag
2) omp 7) und
3) jus 8) sul
4) von 9) kiv
5) tud 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.
Appendix A (Continued)

4) Display stimulus/response pairs at 1 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).
Appendix A (Continued)

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 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 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) zed/wind
   2) fel/tooth
   3) ces/ball
   4) hes/Christmas
   5) sci/fire
   6) pex/floor
   7) chi/egg
   8) jec/dog
   9) toz/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) fai 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 7 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 subjects 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/lightbulb  6) bushing/key ring
2) rock/pencil   7) metal tube/scissors
3) table leg/tennis ball  8) odd shaped wood/yo yo
4) hose coupling/paint brush  9) plastic golf ball/padlock
5) wood rectangle/table fork  10) door knob/drinking glass

Sequence for stimulus only presentation:

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

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.
Appendix A (Continued)

STATION #4

KINESTHETIC 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 and back</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 lower to sides</td>
<td>6) Take two steps forward and 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 circle in the air</td>
<td>8) Stand with legs spread far 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 (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?
Appendix A (Continued)

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

Sequence for stimulus only presentation:

1) Vanilla (#2)   6) Almond (#3)
2) Raspberry (#4)  7) Pineapple (#5)
3) Maple (#9)      8) Rum (#7)
4) Banana (#8)     9) Brandy (#6)
5) Cherry (#1)     10) Wintergreen (#10)
Appendix B: MMPALT II Permission Letter from ILSR

May 14, 2016

Dr. Wayne 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,

[Signature]

Maria Martinez Witte, Ed.D.  
President, Institute for Learning Styles Research

More information available at: www.learningstyles.org
Appendix C: MMPALT IV Answer Booklet
Appendix D: Demographic Form

Demographic Questionnaire

The purpose of this questionnaire is for you to provide basic background information about yourself and your experience. Please complete the following.

1. Gender (circle one) Female Male

2. Birthdate: Month ________ Day ________ Year ________

3. What is your current age? ______________

4. Where were you born? Country ______________ City ______________

5. How many years have you lived in the United States? ______________

6. How many years have you lived in Florida? ______________

7. What is the highest degree you have earned at college or university?
   ______________

8. How many years did you attend college? ______________

9. What is your first language? ______________

10. Did you study English? ______________

   If “yes” for how many years? ________
Appendix E: Exempt Certification

February 22, 2017

Motas Ramirez
L-CACHE - Leadership, Counseling, Adult, Career & Higher Education
Tampa, FL 33612

RE: Exempt Certification
IRB #: Pro00029400
Title: Perceptual Learning Styles Modalities Utilizing the Multimodal Paired Associates Learning Test (MMPALT-IV): An Analysis of Latinos Born in Central and South America

Dear Mr. Ramirez:

On 2/21/2017, the Institutional Review Board (IRB) determined that your research meets criteria for exemption from the federal regulations as outlined by 45 CFR 46.101(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 Solomon, Ph.D., Vice Chairperson
USF Institutional Review Board
About the Author

With nearly 20 years of learning, development and instructional experience, Matias Ramirez has held various positions in organizations including Hilton, Citibank, PricewaterhouseCoopers, the Japanese Ministry of Education and the Florida State Senate. He has developed learning content for a broad range of topics including: leadership development, compliance, anti-money laundering, human trafficking and new hire onboarding.

Matias holds an M.A. in Adult Education and a B.S. in Social Science Education from the University of South Florida. He lives in Tampa, FL with his wife and two children.