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Preliminary Normative Data of the Poreh and Martincin Naming Tests

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To my wonderful husband, Matt, and all the others who have loved and supported me when I needed it most. You are a constant source of strength and guidance. Thank you!

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ABSTRACT

The purpose of this study is to design and evaluate the validity of the Poreh and Martincin Naming Tests, used to evaluate naming difficulties in demented populations. The Poreh and Martincin Naming Tests will be two new computerized tests used to examine anomia, a form of aphasia in which one has difficulty with naming. Both community and clinical groups were sampled, with each participant being administered the Boston Naming Test, the Poreh Naming Test, and Martincin Naming Test, and a task of verbal fluency. Each community sample participant over the age of 65 and every clinical sample participant also received the St. Louis University Mental Status Exam.

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CHAPTER I

INTRODUCTION

In diagnosis of dementia, aphasia which is "an impairment in the understanding or transmission of ideas by language in any of it's forms… that is due to injury or disease of the brain centers involved in language" (American Psychiatric Association, 2000, pg 820), is commonly evaluated because it can be a symptom of all forms of dementia and is a clear sign of cognitive dysfunction. Currently, the gold standard for evaluating naming ability is the Boston Naming Test (BNT), which was developed decades ago and has not been improved upon since. Today there is a greater need than ever for precise diagnosis devices due to the rapid growth of the elderly population. The baby boomer generation is reaching the age where dementia is a great concern, and the younger populations are expected to live even longer due to continuous advances in modern medicine, only reinforcing the need for precise diagnostic tools, which in turn may lead to advanced therapy for dementia and its many symptoms.

Some of the problems with the current BNT include (a) that some of the items are rather low frequency words, (b) resulting in clear bias in favor of better educated

people with a wider vocabulary, and (c) indirectly being biased towards people of a higher socioeconomic status who can afford better education. Another criticism of the current BNT is that the pictures are simple black and white images, which can make recognition of the items more difficult due to ambiguity. Next, latency is not precisely measured. An examinee has 20 seconds to respond to the item, but this is not recorded and is done with a stopwatch. Time is not recorded because the examinee merely has to finish within the time allowed, and there is no benefit to finishing an item quickly, nor is there any penalty for taking longer. Finally, the BNT only examines visual naming, and there is increasingly a need to examine auditory naming as well.

The Poreh and Martincin Naming Tests address each of these concerns (See Appendix A). The Poreh Naming Test is a new, computerized visual naming test. The benefits of a computerized version are primarily that it is now standardized between administrators, and also that it will automatically measure latency and responses. New items have been developed that are higher frequency words that are perhaps more difficult to say, making it a test of actual naming abilities, as opposed to a test of vocabulary. Next, the items are in color, making it clearer as to what they are, and again making it more of a test of naming abilities and eliminating ambiguity. Finally, the Poreh Naming Test is computerized. This allows for latency to be precisely measured, as well as providing test administrators a tool to make the administration more consistent, thus giving it a high level of inter-rater reliability.

The Martincin Naming Test is a test of auditory naming abilities. Auditory naming is similar to visual naming, except that a person will respond to auditory cues,

such as an object being described, instead of visual stimuli. Currently, there are few tests on auditory naming abilities, with most of the research in this area being conducted by Dr. Marla J. Hamberger (Hamberger & Seidel, 2003; Hamberger, Seidel, Goodman, Perrine, & McKhann, 2003; Hamberger, Seidel, McKhann, Perrine, & Goodman, 2005; Hamberger, McClelland, McKhann, Williams, & Goodman, 2006), who studies the location of auditory and visual naming sites in the brain with regard to surgery for temporal lobe epilepsy. Her test was the only one found in a review of the literature. Auditory naming is as important as visual naming, primarily because this sort of naming is commonly used in conversation and everyday interactions with people. A deficit in auditory naming is another form of aphasia, and is equally indicative of dementia or other cognitive dysfunction. The Martincin Naming Test is also computerized. Instead of the examinee viewing a visual cue with the computer program, the program generates a cue for the administrator to read, which the examinee will verbally respond to so that latency and accuracy can be measured precisely. The formation of this addresses the need for further investigation into auditory naming, as there is a distinct lack of diagnostic tools for assessing auditory naming abilities.

Community and clinical populations will be sampled, each being given a battery containing the Boston, the Poreh, and the Martincin Tests. Individual results of the Boston, the Poreh, and the Martincin Naming Tests will be compared for both populations. Within the community sample, any participant over age 65 will also be given a mental status exam to be sure that they are not suffering from dementia.

Following data collection, scores will be examined and correlated for the purpose of establishing validity. A ceiling effect is expected within the community population. Other factors including latency or response time, age, educational level, and sex will also be examined to determine their effects on performance.

For the next stage of test development, the Poreh and Martincin Naming Tests, which each currently contain 58 items, will be refined to 30 item versions, and items will be arranged so that less difficulty items are seen earliest in the test, followed by more difficult items toward the end. The process of collecting both community and clinical samples will need to be repeated, with a larger focus on having a broad clinical sample. Following the collection of a second round of data, results will then be compared to published norms of the Boston Naming Test and Hamberger's auditory naming test.

CHAPTER II

LITERATURE REVIEW

The Boston Naming Test. The gold standard of visual naming tests in the Boston Naming Test (also known as the BNT); it has long been accepted and embraced by the psychological and medical community as an aid for making diagnoses such as dementia or physical damage to the brain from lesions or injury . It is specifically examining "confrontational naming", which is naming what one sees (Saxton, et al, 2000). The test itself is fairly straightforward. A simple line drawing of an object is placed in front of the subject, and the subject responds verbally as to what the picture is. The subject has up to 20 seconds to respond, however there are no bonus points for quick responses, and exact time of responses is not recorded. If the subject does not know what the picture is (e.g. a mushroom), the test administrator can give them a stimulus cue (e.g. "it is something you eat"), or a phonemic cue (e.g. "it begins with M") (Kaplan, Goodglass, & Weintraub, 1983). The items at the beginning are very simple and common (e.g. bed and tree) and increase with difficulty, ending with lower frequency words (e.g. trellis and abacus) (Kaplan, et al, 1983).

Many studies have been conducted to find the normative data for the BNT. Gender does not appear to have a significant impact on BNT scores (Henderson, Frank, Pigatt, Abramson, & Houston, 1998; Zec, Burkett, Markwell, & Larsen, 2007). Only one study reviewed showed significant gender differences, and even that appeared to be minor (males showing a mean score of 29.1, females mean 28.4) (Jefferson, et al, 2007). Education level was controlled for and the author notes that educational differences are large between males and females in the older populations (Jefferson et al, 2007). However, there were differences in which one gender scored better on selected items. Women more frequently correctly identified "asparagus" and "palette", while men more frequently correctly identified all other items. Also of interest, men with specific occupations that used tools such as a compass, protractor, yoke, and tripod, were more likely to identify these items correctly than men who did not use these items (Henderson et al, 1998). The research did not state if women who used these items professionally were more likely to correctly identify them than women who did not use these items professionally.

Education does appear to play a role, with more educated people scoring better (Henderson et al, 1998; Saxton et al, 2000; Zec et al, 2007). Henderson et al (1998) credit this difference to people with higher education having a wider vocabulary, resulting in the increased scores. The Mayo Clinic performed a series of studies of older adults and found that intelligence scores (using the WAIS-R Full Scale IQ) correlated more highly with performance on the BNT than with education, with correlations of .608 and .310 respectively (Steinberg, Bieliauskas, Smith, Langellotti, & Ivnik, 2005). However, Henderson et al (1998) did a comprehensive

literature review and cited several studies that did not find a significant difference in performance between people with varying education levels. Kent and Luszcz (2002) also performed a comprehensive literature review and had similar findings that several studies found differences in performance based on education levels, but a few did not. In all of the studies listed that found differences though, the higher educated population performed better than the lower educated populations. Zec et al (2007) also note that less educated groups scored lower on average and also had a larger standard deviation in scores than did higher educated groups.

Age also appears to play a role, with verbal naming ability declining over time and those over age 80 showing the greatest difficulty (Kent & Luszcz, 2002; Zec et al, 2007). However, the sample sizes of people in older age groups are routinely very small, especially in groups of people over the age of 85. The proportion of society in these advanced age groups is increasing, leading to a great necessity for research in this area to determine if this decline in verbal naming ability is a normal part of aging or a sign of cognitive impairment (Kent & Luszcz, 2002). Zec et al (2007) also noted that similar to lower educated groups, those in advanced age groups not only scored lower, but they also had a larger standard deviation of scores than did younger groups.

Race has not been firmly established as to whether or not it plays a role in declining ability. Differences have been found, but not necessarily at a statistically significant level (Henderson et al, 1998). Henderson et al (1998) presented some research that finds it does as well as other research that finds that it does not, but their research that does indicate race plays a role suggests that African Americans score

more poorly than Caucasians. It should be noted that an interaction effect may be playing a role in these studies because African Americans are less likely to have a bachelor degree or high school diploma than the Caucasian population (Henderson et al, 1998). Jefferson et al (2007) found that race did play a role even after controlling for educational levels. They further note that there are significant socioeconomic and cultural factors that could play a noteworthy role in the differences. It appears that differences between other minorities groups such as Hispanic and Asian populations have not been studied as frequently as the differences between African American and Caucasian populations.

Similar Tests and Shortened Versions. Several other tests have been developed since the formation of the BNT, including the Philadelphia Naming Test by Roach, Schwartz, Martin, Grewal, and Brecher (1996) to address selecting and coding responses, and shortened versions of the BNT for specific use for patients with time or attention span restraints, for repeated testing, and also for time/financial constraints (Fisher, Tierney, Snow, & Szalai, 1999; Mack, Freed, Williams, & Henderson, 1992; Saxton et al, 2000). The shortened tests are usually either 15 or 30 items, compared the full BNT's 60. The two 30 item tests appear to correlate highly with the full version and have high internal consistency, but the four 15 item tests are found in some research to have lower correlations with the full version of the BNT, despite their being more commonly used (Fisher et al, 1999). Of the 15 item versions, there are most commonly four tests, equally divided of the original BNT's 60 items, balancing the number of low frequency, medium frequency, and high frequency items between them for the greatest equality in difficulty (Fisher et al,

1999). Also, the two versions of the 30 item test appear to show the greatest similarity in results between the two forms when administered (correlations ranging from .92 to .96 in various published literature), but the four versions of the 15 item test show greater differences in results between the forms (correlations ranging from .79 to .98 on the various forms published) (Mack et al, 19992; Fisher et al, 1999; Kent & Luszcz, 2002; Saxton et al, 2000). While these 15 item versions are slightly less reliable, they are still effective and necessary in certain diagnostic situations. They are very helpful in test-retest situations (e.g. for Alzheimer's patients who will routinely be retested to assess decline) and for patients who have a limited attention span (Saxton et al, 2000). One of the 15 item versions is routinely used in the neuropsychological battery of the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) (Kent & Luszcz, 2002; Saxton et al, 2000).

The BNT has also been translated into many languages. A quick review of the literature finds that it has been translated in French, Korean, Danish, Swedish, as well as others. In some of these tests, items were altered due to distinct cultural differences, but after alterations similar data was found (Kim & Na, 1999).

Criticisms of the Boston Naming Test. The BNT has been carefully studied and validated over the last forty years, with few improvements made upon it. What has only recently been studied is the effect of latency on the BNT, and within these studies, a stopwatch is being used, which does not allow for an accurate and highly precise measure (Hamberger & Seidel, 2003). This lack of attention to latency is surprising because it may be assumed that a person who takes a significant period of time to identify a simple object may be suffering from the same cognitive deficits as a

person who cannot identify that item at all. Word finding decline, both auditory and visual, has been commonly found in patients who have had temporal lobe surgery (Hamberger, et al, 2005), leading to a perceived neurological link. Perceptual processing is disrupted in those who cannot identify visual stimuli, in contrast to problems with word retrieval in conversation, which is a disruption of auditory functions (Hamberger & Seidel, 2003).

Hamberger's (2003) primary criticism for the majority of naming tests, including the BNT, is that they include low-frequency items, which results in a test of vocabulary as opposed to a test that truly measures naming abilities. In the original normative data collected by the Boston Group in 1983, the mean education level was 15.25 years (Henderson et al., 1998). Henderson (1998) specifically states that items "yoke", "trellis", and "abacus" may only be known to people who have a broad reading vocabulary; this gives clear advantage to the more highly educated and higher socioeconomic strata of society.

Kent and Luszcz (2002) offer another criticism that the majority of normative data and research come from America. These Australian researchers conducted studies in their nation to see if certain items are more familiar to Americans than other populations, and found that results in Australia are similar to the results found in the United States. However, these results combined with results from other international studies raise the question of whether this test, which has been translated into many languages, is truly applicable to non-American populations. Barker-Collo (2007) performed a similar study in New Zealand and found that New Zealanders

scored well below the most closely matched North American sample and identified specific items of bias, suggesting that this does need to be further investigated.

A final criticism is the distinct lack of research on adapting the BNT to special needs groups. The test is obviously inappropriate for the visually impaired populations, but there appears to be no normative data and no alternatives for the hearing and speech impaired populations. The hearing and speech impaired populations have effective ways to communicate, including verbally for some hearing impaired persons, and commonly have no visual impairments, so a visual naming test would be appropriate for this population if someone is experiencing cognitive decline. However, the BNT would need to be validated for this population before making that assumption.

Auditory Naming. While there is a fair amount of information on visual naming processes, fairly little is known about auditory naming. Hamberger began her interest in auditory naming because Temporal Lobe Epilepsy patients frequently report word finding difficulties, and a visual naming task cannot reliably detect this disturbance (Hamberger & Tamny, 1999). Hamberger and colleagues (2007) state that there are virtually no published studies on auditory naming within the temporal-lobe epilepsy population, which is a problem considering that this population commonly requires surgical intervention. Disturbance of both visual and auditory naming sites in surgery can clearly present problems for the patient, but with mapping technology this can be prevented. Hamberger's work has revealed that auditory naming sites are typically located anterior to visual naming sites, which are located in the "posterior portion of the temporal region, primarily on the superior temporal

gyrus and middle temporal gyrus, with some suprasylvian representation" (Hamberger et al, 2007; Hamberger, et al, 2003). Other auditory naming sites are actually "dual" sites, or sites that affect both auditory and visual naming (Hamberger et al, 2007). It has been found that removal or disturbance of auditory naming sites is also associated with word-finding decline, as is disturbance on visual naming sites (Hamberger et al, 2003; Hamberger et al, 2005). See Figure 1.

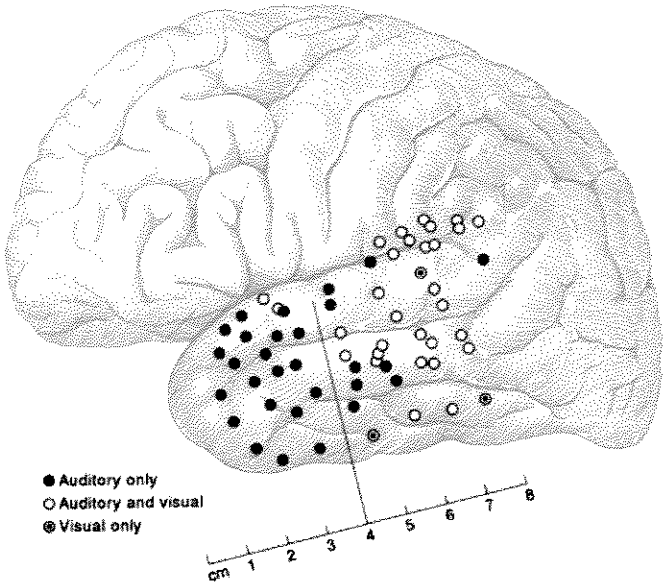


Figure 1: Auditory and Visual Naming Sites

"Topographic distribution of naming sites across patients indicating whether auditory, visual, or both auditory and visual naming were disrupted during stimulation." (Hamberger, Goodman, Perrine, & Tamny, 2001)

Auditory naming tests differ from visual naming tests in that auditory naming tests give verbal cues, such as asking the examinee to identify an object that is described to them, and then similar to visual naming tests, the examinee verbally names the object described. Auditory sites may share the same location in the brain as visual sites, but there are also separate, independent auditory sites that, on occasion, must be identified in patients.

Clinical Applications. Anomia, or difficulty with naming (Henderson et al, 1998), is a common symptom of many various neurological disorders, including but not limited to various forms of dementia (Hamberger & Seidel, 2003; Henderson et

al, 1998). Anomia is a form of aphasia, which is "an impairment in the understanding or transmission of ideas by language in any of it's forms… that is due to injury or disease of the brain centers involved in language" (American Psychiatric Association, 2000, pg 820), and is one of the most common signs of cognitive-linguistic impairment (Henderson et al, 1998). More importantly, different forms of aphasia can be indicative of different forms of dementia; this is due to damage in different areas of the brain affecting various forms of language production and comprehension. This is highly applicable to today's aging population, and evaluation of naming problems is especially important in the cognitive testing of older individuals (Saxton et al, 2000).

Arnold Pick (1851-1924) was one of the first medical professionals to observe and study the effects of language difficulties as associated with cognitive decline (Kertesz & Kalvach, 1996; Spatt, 2003). His work in the late 19th century lead to great strides in the areas of dementia, including but not limited to Pick's Disease, the form of dementia that bears his namesake (Kertesz & Kalvach, 1996). The anatomy of Pick's Disease is characterized by argyrophilic inclusions, which are similar to neurophibrillary tangles, and Pick's Bodies, which are swollen neurons. Pick's Disease primarily affects the frontal and temporal lobes, which in early on can cause "changes in personality (…) deterioration of social skills, emotional blunting, behavioral disinhibition, and prominent language abnormalities" (American Psychiatric Association, 2000, pg 165). While the similarities between Pick's Disease and Alzheimer's Disease are clear, Pick's Disease is far rarer, occurring at a

ratio of 1:10 to Alzheimer's Disease; both can involve progressive aphasia (Kertesz & Kalvach, 1996).

The BNT is also used and has been validated with specific diagnostic populations including those with head injuries, cerebrovascular disease, brain tumors, seizure disorders (including but not limited to Temporal Lobe Epilepsy), alcoholic dementia, and depression (Hamberger et al, 2005; Saxton et al, 2000). It is appropriate for use in most ages (with the obvious exception of younger populations, due to limited vocabulary development) and as a diagnostic tool for any injury or illness related to decline in cognitive functioning.

St Louis University Mental Status Examination (SLUMS)

The St. Louis University Mental Status Examination (SLUMS) is used to assess difficulty in orientation, memory, executive function, and attention (Tariq, Tumosa, Chibnall, Perry, & Morley, 2006). It is a 30 item test used for screening the elderly, or anyone suspected of having cognitive difficulty (see Appendix B). The SLUMS has found to be more sensitive than the Mini Mental State Examination (MMSE) (another popular screening tool) at detecting mild neurocognitive disorder (Rosack, 2006; Tariq et al, 2006). For the purposes of this study, where it will be used to screen the general population for mild cognitive impairment, it is imperative that the most sensitive tool is used. The most common criticism of the SLUMS is that it is fairly new (it was developed in 2003), but it has been found in published studies to be more sensitive that the older and more popular MMSE (developed in 1975) (Farlow, Miller, & Pejovic, 2008; Rosack, 2006). With this increased sensitivity, the SLUMS addresses many of the common criticisms of the MMSE,

including that the MMSE does not accurately estimate the severity of dementia in low socioeconomic population with limited literacy skills, and that the MMSE does not accurately track the progression of non-Alzheimer's Disease dementias (Osher, Wicklund, Rademaker, Johnson, & Weintraub, 2007; Scazufca, Almeida, Vallada, Tasse, & Menezes, 2009). One article goes as far as stating "The MMSE has become like a somewhat embarrassing member of the family," referring to its many flaws but its popularity in the literature (Zarit, Blazer, Orrell, & Woods, 2008, pg 411). The SLUMS addresses some of these concerns, including that it has a separate scale for people who have less than a high school education, and a slightly different scale for those who have a high school education or greater.

CHAPTER III

METHOD

Participants. One hundred subjects received the Poreh and Martincin Naming Tests, the Poreh being a revised and improved visual naming test specifically designed to measure latency, and the Martincin being an auditory naming test (Appendix A). They will also receive the BNT, as well as a task of Verbal Fluency, which is a portion of the SLUMS. For this item on the SLUMS, the subject is asked to name as many animals as possible in one minute. If the subject repeats an animal, it is not counted toward the final tally. People over the age of 65 received the whole SLUMS (Appendix B) to make sure they are not suffering from dementia. See Appendix D for full procedure of administration. The scores of these 100 participants were compared to establish reliability, and the data will be compared with previous published data of the norms for the BNT. A 10 person sub-sample of N was retested after a three month period. A smaller clinical population (N=5) from the Willowood Care Center, a nursing home in Brunswick, Ohio, also received the same battery. These participants had a previous diagnosis of dementia (mild to moderate dementia,

as those who are severely demented would not be able to be tested due to severe impairment), and consent was received from their families prior to testing.

All community sample participants were age 18 or older with no personal history of dementia or related illness, including any diagnosis or symptoms of cognitive deficit or decline or head injury with loss of consciousness. Participants were recruited from the Cleveland State University community and surrounding area. All participants, community and clinical samples, will consist of native English speakers. Community sample participants will be excluded if they have any of the following: a history of dementia, significant head injury or illness including but not limited to concussion with loss of consciousness, are non-native English speakers, any person over the age of 65 who scores the mild cognitive impairment range on the SLUMS, and any person who displays any difficulty with vision on hearing.

The sub-sample for retesting after a three month period was selected primarily based on availability, with a smaller emphasis placed on finding people of differing age groups and education levels to retake the test. There people selected were all people who were known to me, and therefore I could contact them again after a period of time for retesting.

Test Construction. The Poreh and Martincin Naming Tests will be constructed using modern word frequency tables as a basis for the items, with a focus on finding items of varying word frequency as well as items that would be known to people of all ages and education levels. Once data has been collected from both populations, these tests will be refined from 58 item versions to 30 item versions. Items will first be deleted if they are ambiguous or flawed in any way. Next, reaction

time and number of errors will be examined within the clinical population. The items will be arranged in order of difficulty (easiest to hardest) and the first ten items will be "easy", the middle ten "moderate", and the final ten items will be "hard" items.

Poreh Naming Test. The Poreh Naming Test (PNT) is administered on computer with the appropriate software for the administrator to oversee the test. The participant views the stimuli on the laptop screen, while the administrators records his or her responses, with the ability to record latency as well as whether a phonemic or semantic error was made and precisely what that error was. The items selected as visual stimuli were selected more for words that are more complex to say instead of low-frequency words (e.g. helicopter and broccoli, as opposed to abacus and trellis), greatly reducing the complications of a vocabulary deficit, as opposed to a true naming deficit. If a participant is having trouble with the stimulus item, a semantic cue is given (e.g. for broccoli "it is a vegetable") and if they continue to have trouble, a phonemic cue is given (e.g. it begins with "br") .

Martincin Naming Tests. The Martincin Naming Test (MNT) is an auditory naming measure. It is done on the computer with the same interface as the Poreh Naming Test, but instead of the examinee viewing a picture, a verbal cue is generated and is read to the examinee by the administrator. The participant will still respond verbally, latency will be recorded as well as if the participant has made a semantic or a phonemic error. Particularly with the clinical sample and the portion of the community sample over the age of 65, hearing difficulties may present a significant problem. If any hearing difficulties are noticed (e.g. in general conversation pervious

to testing), the testing will cease and this participant's data will not be used in the sample.

Data Analysis. Scores will be assessed using Pearson product moment correlations comparing performance on the BNT, PNT, MNT and the task of Verbal Fluency (animal naming). Additional correlations will be used to examine the role of age and education on performance of each of these tasks. For the clinical sample, performance on the SLUMS will also be examined to determine if there is any correlation of SLUMS score to score on the BNT, PNT, or MNT.

Hypothesis. One hypothesis is that the PNT will correlate highly with the BNT. A ceiling effect may occur because I am examining a normal population and this could reduce correlation coefficients; however I do not believe this shall be problematic because the goal is to establish a valid test of naming, not a valid test of vocabulary. A second hypothesis is that performance on the MNT will correlate highly with performance on the BNT and PNT, in both the clinical and community samples. Finally, a third hypothesis is that the comparisons to the clinical population at the nursing facility will find a significant differences on both tests, thereby establishing construct validity of the instruments.

CHAPTER IV

RESULTS

For the community sample, the mean score on the PNT was 57.6 out of 58 items. The mean score on the MNT was 57.7 out of 58 items. The mean score on the BNT was 29.4 out of 30 items. Performance on the PNT, or visual naming task, and the MNT were found to significantly correlate ($r=.407$, $p<.01$). Performance on the BNT correlated significantly with both the PNT ($r=.435$, $p<.01$) and the MNT ($r=.302$, $p<.05$). Age correlated significantly with performance on the BNT ($r=.236$, $p<.05$), but age did not correlate significantly with the PNT or MNT. Performance on the task of Verbal Fluency correlated significantly with the MNT ($r=.283$, $p<.01$), but it did not correlate significantly with performance on the BNT or PNT. Finally, education did appear to play as a role on the current sample as it has in published literature. Education level significantly correlated with performance on the PNT ($r=.226$, p,.05), but it did not significantly correlate with performance on the BNT or the MNT. The community subjects over the age of 65 also received the SLUMS exam. Of their scores on the PNT, MNT, and BNT, none significantly correlated

with scores on the SLUMS. See Appendix E for a list of all correlations and significance values.

For the clinical sample, the mean score on the PNT was 44.4 out of 58 items. The mean score on the MNT was 39.8 out of 58 items. The mean score on the BNT was 20 out of 30 items. Performance of the SLUMS and the MNT or auditory naming task were found to be significantly correlated ($r=.908$, $p<.05$). No other significant correlations were found in the clinical sample. See Appendix E for a list of all correlations and significance values.

For the test-retest group, performance was found to be nearly identical in each person retested after a three month waiting period. Nearly all of these participants scored perfectly on each of the measures to begin with (as did most of subjects in the community sample), so the ceiling effect strongly influenced this measure of validity.

Following the data analysis, each item was examined in relation to response time and difficulty for the clinical population. This allowed for the original 58 item versions of the PNT and MNT to be refined into 30 item tests. The first ten items on each tests are considered "easy", the middle ten items "medium", and the final ten items to be "hard", so there would be a progression in difficulty for each task, as displayed in the following graphs. Difficulty was used to establish which items were in the easy, medium, or hard groups, and this allowed reaction time to be evaluated. For the easy group, items with a faster reaction time were used. For the medium group, items with moderate reaction times for this group were used. For the hard group, items with the slowest reaction times were used. See Appendix C for the new order or items on each test.

Figure 2: Reaction Times of Items on the Poreh Naming Test

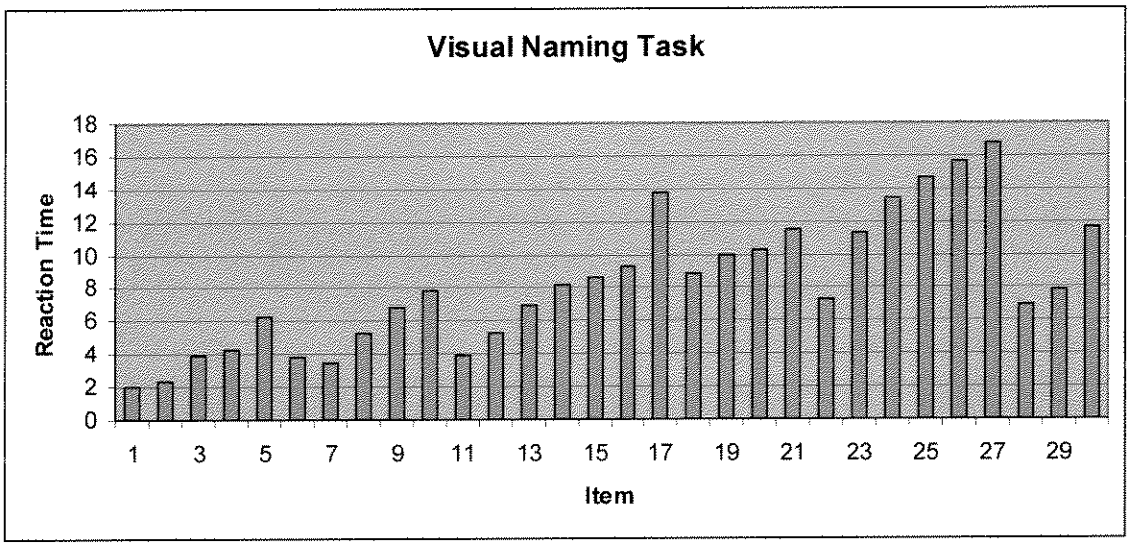


Figure 3: Difficulty of Items on the Poreh Naming Test

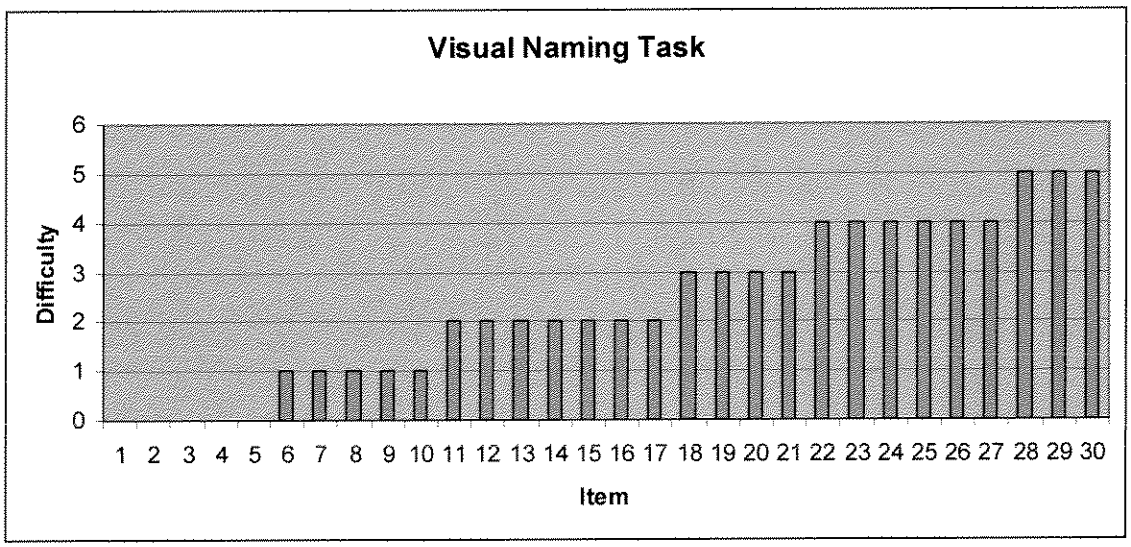


Figure 4: Reaction Time of Items of the Martincin Naming Test

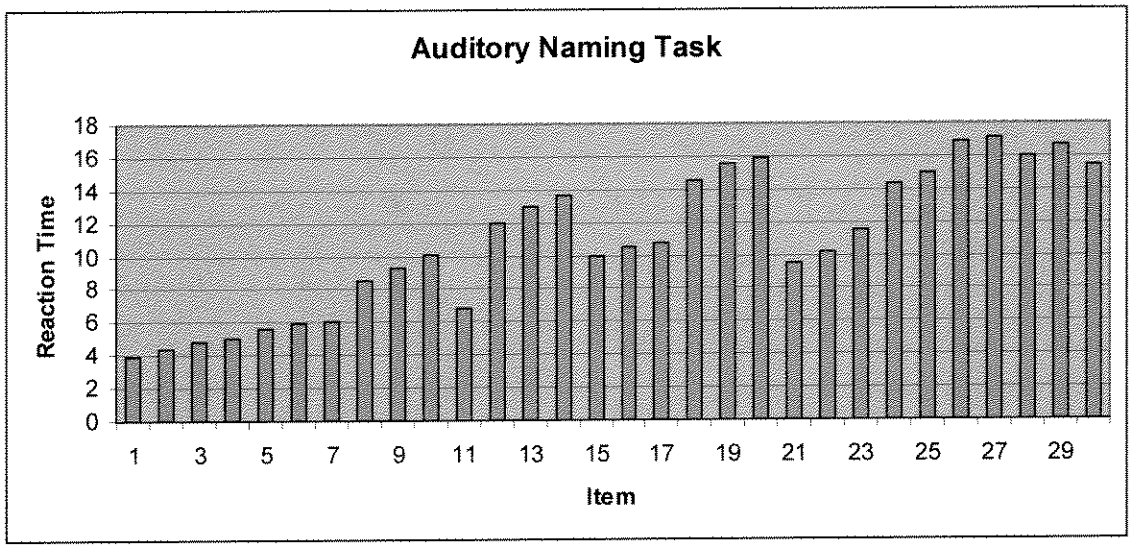
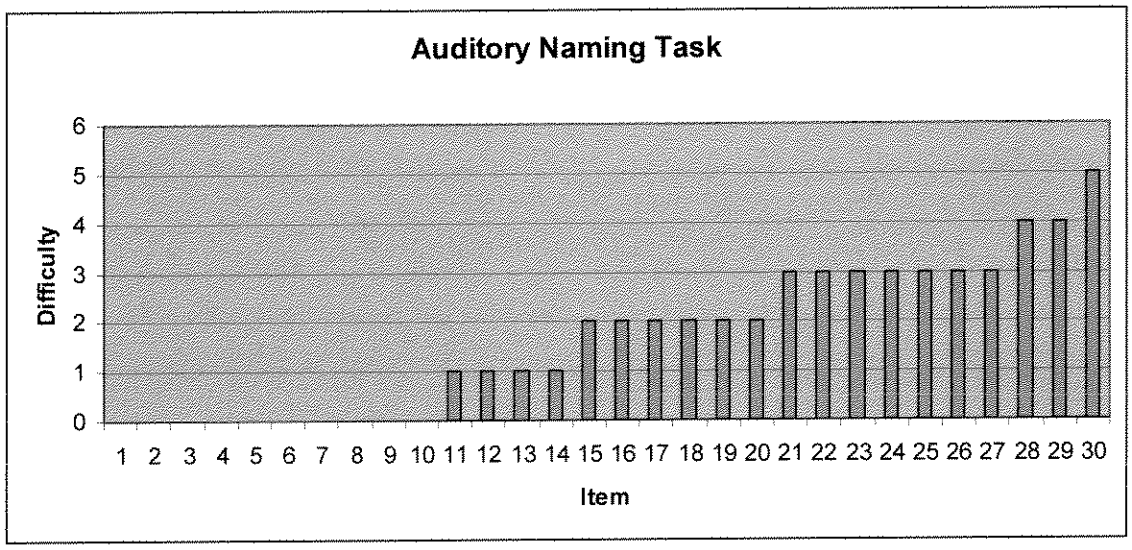


Figure 5: Difficulty of Items on the Martincin Naming Test



CHAPTER V

DISCUSSION

Results. Within the community sample, the hypothesis that performance on the BNT, PNT, and MNT would all correlate significantly was confirmed. However, it was slightly surprising that the task of Verbal Fluency only significantly correlated with the MNT, or the auditory naming task, and not the PNT and BNT, which are both visual measures. This would be of interest to examine again in the next phase of test construction with a more diverse community sample and a larger clinical sample.

The results of the clinical sample were largely disappointing, and I believe this is due primarily to the limited sample size (N=5). Only performance on the SLUMS and the MNT significantly correlated, while performance on the BNT and PNT did not significantly correlate with anything, and most importantly they did not significantly correlate with each other as I had hypothesized. The correlation between the SLUMS and the MNT raises many questions about the validity of the MNT. This strong correlation is very odd is because there was no significant correlation between SLUMS score and MNT performance in the community sample, which consisted of eight healthy adults over the age of 65. Due to this discrepancy,

further study would be needed with a much larger clinical sample as this could be an indication that the MNT is invalid. With a larger clinical sample, results could be compared to Hamberger's auditory naming studies, and construct validity could be established.

Ceiling Effect. As expected, responses of the community sample evidenced a strong ceiling effect on the BNT, PNT, and MNT. Even the oldest people in the community sample, age 82, were able to score nearly perfectly on all three measures. This was expected, as the tasks are intended to be a measure of naming and not of vocabulary. However, in the next phase of test construction, it would be in our best interest to examine some harder items for both the PNT and MNT to help differentiate between earlier and later stages of dementia (see Appendix C). Related to this, it is interesting that age and performance on the BNT showed a significant correlation ($r=.236$, $p<.05$), but age did not correlate significantly with performance on the PNT or MNT. This may suggest that the items on the BNT are better suited for an older population because older people tended to score better (examples being a yoke for oxen and abacus), and we were able to select items that were known to both older and younger populations.

Sample Limitations. Data collection for the clinical sample proved to be far more difficult that originally imagined. During the time of data collection, the Willowood Care Center was suffering from a dramatic drop in census, to the point where the facility had to close one entire ward due to lack of residents. Because of this, there was a more limited pool to draw from than originally imagined. The Director of Nursing at the facility selected 30 residents who she believed met the

selection criteria of mild to moderate dementia, minimal visual and auditory impairment, and able to participate in conversation. Letters were then sent to the selected participants' Power of Attorneys. Of these 30, 15 POAs responded that they would allow testing of their wards. Of these 15, one noted that his ward was functionally blind, so she was eliminated from the sample and not tested. The next difficulty came once actual testing of the residents began. A good portion of these residents, five total, were far more advanced in their dementia than it appeared on the surface. Of these residents, most scored a zero on the SLUMS and could not answer any of the items on the BNT, so their scores were not included in data analysis. Four other residents were either too ill to test or passed away between the time approval was received from their POAs and testing administration. This left a sample of only five residents who were able to complete the battery. Of these residents, there was a fairly diverse sample of people. Age ranged from 81-95, there were two males and three females, all had 12 years of education, and scores on the SLUMS ranged from 3-18.

Of the five participants who were too advanced in their dementia to test, interesting knowledge was still gained. These participants were each still verbal, able to greet people and have a very basic conversation (e.g. "good morning"), and also were able to express basic needs (e.g. "I'm hungry"). One participant in particular was rather surprising as she appeared much better on the surface than testing would suggest. This particular participant resides in the nursing home with her husband who does not have dementia. They moved to Willowood together once her dementia progressed to the point where he was having a much harder time taking care of her,

despite his lack of dementia or pervasive physical impairment. The husband requested to be present for her testing, and this request was granted. He did not interfere with testing in any way, allowing his spouse to answer each question on her own; however following testing he was quite upset as he could tell without seeing any scores that his wife was in worse condition than even he imagined. This example reinforces the need for precise measurement instruments, as well as continued research of dementia, as many people are quite skilled at cloaking their dementia, which could result in waiting to seek help as well as perhaps not being as aggressive in treatment.

Refinement of Measures. Despite having its limitations, these data have allowed us to refine our 58 item tests into more concise 30 item tests. This data has also allowed us to eliminate poorly worded items on the MNT, and less desirable images on the PNT. At this stage, it will be necessary to continue investigation and repeat the data collection process. For the second round of data collection, it would be wise to repeat a community sample with more of a focus on obtaining elderly participants. Next, a much larger community sample must be obtained. Within this sample, it would be helpful to get people with more diverse education and socioeconomic backgrounds (each of the clinical participants in the current sample had 12 years of formal education and came from middle class, blue collar occupations). Once this sample is collected, all the same correlation that have already been done should be done once more within sample, then again between samples, and finally, t-tests should be used to compare the new sample with published norms for the BNT as well as Hamberger's auditory naming task.

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APPENDICES

Appendix A: Original Martincin Naming Test Items and Poreh Naming Test Items

Martincin Naming Test Items

1. Hat – an article of clothing worn on one's head.
2. Cow – a large farm animal that produces milk.
3. Ring – a piece of jewelry worn on one's finger.
4. Heart – the organ of the body responsible for pumping blood.
5. Couch – a piece of furniture one commonly sits on and is built for multiple people.
6. Train – a locomotive that moves on rails.
7. Teepee – a cone-shaped building that was home to some tribes of Native Americans.
8. Fork – an eating utensil which commonly has three or four prongs.
9. Pen – a writing instrument containing ink.
10. Aunt – a relative who is a sister to either of one's parents.
11. Bride – a woman who is getting married
12. Costume – an outfit worn to disguise one's appearance.
13. Baseball – an American sport using a bat and a ball
14. Towel – a piece of cloth used to dry things
15. Bathing suit – what one wears when going swimming
16. Belt – item of clothing, commonly made of leather, worn around the waist
17. Coin – a small, round piece of money
18. Bubble gum – candy that is meant to be chewed and not swallowed
19. Moon – a large celestial body found in the sky at night which orbits the Earth
20. Clock – an item, sometimes found on a wall, used for telling time
21. Kangaroo – an animal known for moving by hopping and having a pouch.
22. Valentine's Day – A holiday in February known for celebrating love.
23. Teacher – a person who's job it is to educate children.
24. Slippers – shoe like articles worn to keep one's feet warm.

25. Bridge – a man-made structure, constructed to allow one to travel over a body water
26. Portrait – a picture or painting of a single person, family, or group of people
27. Wine – an alcoholic beverage made of fermented grapes
28. Iron – a household appliance used for removing wrinkles from one's clothes
29. Exercise – physical activity done to keep one's body healthy
30. King – a man who is ruler of his country and considered royalty
31. Angel – a religious figure or symbol, known for having wings and a halo
32. Beach – a sandy area of land bordering a body of water
33. Dictionary – a book containing the definitions of words.
34. Ballerina – a dancer known for dancing on her toes and wearing a tutu.
35. Dove – a white bird symbolizing peace.
36. Carrot – a common, orange vegetable enjoyed by rabbits
37. Curtains – Fabric window coverings
38. Diploma – the piece of paper one receives when graduating high school or college
39. Kitchen – the room in one's house mostly used for preparing food
40. Italy – the country home to cities such as Rome and Venice
41. Monday – the first day of a normal work week
42. Bark – the wooden covering of the trunk of a tree.
43. Rose – a common flower known for having thorns
44. Lawn mower – a device which can be pushed or ridden, used for trimming grass
45. Tortoise – a land dwelling retile that has a shell
46. The Nile – a very long river found in Egypt.
47. Mile – the standard unit measuring length of American roads
48. Widow – a woman who's husband has died.
49. Dentist – a medical professional who is responsible for care of one's teeth.
50. Thermostat – the device in one's home used to regulate the temperature of one's air conditioner and furnace.
51. Refrigerator – an appliance in ones kitchen where food is kept cool

Appendix A - Continued

52. Motorcycle – a motor vehicle with only two wheels
53. Shampoo – soap used to wash ones hair
54. Leash – a rope used to walk a dog
55. Titanic – a famous ship that sunk on its maiden voyage when it hit an iceberg
56. Dalmatian – a white dog with black spots, commonly associated with firemen
57. Mummy – an Egyptian monster known for being wrapped in white cloth
58. Spaghetti – a common Italian food with long thin noodles and tomato sauce, commonly eaten with meatballs

Appendix A Continued – Original Poreh Naming Test Items

1 Anchor
2 Cactus
3 Avocado
4 Globe
5 Harmonica
6 Iron
7 Palette
8 Pretzel
9 Snake
10 Telescope
11 Umbrella
12 Window
13 Banana
14 Broccoli
15 Crab
16 Funnel
17 Grasshopper
18 Helicopter
19 Belt
20 Bottle
21 Camel
22 Clock
23 Fork
24 Frog
25 Glove
26 Grapes
27 Hanger
28 Bell
29 Kite
30 Mask
31 Pelican
32 Piano
33 Pliers
34 Rhinoceros
35 Scissors
36 Scroll
37 Asparagus
38 Accordion
39 Tweezers
40 Compass
41 Gorilla
42 Hammock
43 Hourglass
44 Toaster
45 Microscope
46 Moustache
47 Vampire
48 Taj Mahal
49 Volcano
50 Windmill
51 Zebra
52 Soap
53 Strawberry
54 Igloo
55 Truck
56 Swing
57 Violin
58 Trumpet

SLUMS EXAMINATION

e-mail: aging @Slums.com Saint Louis Univ. Mental Status Exam

___/1 1. What day of the week is it? ___/1 3. What State are we in
___/1 2. What is the year?

4.; Please remember these five objects. I will ask you what they are later:
Apple Pen Tie House Car

5. You have $100 and you go to the store and buy a dozen apples for 3 dollar and a tricycle for $20
___/1 How much did you spend? ____/2 How much do you have left?

6. Please name as many animals as you can in one minute:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

0 0-4 animals 1 5-9 animals 2 10-14 animals 3 15+ animals

7. What are the five objects I asked you to remember? (1 point for each)
__Apple __ Pen __ Tie __House __Car Total score = _____

8. I am going to say a series of numbers and I would like you to say them to me backward
___0 ___1 ___1
87 649 8537 Total score = _____

9. On this page is a clock face. Please put in the hour markers and the time at ten minutes past eleven o'clock
___2 Hours marked okay ___2 Time correct

10. Place an X on the triangle ___/1 Which Figure is the largest ___ /1

11. I am going to tell you a story. Please listen carefully because afterwards, I'm going to ask you some questions about it

Jill was a very successful stockbroker. She made a lot of money on the stock market. She then met Jack, a devastatingly handsome man. She married him and had three children. They lived in Chicago.
She then stopped work and stayed at home to bring up her children. When they were teenagers, she want back to work. She and Jack lived happily ever after.

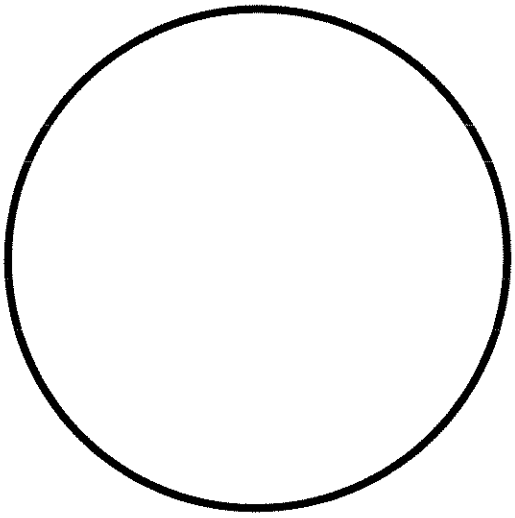
__2 What is the name of the woman? ___ 2 What work did she do?
__2 When did she go back to work? ___ 2 What State did she live in?

Total score _____

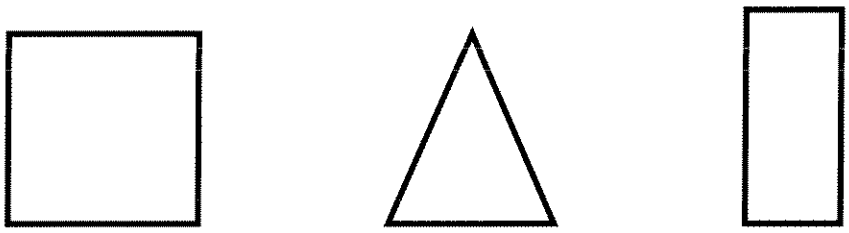
High School Education		Less than High School Education
27-30	Normal	25-30
21-26	MNCD*	20-24
01-20	Dementia	01-19

* Mild Neurcoognitive Dementia

APPENDIX B Continued: St. Louis University Mental Status Exam



Fold ----------



Appendix C: Second Phase of Test Construction – Item Order for Poreh and Martincin Naming Tests

Poreh Naming Test

	Item	Mean Reaction Time	Difficulty	Original Item Number
1	Umbrella	1.96	0	11
2	Swing	2.3	0	56
3	Glove	3.92	0	25
4	Belt	4.2	0	19
5	Moustache	6.28	0	46
6	Frog	3.84	1	24
7	Kite	3.48	1	29
8	Accordion	5.26	1	38
9	Strawberry	6.84	1	53
10	Zebra	7.86	1	51
11	Anchor	3.92	2	1
12	Trumpet	5.26	2	58
13	Cactus	6.88	2	2
14	Helicopter	8.18	2	18
15	Tweezers	8.62	2	39
16	Windmill	9.28	2	50
17	Globe	13.76	2	4
18	Iron	8.84	3	6
19	Broccoli	9.92	3	14
20	Taj Mahal	10.28	3	48
21	Grasshopper	11.56	3	17
22	Crab	7.32	4	15
23	Microscope	11.24	4	45
24	Hourglass	13.46	4	43
25	Vampire	14.68	4	47
26	Palette	15.62	4	7
27	Gorilla	16.76	4	41
28	Avocado	6.88	5	3
29	Soap	7.86	5	52
30	Rhino	11.64	5	34

Appendix C Continued: Second Phase of Test Construction – Item Order for Poreh and Martincin Naming Tests

Martincin Naming Test

	Item	Mean Reaction Time	Difficulty	Original Item Number
1	Kitchen	3.9	0	39
2	Cow	4.32	0	2
3	Pen	4.82	0	9
4	Ring	5.02	0	3
5	Widow	5.62	0	48
6	Carrot	5.94	0	36
7	Baseball	6.02	0	13
8	Refrigerator	8.52	0	51
9	Dentist	9.26	0	49
10	Heart	10.01	0	4
11	Teacher	6.84	1	23
12	Bark	11.98	1	42
13	Mile	12.96	1	47
14	Dove	13.68	1	35
15	Diploma	9.92	2	38
16	Bubble Gum	10.5	2	18
17	Shampoo	10.76	2	53
18	Exercise	14.58	2	29
19	Aunt	15.56	2	10
20	Valentines Day	15.92	2	22
21	Thermostat	9.54	3	50
22	Nile	10.14	3	46
23	Titanic	11.5	3	55
24	Motorcycle	14.34	3	52
25	Kangaroo	15	3	21
26	Leash	16.9	3	54
27	Rose	17.06	3	43
28	Teepee	16.04	4	7
29	Italy	16.7	4	40
30	Ballerina	15.48	5	34

Appendix D: Procedure of Administration

1. Greet participant. Give them my name and tell them that I am a graduate student at Cleveland State University who is looking for people to participate in a simple task for psychological assessment. Inform them that testing will take roughly ten minutes and all responses will be completely confidential and they may discontinue testing at any time during the process. Present informed consent form, with extra copy given to participant for them to keep. Ask the participant if they are over the age of 18 and have any history of dementia or head injury or illness, and have them initial this area on the form. Ask if they have any questions at this time.
2. Ask participant if English is his or her native language. Perform task of verbal fluency – Ask the participant to name as many animals as possible in one minute. Tell the participant that you will keep track of the time and the animals, and to try their best to continue if they feel they are stuck. Begin stop watch when participant is ready and record the animals as they go. Do not count the animal if it is mentioned twice.
3. Administer The Boston Naming Test, Poreh Naming Test, and Martincin Naming Test. Alter order of test presentation with each new participant.
    a. Boston Naming Test – administer the 30 item short form using the odd numbered items. Instruct the participant that you are going to show them some picture, and to please tell you what each is. Adhere to the published directions of the BNT, including the 20 second time limit, and using the semantic and phonemic clues as needed.

b. Poreh Naming Test – Enter in personal data for the participant in the first screen. Next, the computer program will give the participant directions stating "I am going to show you some pictures. Please look at each carefully and tell me what it is." As the participant answers, click on the button stating if they are correct, or if they are stuck click on the "semantic" or "phonemic" buttons, depending on which type of error the participant is making. If they are not sure what the item is, administer the semantic clue. If they seem to know what the item is but cannot come up with the name (e.g. if they state "oh it's that musical instrument…" for "accordion"), administer the phonemic clue. If you are unable to differentiate immediately, administer the semantic clue. If they are still unsure, note that in the text box and move on the phonemic clue and repeat.

c. Martincin Naming Test – Enter in personal data for the participant in the first screen. Next, the computer program will give the participant directions stating "I am going to read you some clues. Please listen carefully and tell me what it is." As each item appears, read it to the participant without the participant viewing the screen. No semantic or phonemic clues are given. If the participant answers incorrectly, mark that in the text box and move on to the next item.

4. Thank the participant for his or her time. Ask if they have any final questions.

Appendix E: Tables of All Correlation Values

(*) = Correlation is significant to the .05 level (2-tailed)
(**) = Correlation is significant to the .01 level (2-tailed)

Correlations with Community Sample	**r=**	**p=**
BNT & PNT	.435(**)	0
BNT & MNT	.302(**)	0.003
PNT & MNT	.407(**)	0
Age & BNT	.236(*)	0.019
Age & PNT	0.15	0.14
Age & MNT	0.051	0.621
Verbal Fluency & BNT	0.138	0.175
Verbal Fluency & PNT	0.152	0.135
Verbal Fluency & MNT	.238(**)	0.005
Education & BNT	0.108	0.292
Education & PNT	0.226(*)	0.026
Education & MNT	0.013	0.9

Correlations with Community Sample Subjects over the Age of 65	**r=**	**p=**
SLUMS & BNT	0.022	0.96
SLUMS & PNT	0.496	0.212
SLUMS & MNT	-0.022	0.963
BNT & PNT	0.696	0.055
BNT & MNT	0.113	0.809
PNT & MNT	0.077	0.87

Correlations with Clinical Sample	**r=**	**p=**
BNT & PNT	0.824	0.086
BNT & MNT	0.869	0.059
PNT & MNT	0.663	0.222
Age & BNT	-0.596	0.289
Age & PNT	-0.726	0.165
Age & MNT	-0.194	0.754
Verbal Fluency & BNT	0.356	0.557
Verbal Fluency & PNT	-0.215	0.728
Verbal Fluency & MNT	0.504	0.387
SLUMS & BNT	0.711	0.178
SLUMS & PNT	0.679	0.208
SLUMS & MNT	0.908(*)	0.033

Appendix F: IRB Approval Form

Cleveland State University

Office of Sponsored Programs and Research
Institutional Review Board (IRB)

Memorandum

To: Amir, Poreh
Psychology

From: Blake Hodges
Institutional Review Board
Office of Sponsored Programs & Research

Date: 9 January 2009
Re: Results of IRB Review of your project number: 38366-POR-HS
Co-Investigator: Kelly Martincin
Entitled: Normative Data of the Poreh Naming Test

The IRB has reviewed and approved your application for the above named project, under the category noted below. Approval for use of human subjects in this research is for one year from the approval date listed below. If your study extends beyond this approval period, please contact this office to initiate an annual review of the project. ***This approval expires at 11:59 pm on 12/18/2009.***

By accepting this decision, you agree to notify the IRB of: (1) any additions to or changes in procedures for your study that modify the subjects' risk in any way; and (2) any events that affect that safety or well-being of subjects.

Thank you for your efforts to maintain compliance with the federal regulations for the protection of human subjects.

Approval Category: **Date: 12/19/2008**

Exempt Status: Project is exempt from further review under 45 CFR 46.101 (b)(2)

X Expedited Review: Project approved, Expedited Category 7

Regular IRB Approval

cc: Project file

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