A COMPARISON OF LIMITED ENGLISH PROFICIENT AND ENGLISH PROFICIENT HMONG STUDENTS’ PERFORMANCE ON THE COMPREHENSIVE TEST OF NONVERBAL INTELLIGENCE

A Thesis Submitted in Partial Fulfillment of the Requirements for an Education Specialist Degree in School Psychology

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ABSTRACT


Due to the inappropriateness of using traditional language-loaded intelligence tests with linguistic and cultural minority students, nonverbal intelligence tests are considered to be one suitable alternative. Research, however, on the use of recently developed nonverbal intelligence tests, especially with specific ethnic minorities is limited. This study investigated the performance of limited English proficient (*n* = 14) and English proficient (*n* = 14) 4th, 5th, and 6th grade Hmong students on the Comprehensive Test of Nonverbal Intelligence (CTONI). As expected, both the limited English and English proficient students performed in the “average” range on all CTONI composites (NIQ, PNIQ, GNIQ), and all three CTONI composite scores were strongly intercorrelated. Independent samples *t*-tests compared the limited English and English proficient students’ mean CTONI scores. As the main hypothesis predicted, English proficient students achieved higher NIQ and PNIQ scores than limited English proficient students, suggesting that language proficiency impacted students’ test performance. Although further studies are needed to investigate the relationship between language proficiency and nonverbal test performance, this study’s findings support the use of the CTONI as a suitable, language “reduced” cognitive measure for Hmong students.
Candidate: Daniel J. Redwine

We recommend acceptance of this thesis in partial fulfillment of this candidate's requirements for the Education Specialist Degree in School Psychology.

The candidate has successfully completed the final thesis defense.

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CHAPTER I

INTRODUCTION

Background

Although psychometricians have been attempting to measure people's mental ability since the early nineteenth century, the 1905 Binet-Simon Scale developed in France could be considered one of the earliest intelligence tests as psychologists recognize them today (Sattler, 1988). Since that time, there have been numerous advances in both intelligence theories and tests. Consequently, today's clinicians have a wealth of traditional cognitive assessment measures to choose from, such as the Woodcock-Johnson III Tests of Cognitive Ability (Woodcock, McGrew, & Mather, 2001), the Differential Ability Scales (Elliot, 1990), and the Wechsler Intelligence Scale for Children-Fourth Edition (Wechsler, 2003). These traditional measures of intellectual ability inherently involve significant language demands due to item content, verbal administration of test items, and required verbal responses from examinees. Although traditional intelligence tests are considered to be appropriate cognitive assessment measures for most students, the heavy emphasis on language in these tests may make them inappropriate for students with limited English proficiency (LEP).

The U.S. Department of Education (1994) defines LEP students as, "those who were not born in the United States and whose native language is other than English, or come from environments in which a language other than English is dominant" (p. 21).
In the current study, "Limited English Proficient" was operationally defined as students receiving English-as-a Second Language (ESL) services, whereas "non-LEP" was defined as students who had been assessed as fully English Proficient and were no longer receiving ESL services (see "Definitions of Terms" for explanation of ESL criteria).

Due to the heavy verbal demands of most traditional intelligence tests, LEP students are clearly at a disadvantage. Their performance on these measures is confounded by the construct of language (Reynolds, Lowe, & Saenz, 1999). Essentially, traditional intelligence tests involving verbal directions and responses become language tests for LEP students, rather than tests of intellectual ability. For school psychologists seeking valid measures of LEP students’ cognitive abilities, this issue is of great importance.

This concern is amplified, considering the increasing numbers of ethnic minorities and linguistic diversity in the United States. A review of the 1997 reauthorization of the Individuals with Disabilities Education Act (IDEA; P.L. 105-17) reveals that the rate of increase in the U.S. population between 1980 and 1990 was 6% for White Americans, 53% for the Hispanic population, 13.2% for African Americans, and 107.8% for Asians. This trend is reflected in the extraordinary number of languages spoken in United States’ schools. Pasko (1994) reported that in the Chicago City schools alone, the students speak more than 200 languages. This linguistic diversity has also been reported in individual New York City schools, where the student population speaks over fifty languages (New York City Public Schools, 1993). A more recent study estimated that almost four million LEP students are currently enrolled in United States public schools, a 72 percent increase from 1992 (Zehler et al., 2003).
The combination of a growing number of LEP students in U.S. schools and the limitations of traditional language-loaded measures of intellectual assessment for this population have prompted needed changes in both legislation and professional standards. These changes have had a significant impact on how school psychologists approach assessment of LEP students. In the court case Diana v. State Board of Education (1970), the court established that children being evaluated for special education must be tested in their native or primary language. The Education for All Handicapped Children Act of 1975 and its more recent amendments, IDEA (1990 & 1997), reemphasize that school psychologists should use assessment methods that are culturally and linguistically valid. In addition to legislative changes, both the American Psychological Association’s (1990) Guidelines for Providers of Psychological Services to Ethnic, Linguistic, and Culturally Diverse Populations and the National Association of School Psychologist’s Standards for the Provision of School Psychological Services (NASP, 1992) encourage school psychologists to select and administer assessment measures that are valid in regards to students’ cultural, ethnic, and linguistic background. In response to the dramatic increase in the number of LEP students in today’s schools, changes in legislation and standards, and the need to conduct valid and ethical intellectual assessments with these students, school psychologists (and test developers) have had to develop a renewed interest in alternative methods of assessing the intellectual abilities of the LEP population. One such method is the use of nonverbal intelligence tests.

Currently, clinicians have a variety of nonverbal measures to choose from including, the Test of Nonverbal Intelligence: Third Edition (TONI-III) (Brown, Sherbenou, & Johnson, 1997), the Leiter International Performance Scale-Revised
(Leiter-R) (Roid & Miller, 1997), the Universal Nonverbal Intelligence Test (UNIT) (Bracken & McCallum, 1998), and the Comprehensive Test of Nonverbal Intelligence (CTONI) (Hammill, Pearson, & Wiederholt, 1996). Nonverbal tests frequently are recommended when assessing the cognitive abilities of LEP students as they purport to yield a language-free, or at least a language-reduced, measure of intellectual ability. However, most of the currently used nonverbal intelligence tests have been either developed or revised in recent years. Consequently, research in the area of nonverbal intelligence tests and their use with LEP students is limited.

Problem

One disconcerting trend has been the exclusion of LEP students from the normative samples of many nonverbal intelligence tests. Lopez (1997) highlights the fact that many commonly used nonverbal intelligence tests do not include LEP and bilingual children in their standardization samples. This is problematic, considering that nonverbal measures are designed with the purpose of being valid tests for assessing cognitive abilities of LEP students. Some of the new, or recently revised nonverbal measures of intelligence (i.e., UNIT and Leiter-R), have attempted to address this concern by including ESL students in their normative samples. However, the number of ESL students included in these tests’ samples may be insufficient. For example, the UNIT test manual (Bracken & McCallum, 1998) reports that the ESL sample (2%) in the normative group was slightly underrepresented compared to the general population (4%). Furthermore, the UNIT does not clearly indicate the ethnicity of the ESL students.

The limited research on the use of nonverbal intelligence tests with LEP students, combined with the reality of increasing number of LEP students in today’s schools,
creates a difficult situation for practitioners attempting to conduct ethical and valid cognitive assessments. The fact that Asians have been one of the fastest growing ethnic minority groups in the United States creates a particular problem for practitioners working in schools with large populations of LEP students from Asian ethnic groups. Asians, however, are a very heterogeneous group, including over 40 cultures (i.e. Chinese, Japanese, Koreans, and Southeast Asians). Furthermore, Southeast Asians include Vietnamese, Cambodians, Laotians, Mien, and Hmong. These specific Asian ethnic groups clearly differ in a variety of ways (i.e., cultural traditions, values, learning styles). However, the normative sample information in technical manuals of nonverbal intelligence tests does not specify which ethnic subgroups are included under the general category of “Asian”. Therefore, information about a specific Asian subgroup (i.e., Hmong, Vietnamese) is not accessible for practitioners. This allows practitioners to assume they can make generalizations from the “Asian” group to Hmong students’ performance on nonverbal measures of intelligence. This may be a faulty assumption, given the diversity among Asian subcultures.

Purpose and Value of the Study

Clearly, there is a need to conduct further research in the use of nonverbal intelligence tests with the overall population of LEP students. Moreover, there is a need to investigate the use of nonverbal intelligence tests with various Asian ethnic groups, considering the increasing numbers of these students in our schools. Due to the significant number of Hmong refugee families that have resettled in the U.S. (especially in the states of California, Wisconsin, Minnesota, Rhode Island, and Texas) and the resulting number of Hmong students in many schools, there is a great need to increase the
research base in the area of cognitive assessment of this specific population.

The research on the use of recently developed or revised nonverbal intelligence tests (i.e., UNIT, Leiter-R, TONI-III, and CTONI) with LEP students is quite limited. The research investigating the use of these tests with the Hmong population is almost non-existent. One study by C. Keiler (personal communication, spring 2001) addressed the limited research on the use of nonverbal intelligence testing with both LEP students and the Hmong student population. Although the study was not published, Keiler specifically investigated how ESL and non-ESL Hmong students compared in their performance on the UNIT. Based on the logic that the UNIT is a nonverbal language-free test, Keiler hypothesized there would be no significant difference between the ESL and non-ESL Hmong students’ performance on the UNIT. Keiler’s preliminary findings indicated the non-ESL students had significantly higher UNIT Full Scale IQ means than the ESL students.

The general purpose of the current study is to investigate the performance of Hmong students on the Comprehensive Test of Nonverbal Intelligence (CTONI), a commonly used cognitive assessment tool for students of limited English proficiency. This study is valuable for three main reasons. First, research on the use of nonverbal intelligence tests with LEP students is very limited. Second, research on the CTONI is very limited, which is problematic considering it’s common usage with LEP students. Third, research examining the performance of Hmong students on nonverbal intelligence tests is extremely limited. The outcomes of the current study will provide an additional source of information to help practitioners make appropriate and ethical decisions regarding their selection of assessment measures for the growing population of Hmong
students. Considering the role that cognitive assessment results play in helping to
distinguish between LEP students with actual disabilities and those with insufficient
second language programming, results from the current study could have very important
implications for school psychologists, other members of the school evaluation team, and
most importantly the students being assessed. Some authors have indicated the over-
representation of minority language children in special education programs is primarily
due to the misinterpretation of these students' scores on language-loaded intelligence
tests as accurate measures of their true cognitive ability (Ortiz & Yates, 1983).

More specifically, the current study will compare the performance of LEP and
non-LEP (English Proficient) Hmong students on the CTONI. "Limited English
Proficient" is operationally defined as Hmong students who receive ESL services,
whereas "non-LEP" is defined as Hmong students who have been determined to be fully
English Proficient and are no longer receiving ESL services (see "Definitions of Terms"
section for explanation of ESL criteria). The CTONI yields three composite scores:
Nonverbal Intelligence Quotient (NIQ), Pictorial Nonverbal Intelligence Quotient
(PNIQ), and Geometric Nonverbal Intelligence Quotient (GNIQ). The ESL and non-ESL
Hmong students' standard scores on each of the three CTONI composites will be
compared. Therefore, the study will address the following primary research questions.

Research Questions and Hypotheses

1. Do both ESL and non-ESL Hmong students perform within the "average" range
   on all CTONI composites (NIQ, PNIQ, and GNIQ)?

   H1. Both the ESL and non-ESL Hmong groups will perform within the "average"
   range (standard scores between 90 and 110) on all CTONI composite scores.

2. Is there a significant difference between ESL and non-ESL Hmong students’
group mean NIQ, GNIQ, and PNIQ scores on the CTONI?
H₂. Non-ESL students will have higher NIQ, GNIQ, and PNIQ scores than ESL students.

3. Are the NIQ, GNIQ, and PNIQ scores related for the overall sample of Hmong students?

H₃. The NIQ, PNIQ, and GNIQ scores will be positively intercorrelated for the overall Hmong sample.

Assumptions

The study has the following assumptions:

1. The researcher assumes the two trained graduate students who administered the CTONI strictly followed the same standardized administration rules outlined in the test manual.

2. The sample of Hmong students in the study represents a normal distribution of the Hmong population.

Limitations

The study has the following limitation:

1. The current study used a convenience sample, as participants were taken from a sample of students originally tested in Keiler’s study in the spring of 2001. In addition, as parent permission was a requisite for participation in the original study, a random sample was not obtained.

Definitions of Terms

*Limited English Proficient* - “Those who were not born in the United States and whose native language is other than English, or come from environments in which a language other than English is dominant” (The U. S. Department of Education, 1994, p. 21).
English-as-a Second Language (ESL) – Although there are different instructional models for supporting students learning English as a second language, ESL services (in the current study) refer to programming which supplements regular, mainstream classroom instruction with instruction in a small-group or one-on-one setting outside the mainstream classroom. Students evaluated for ESL services in the current study were assessed using the Student Oral Language Observation Matrix (SOLOM). The students’ teachers used this tool to assess the students’ English language proficiency in the areas of Comprehension, Fluency, and Vocabulary in both academic and social settings. The students’ pronunciation and grammar were also assessed. The students’ English proficiency level was determined to be at one of six levels: 1. Beginning/Pre-production; 2. Beginning/Production; 3. Intermediate; 4. Advanced Intermediate; 5. Advanced; and 6. Full English Proficiency. Students assessed to be at level 6 were exited from the ESL program and considered to be English proficient.

Hmong - Hmong refers to a specific Southeast Asian ethnic group from Laos. After the Communists took over Laos in 1975, a large number of Hmong refugees entered the United States between 1979 and 1982, with another surge in 1987 to 1988.

Nonverbal test - Braden (2000) defines nonverbal tests as “tests that largely or exclusively use nonverbal items and reduce or eliminate language demands for administering and responding to the test” (p. 204).

Comprehensive Test of Nonverbal Intelligence (CTONI) – The CTONI is an individually administered nonverbal intelligence test developed for ages 6 to 89 years, 11 months. The test consists of six subtests and yields three composite scores: Nonverbal Intelligence Quotient (NIQ), represents the overall measure of intelligence; Pictorial
Nonverbal Intelligence Quotient (PNIQ), an index of problem solving and reasoning in which representational pictures of familiar objects are used; and the Geometric Nonverbal Intelligence Quotient (GNIQ), an index of problem solving using unfamiliar designs as stimuli. All three composite scores are based on a mean of 100 and standard deviation of 15.

Summary

Today's school psychologists are faced with an increasing population of linguistic and cultural minority students. Specifically, the number of Hmong students is growing in many U.S. communities. When these students are referred for evaluations in school, an assessment of their cognitive ability is frequently conducted. Due to the inappropriateness of using traditional language-loaded intelligence tests with these students, nonverbal measures of intelligence appear to be a more suitable alternative assessment tool. However, due to the recent development of many of the commonly used nonverbal cognitive tests, the research on their use is limited. Moreover, studies investigating the performance of Hmong students on cognitive assessment measures are almost nonexistent. The current study aims to contribute to this lack of research, and provide clinicians with additional information to help guide their selection of cognitive assessment measures for Hmong students.
CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The following is a review of the literature on issues related to the cognitive assessment of language minority students. Specifically, this chapter is divided into five sections. Section one provides a review of different methods used for assessing the cognitive abilities of bilingual and LEP students, including a brief history of nonverbal assessment of intelligence. Section two includes an overview of four major nonverbal intelligence tests most commonly used by today’s clinicians. The third section reviews some of the general research conducted with nonverbal intelligence tests. Given the specific purpose of the current study, section four provides some background information on the Hmong culture. The fifth section focuses on the limited research investigating the performance of Hmong students on cognitive assessment measures.

Cognitive Assessment Options for LEP and Bilingual Students

A variety of options exist for assessing the cognitive abilities of LEP students. However, many of the methods are potentially impractical, inefficient, and/or problematic in regards to psychometric issues. One method is to translate traditional intelligence tests into the native language of the LEP student. This is relatively easy to do and would appear to be an acceptable solution to the problem of assessing language minority students with traditional language-loaded tests. However, Geisinger (1994)
suggested that validity problems can arise when the original normative group of the test is substantially different than the group for whom it is being translated. He provides an extensive set of guidelines for translating cognitive tests for new target populations, but the process requires a significant amount of time and resources, time and resources most practitioners do not have. An additional problem with translating intelligence tests is that items can sometimes change in meaning and actually become more difficult in the translation from one language to another language (Gomez-Palacio, Padilla, & Roll, 1983).

A second option, using an interpreter during the testing situation, is common practice for many school psychologists. This method, however, can also present problems because many interpreters are not trained in the standardized administration of intelligence tests, which may result in invalid test scores for the LEP student. Figueroa (1987) suggests the research on the use of interpreters in testing situations is inadequate, and that the use of interpreters is not best practice.

The use of a bilingual school psychologist to administer the test is another common practice. This method eliminates the problem of having to train an interpreter in standardized assessment procedures, but does not resolve the issue of the items changing in meaning during the translation into the child's primary language. In addition, it is unreasonable to assume that school psychologists can be fluent in the plethora of languages spoken in today's schools, or that school districts will contract the services of a bilingual school psychologist for every unique LEP assessment.

A final alternative method for assessing the cognitive abilities of LEP students is the use of nonverbal intelligence tests. Braden (2000) defines nonverbal tests as, "tests
that largely or exclusively use nonverbal items and reduce or eliminate language demands for administering and responding to the test” (p.204). Nonverbal intelligence tests provide a unique approach of assessing the cognitive ability of LEP students by removing, or at least reducing, the confound of limited English proficiency. Many school psychologists find nonverbal measures appealing as they can avoid the psychometric problems and inefficiency involved with translating tests and using interpreters. In addition, professional standards also endorse the use of nonverbal tests with LEP students. The Standards for Educational and Psychological Testing (3rd Edition) state that, “In cases where a language-oriented test is inappropriate due to the test-takers limited proficiency in that language, a nonverbal test may be a suitable alternative” (American Educational Research Association, American Psychological Association, National Council for Measurement in Education, 1999, p.91).

In addition to being suitable for LEP students who have a strong foundation in their first language, nonverbal intelligence tests are also considered to be a viable option for assessing LEP students who may not have adequate proficiency in either their first language (L1) or English (L2). This situation is common in LEP students, due to the fact that many of them are acquiring both English and their native language simultaneously (Figueroa, 1990). In the process of second language acquisition, children develop basic interpersonal communicative skills (BICS) before acquiring cognitive academic language proficiency skills (CALPS) (Cummins, 1984). BICS, which takes about 1 to 3 years to develop, involves the ability to communicate basic wants and needs, and carry on basic social conversations. CALPS, which takes at least 5 to 7 years to develop, refers to the ability to communicate thoughts and ideas clearly, and involves the language skills
necessary for academic success in the classroom. Cummins discussed how proficiency in the child’s first language (L1) is required to develop proficiency in the second language (L2), and hypothesized that there is a Common Underlying Proficiency (CUP), which facilitates the transfer of cognitive skills from L1 to L2.

Nonverbal assessment of intelligence is not a new practice. During World War I, soldiers with limited English proficiency were assessed with the Beta section of the group-administered Army Mental test. Many of the performance tasks on the Army Beta can be seen in the Performance scales on the Wechsler intelligence tests commonly used today (McCallum, Bracken, & Wasserman, 2001). Throughout the twentieth century, numerous nonverbal measures were developed in the United States to address the issue of accurately assessing the intellectual ability of individuals with limited English proficiency, deafness, and other communication or language disorders. However, due to the staggering increase in linguistic and ethnic diversity in the U.S., test developers in recent years have taken a renewed interest in developing and improving nonverbal intelligence tests.

Overview of Nonverbal Intelligence Tests

As previously mentioned, there have been numerous nonverbal measures of intelligence developed over the years. In this section, brief overviews of four major nonverbal intelligence tests are provided. These four tests were selected on the basis of their recent development or revisions, and their common usage among practitioners.

*Leiter International Performance Scale-Revised (Leiter-R).* The Leiter-R (Roid & Miller, 1997) is an individually administered nonverbal measure designed to assess the intellectual abilities of special populations of individuals (i.e., deaf, language impaired,
ESL students) ages 2 to 20 years, 11 months. The Leiter-R measures overall intellectual ability, fluid reasoning, visualization, attention, and memory. Administration of items is nonverbal (presented through pointing, gesture, facial expression, and pantomime) and examinee responses do not require speaking, reading, or writing. According to the test manual, the Leiter-R’s standardization sample included 1,719 individuals and is representative of the general population in respect to geographic region, sex, race, ethnicity, parent education, and age. The sample also included ESL students (Spanish, \( n = 73 \); Asian/Other, \( n = 26 \)).

*Test of Nonverbal Intelligence. Third Edition (TONI-3).* The TONI-3, described as “a language-free measure of cognitive ability” (cover), was designed as a measure of abstract/figural problem solving for individuals aged 6 to 89 years, 11 months (Brown, Sherbenou, & Johnson, 1997). Test items are presented completely nonverbally in a matrices format. The normative sample included 3,451 people and was representative of the general population on a variety of demographic variables. The TONI-3 requires approximately 15 minutes to administer and provides only one total composite score (representing an overall measure of intellectual ability) based on 45 items. Athanasiou (2000) refers to the TONI-3 as a unidimensional test due to its narrow breadth of intellectual assessment. Development of the TONI-3 was guided by Jensen’s (1980) guidelines for constructing more culturally fair nonverbal measures.

*Universal Nonverbal Intelligence Test (UNIT).* According to Bracken and McCallum (1998), the UNIT is an individually administered nonverbal test that is “designed to measure fairly the general intelligence and cognitive abilities of children and adolescents from ages 5 years through 17 years who may be disadvantaged by traditional
verbal and language loaded measures” (p. 1). The UNIT yields a Full Scale IQ score and measures memory, reasoning, symbolic processing, and nonsymbolic processing. Test items are presented through the use of gestures and no verbal responses are required from examinees. The normative sample included 2,100 participants and was representative of the U.S. population in terms of race, ethnicity, parent education level, age, gender, geographic region, and disabilities. Although the normative sample did include bilingual (1.8%) and ESL students (2.0%), both groups were slightly underrepresented compared to the general population, 3.1% and 4.0%, respectively (Bradley-Johnson & Fachting, 2000). Furthermore, the test manual does not clearly indicate the ethnicity of the students in the ESL sample (Bracken & McCallum, 1998).

Comprehensive Test of Nonverbal Intelligence (CTONI). According to the test manual, the CTONI (Hammill, Pearson, & Wiederholt, 1997) is an individually administered nonverbal test designed to assess “those intellectual abilities that do not involve the use of words” (p. 10). Administration of items can be done either orally or through pantomime gestures, and no complicated motoric responses are required from examinees. Therefore, the CTONI is considered by many (Aylward, 1998; Hammill, Pearson, & Wiederholt, 1996; Nicholson, 1999; Wiederholt & Rees, 1998) to be a useful tool in assessing the cognitive abilities of bilingual/LEP students, individuals who are deaf, have language deficits, auditory processing problems, motor impairments, and come from socially disadvantaged environments. The test measures three types of cognitive abilities: categorical classifications, sequential reasoning, and analogical reasoning, within two different contexts: pictorial (e.g., people, animals), and geometric designs (e.g., unfamiliar shapes and figures). The CTONI normative sample included 2,901
participants and was representative across a variety of demographic variables such as geographic region, sex, race, ethnicity, SES, parent education, and disability. The CTONI manual does not clearly indicate whether ESL students were included in the original normative sample.

General Research with Nonverbal Measures of Intelligence

Clinicians have been using nonverbal tests for decades to assess the cognitive abilities of special populations, such as those individuals with limited English proficiency, deafness, and other communication or language disorders who cannot be assessed with more traditional language-loaded measures of intelligence. Until recent years, clinicians used such nonverbal tests as the Standard Progressive Matrices (Raven, 1958), the Columbia Mental Maturity Scale (Burgemeister, Blum, & Lorge, 1972), the Leiter International Performance Scale (Leiter, 1979), and the TONI-2 (Brown, Sherbenou, & Johnson, 1990). However, McCallum and Bracken (1993) have pointed to inadequate psychometric properties, reliance on extensive verbal directions, and outdated norms as just some of the weaknesses of these nonverbal intelligence tests. In an effort to address the limitations of these outdated nonverbal intelligence measures, test developers have introduced a variety of new nonverbal cognitive assessment tools (i.e., UNIT, Leiter-R, TONI-3, and the CTONI) within only the past 10 years. Consequently, the body of research investigating the utility of these recently developed nonverbal tests is limited.

However, there have been some recent studies that have investigated the validity of these newer nonverbal tests with various special populations. Tsatsanis et al. (2003) examined the concurrent validity between the Leiter and the Leiter-R with low functioning autistic children and found no significant difference between the mean IQ
scores for the two scales (3.7 point difference), supporting the validity of the Leiter-R as an appropriate cognitive assessment tool for children with autism. In a different study, Farrell (2001) compared the Leiter-R and the UNIT in a sample of children with severe language impairments and found that both tests yielded comparable scores and appear to be appropriate cognitive measures for this population of students. Bostantjopoulou, Kiosseoglou, Katsarou, and Alevriadou (2001) found no significant differences between TONI-2 quotients for patients with Parkinson’s disease and a control group (means = 89.61 and 90.45, respectively), supporting the clinical use of the TONI-2 in patients with this disease. The validity of the UNIT with children diagnosed with ADHD has also been recently supported in a study conducted by Pendley, Myers, and Brown (2004). All of these studies support the use of nonverbal intelligence tests with specific groups of individuals. However, what does the literature suggest about the validity of currently used nonverbal intelligence tests with culturally and linguistically different students?

Although most of the research addressing this question consists of validity studies cited in these tests’ manuals, two recent studies have investigated the use of nonverbal cognitive measures with culturally and linguistic minorities. Koehn (1999) investigated the use of the Leiter-R as a culture-fair cognitive assessment measure for Hispanic-American children who had English as a second language (ESL). The investigator administered the students both the Leiter-R and the WISC-III, hypothesizing that the students’ Leiter-R scores would be more related to their WISC-III Performance IQ scores than their Verbal IQ scores. The students’ Leiter-R, PIQ, and VIQ mean scores were 93.57, 93.96, and 80.46, respectively, supporting the author’s hypothesis. This, along with other findings from Koehn’s study suggests the Leiter-R may be a valid test for
assessing the cognitive functioning of students with limited English proficiency. In another study, Wiseley (2001) looked at the performance of learning disabled Native-American Navajo students (ages 7 to 16) on the CTQNI and the WISC-III. Results from the study suggest that the CTQNI is a valid tool for assessing the cognitive abilities of Native-American populations. In addition to Koehn and Wiseley's research, the manuals of recently developed nonverbal intelligence tests include several validity studies supporting their use with limited English proficient and cultural minority students.

The Leiter-R manual (Roid & Miller, 1997) reports a variety of criterion groups by comparing group means. The Leiter-R Full IQ means for the “ESL-Spanish” (92.5) and “ESL-Asian/Other” (94.8) groups were highly correlated, and were within one-third a standard deviation of the normative sample mean (100).

The UNIT manual (Bracken & McCallum, 1998) includes a study comparing a sample of Native-American students' performance on the UNIT and the WISC-III. Their Full Scale IQ scores (UNIT = 101, WISC-III = 98.85) were highly correlated, suggesting the UNIT provides a valid intellectual assessment for this cultural minority group. The UNIT manual also includes a group comparison study of 49 “Asian-Americans/Pacific Islanders” and 49 “White” students. The UNIT Full Scale IQ group means were 102.2 and 113.1 for the “White” and “Asian” groups, respectively, supporting the UNIT's claim of reducing the effects of culture on ability scores. In another analysis cited in the UNIT test manual, UNIT Full Scale IQ means were compared for a Spanish-speaking ESL group (n = 78) and a White non-Hispanic group (n = 78). There was no significant difference between the ESL group mean (93.3) and White non-Hispanic group mean (97.03), suggesting the test is appropriate for the LEP population.
The CTONI manual (Hammill, Pearson, & Wiederholt. 1997) reports that the Delta Scores approach was used to compare the item performance between various dichotomous groups including ESL (mostly Hispanic-Americans) versus non-ESL individuals. Correlation coefficients ranged from .98 to .99 for the ESL/Non-ESL groups across all six CTONI subtests, suggesting that little or no bias existed in the test’s items for this sub-group. The CTONI manual also reports mean NIQ, PNIQ, and GNIQ scores for “ESL” and “Asian” groups. The ESL group means for the NIQ, PNIQ, and GNIQ were 92, 92, and 93, respectively. The Asian group means for the NIQ, PNIQ, and GNIQ were 103, 101, and 104, respectively. Means for both groups were within the “average” range (standard scores between 90 and 110) for all three composite scores, which supports the use of the CTONI with cultural and linguistic minority students.

The research, although limited at this time, suggests that the use of recently developed nonverbal intelligence tests (i.e., UNIT, CTONI, Leiter-R) may be appropriate for a variety of populations, including students of limited English proficiency (i.e., ESL students) and minority cultures (i.e., Hispanics, Asians, etc.). However, none of the studies previously discussed have specifically investigated the performance of Hmong students on currently used nonverbal intelligence tests. Due to the variability among different Southeast Asian cultures (i.e. Hmong, Vietnamese) and the growing Hmong population in many communities, further research is clearly needed in the area of nonverbal cognitive assessment of Hmong students.

Hmong Background

Over 150 years ago, the Hmong migrated from China to the Southeast Asian countries of Burma, Thailand, Vietnam, and Laos. They lived peaceably in isolated
mountain villages until they were forced to fight in the Laotian civil war, which began following World War II (Meyers, 1992). When the Vietnam War escalated in the 1960's, the United States recruited the Hmong to aid in the effort to overthrow the communist Pathet Lao. When the Pathet Lao forces overthrew the Royal Lao government in 1975, the Lao communist government attempted to punish Hmong individuals who aided the United States in Vietnam (Meyers, 1992). Consequently, thousands of Hmong were forced to flee to refugee camps in Thailand, where they typically waited for years before being accepted for resettlement in another country (Cerhan, 1990). The greatest number of Hmong refugees came to the United States between 1979 and 1982, with a second group arriving in 1987 and 1988 (Lewis, Vang, & Cheng, 1989).

There are two major dialects of Hmong spoken today--White and Blue/Green--which were selected by each group for articles of clothing and decoration (Koumarn, 1979). Whereas Hmong adults can often understand speakers of the other dialect, young Hmong children are less able to switch between the two dialects (Lewis, Vang, & Cheng, 1989). Although their oral language is rich and complex, the Hmong had no formal written language prior to 1952 (Yang, 1992). Education and learning, therefore, involved the oral passing of knowledge and tradition from elders to children through recitation and memorization of poems, songs, prayers, etc. Consequently, auditory processing skills were nurtured due to their importance in the process of passing information from generation to generation (Lewis, Vang, & Cheng, 1989).

Since schools were just being built in Laos during the time of the Vietnam War, most Hmong received little or no formal education prior to their arrival in the United States (Preston, 1999). Therefore, many students who currently attend U.S. schools have
parents who received little or no formal education. However, Hmong parents and the Hmong community as a whole value and support their children's educational progress, viewing it as a means to success in the United States. This parental value on education may be one factor, which supports the fact that Hmong children adjust exceptionally well to the educational system in the United States and are able to compete with American children (Yang, 1990). One study (McNall, et al., 1994) comparing Hmong and non-Hmong students revealed that Hmong students reported higher grade point averages, more time spent on homework, and a lower school drop-out rate than their peers.

Even though many Hmong students adjust well to school, there are many who experience academic difficulties related to learning English as a second language and/or acculturation issues. And, of course, a certain population of Hmong students will struggle in school due to various disabilities (i.e., learning disabilities, cognitive disabilities, emotional behavioral disabilities, speech/language impairments, etc.). When Hmong students are referred for special education evaluations due to academic difficulties in school, an assessment of their cognitive ability is typically conducted as part of the evaluation. As previously discussed, traditional language-loaded intelligence tests are not considered to be appropriate cognitive assessment measures for students of limited English proficiency. Currently a variety of nonverbal cognitive tests are available. These nonverbal tests are considered to be more appropriate intellectual measures for linguistic and cultural minority students. However, there has been very little research conducted investigating the performance of Hmong students on cognitive assessment measures.
Cognitive Assessment of Hmong Students

Following a review of the literature, this researcher is aware of only three studies that have investigated the performance of Hmong students on intellectual ability tests. The first study conducted by Smith, Wessels, and Riebel (1997) compared the performance of 40 Hmong students (mean age of 9 years, 6 months) on the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) and the Kaufman Brief Intelligence Test (K-BIT). Results showed there was no significant difference between the mean WISC-III Full Scale IQ (82.70) and the K-BIT Composite score (81.59). In addition, mean scores between similar scales (Verbal IQ (74.32) / K-BIT Vocabulary (72.49), Performance IQ (95.05)/ K-BIT Matrices (94.21) were not significantly different. The large difference between the verbal and performance mean scores likely reflected the impact of the Hmong students’ limited English proficiency on their performance on verbal tasks. Results from this study suggested that, for the selected Hmong sample, the K-BIT Composite and WISC-III FSIQ scores were interchangeable.

In a different study, Preston (1999) investigated the performance of 56 Hmong students aged 6 years, 4 months to 13 years on four different cognitive ability measures: WISC-III, K-BIT, CTONI, and the TONI-3. Mean scores for scales measuring crystallized intelligence, or verbal reasoning abilities were within the borderline range (WISC-III Verbal IQ = 73; K-BIT Vocabulary = 70), reflecting the limited English proficiency of the Hmong students. Mean scores on scales measuring fluid intelligence, or nonverbal reasoning abilities were all within the average range (WISC-III Performance IQ = 94.0; K-BIT Matrices = 95.0; TONI-III Composite = 100.3; CTONI PNIQ = 91.6; CTONI GNIQ = 95.8; CTONI Composite [NIQ] = 93.0). These results support the use of
nonverbal cognitive assessment measures for students, who have linguistic and cultural differences, which may negatively impact their performance on a traditional verbally weighted intelligence measure.

A research question that has not been addressed is how would ESL and non-ESL Hmong students compare in their performance on a nonverbal intelligence test? Keiler (personal communication, spring 2001) examined this question, and compared how ESL and non-ESL Hmong students performed on the UNIT. Although results were not published, Keiler reported a significant difference between the ESL group Full Scale IQ ($M = 92.3$, $SD = 8.8$) and the non-ESL group Full Scale IQ ($M = 105.5$, $SD = 8.0$).

The current study compared the performance of ESL and non-ESL Hmong students on the CTONI. The main purpose of this research project was to investigate whether English proficiency (ESL and non-ESL) had an affect on Hmong students’ performance on the CTONI. This researcher predicted that the non-ESL group mean scores would be significantly higher than the ESL group mean scores on the CTONI. This hypothesis would be expected, given that the UNIT and CTONI are highly correlated, and the participants in the current study were the same as in Keiler’s study. Furthermore, the CTONI manual reports lower mean scores for the ESL sample (NIQ = 92, PNIQ = 92, GNIQ = 93), when compared to a general population mean of 100.

Summary

Over the past few decades, clinicians have used a variety of methods to assess the cognitive ability of individuals with limited English proficiency, including: translating traditional tests into the native language of the student, using an interpreter during test administration, and having bilingual school psychologists administer traditional
intelligence tests. The literature suggests a variety of problems with these different methods, and points to nonverbal intelligence tests as a suitable alternative for assessing LEP and culturally different students. Although the general research on recently developed nonverbal intelligence tests is limited, existing studies appear to support their use with a variety of populations, including linguistic and cultural minorities. However, studies exploring the use of nonverbal assessment measures, specifically with the Hmong population need to be conducted. The current study will address this need by comparing the performance of LEP and English proficient Hmong students on the CTONI. The specific methods and procedures for the current study are outlined in the following chapter.
CHAPTER III

METHODS AND PROCEDURES

Introduction

A general purpose of the current study was to increase the research base in the area of nonverbal cognitive assessment of limited English proficient students. More specifically, the research questions outlined in the current study were intended to provide valuable information regarding the performance of Hmong students on the CTONI. This study aimed to address the following hypotheses:

H1. Both the ESL and non-ESL Hmong groups will perform within the "average" range (standard scores between 90 and 110) on all CTONI composite scores.

H2. Non-ESL students will have higher NIQ, GNIQ, and PNIQ scores than ESL students.

H3. The NIQ, PNIQ, and GNIQ scores will be positively intercorrelated for the overall Hmong sample.

Participants

Participants were selected from a sample of 39 students (grades three, four, and five), who were administered the UNIT in a study conducted by Keiler (personal communication) during the spring of 2001. Tested during the spring of 2002, participants for the current study were 28 Hmong students in grades four, five, and six who were either receiving \( n = 14 \) or not receiving \( n = 14 \) ESL services in public schools in a mid-size midwestern city. Of the 14 ESL students, 14.2% were classified Level 3 \( n = 2 \), 64.2% were classified as Level 4 \( n = 9 \), and 21.4% as Level 5 \( n = 3 \) (see "Definitions
of Terms” section in Chapter I for description of ESL levels). The sample consisted of 39.3% males \((n = 11)\) and 60.7% females \((n = 17)\), with an average age of 10 years, 11 months \((SD = 1.08)\).

Demographic information for each participant was obtained from Keiler (personal communication). Based on information collected from participants’ parents (by a Hmong interpreter), the majority of participants’ parents reported speaking both Hmong and English at home \((78.6\%)\), and having no formal education \((57.1\%)\). Regarding annual family income, over 85 percent of participant’s parents reported earning $35,000 or less.

Procedures

Through the phase of data collection, this researcher worked collaboratively with a fellow school psychology graduate student. Researchers initially obtained approval from the University of Wisconsin-La Crosse Institutional Review Board (IRB) to conduct the current study, before getting approval from the local school district’s research committee. Following approval from the school district, the researchers developed a letter explaining the purpose of the study (see Appendix A: Parent Letter) and a parent consent form (see Appendix B: Parent Consent Form), which were translated into Hmong by a trained interpreter in the school district. Parents of the participants were mailed both the Hmong and English versions of the consent form requesting permission of their child’s involvement in the study.

Students receiving parental permission to participate in the study, were administered the Comprehensive Test of Nonverbal Intelligence (CTONI) in a one-on-one testing situation with one of the two graduate student researchers trained in administering the test. Participants were administered the CTONI either during or after
school, depending on the parent's preference as indicated on the parent consent form.

Prior to testing, the researchers briefly explained the purpose of the project and asked the student to give their assent to participate (see Appendix C: Student Assent Form).

Participants were informed that they could terminate the testing at any time. Each student was tested for approximately 45-60 minutes in a quiet room within the school. Although the CTONI test items can be presented either orally or using pantomime gestures, the researchers used pantomime administration to achieve a truer nonverbal assessment.

Following completion of the test, each student received a pencil or eraser for participating in the study. Participants in this study were each assigned a number, which corresponded to a number that was written on their testing protocol. To ensure confidentiality, all information containing participants' names was kept in a locked file, which was accessible only to the researchers.

Materials

The CTONI (Hammill, Pearson, & Wiederholt, 1996) is an individually administered nonverbal intelligence test designed to assess the cognitive functioning of individuals with language deficits, limited English proficiency, limited fine motor skills, and hearing impairments. The presentation of items can be done orally or using pantomime, and the examinee responds to all items by pointing to the test stimulus on the easel. The test, developed for ages 6 to 89 years, 11 months, consists of six subtests: Geometric Analogies, Pictorial Analogies, Geometric Categories, Pictorial Categories, Geometric Sequences, and Pictorial Sequences. Standard scores can be obtained for each subtest \( M = 10, \ SD = 3 \), and three composite scores: Pictorial Nonverbal Intelligence Quotient (PNIQ), Geometric Nonverbal Intelligence Quotient (GNIQ), and the Nonverbal
Intelligence Quotient (NIQ). The NIQ is considered the overall measure of nonverbal intelligence and is based on all six subtests. All three composite scores are based on a mean of 100 and standard deviation of 15.

The CTONI normative sample included 2,901 students in grades 1-12 and was representative in regards to demographics such as gender, geographic region, family socio-economic status, parent education level, ethnicity, and race according to the 1990 U.S. Census data. In each grade level, there were at least 101 subjects who were either in general education or were mainstreamed students with disabilities.

The CTONI examiner’s manual (Hammill, Pearson, & Wiederholt, 1997) reports the test has good reliability. Test-retest reliability coefficients (based on a 1-month interval) ranged from .79-.89 for subtests and .87-.94 for the composites. Internal consistency coefficients across the six subtests ranged from .80-.97, and from .92-.97 for the composites. The CTONI also appears to have good inter-rater reliability with coefficients for subtests ranging from .95-.99.

Three types of validity are addressed in the examiner’s manual: construct, content, and concurrent. The CTONI’s ability to differentiate between age groups and the fact that there is little difference between groups’ (i.e., gender, race, etc.) mean performance provides support for the test’s construct validity. Content validity is addressed as the CTONI subtest content is compared to a variety of theories of intelligence (Horn & Cattell, 1966; Jensen, 1980; Wechsler, 1958). In addition, Item Response Theory and the Delta Scores method were used to compare different groups (i.e., male vs. female) to assess item bias. The results indicated little or no item bias across a number of different groups. Concurrent validity was evaluated by comparing the
CTONI to the WISC-III, TONI-2, and Peabody Picture Vocabulary Test-Revised (PPVT-R). Correlations between the CTONI and TONI-2, PPVT-R, and WISC-III Performance Scale (PIQ) were .82, .74, and .70 respectively. In another study, the CTONI and WISC-III PIQ scores for a deaf sample correlated at .90, supporting the CTONI's concurrent validity.

Summary

Twenty-eight Hmong students (ESL = 14, non-ESL = 14) in grades four, five, and six were administered the CTONI individually. In order to obtain a truer nonverbal assessment, pantomime administration was used. Three CTONI composite scores (NIQ, PNIQ, and GNIQ) were calculated for each participant, and served as the primary data for the current study. The NIQ represents the overall measure of intelligence. The PNIQ is a measure of problem solving and reasoning in which representational pictures of familiar objects are used, whereas the GNIQ is a measure of problem solving using unfamiliar designs as stimuli. A series of descriptive and inferential statistical analyses were conducted to address the study's three hypotheses. Results from these analyses are presented in the following chapter.
CHAPTER IV

RESULTS

Descriptive Statistics

The majority of participants' parents reported speaking both Hmong and English at home (78.6 %), and having no formal education (57.1 %). Regarding annual family income, over 85 percent of the parents reported earning $35,000 or less (see Table 1).

Table 1

Descriptive Statistics for Demographic Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Education level (N = 28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>16</td>
<td>57.1</td>
</tr>
<tr>
<td>3rd grade or less</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>4th to 7th grade</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>Finished High School</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td>Technical School/ Bachelors degree</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>Family Income (annual) (N = 27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$10,000 or less</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>$10,001 - 15,000</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>$15,001 - 25,000</td>
<td>10</td>
<td>35.7</td>
</tr>
<tr>
<td>$25,001 - 35,000</td>
<td>6</td>
<td>21.4</td>
</tr>
<tr>
<td>$35,001 - 45,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$45,001 - 60,000</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>$60,001 or more</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>Gender (N = 28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>39.3</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>60.7</td>
</tr>
<tr>
<td>Language Spoken at Home (N = 28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hmong only</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>English only</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Hmong and English</td>
<td>22</td>
<td>78.6</td>
</tr>
</tbody>
</table>
Hypotheses

$H_1$ Both the ESL and non-ESL Hmong groups will perform within the “average” range (standard scores between 90 and 110) on all CTONI composite scores.

The primary data collected for this study were participants’ standard composite scores on the CTONI, including the PNIQ, GNIQ, and overall NIQ ($M = 100$, $SD = 15$).

In order to address the study’s first hypothesis, descriptive statistics were calculated for the ESL group, non-ESL group, and the overall sample for all CTONI composite scores (see Table 2). Results of this analysis indicated, “average” mean NIQ, PNIQ, and GNIQ scores for both groups and the overall sample, supporting the study’s first hypothesis. A series of z-tests were performed to compare each of the ESL and non-ESL CTONI means to the general population mean (100). This analysis indicated that only the ESL group’s PNIQ mean (92.07) was significantly lower than the general population mean ($z = 1.98$, $p = .05$).

Table 2

<table>
<thead>
<tr>
<th>Composite</th>
<th>ESL (n = 14)</th>
<th>Non-ESL (n = 14)</th>
<th>Overall Sample (N = 28)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>NIQ</td>
<td>94.21</td>
<td>8.41</td>
<td>100.43</td>
</tr>
<tr>
<td>PNIQ</td>
<td>92.07*</td>
<td>7.40</td>
<td>98.36</td>
</tr>
<tr>
<td>GNIQ</td>
<td>97.21</td>
<td>9.62</td>
<td>102.50</td>
</tr>
</tbody>
</table>

Note. Mean CTONI scores between 90 and 110 are considered in the “average” range.

$p < .05$, one-tailed.
H₂. Non-ESL students' will have higher NIQ, GNIQ, and PNIQ scores than ESL students.

In order to test the study's second hypothesis, the ESL and non-ESL mean CTONI scores were compared through a series of independent samples t-tests. Results from this analysis supported the study's second hypothesis for two of the three CTONI composites. As expected, the non-ESL mean NIQ (100.43) score was significantly higher than the ESL mean NIQ (94.21) score, \( t(26) = 1.80, p = .04 \). The PNIQ mean for the non-ESL group (98.36) was also significantly higher than the ESL group mean PNIQ (92.07) score, \( t(26) = 2.03, p = .03 \). Although there was a 5.29 point difference between the GNIQ means of the non-ESL (102.50) and ESL (97.21) groups, this difference was not found to be statistically significant, \( t(26) = 1.31, p = .10 \).

H₃. The NIQ, PNIQ, and GNIQ scores will be positively intercorrelated for the overall Hmong sample.

The study's third hypothesis was investigated by calculating a series of Pearson correlation coefficients. Correlations between all CTONI composites were found to be significant at the .01 level (see Table 3), supporting the third hypothesis.

<table>
<thead>
<tr>
<th></th>
<th>NIQ</th>
<th>GNIQ</th>
<th>PNIQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIQ</td>
<td>1.00</td>
<td>.94**</td>
<td>.90**</td>
</tr>
<tr>
<td>GNIQ</td>
<td>1.00</td>
<td></td>
<td>.70**</td>
</tr>
<tr>
<td>PNIQ</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Note. ** \( p < .01 \).
Summary

All three of the study’s hypotheses were supported. As expected, both the ESL and non-ESL students performed in the “average” range on all CTONI composites (NIQ, PNIQ, GNIQ). Correlational analyses also indicated a strong relationship between all three CTONI composites for the overall Hmong sample. Independent samples t-tests compared the non-ESL and ESL mean CTONI scores to address the study’s main hypothesis. As predicted, non-ESL students achieved higher NIQ and PNIQ scores than ESL students. However, no significant difference was found between non-ESL and ESL students’ mean GNIQ scores.
CHAPTER V

DISCUSSION OF RESULTS

Summary of the Study

Due to the inappropriateness of using traditional language-loaded intelligence tests with students who are not proficient in the dominant language, nonverbal cognitive measures often are recommended as a suitable alternative assessment method. Although the existing literature generally supports the use of nonverbal intelligence tests with linguistic and cultural minority students, the research with recently developed nonverbal tests (i.e. UNIT, CTONI) is limited. Even more limited, are studies exploring the use of these nonverbal intelligence tests with Hmong students. This is of concern to practitioners, who are faced with conducting appropriate cognitive assessments with an increasing number of Hmong students in today’s schools.

In an effort to help address this problem, the current study investigated the performance of Hmong students on the Comprehensive Test of Nonverbal Intelligence (CTONI). Participants included 28 Hmong students in grades four, five, and six. Of the 28 students, 14 were considered proficient in English (no longer receiving ESL services), while 14 were limited English proficient (receiving ESL services). In addition to collecting demographic information (participant gender, family income, parental level of education, and language spoken at home), the primary data for this study were participants’ CTONI composite scores, including the NIQ, PNIQ, and GNIQ.
Statement of Research Hypotheses

The specific research hypotheses for the current study were:

H₁. Both the ESL and non-ESL Hmong groups will perform within the “average” range (standard scores between 90 and 110) on all CTONI composite scores.

H₂. Non-ESL students’ will have higher NIQ, GNIQ, and PNIQ scores than ESL students.

H₃. The NIQ, PNIQ, and GNIQ scores will be positively intercorrelated for the overall Hmong sample.

Conclusions

In support of the current study’s first hypothesis, the mean NIQ, GNIQ, and PNIQ scores were within the average range (90 to 110) for both ESL and non-ESL Hmong students. The ESL group means ranged from 92.1 to 97.2, while the non-ESL group means ranged from 98.4 to 102.5. The ESL group means from the current study appear consistent with ESL group means cited in the CTONI test manual (Hammill, Pearson, & Wiederholt, 1997), and the Hmong students’ CTONI means reported in Preston’s (1999) study. The current study’s finding that Hmong students (both ESL and non-ESL) performed within the “average” range on the CTONI, lends additional support for the use of the CTONI as a valid cognitive assessment measure with Hmong students (both LEP and English Proficient Hmong students).

The study’s second, and primary hypothesis was supported for two of the three CTONI composites. As predicted, non-ESL students obtained higher NIQ and PNIQ scores (6.2 and 6.3 point differences, respectively) than ESL students. Although not statistically significant, non-ESL students also achieved higher GNIQ scores (5.9 point difference) than ESL students. The significant difference between non-ESL and ESL students’ overall CTONI NIQ score is consistent with Keiler’s reported finding of non-
ESL students' higher UNIT Full Scale IQ scores than ESL students (13.2 point difference). The consistent findings between Keiler's study and the current study would be expected, given that the same students participated in both studies, and the UNIT and CTONI are highly correlated. However, this finding appears inconsistent with a common assumption that "nonverbal" intelligence tests provide a language-free measure of cognitive ability.

What might explain the significant difference in CTONI scores between the non-ESL and ESL students? One possible explanation is that the difference in CTONI scores reflects an actual difference in overall intellectual ability between non-ESL and ESL students. This explanation is based on the premise that overall cognitive ability directly impacts the rate of first and second language acquisition. In other words, the ESL students' slower language acquisition may reflect lower overall cognitive ability, whereas the non-ESL students' ability to acquire English at a quicker rate may be due to higher general intellectual ability. Under this logic, the non-ESL students would be expected to achieve higher scores than ESL students on a measure of overall cognitive ability. This argument assumes that the CTONI provides a measure of general intelligence, or "g" (Horn, 1988; Carroll, 1993).

Another possible explanation for the difference between the non-ESL and ESL students' CTONI scores points to the "nonverbal" test itself, rather than an actual difference between participants' general intelligence. Perhaps, the CTONI is not as independent of language demands as it purports to be, and requires language proficiency to some extent. Within this argument, the ESL students' lower CTONI scores may simply reflect their limited language proficiency, rather than their true cognitive ability. Braden
(2000) refers to this situation as construct irrelevance, when individuals’ test scores reflect some irrelevant construct (i.e. language proficiency) rather than the construct of interest (i.e. general intelligence). In support of this explanation for the difference between the non-ESL and ESL CTONI scores. Oller, Kunok, and Choe (2000) suggest that “nonverbal” intelligence tests may not be as free of language demands as many assume. They argue that gestures (i.e. pantomime) can never make the instructions to nonverbal tasks perfectly clear, and that complex nonverbal tasks involve some level of verbal mediation. The current study found that ESL students had significantly lower PNIQ scores, but not GNIQ scores than the non-ESL students. Given that the PNIQ measures nonverbal abilities using familiar pictured objects (e.g., furniture, clothing, food, etc.), whereas the GNIQ uses geometric designs, the ESL students’ lower PNIQ scores may suggest that the PNIQ tasks require more verbal mediation, or subvocalization, than the GNIQ tasks. Another possibility is that the difference between the ESL and non-ESL groups’ PNIQ scores reflects a difference in the students’ level of acculturation. Future research that investigates the influence of acculturation level on nonverbal test performance may lend additional insight to this question.

The study’s third hypothesis was also supported. Correlations were significant between all CTONI composites. The PNIQ and GNIQ composites produced a correlation of .70 ($p < .01$). The NIQ/GNIQ correlation was .94 ($p < .01$) and the NIQ/PNIQ correlation was .90 ($p < .01$). These correlation coefficients suggest a strong relationship between the CTONI composites, and lend additional support to the CTONI as a measure of overall intellectual ability, or “$g$".
Implications

Consistent with other researchers’ findings (Hammill, Pearson, & Wiederholt, 1996; Preston, 1999), the results from the current study found that Hmong students performed in the average range on the CTONI. Despite this study’s small sample size, this finding adds support to the CTONI’s claim of providing a valid cognitive assessment for students of minority cultures. In support of the study’s main hypothesis, non-ESL students achieved higher scores than the ESL students, suggesting that language proficiency did impact their performance on the CTONI. However, it remains unclear whether the difference between the two groups reflects a true difference in general intelligence, the limited English proficiency of the non-ESL Hmong students, or possibly acculturation level differences between the two groups. Despite the difference between the non-ESL and ESL students’ scores, both groups performed within the “average” range, supporting the CTONI’s utility with students of different linguistic and cultural minoritities. However, the difference between the non-ESL and ESL groups’ CTONI scores suggests that one set of norms may not apply well for all Hmong students. Given the relationship between cognitive and language development, it may never be possible to create a truly language “free” intelligence test. However, the CTONI appears to provide at least a language “reduced” assessment of cognitive ability. Thus, in situations where practitioners (i.e., school psychologists) are seeking an overall intellectual ability score for linguistic and cultural minority students, the CTONI appears to be a suitable measure.

Limitations and Suggested Further Research

In conducting this study, this investigator acknowledged both limitations and alternative research questions that may prompt additional research studies in this area.
1. One limitation of this study was the small sample size for each group (ESL = 14, non-ESL = 14) in the study. As participants were selected from an existing convenience sample, it was not possible to include more participants in the current study. Although this study’s small sample size did not seem to inhibit statistical power, future research comparing the performance of ESL and non-ESL Hmong students’ CTONI performance should attempt to include a larger number of participants in each group.

2. Another possible limitation within this study is that there may not have been a big enough dichotomy between the ESL and non-ESL groups (levels 1 through 5 = ESL, level 6 = non-ESL). Future studies might use a large overall sample size, with an adequate number of participants representing each language proficiency level. Using this design, researchers may be able to identify more specific relationships between language proficiency level and performance on the CTONI (and other nonverbal intelligence tests).

3. Another possibility for future research would be to administer participants the Bilingual Verbal Ability Tests (BVAT) (Munoz-Sandoval, Cummins, Alvarado, & Ruef, 1998) to assess their total language proficiency, and then see how it correlates with their intellectual ability (as measured by the CTONI).

4. Further research is needed to investigate the question of why the current study (and Keiler’s study) found a significant difference between non-ESL and ESL students on nonverbal tests such as the CTONI and UNIT. It would be interesting to test the current study’s participants with the CTONI at a follow up time (i.e. after more years of exposure to English language) and compare the scores of individuals currently classified non-ESL and ESL. Would the students currently classified as ESL continue to demonstrate lower CTONI scores after years of English exposure? Future studies should also attempt to use
a random sample and control for factors such as SES, parent education level, date of immigration to U.S., and level of acculturation to identify potential confounding variables that may be related to participants' test performance.

5. Further research should continue to investigate the use of different nonverbal intelligence tests with Hmong students. In addition, studies should explore the performance of a variety of different ethnic and cultural groups on recently developed nonverbal cognitive measures (i.e. CTONI, UNIT, Leiter-R, TONI-3). Given that many of these tests were developed in recent years, and the increasing ethnic diversity in today's schools, the research in this area is greatly needed.

Summary

A general purpose of this study was to investigate the performance of Hmong students on the CTONI, considering the extremely limited research on the use of nonverbal intelligence tests with this specific ethnic group. Consistent with the limited existing research, results from this study support the utility of the CTONI as a valid cognitive assessment tool for Hmong students. A more specific purpose of this study was to investigate the relationship of language proficiency to Hmong students' performance on the CTONI. Since students with limited English proficiency performed lower than English proficient students on the CTONI, further research is clearly needed to investigate the relationship between students' language proficiency level and their performance on nonverbal cognitive tests. Clearly, the CTONI is a more suitable alternative than traditional language-loaded intelligence measures, for providing a more valid and fair cognitive assessment for linguistic and cultural minority students. Although additional studies are needed to compare the CTONI with other recently developed
nonverbal intelligence tests, the CTONI would appear to be a valuable tool in any practitioner's cognitive assessment battery. Of course, practitioners should utilize a variety of assessment methods (i.e., standardized tests, observations in multiple settings, thorough interviews, informal assessments, etc.) when conducting evaluations in the school setting. A comprehensive assessment approach is particularly important when assessing linguistic and cultural minority students.
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APPENDIX A

PARENT LETTER
Dear parent(s):

We are trying to find out how well a special ability test works with Hmong students. This test does not involve any spoken language. It is thought to be a fair test to use with Hmong students and other students who speak two languages. The information we find out from using this test with some Hmong students will be very helpful to the La Crosse School District and other schools where Hmong students attend.

The test will only take about 45 minutes. It can be done during the school day or after school.

If you wish to have your child participate, please sign one of the attached forms and return it in the enclosed envelope by Friday, ____________. Keep the second one for yourself. If you have any further questions regarding this study, please feel free to contact either of us by telephone or e-mail at:

Dan Redwine (available after 6:00pm) Robyn Neff (available after 6:00pm)
(608) 796-0521 (608) 796-0828
dredwine99@yahoo.com neffra13@aol.com

Thank you for your time and consideration.

Sincerely,

Dan Redwine Robyn Neff
APPENDIX B

PARENT CONSENT FORM
Parent Consent Form
Ability Testing with Hmong Children

I will allow my child to take this ability test. This information may be helpful in meeting the needs of Hmong children in La Crosse. My child’s individual scores will not be given to anyone. I have been told that general information from this study may be presented or publicized.

My child will be tested for about 40 to 45 minutes on skills such as memory and reasoning. The purpose of this study is to see if an ability test is fair for Hmong children. My child is not likely to be uncomfortable during testing and there are no likely risks. This test has been used with Hmong students in the past without any problems. There are no hidden purposes of this test. Dan or Robyn will answer any questions before or after testing. My child can quit at any time without any penalties. My child will receive a dictionary or school supplies for taking the test.

If you have any questions about this project, please call Dan Redwine (608) 796-0521, Robyn Neff (608) 796-0828 or Dr. Milt Dehn (608) 785-8124. Questions regarding the protection of human subjects may be addressed to the chair of the UW-La Crosse Institutional Review Board for the Protection of Human Subjects, (608) 785-8124.

Parent’s Signature: __________________________ Date: __________________________

Home Phone Number: __________________________

Child’s Name: __________________________ Grade: __________________________

Teacher’s Name: __________________________

School Name: __________________________

Please check when you prefer your child to participate:

☐ During the school day
☐ After school

***Please sign and return one copy to your child’s teacher. Keep one copy for yourself***
APPENDIX C

STUDENT ASSENT FORM
Student Assent Form

Ability Testing with Hmong Children

➢ I agree to participate in this project

➢ I was told that I will have to work on some activities for about 45 minutes to help with this project.

➢ I was told that this is not for a grade and I just have to try my best.

➢ I was told that the person helping with this project will answer any questions I have about it.

➢ I was told that I can quit this project at any time if I feel uncomfortable or for any other reason.

➢ I was told that my scores will be kept private and nobody will know how I did.

Researcher ___________ Date ___________ Student ___________ Date ___________