TAMIL-ENGLISH BILINGUAL APHASIA TEST

THE PERFORMANCE OF NON-IMPAIRED TAMIL-ENGLISH BILINGUALS ON THE BILINGUAL APHASIA TEST

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Abstract

This thesis examines the performance of non-impaired Tamil-English speaking bilinguals on the Tamil-English version of the Bilingual Aphasia Test (BAT) (Paradis and Libben, 1987). The test was administered to 25 participants, 15 women and 10 men. The results show that, on average, participants achieved an overall score of 97%. However, participants did not do well on two subtests on the English version, specifically sections on derivational morphology and morphological opposites. Also, a more detailed analysis indicates that years of education significantly correlates with performance, even though it is claimed that years of education should not affect performance on this test. This study makes suggestions for how to improve the Tamil-English version, in view of the findings from this study, and provides a cautionary note on the role played by years of education in test performance. If the latter factor is not taken into account, the test could possibly lead to an inaccurate assessment of a patient's language abilities, and could potentially result in misdiagnosis. In an effort to increase the test's validity and reliability, this study recommends a series of modifications to the Tamil-English version of the BAT, based both on participants' comments and on statistical analyses.

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Table of Contents

Descriptive Note ii

Abstract iii

Acknowledgements iv

Table of Contents v

List of Tables and Figures vii

Declaration of Academic Achievement viii

1.0 Introduction 1

1.1 Language and Aging 1

1.2 Bilingualism and Aging 3

1.3 Aphasia 6

1.4 Bilingual Aphasia 8

1.5 Bilingual Aphasia Test (BAT) 10

1.6 Objectives 19

1.7 Linguistic Sketch of Sri Lankan Tamil 20

1.8 Socio-Political Characteristics of Sri Lankan Tamil Population 22

2.0 Methods 23

2.1 Participants 23

2.2 Materials 25

2.3 Procedure 30

2.4 Statistical Analysis 31

3.0 Results 31

3.1 Universal Answer Key 31

3.2 Performance 35

3.3 Data Analysis 41
3.4 Comparisons 41
3.4.1 Language of Instruction 42
3.4.2 Age 43
3.4.3 Gender 44
3.5 Subtests 45

4.0 Discussion 46
4.1 Subtest Performance 49
4.2 Modifications 56
4.3 Observations 62

5.0 Conclusion 64

6.0 References 66

7.0 Appendix 70
7.1 Appendix A: English Poster Advertisement 70
7.2 Appendix B: Tamil Poster Advertisement 71
7.3 Appendix C: Screening Questionnaire 72
7.4 Appendix D: English Letter of Information and Consent 73
7.5 Appendix E: Tamil Letter of Information and Consent 76

List of Tables and Figures

Tables

Table 1: Demographic variables of participants 24
Table 2: Part A – History of Bilingualism 25
Table 3: Part B – Language (English/Tamil) background 26
Table 4: Part B – Subtests 27
Table 5: Part C – Subtests 29
Table 6: Sentences from Syntactic comprehension with incorrect answers 33
Table 7: Descriptive Statistics 36
Table 8A: English Score 36
Table 8B: Tamil Score 37
Table 8C: Tamil – English score 38
Table 9A: Writing scores 39
Table 9B: Unconnected sentences 39
Table 9C: Continuous Narrative 40
Table 10: Spontaneous speech scores 41
Table 11: Participants with English language of instruction 42
Table 12: Participants with Tamil language of instruction 42
Table 13: Participants age 50-69 years 43
Table 14: Participants age 70-89 years 43
Table 15: Male participants 44
Table 16: Female participants 44
Table 17: Morphological Opposites task – Difficult words for participants 50
Table 18: Derivational Morphology task 52
Table 19: Sentence Construction Task – Performance in both languages 63

Figures

Figure 1: Visual options for “Van” 32

Declaration of Academic Achievement

My supervisor Anna Moro and I refined my thesis project. I conducted the assessment and collected and statistically analyzed all of the data. Diana Gresku and Anita McFarlane assisted with coding data and preliminary data analysis. I wrote the thesis, including the literature review myself, accommodating helpful comments from the supervisory committee.

1.0 Introduction

The area of research investigating the aging, bilingualism and assessment is beginning to expand. Due to the lack of diagnostic tools available for assessing bilinguals with language impairment, researchers are investigating the validity of existing assessments, such as the Bilingual Aphasia Test (BAT) (Muñoz and Marquardt, 2008; Paulin and Purdy, 2008). This thesis is the only study to examine the reliability of the Tamil-English version of the BAT. To gain an understanding of this analysis, the current literature on the topics of language and aging, bilingualism and aging, aphasia and bilingual aphasia must be discussed. This section presents an overview of these topics, as well as an introduction to the Bilingual Aphasia Test and a review of the studies that have investigated the BAT among different linguistic groups (1.5). The principal objectives of this study are outlined in 1.6. This section concludes with a linguistic sketch of modern Tamil (1.7) and brief overview of the Sri Lankan Tamil community in Canada (1.8).

The rest of the study is organized as follows: section 2 describes the methodology adopted for this study; section 3 presents detailed results; section 4 contains the discussion of findings, and includes recommendations for modifications to the Tamil-English version of the BAT. The final section (5) contains concluding remarks.

1.1 Language and Aging

A lot of what we know about language and healthy aging is based on the study of monolinguals. Some of the more common changes among aging adults include difficulty with word-finding and retrieval. This may be due to either rerouted phonological

networks as a result of neural compensation (Grossman et al., 2002), or a weakening of existing connections that require additional cues or time to arrive at the correct response (Burke, MacKay, Worthley and Wade, 1991). Syntactic processing is another area of language that is believed by some to be generally compromised with age. Complex sentences such as those with embedded clauses, and multiple antecedents and pronouns can be difficult to manage and decipher with a reduced memory capacity. For example, a syntactic processing study conducted by Waters and Caplan (2001) found that aging adults did not perform as well as the young adults in tasks involving syntactic complexity. Other studies, however, suggest that syntactic processing is relatively well maintained in older adults. A study conducted by Christianson, Williams, Zacks and Ferreira (2006) examined the comprehension and interpretation of garden-path sentences in older and younger adults; these researchers observed minimal differences in performance between the age groups. Whether or not syntactic processing declines with age appears to still be uncertain.

With respect to the comprehension of spoken language, studies have indicated that aging adults find speech processing difficult. This may be the result of hearing loss (Wingfield and Stine-Morrow, 2000) and, possibly, poor inhibitory control (Zacks and Hasher, 1997). Aging adults seem to rely rather heavily on contextual information to facilitate following a conversation or story (Wingfield and Stine-Morrow, 2000).

Although comprehension can be compromised, oral production appears to be preserved in aging adults. Speech errors appear to be made rarely, and aging adults seem to notice their errors and correct them (Cooper, 1990). Another area of language that

seems to be relatively unaffected in aging adults is semantic memory and retrieval. The reaction times of healthy aging adults in semantic word retrieval tasks appear to be comparable to those of younger adults (St-Laurent, Abdi, Burianova and Grady, 2011). One possible explanation for the preservation of semantic memory is the fact that visual or auditory representations of words facilitate an association with related items and concepts; perhaps automatic processes such as these are simply more resistant to degradation than controlled processes (Schrauf, 2008).

It is clear that in the past few decades we have gained a lot of understanding of what aspects of language are affected by the aging process and what aspects appear to be resistant to effects of aging. We must bear in mind, though, as stated at the outset, that much of what we know about language and aging is based on research that focuses on monolinguals (cf. Schrauf, 2008).

1.2 Bilingualism and Aging

Schrauf (2008, p. 105) describes the research area that bridges cognitive aging and bilingualism as one "in its infancy". First, it is well-known that the concept of bilingualism itself is not straightforward. As Schrauf and others indicate, bilingualism exists on a continuum. A bilingual's ability in each language is affected by many important factors, such as the number of speakers with whom the individual interacts in each language, frequency of usage, the social function of each language (home language versus work language), the age of acquisition of the languages, the mode of acquisition (formal or informal), issues of dominance and prestige (the perceived value of each

language in the bilingual's environment), and the typological relatedness of the languages. Given the number of factors that can affect an individual's proficiency, bilingualism can be highly asymmetric, i.e. an individual can be dominant in one language and have very limited proficiency in the other, or more or less symmetrical (balanced bilingualism). As mentioned above, most of what we know about language from the perspective of aging is based on the study of monolinguals. It is not surprising that conclusions stemming from studies that have looked at bilingualism from the point of view of aging are few. The following discussion, which looks at what studies on bilingualism and aging have found, is informed by Schrauf's (2008) thorough overview.

Schrauf (2008) identifies three themes or hypotheses in the literature on bilingualism and aging:

1. Performance on language tasks is similar between monolinguals and bilinguals.
2. Regression in performance, caused by age, occurs in both languages.
3. "Language-switching" may retard degradation of both languages.

For the evidence in support of the first hypothesis, Schrauf points to studies based on neuropsychological assessments conducted by Obler, Albert and Lozowick (1986) and Rosselli et al., (2000). Obler et al. (1986) examined the difference in performance between older Yiddish-English bilinguals and older English monolinguals. All the bilingual participants were native English speakers, which allowed the researchers to assess the effect that knowledge of a second language (Yiddish) has on the first language (English). Participants were administered a number of tasks from varying language

batteries aimed at examining different language areas in different modalities. Obler et al. (1986) conclude that language comprehension and production are similar between bilinguals and monolinguals. The study conducted by Rosselli et al. (2000) investigated the performance of monolingual English speakers, monolingual Spanish speakers and Spanish-English bilinguals. They found a minimal difference in performance between monolinguals and bilinguals, even after categorizing participants according to age of acquisition.

Schrauf (2008) finds support for the second hypothesis mentioned above – an age-related decline in both languages – in De Picciotto and Friedland's (2001) semantic fluency study that examined the performance of aging English-Afrikaans bilinguals. In this study, animal names were generated in three conditions: Afrikaans only, English only and a mix of Afrikaans and English. The authors conclude that performance was comparable in each condition, a factor which they attribute to the possible balanced bilingualism of many of the participants.

The third theme that Schrauf highlights is the claim encountered in the literature that the language-switching abilities of bilinguals may actually shield against neural deterioration. As Schrauf (2008) mentions, studies conducted by Zied et al. (2004) and Bialystok, Craik, Klein and Viswanathan (2004) are in support of this proposal. Zied et al. (2004) tested Arabic-French bilinguals using the bilingual Stroop test. The participants were categorized as balanced bilinguals, Arabic-dominant and French-dominant; their results showed that monolinguals, as well as, bilinguals who were dominant in one language, performed similarly, but balanced bilinguals performed the best. What this

appears to suggest is that balanced bilingualism offers protection against inhibitory deficits. Bialystok et al. (2004) administered a variation of a non-linguistic task known as the Simon task; the task required individuals to press a particular key if a square appeared on a screen in a specific colour, and to press another key if a square appeared in a different colour. They increased the difficulty of this task by adding two additional colours and keys. They found that bilinguals maintained reaction times with increasing age, whereas monolinguals had increased reaction times as age increased. Their findings support the view that bilingualism offers resistance to age-related decline in a way that monolingualism appears not to.

1.3 Aphasia

Even though more than 100,000 Canadians are diagnosed with aphasia, many people are unaware of this disease's existence (Aphasia Institute, 2012; Simmons-Mackie, Code, Armstrong, Stiegler, Elman, 2002). Aphasia is a neurological disorder that results from damage to the language areas of the brain. It is typically caused by a head injury, brain tumour or stroke (National Institute on Deafness and Other Communication Disorders, 2010). Aphasia is generally subdivided into three broad categories: expressive aphasia, receptive aphasia and global aphasia. Expressive aphasia, also called Broca's aphasia or non-fluent aphasia, results from damage to the frontal lobe of the brain, and is characterized by an inability to communicate through well-formed utterances in speech or grammatical sentences in writing. Expressive aphasics generally have good comprehension, but are only able to produce short sentences (National Institute on

Deafness and Other Communication Disorders, 2010; National Institute of Neurological Disorders and Stroke, 2012). Receptive aphasia, also often called Wernicke's aphasia, or fluent aphasia, results from damage to the temporal lobe and is characterized by the inability to comprehend spoken or written language. However, fluent aphasics may generate sentences with limited meaning and can be unaware that their speech is incomprehensible (National Institute on Deafness and Other Communication Disorders, 2010). Global aphasics suffer from a loss of comprehension of written and spoken language as well as severe deficits in the expression of language through speech and writing (National Institute of Neurological Disorders and Stroke, 2012).

Aphasia is increasing in prevalence in the aging population as a symptom of a number of diseases, injuries and medical emergencies that increase in incidence with age (Wade, Hewer, David and Enderby, 1986). This is of concern since seniors make up the fastest-growing age group (Human Resources and Skills Development Canada, 2012). In 2010, approximately 14% of Canadians were 65 years of age or older, but by the year 2051, it is expected that 25% of Canadians will be 65 years of age or older (Human Resources and Skills Development Canada, 2012).

Immigrant seniors may be among the most vulnerable members of the aging population in Canada in general. A report of the Special Senate Committee on Aging, published in 2009, states that immigrant seniors 'are particularly at risk of living in poverty' (p.101) because of certain disadvantages they face within the Canadian pension system. Witnesses before the Senate Committee noted in particular the economic burden faced by senior immigrants from source countries with which Canada does not have a

reciprocal social security agreement, such as India, Pakistan and Sri Lanka (p.102). The Senate Committee report on aging points to several recommendations that could assist immigrant seniors in general, and language is a key component of several of them. What the report stresses (p. 140ff) is the importance of addressing the needs of immigrant seniors in their language, and of taking cultural and religious practices into account, particularly in the domain of health care.

1.4 Bilingual Aphasia

In 2006, Canada consisted of 200 different ethnic groups (Human Resources and Skills Development Canada, 2012). Therefore, living in a country as culturally and linguistically diverse as Canada, we can expect a rise in the number of aging bilinguals who acquire aphasia. Aphasia can affect one or both languages known by the patient, and recovery can occur in one or both languages as well. The recovery patterns can be categorized as selective, differential or parallel (Paradis, 2004). Selective recovery occurs when both languages are affected by aphasia, but one language cannot be accessed or treated. Differential recovery refers to an impairment of both languages, but language recovery patterns differently based on the proficiency of each language prior to the onset of aphasia. Parallel recovery refers to equal impairment in and recovery of both languages (Paradis, 2004).

Within these broad categories we find more specific types of recovery: blended, successive and antagonistic recovery (Paradis, 2004). As Paradis (2004) explains, blended recovery refers to cases in which the patient mixes the languages; successive

recovery refers to when a patient recovers their second language only upon recovering their first language. In antagonistic recovery, a patient makes some progress but then reverts back to an impaired state in that language as the second language begins to recover; if this process continues to repeat itself, with progress and deterioration in alternating languages, then the term 'alternating antagonistic recovery' is used.

Why one language is sometimes retained better than the other is not well understood. Paradis (2004) provides a brief summary of the accounts that explain this phenomenon. One theory suggests that this may be due to the different lateralization of languages across hemispheres (Obler, Albert, Goodglass and Benson, 1978), which may differ from individual to individual. A bilingual whose first or second language is more lateralized may have that language more available even as an aphasic. The lateralization hypothesis is based on the assumption that language is initially represented in the right hemisphere and, as it is learned and becomes more familiar, lateralizes onto the left hemisphere. The proficiency of an individual's languages influences their lateralization in the brain (Obler et al., 1978). Some studies have also shown that there exists anatomical variation between those who learned both languages at an early age and those who learned a second language at a later age (Kim, Relkin, Lee, Hirsch, 1997). Using fMRI, Kim et al. (1997) found that those who acquired both languages at an early age show frontal cortical activation when using either language, whereas those who acquired their second language at a later age showed activation in different regions within Broca's area.

With respect to injury and severity, researchers have put forward multiple reasons to explain language impairment and recovery in aphasia. Paradis (2004) reviews the

hypotheses that have emerged since the late 1800s. Perhaps it is the language learned first that is most resilient to impairment or is the one to be recovered first. Perhaps it is the language with which we are most familiar that is capable of resisting damage. Perhaps the 'most functional language' of the two languages in question offers protection against impairment or assistance with recovery.

Given that aphasia stems from an array of causes and results in different degrees of severity and different recovery patterns, Green (2008) states that a thorough understanding of the causes and effects of aphasia is crucial to understanding language representation and control in the brain. Such an understanding would facilitate the creation of effective rehabilitation programs for bilingual aphasics. Of course, in order to do this, the aphasia diagnosis itself must be accurate. A reliable diagnostic tool must effectively assess which linguistic areas are weak and impaired, and which have been relatively well maintained. One of the tools available to diagnose aphasia in bilinguals is the Bilingual Aphasia Test (Paradis and Libben, 1987).

1.5 Bilingual Aphasia Test (BAT)

The Bilingual Aphasia Test (BAT) was created by Paradis and Libben in 1987 and is used to assess the severity of impairment in each language of a bilingual aphasic. The original versions were developed in English and French. The BAT has been adapted for over 60 languages and 150 language pairs (Paradis, 2011; Zanetti, Tonelli and Piras, 2012). It takes approximately 75 minutes to administer in each language. If time constraints do not permit the administration of the full version of the BAT, a shortened

version is available. The BAT is used primarily to test the extent of impairment in bilingual aphasic patients. In addition, it can be used to detect cognitive impairments such as mild cognitive impairment (MCI) and Alzheimer's disease (Gomez-Ruiz and Aguilar-Alonso, 2011; Paradis, 2011). Gomez-Ruiz and Aguilar-Alonso (2011) conducted a study investigating the ability of the subtests within the BAT to correctly discriminate between healthy individuals, those with mild cognitive impairment and those with Alzheimer's disease. Using the Spanish-Catalan population and the Spanish and Catalan versions of the BAT, they found that specific lexical access tasks (e.g. Verbal Fluency and Automatic Series) and comprehension tasks (e.g. Semantic Acceptability and Lexical Decision) were most effective in differentiating between participants of each type (Gomez-Ruiz and Aguilar-Alonso, 2011). The Spanish version was able to correctly discriminate 93.3 % of the participants, while the Catalan version correctly discriminated 88.9% of participants; when scores based on the two versions were combined, however, 95.6% of participants were correctly identified (Gomez-Ruiz, Aguilar-Alonso, 2011).

For the purpose of a diagnostic assessment, a bilingual is defined as a person who has a practical command of both languages (Paradis, 2004). The BAT consists of three parts. Part A addresses the language history of the patient and can be administered in any language. Generally, the language spoken by the physician or the language that the patient can best communicate in is used (Paradis, 1987; 2011). Part B tests multiple areas of receptive and expressive language and is the only section that is conducted in both languages. Finally Part C tests the patient's translation ability between languages at the word and sentence level, and assesses the patient's ability to provide grammaticality

judgments. Parts B and C test a number of language areas (phonology, syntax, morphology etc.) in all modalities (Paradis, 1987; 2011).

To compare performance across languages, adaptations of the test need to be linguistically and structurally equivalent. According to Paradis (2004; 2011), this criterion has been met by maintaining structural and linguistic equivalence across items in each language pair. For instance, the frequency of words used in one version must be comparable to the frequency of words used in the second version of a language pair. This feature of the BAT should allow healthcare providers to determine whether deficits are more focused in one language area or generalized to affect more than one area – an observation which may not be obvious if a patient were tested in only one of the two languages. A further claim by the authors is that the BAT is designed so as to minimize the effects of years of education and intelligence (IQ) effects on performance. According to Paradis (2011), though there is a tendency for better educated persons to perform better on the test compared to individuals with lower levels of education, the difference in performance should not be significant. The BAT should also be unaffected by literacy skill and socioeconomic status and has been described as a culturally neutral assessment tool (Paradis, 1987). Given these characteristics, the test is said to be simple enough for a non-impaired bilingual to achieve 100% for each language section of the test (Paradis and Libben, 1987; Muñoz and Marquardt, 2008). However, few studies have reported on the reliability and/or validity of these claims following adaptation into other languages.

Recent studies that discuss the reliability of specific adapted versions of the BAT support the need to validate these translated versions. For example, the performance of

non-impaired Spanish-English bilinguals on the shorter version of the BAT was examined by Muñoz and Marquardt (2008). Twenty-two bilinguals from 50 to 80 years of age were tested, all of whom had learned both languages by the age of ten and had not suffered from speech/language or cognitive impairments. Part C of the BAT and other bilingual measures were used in the initial interview to ensure that only those who had a good command of both Spanish and English were tested. The interview was followed by the completion of Part B in each language in two sessions conducted on consecutive days. Overall, participants obtained high scores in both languages, but scored higher in English than in Spanish. The researchers found a significant difference in literacy skill: participants had a higher average literacy skill in English. Muñoz and Marquardt (2008) found that proficiency level and degree of language use were significant predictors of performance in both languages. They also reported that 54 items in the BAT produced a correct response rate of less than 70%. This is important since a score of less than 80% is supposed to be diagnostic for aphasia. The 54 items include five items from the English version, 22 items from the Spanish version and 27 items from Part C, 18 of which required participants to translate from Spanish to English and 9 required them to translate from English to Spanish. Three out of the five items on the English version were from the verbal auditory discrimination subtest, whereas the items from the Spanish version came from a number of different subsections. Those in Part C involved semantic and syntactic errors in the translation of sentences, and grammaticality judgments. Muñoz and Marquardt (2008, p. 13) underscore that data on the performance of non-impaired

populations on the BAT are almost "non-existent," but are needed in order for the BAT to be an effective assessment tool in clinical settings.

Paulin and Purdy (2008) evaluated the performance of non-impaired aging New Zealand English speakers on the BAT (English). They sampled participants ranging from 50 to 85 years of age. Prior to administering the test, modifications were made to two items to make the test culturally more suitable. Their results showed that participants performed at ceiling on only four of forty subsections; obtained scores of less than 90% on a few subsections; and achieved scores lower than the normal range on several subtests. Participants found the auditory comprehension, derivational morphology and verbal auditory discrimination subsections to be the most difficult tasks. This study suggests that years of education and socioeconomic status did not affect performance on the assessment. Paulin and Purdy (2008) comment that although the BAT is criterion-referenced, there are subsections, such as the verbal fluency subtest, for which there are no criteria provided for comparison. The verbal fluency task requires the individual to produce as many words as possible in one minute that begin with a particular sound; it is not known, however, how many words are typically produced by a non-impaired individual to know whether the number of words produced by the individual being tested is diagnostic of aphasia. A clear objective of the Paulin and Purdy (2008) study is to test the cultural neutrality of the BAT. Although the participants were native speakers of English, the material on the BAT did not appear to reflect the general knowledge of speakers in all cases. The authors conclude on a favourable note overall: they state that

with appropriate modifications, the BAT can be a useful assessment for speakers of New Zealand English.

After Paulin and Purdy's (2008) discussion of a New Zealand version of the English BAT, McCann, Lee, Purdy and Paulin (2011) used the modified version of the New Zealand BAT and the Chinese version to assess language impairment in both languages of a Mandarin-New Zealand English speaker with aphasia. The researchers were able to compare the patient's (referred to in the study as CL) results against the performance of an unimpaired population of New Zealand English speakers and gathered valuable information on CL's performance. Unfortunately, normative data were not available for the Chinese version; as a result, McCann et al. (2011) could not be sure whether some of CL's errors were the result of aphasia or difficulty of specific items in the Chinese version of the BAT.

The Chinese BAT was also the focus of a study conducted by Kong and Weekes (2011). Kong and Weekes (2011) examined the performance of a Cantonese-Putonghua (Mandarin) speaker with aphasia. In this case, the BAT was useful in creating a summary of the patient's language impairments but the authors felt that further detailed testing was needed in order to establish a more precise linguistic profile. Kong and Weekes stressed the importance of altering the standard Chinese version to match that of the patient's dialect to ensure that the appropriate cultural and linguistic references are used. For instance, certain varieties of Chinese use a traditional character system while others use a simplified system. It is the test administrator's responsibility to make certain that the character system the patient is most familiar with is used. The researchers strongly

encourage the collection of normative and aphasic data, which they believe would "improve the clinical utility of the BAT" (Kong and Weekes, 2011, p. 11). This study emphasizes the importance of determining the specific dialects used on the language-adapted versions of the BAT to ensure that the most objective and accurate form of assessment is provided.

Ivanova and Hallowell (2009) investigated the performance of Russian-speaking adults with aphasia on the shorter version of the Russian BAT. They tested 83 patients aged 15-74. The researchers make the important observation that there were visually confusing stimuli in the BAT that led to incorrect responses, even when patients understood the questions correctly. For instance, one of the items in the verbal auditory discrimination section of the Russian version is the word "harbour". Although patients knew what a harbour was, the picture for that item did not correspond to their personal representation of a harbour. Therefore, participants pointed to either an incorrect picture or to the "X", which is to be used to indicate that there is no picture for the word. The authors express concerns about the reliability and validity of several questions in certain subtests including the following: pointing, simple and semi-complex commands, verbal auditory discrimination, lexical decision and reading comprehension for words. Ivanova and Hallowell comment that, given the lack of published norms and psychometric data available for this test, diagnoses cannot be made accurately, nor can decisions be taken about an appropriate therapy. The researchers echo the views expressed by Muñoz and Marquardt (2008), and referred to above: researchers need to document the performance

of healthy individuals on the BAT in order to help distinguish between normal and impaired performance.

Muñoz and Marquardt (2008) examined the performance of healthy Spanish and English speaking bilinguals on the Spanish-English BAT. A study by Juncos-Rabadán (1994), one of the first after the publication of the BAT, also focused in part on Spanish. Juncos-Rabadán (1994) examined the suitability of the BAT in view of language decline in unimpaired aging bilinguals. He administered the test to 60 Galician- Spanish bilinguals ranging in age from 30 to 90. Since a number of the older subjects were illiterate, the reading and writing tasks were omitted. This study showed that the poorest scores were obtained by the oldest group of participants (70-90). Despite the claim that education level should not affect an individual's performance on the BAT, Juncos-Rabadán found that subjects with the highest level of education obtained the highest scores on the assessment. Significant differences were found between age groups for 15 of the 21 subtests used, including subtests based on the following skills: commands, verbal auditory discrimination, syntactic comprehension, semantic categories, synonyms, antonyms, grammaticality judgments, repetition of words and lexical decision, syntactic construction, semantic opposites, derivational morphology, morphological opposites, description, mental arithmetic and listening comprehension. Age did not affect pointing, semantic acceptability, repetition of sentences, series, verbal fluency and naming tasks. Participants performed better overall in Spanish, which Juncos-Rabadán attributed to the fact that most participants lived in a city where Spanish is the dominant language. This study suggests that linguistic abilities decline in parallel ways in both languages in aging.

Juncos-Rabadán concludes that the BAT is a suitable instrument to evaluate the linguistic capacities of aging bilinguals, but cautions that educational level seems to affect performance, which could lead to inaccurate diagnoses.

A recent study by Peristeri and Tsapkini (2011) compared the performance of Greek-speaking Broca's aphasics on the BAT with their performance on the short form of the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1972). They compiled subtests from both tests that target the same linguistic components to determine if they yield comparable results. The hypothesis was that the BAT, being a more thorough diagnostic tool, would be more accurate in distinguishing between aphasia and normal aging in comparison to the BDAE, which lacks tasks in morphosyntax and morphophonology. A secondary purpose of this study was to validate the sensitivity and accuracy of the Greek BAT because of its frequent use in clinical settings. Nine individuals were tested with varying educational backgrounds. The authors found that the participants achieved a wide range of scores on the BAT and BDAE. The reading tasks on both tests yielded very similar scores, while participants achieved different scores on the verbal auditory discrimination task on both tests. Quantitatively, the BAT and BDAE were comparable in the listening comprehension and series tasks. The auditory discrimination subtest of the BAT was less difficult than the corresponding section on the BDAE because the BAT limits its items to nouns while the BDAE does not. Though higher scores would be obtained assessing one grammatical class, it would not yield an overall assessment of an individual's ability to distinguish grammatical classes. The authors also mention that the BAT scores were much higher for the naming subtest than

the BDAE scores. This was attributed to the higher frequency words used on the BAT in comparison to those words used on the BDAE. This study suggests that the BAT is a good predictor of general word retrieval, which is highly desirable when dealing with individuals with a variety of educational levels (Persiteri and Tsapkini, 2011). Participants performed poorly on the verbal fluency section of the BAT. The authors speculate that this could be attributed to the anxiousness or discomfort that an individual may have felt having been given a time limit. The authors also note that what constitutes a normal range for the performance of a healthy individual on the verbal fluency task is not provided; it is therefore difficult to distinguish what is typical of normal aging from what is the result of cognitive impairment. Peristeri and Tsapkini (2011) conclude that both assessments are adequate diagnostic tools and that the BAT is capable of measuring linguistic abilities at a more detailed level.

All of these studies strongly point to the need to examine the performance of non-impaired individuals on the BAT in order to use such information as a reference point in the clinical application of the BAT.

1.6 Objectives

There is a need to validate the language-adapted versions of the BAT as aphasia rates increase in the aging bilingual population in Canada. One of the aging bilingual populations on the rise is the Tamil-Canadian population. It is, therefore, necessary to validate the Tamil version of the BAT in Canada. This study examines the Tamil version of the BAT in the Canadian context. Data from non-impaired bilingual speakers of Tamil

and English was collected to determine the suitability of this assessment in the Tamil community in Canada. The study makes recommendations on modifications to the BAT, and provides details on the performance on the BAT by a non-impaired population as was done in the case of New Zealand English version (Paulin and Purdy, 2008), as discussed above.

Paradis and Libben (1987) and Paradis (2011) stress the importance of administering the test in the patient's own language variety to arrive at the most accurate assessment of the patient's language impairments. Although this study focuses on a non-clinical population, it was nevertheless crucial to adhere to this principle. With professional assistance, it was established that the variety of Tamil used in the BAT is Sri Lankan Tamil. Before discussing recruitment methods and participants, I will present a brief sketch of Sri Lankan Tamil, and comment briefly on the Sri Lankan Tamil community in Canada.

1.7 Linguistic Sketch of Sri Lankan Tamil

Tamil is a South Dravidian language that is commonly spoken in Southern India and Sri Lanka, and enjoys official status in Sri Lanka, India, Malaysia and Singapore (Annamalai and Steever, 1998). It closely resembles Malayalam spoken in Kerala India, and Irula, a tribal district in Tamil Nadu. However, Sri Lankan Tamil is a more conservative variety than Southern Indian Tamil (Annamalai and Steever, 1998).

Sri Lankan Tamil is written "alpha-syllabically" as are many South Asian languages (Annamalai and Steever, 1998, p. 103). It consists of 18 consonant phonemes

and 12 distinctive vowels. Vowels occur in all positions; initially, medially and finally. Consonants can be categorized into three manners of articulation: stops, nasals and liquids. With the exception of alveolar consonants, the remainder can occur word-initially; only nasals and liquids can occur in word-final position (Annamalai and Steever, 1998). Tamil prohibits consonant clusters at word edges: they are found neither in word-initial nor in word-final position. Loanwords with consonant clusters undergo epenthesis of vowels or deletion of consonants to achieve cluster simplification (Annamalai and Steever, 1998).

Sri Lankan Tamil is an agglutinative language where suffixes are joined to root and stem morphemes (Annamalai and Steever, 1998). The agglutinative structure of Modern Tamil is one of its defining characteristics. Although both derivational and inflectional affixes are found, inflectional morphology appears to be more developed than derivational morphology (Annamalai and Steever, 1998; cf. Lehmann, 1989). The examples below, drawn from Lehmann 1989 (p.8-9), serve to illustrate the morphology of Tamil. Example (1) illustrates inflectional suffixation of a nominal root; (2) shows inflectional suffixation of a verbal root; (3) is an example of derivational affixation: a nominalizing suffix is attached to a verbal root. Diacritics under the segments *t* and *l* indicate that they are retroflex; PL = plural; LOC = locative; PT = past; 3PSM = third person singular masculine; DA = derivational affix.

(1) viiṭu-kɑḷ-il

house.PL.LOC

‘in the house’

(2) vɑ-nt-ɑɑn

come.PT.3PSM

'he came'

(3) cirri-ppu

'laugh.DA'

'laughter'

Although the concatenation of affixes is a key feature of Tamil morphology, in some cases Tamil also makes use of reduplication (Lehmann, 1989). When affixes are attached, common morphophonemic modifications occur, including the "loss of a final segment, the doubling of a consonant at the morpheme boundary, assimilation and glide insertion" (Annamalai and Steever, 1998, p. 103).

The basic parts of speech are the noun and verb, which differ by grammatical inflections. Tamil has a subject-object-verb word order (head-final syntax) that is flexible and can change under certain pragmatic conditions: sentences in Tamil can omit the subject (Annamalai and Steever, 1998).

1.8 Socio-Political Characteristics of the Sri Lankan Tamil Population

The largest group of Sri Lankan Tamils (48,302 people) migrated to Canada between the years of 1984-1994 due to the civil war in Sri Lanka (Aruliah, 1994). There were slightly more males than females in the immigrant population, and roughly 90% of both genders were under the age of 45 (Aruliah, 1994). During the mid to late 1980s, nearly half of the migrant population of Sri Lankan Tamils had post-secondary education.

By the mid 1990s, the mean length of education had decreased within this population (Aruliah, 1994). According to the census conducted by Statistics Canada in 2006, out of a total of 92, 680 Tamil citizens, 16, 425 individuals aged 16 and below spoke Tamil most often at home. However, only 1, 230 aged 17 and above spoke Tamil most often at home. The same census confirmed that the majority of the Tamil population were first generation Canadians and less than 20 individuals identified themselves as second or third generation Canadians (Statistics Canada, 2006). It is important to consider these facts when analyzing the performance of non-impaired Tamil-English speakers in this study.

2.0 Methods

2.1 Participants

Participants were recruited through poster advertisement and word of mouth. The poster advertisement's title concisely described the study and included the eligibility criteria, time commitment for participation, compensation and contact information (Appendices A and B). English and Tamil versions of the poster were distributed to locations frequented by the target population. These included senior's apartment complexes, pharmacies and cultural centers in the Toronto area. Convenience sampling or word of mouth was the more successful recruitment method. Once contacted by a potential participant, eligibility criteria were reviewed to ensure the participant's suitability for the study. The principal criteria were as follows: that the participant had no history of psychological or neurological impairment; no diagnosis of visual or hearing

loss without correction to normal with the use of an appropriate hearing aid; and that the participant be a speaker of Sri Lankan Tamils so as to avoid dialect effects.

A total of 25 healthy self-identified bilingual speakers of Tamil and English were tested, 10 men and 15 women. Participants ranged from 50 to 89 years of age with a mean age of 71.20 (*SD* = 8.95) (Table 1). Individuals within this sample were highly educated, with the average number of years of education at 14.64 (*SD* = 1.38). The average age of acquisition of English was 7.24 years (*SD* = 3.79). With the exception of one individual, participants had learned Tamil as their first language (L1) and English as their second (L2). As mentioned, one participant had English as her L1, but learned Tamil at the age of four, which permitted attaining native-like abilities in her L2 as well. On average, participants had been living in Canada for 16 years and for the most part, were raised in a household with at least one English-speaking parent, if not both.

Table 1: Demographic variables of participants

Variable	Mean	Standard Deviation	Range
Age	71.20	8.95	50-89
Years of Education	14.64	1.38	13-17
Age of Acquisition of English	7.24	3.79	0-16
Age of Acquisition of Sri Lankan Tamil	0.16	0.80	0-4
Number of years living in Canada	16.33	8.03	1-25
Parent's knowledge of English	1.16	0.69	0-2 0 = No; 1 = Yes; 2 = Father only

2.2 Materials

A short screening questionnaire was administered to confirm for a third time that the requirements to participate in the study were met. In addition, participants were asked to rate their state of alertness (see Appendix C).

Part A of the BAT consists of an array of questions that establish the language history of the participant (Table 2). This section asks detailed questions of the linguistic environment at home and at school/work, as well as the participant's language experience with his/her mother, father and/or guardian. This section is to be conducted in the language most familiar to the participant, but in clinical settings is most often conducted in the institutional language.

Some of the questions in this section of the BAT included phrases that referred to an accident or illness, i.e. the incident that brought on aphasia. Of course, these phrases were removed due to their irrelevance to the population of this study. For instance, Part A (Question 50) asks: "Before your accident/illness, what languages were you able to speak?" This question was changed to: "What languages are you able to speak?" See Table 2 for examples of the questions administered in Part A.

Table 2: Part A – History of Bilingualism (Paradis and Libben, 1987)

Question	Answer
3. As a child, what language did you speak most at home?	
6. What was your father's native language?	
7. Did he speak any other languages?	+ (yes) - (no) 0 (no response)
12. What was your mother's native language?	

13. Did she speak any other languages?	+ - 0
18. Did anyone else take care of you as a child?	+ - 0
19. What was his/her native language?	
25. What language did you speak most with friends?	
27. When you started school what was the language of instruction?	
30. What language did most of the other students speak at this school?	

Once this section of the assessment was completed, Part B was conducted in the language that had not been used to administer Part A, in order to counterbalance the languages.

Part B of the BAT (see Tables 3 and 4) is a test of linguistic capacity in all domains. It begins with a short questionnaire in which participants are asked to rate their speaking, reading and writing abilities and to comment on how often each modality is used in daily life. This allows the administrator to decide what sections need to be assessed and which ones can be omitted.

Table 3: Part B – Language (English/Tamil) Background (Paradis and Libben, 1987)

Question	Answer
4. Your English speaking is:	1 (Not good) 2 (Good) 3 (Very Fluent)
5. How old were you when you learned to speak English?	
6./7./8/ Do you speak English at home/work/ with friends?	+ -
9. Do you speak English:	1 (Every day) 2 (Ev. week) 3 (Ev. month) 4 (Ev. year) 5 (Less than once a year)

These questions are followed by 32 subtests in Part B and Part C of the BAT assessing various language skills in a number of modalities. They are as follows:

Table 4: Part B – Subtests (Paradis and Libben, 1987)

Subtest	Explanation	Contribution	Example
Spontaneous speech	5 minutes of participant's spontaneous speech recorded	Production abilities; all linguistic components (syntax, phonology, morphology, discourse)	N/A
Pointing	Common household items provided; touch objects that are named	Auditory comprehension	Please touch the ring + - 0
Simple and Semi-complex commands	Listen and act out verbal commands Simple involves 1 command; semi-complex involves commands manipulating 2 objects	Auditory comprehension	<u>Simple:</u> Please close your eyes + - 0 <u>Semi-complex:</u> Put the fork in the glass + - 0
Complex commands	Given 3 of the same object with one distinguishing feature - separate act is done to each item	Auditory comprehension; memory capacity	Here are 3 pencils. Drop the yellow one on the floor, give me the blue one and pick up the red one + 3 2 1 0
Verbal Auditory Discrimination	Point to numbered picture that represents word heard (4 pictures and X to choose from)	Phonemic discrimination; auditory comprehension	Mat X 1 2 3 4 0
Syntactic Comprehension	Point to picture that represents sentence heard	Syntactic comprehension	The boy holds the girl 1 2 3 4 0
Semantic Categories	Select word that does not belong in group	Comprehension; memory capacity; association	1) tulip 2) rose 3) frog 4) daisy 1 2 3 4 0
Synonyms	Select item that has similar meaning	Association; relationships	SEAT: 1) vase 2) pencil 3) armchair 4) watch 1 2 3 4 0

Antonyms	5 of 10 questions require selection of item with opposite meaning Last 5 items require selection of opposite that match morphological form of word given	Association; relationships; morphology; metalinguistic knowledge	Simple: HAPPY 1) glad 2) sad 3) rich 4) baby 1 2 3 4 0 Complex: SILENT 1) noise 2) noisily 3) noisy 1 2 3 0
Grammaticality Judgment	Hear sentences and deem as grammatically correct or incorrect	Syntax	It's truck is pulled by the car + - 0
Semantic Acceptability	Hear sentences and deem as semantically correct or incorrect	Comprehension in association with worldly and linguistic knowledge	The sun shines by night + - 0
Repetition of words and nonsense words and lexical decision	Hear words, asked to repeat and judge whether real word or not	Motor skills; listening skills	Sollick Repetition: + - 0 Judgment: + - 0
Repetition of sentences	Hear sentences, asked to repeat	Motor; listening skills	The boy pushes the girl + - 0
Series	Name days of week, months of year and count from 1-20 or 25	Ability to produce rehearsed speech	N/A
Verbal Fluency	Produce as many words that begin with particular sound in 1 minute	Word-finding ability	"P" Words begin with right sound? + - 0 Number of acceptable words?
Naming	Name items as presented one at a time	Word-finding ability; production skills	N/A
Sentence Construction	Create a sentence with 2, 3 or 4 words	Syntax; grammaticality; semantics	House/cat
Semantic Opposites	Provide semantic opposite to words heard	Lexical comprehension; association	Wide (Narrow) + 1 - 0 1 = equivalent form
Derivational Morphology	10 nouns given, provide corresponding adjectival forms	Morphology; metalinguistic knowledge	Power (Powerful) + 1 - 0

Morphological Opposites	Produce antonym of word heard by adding prefix	Morphology	Trust (Distrust) + 1 - 0
Description	Tell 2 minute story about cartoon strip provided	Amount of speech produced; discourse;	N/A
Mental Arithmetic	Answer simple mathematical equations	Non-linguistic cognitive abilities	Eight plus seven + - 0
Listening Comprehension	Hear a story and answer questions	Information retention; auditory comprehension	Where were the boy and his sister? + - 0
Reading words, sentences and paragraph	Words and sentences read aloud Story in paragraph style is given and questions are asked	Reading skills; reading comprehension	Cat/ The boy holds the girl + - 0
Copying	Copy words	Graphemic transcription	Thick + - 0
Dictation of words and sentences	Write words and sentences as dictated	Auditory word recognition; Orthography	Tramp/ She pulls her + - 0
Reading Comprehension of words and sentences	Read words and sentences and point to corresponding visual representation	Reading comprehension; visual word comprehension ability	Chick/ The boy holds the girl + - 0
Writing	5 minutes of spontaneous writing	Writing skills	N/A

Part C of the BAT (see Table 5) examines the translation ability between languages at the word and sentence level, and contains grammaticality judgments.

Table 5: Part C – Subtests (Paradis and Libben, 1987)

Subtest	Explanation	Contribution	Example
Word Recognition	Presented with 5 words visually and orally, point to translation from list of 10 words	Cross-language ability	N/A
Word Translation	Provide translation for words given Occurs in both languages	Cross-language ability; auditory comprehension	Knife ([kaθi]) + 1 - 0

Translation of Sentences	Hear sentences and provide translation	Determine stronger language	He will phone as soon as he arrives Read text: 1 2 3 Number of errors: 0 1 2 3
Grammaticality Judgment	Hear sentences and deem whether grammatically correct or not If incorrect, must provide corrected sentence	Notice of errors; syntax	He fell and fell while studying for the examination + - 0

2.3 Procedure

Participants were tested in the community room of a senior's apartment complex. They were given the option of either completing the assessment in one sitting with a break in between or in two sessions conducted on consecutive days (two mornings, two afternoons or two evenings).

Participants were provided with a letter of consent in the language of their choice that was read aloud to ensure understanding of the purpose of the study, what was expected of them, their option to withdraw, confidentiality and reimbursement (Appendices D and E). Participants were then notified that their answers to particular sections of the assessment would be recorded for the purpose of verifying responses when analyzing data. Each participant opted to complete the assessment in one session. The administration of the entire test, including the short screening questionnaire, took roughly 3 to 3.5 hours to complete.

Once the study was completed, any remaining questions participants had were answered. Participants were then compensated ($20 CAD) for their time; those interested in receiving a summary of the results provided the contact information of their choice.

2.4 Statistical Analysis

The data collected for this study was analyzed using IBM SPSS Statistics software version 20. The following factors were examined against performance on all versions and sections of the BAT: age, years of education, age of acquisition of English, age of acquisition Tamil, number of years living in Canada and whether participants had/have English-speaking parents. Once significant correlations were identified, a regression analysis was conducted. In addition to these analyses, participants were divided into groups based on language of instruction (English and Tamil), age (50-69 and 70-89) and gender. Performance by participants in each group was then compared using *t*-tests.

3.0 **Results**

3.1 Universal Answer Key

A universal answer key for several subtests of the BAT was provided (Paradis, 2004). However, comparison of the answers Paradis offers on the English and Tamil versions showed that several answers from the universal answer key are incorrect, namely: the answer to one question in the English version, 12 questions in the Tamil version, and one question in the Tamil-English section (Part C). These questions are discussed below:

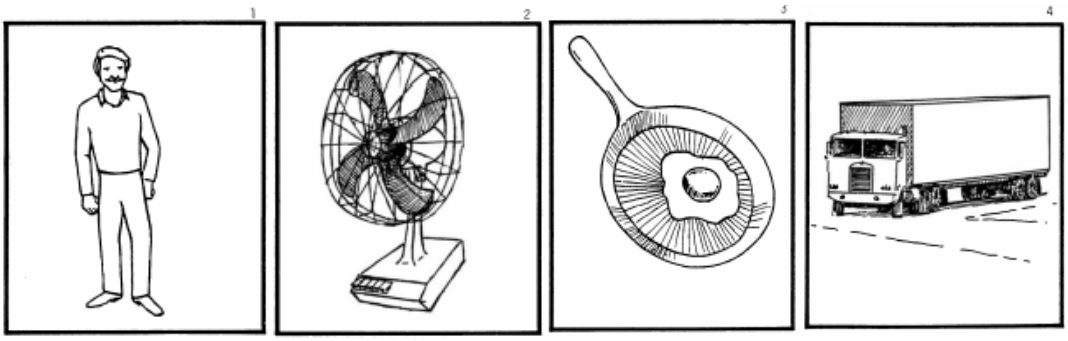
English version:

Verbal Auditory Discrimination

This task assesses the participant's phonemic discrimination and auditory comprehension. The instructions are as follows: "You are going to hear a word. Please touch the picture that shows the meaning of the word. If none of the pictures show the meaning of the word then touch the large "X"" (Paradis, 1987).

Item 54. Van

Figure 1: Visual options for "Van"



According to the answer key, the correct picture is number four, the last one. Participants in this study were well aware of the difference between a van and a truck; in fact, they selected the "X", the correct answer objectively, but incorrect according to the answer key.

<u>Tamil Version:</u>

Syntactic Comprehension

The instructions and questions have been translated into English and are as follows: "You are going to hear a sentence. Please touch the picture that shows the meaning of the sentence" (Paradis, 1987). There were several incorrect answers in the

answer key. The correct answer and the answer according to the answer key are summarized in Table 6 below.

Table 6: Sentences from Syntactic Comprehension with incorrect answers

Sentence	Correct Answer	Answer Key
69. He holds her	2	4
77. The girl holds the boy	4	1
99. The truck is pulled by the car	4	2
100. The car pulls the truck	4	2
103. It's the car that pulls the truck	4	2
104. It's the truck that the car pulls	4	2
117. The girl's hair is combed by the mother	2	1
119. The girl's hair is not combed by the mother	1	2
120. The girl's hair is combed by the mother	2	1

Reading Comprehension for words

This task assesses the participant's reading skill and comprehension. The instructions and questions have been translated into English and are as follows: "You will get some words to read. Touch the picture that shows the meaning of the word" (Paradis, 1987).

411. [la:du] (transcription of Tamil word) – Participants are not familiar with the term and therefore did not respond or guessed; the answer key gives (3) as the correct answer.

414. Stump – The correct answer is picture (1); according to the answer key, picture (4) is correct.

Reading Comprehension for sentences

The instructions and questions have been translated into English and are as follows: "Read the sentences silently and then touch the picture that shows the meaning of the sentence" (Paradis, 1987).

427. The bus is not followed by the motorcycle – The correct answer is picture (1); according to the answer key, it is number (2)

<u>English-Tamil Bilingualism:</u>

Word Recognition

The instructions are as follows: "I am going to show you a word in English and you are going to tell me which of the words in the list means the same thing in Tamil" (Paradis, 1987).

434. Snow

Within a list of 10 Tamil translations (listed below in their English equivalent), a suitable translation for the word "snow" is not provided.

1. Apple
2. Rain
3. Lightening
4. Hammer
5. Door

6. Fish
7. Window
8. Handle
9. Tree
10. Goat

3.2 Performance of the participants

Once the errors were corrected, all analyses were conducted using only the corrected scores. Scores were tallied and divided into four separate scores: English version score, Tamil version score, Tamil-English (Part C) score and total score (cumulative total). As mentioned earlier, Part A of the BAT is not scored and is only used to create a detailed language profile of the participant. For the English and Tamil versions of Part B, participants can achieve a maximum of 430 points for each language version, not including the spontaneous writing section. Writing scores were analyzed separately, since three participants did not provide a writing sample. With Part C totaling 112 points for each language version, the total number of points that can be obtained by a participant is 972. The scores are shown in Tables 7-10. On average, participants achieved a total score of 97%. Calculations showed that participants scored higher on the Tamil version (M = 422.64, SD = 4.23) than on the English version (M = 414.80, SD = 8.37), but the difference was not significant (p = 0.479). Participants performed very well on the Tamil-English section with an average score of 108 (96%).

Table 7: Descriptive Statistics

This table shows the average score achieved, standard deviation and range on each version and section of the BAT.

	Mean	Standard Deviation	Minimum	Maximum
English Version (/430)	414.80	8.37	393.00	422.00
Tamil Version (/430)	422.64	4.23	412.00	428.00
Tamil-English (/112)	108.12	1.56	104.00	110.00
Total score (/972)	945.56	10.54	922.00	958.00

Tables 8A, 8B and 8C: Subtest Scores

The following tables show the average score achieved on each subtest and its corresponding percentage on each version of the BAT. The bolded subtests indicate tasks that participants did not perform well on.

Table 8A: English score

Subtest	Average	Percentage of Correct Answers (%)
Spontaneous speech	19.6	98
Pointing	10	100
Simple & semi-complex commands	10	100
Complex commands	19.32	96.6
V.A.D.	15.8	87.77
Syntactic Comprehension	4.76	95.2
2nd set	5.6	93.3
3rd set	3.84	96
4th set	7.52	94
5th set	7.56	94.5
6th set	7.24	90.5
7th set	5.56	92.6
8th set	3.8	95
9th set	5.64	94
10th set	3.56	89

11th set	3.92	98
12th set	3.8	95
13th set	3.56	89
14th set	15	93.75
Semantic Categories	5	100
Synonyms	4.88	97.6
Antonyms	9.28	92.8
Grammaticality Judgment	9.64	96.4
Semantic Acceptability	10	100
Repetition and Lexical Decision	67	100
Series	2.88	96
Verbal Fluency	2.96	98.6
Naming	20	100
Sentence Construction	15	100
Semantic opposites	9.76	97.6
Derivational Morphology	**7.08**	**70.8**
Morphological Opposites	**6.92**	**69.2**
Description	6	100
Mental Arithmetic	13.44	89.6
Listening Comprehension	5	100
Reading	26	100
Copying	5	100
Dictation	9.84	98.4
Reading Comprehension for words	10	100
Reading Comprehension for sentences	10	100

Table 8B: Tamil score

Subtest	Average	Percentage of Correct Answers (%)
Spontaneous speech	20	100
Pointing	10	100
Simple & semi-complex commands	10	100
Complex commands	19.4	97
V.A.D.	17.16	95.3
Syntactic Comprehension	4.96	99.2
2nd set	5.56	92.7
3rd set	3.84	96

4th set	7.84	98
5th set	7.28	91
6th set	6.89	86.1
7th set	5.72	95.3
8th set	3.64	91
9th set	5.8	97
10th set	3.68	92
11th set	3.84	96
12th set	3.8	95
13th set	3.64	91
14th set	16	100
Semantic Categories	5	100
Synonyms	5	100
Antonyms	9.68	96.8
Grammaticality Judgment	9.32	93.2
Semantic Acceptability	9	90
Repetition and Lexical Decision	64.16	95.8
Series	2.6	86.7
Verbal Fluency	3	100
Naming	20	100
Sentence Construction	15	100
Semantic opposites	9.88	98.8
Derivational Morphology	9.72	97.2
Morphological Opposites	8	80
Description	6	100
Mental Arithmetic	14.76	98.4
Listening Comprehension	5	100
Reading	26	100
Copying	5	100
Dictation	10	100
Reading Comprehension for words	9	90
Reading Comprehension for sentences	8.6	86

Table 8C: Tamil-English Score

Subtest	Average	Percentage of Correct Answers (%)
Word Recognition	9	90
Word Translation	18.56	92.8

Translation of Sentences	47.64	99.25
Grammaticality Judgments	31.92	93.8

Participants performed very well on most subtests on both language versions as well as on the translation section of the BAT. Participants did not perform well (achieving approximately 70%) in only two subtests from the English version; the derivational morphology and morphological opposites tasks (Table 8A). This is discussed ahead in section 4.0

Tables 9A, 9B and 9C: Writing scores

The following tables describe participant performance on the writing task. The first table, 9A includes all participants, Table 9B includes only those participants who provided short unconnected sentences and Table 9C includes only those participants who provided writing samples as a continuous narrative.

Table 9A: All participants

	Average number of words	**Average number of different words**	**Average type/token ratio**	**Average number of grammatical errors**	**Average number of spelling errors**	**Mean Length Utterance**
English	43.56	29.76	0.69	1.40	0.08	7.82
Tamil	26.65	23.48	0.86	0.78	1.09	4.64

Table 9B: Unconnected Sentences

	Average number of words	**Average number of different**	**Average type/token ratio**	**Average number of grammatical errors**	**Average number of spelling**	**Mean Length Utterance**

		words			errors	
English	30.56	21.11	0.70	1.22	0.00	7.25
Tamil	22.77	19.67	0.83	0.44	0.89	4.60

Table 9C: Continuous Narrative

	Average number of words	**Average number of different words**	**Average type/token ratio**	**Average number of grammatical errors**	**Average Number of spelling errors**	**Mean Length Utterance**
English	54.27	36.93	0.69	1.60	0.13	8.17
Tamil	29.14	25.93	0.89	1.00	1.21	4.66

The results of the spontaneous writing task show that, on average, participants had a type/token ratio of 0.69 in English and 0.86 in Tamil, with a very low number of grammatical and orthographical errors in both languages (Table 9A). However, some participants seemed to have interpreted the task differently from others with respect to writing style. Some participants provided sentences within a continuous narrative while others provided short unconnected sentences. This warranted separate analyses for both interpretations. The type/token ratio was calculated by dividing the average number of different content words from the average number of total words. Analyses showed that participants who provided a continuous narrative had average type/token ratios of 0.69 for English and 0.89 for Tamil. Those who wrote unconnected sentences had average type/token ratios of 0.70 for English and 0.83 for Tamil. With similar type/token ratios for both interpretations, it was expected and confirmed that the difference in interpretation was not significant (English: $p = 0.334$; Tamil: $p = 0.563$). Though the difference between type/token ratios for each language appears large, it was also not

significant (p = 0.720). The mean length of utterance (MLU) overall in English was 7.82 and 4.64 in Tamil, corresponding to the type/token ratios for each language.

Table 10: Spontaneous speech scores

	Average number of words	**Average number of different words**	**Average type/token ratio**	**Average number of grammatical errors**
English	693.80	484.86	0.70	16.88
Tamil	714.22	606.52	0.85	9.17

Although for spontaneous speech, the total number of words was much higher, calculations showed very similar type/token ratios in both languages (p = 0.782) (Table 10).

3.3 Data Analysis

In addition to examining the overall performance of non-impaired bilinguals, I investigated the influence of the following factors on performance: age, years of education, age of acquisition, number of years living in Canada and whether participants had English speaking parents. Correlation and regression analyses showed four significant correlations. Age was significantly correlated with performance on the Tamil version (r(24) = 0.655, p = 0.000) and years of education was significantly correlated with performance on the English version (r(24) = 0.603, p = 0.001), the Tamil-English section (r(24) = 0.407, p = 0.044) and total score (r(24) = 0.595, p = 0.002).

3.4 Comparisons

To further understand the effect these variables have on performance on the BAT, participants were divided into groups on which independent *t*-tests were conducted. The participants were categorized by language of instruction – English or Tamil; age – 50 to 69 and 70 to 89; and gender.

3.4.1 Language of Instruction

Table 11: Participants with English language of instruction

	Mean	**Standard Deviation**	**Minimum**	**Maximum**
English Version (/430)	415.06	7.81	395.00	422.00
Tamil Version (/430)	423.76	3.07	417.00	428.00
English-Tamil (/112)	107.88	1.83	104.00	110.00
Total score (/972)	946.71	10.43	922.00	958.00

Table 12: Participants with Tamil language of instruction

	Mean	**Standard Deviation**	**Minimum**	**Maximum**
English Version (/430)	414.25	10.01	393.00	422.00
Tamil Version (/430)	420.25	5.50	412.00	427.00
English-Tamil (/112)	108.63	0.52	108.00	109.00
Total score (/972)	943.13	11.05	925.00	958.00

The participants were split into two groups according to their language of instruction at school, English or Tamil (See Tables 11 and 12). Those who were taught in English performed better overall than those taught in Tamil. For those participants whose language of instruction was English, analyses showed that years of education alone was significantly correlated with performance on the English version ($r(15) = 0.649$, $p = 0.000$), Tamil version ($r(15) = 0.895$, $p = 0.000$) and total score ($r(15) = 0.734$, $p =$

0.001). For the Tamil-English section, years of education and age affected performance (r(15) = 0.629, p = 0.031).

Those participants whose language of instruction was Tamil showed that increasing age correlated with better performance on the Tamil version (r(8) = 0.827, p = 0.011). The remaining scores (English version, Tamil-English section and total score) were not significantly affected by any variables for this group of participants. *t*-tests confirmed that language of instruction did not affect performance (p = 0.503) on these components.

3.4.2 Age

Descriptive statistics of performance in younger and older age groups can be seen in Tables 13 and 14, respectively.

Table 13: Participants ages 50-69 years

	Mean	**Standard Deviation**	**Minimum**	**Maximum**
English Version (/430)	416.11	9.02	393.00	422.00
Tamil Version (/430)	419.78	5.19	412.00	427.00
English-Tamil (/112)	108.89	0.60	108.00	110.00
Total score (/972)	944.78	10.20	925.00	958.00

Table 14: Participants ages 70-89 years

	Mean	**Standard Deviation**	**Minimum**	**Maximum**
English Version (/430)	414.06	8.19	395.00	422.00
Tamil Version (/430)	424.25	2.57	420.00	428.00
English-Tamil (/112)	107.69	1.78	104.00	110.00
Total score (/972)	946.00	11.03	922.00	958.00

On average, participants from the 70-89 year age group had a slightly higher total score than participants in the 50-69 year age group. The 50-69 age group performed better on the English version and Tamil-English section than the 70-89 age group. Analyses showed that age alone was significantly correlated with better performance on the Tamil version (r(7) = 0.844, p = 0.004). That is, as age increased within the 50-69 age group, scores on the Tamil version increased as well.

The 70-89 age group showed a greater number of correlations with higher test scores than the 50-69 age group. In the 70-89 age group, years of education significantly correlated with a higher score on the English version (r(16) = 0.711, p = 0.002), on the Tamil version (r(16) = 0.822, p = 0.000), on the Tamil-English section (r(16) = 0.547, p = 0.028) and in total score (r(16) = 0.807, p = 0.000). For this group as well t-tests confirmed that as age increased (within the group) so did scores on the Tamil version (p = 0.035).

3.4.3 Gender

Table 15: Male Participants

	Mean	**Standard Deviation**	**Minimum**	**Maximum**
English Version (/430)	418.90	3.28	412.00	422.00
Tamil Version (/430)	422.70	6.00	412.00	428.00
English-Tamil (/112)	108.40	1.71	104.00	110.00
Total score (/972)	950.00	8.31	936.00	958.00

Table 16: Female Participants

	Mean	**Standard Deviation**	**Minimum**	**Maximum**

English Version (/430)	412.07	9.65	393.00	422.00
Tamil Version (/430)	422.60	2.75	417.00	427.00
English-Tamil (/112)	107.93	1.49	104.00	110.00
Total score (/972)	942.60	11.06	922.00	958.00

Although the sample size is not particularly large (10 men), gender analyses were conducted. The male participants had a higher overall total score than females, as a result of a higher score on the English version. Within the male group, as age increased, the score on the Tamil version increased ($r(9) = 0.745$, $p = 0.013$). In addition, age of acquisition of English and age correlated with performance on the Tamil-English section ($r(9) = 0.900$, $p = 0.003$).

For the female group, consisting of 15 participants, different correlations were observed than was the case for males. Years of education significantly correlated with a higher score on the English version ($r(14) = 0.619$, $p = 0.014$) and with a higher total score ($r(14) = 0.664$, $p = 0.007$). *t*-tests did not show that gender affects performance ($p = 0.167$).

3.5 Subtests

As mentioned earlier, participants scored an average of 70.8% on the derivational morphology task and 69.2% on the morphological opposites task on the English version. There is a possibility that participants may have obtained even lower scores if the sample had been educationally diverse. This is problematic because patients to whom these tasks are administered may be incorrectly assessed as being weak in morphology. This could

lead to an ineffective therapy plan for the patient and ultimately not show any improvement.

When these two subtests were analyzed, years of education significantly correlated with better performance on the derivational morphology task ($r(24) = 0.508$, $p = 0.010$). For the morphological opposites task, whether participants had/have English-speaking parents may possibly have had an effect on performance. The p-value generated approached significance at 0.050, which may or may not be significant if a larger population were tested.

4.0 Discussion

The purpose of this study was to investigate the performance of non-impaired Sri Lankan Tamil-English bilinguals on the Tamil-English version of the BAT. The results indicate that overall participants performed very well on this assessment, with an average total score of 97%. Based on this outcome, it can be concluded that the BAT is a suitable test to use on the Canadian- Sri Lankan Tamil community. There is a caveat, however, in that participants in this study were highly educated (13-17 years of education), which may not be representative of the education level of the Sri Lankan Tamil community as a whole. This study was not able to exclude the possibility that years of education significantly influences performance on this test.

As the results in Tables 11 and 12 (participants with English language of instruction and Tamil language of instruction, respectively) show, participants who attended schools with English as the language of instruction performed better on both the

English and Tamil versions of the BAT than participants who were instructed in Tamil. However, the difference between these scores was not significant (p= 0.503), which suggests that, irrespective of language of instruction, participants perform well on this test. This can be explained by educational history. First, Sri Lanka was formerly a British colony. As a result of being under British rule, Sri Lanka adopted many of Great Britain's social, cultural and educational norms, including English as the language of instruction in schools; as a result, this system produced highly bilingual and professional individuals (Aruliah, 1994), particularly those who are roughly 70 years of age or older. In contrast, with the exception of two participants, most of the participants under the age of 70 attended Sri Lankan schools in which Tamil was the language of instruction[1]. Although the younger participants lack the same type of formal training in English, they have gained experience with English nonetheless. These participants immigrated to Canada and had children who were born and/or raised in Canada, thereby gaining greater exposure to English in the household. More importantly, these individuals are currently employed in settings that require them to speak, read, and write in English. Analyses testing several variables against performance of participants who were taught in English showed that years of education was significantly correlated with performance on both versions of the BAT and total score. Additionally, years of education and age together affected performance on the Tamil-English section of the BAT. For those whose language of instruction was Tamil, only age was significantly correlated with performance on the Tamil version. Level of education appears to only have influenced

[1] By 1960, most schools in Sri Lanka had converted to Tamil instruction.

the scores of those taught in English in earlier schooling, which could be the result of a sampling bias and/or a test bias.

As reported earlier, when participants were subdivided on the basis of age, the younger group (ages 50-69) performed better on the English version, while the older group (age 70-89) scored higher on the Tamil version. *t*-tests showed an advantage for the older group on performance on the Tamil version of the BAT. A possible explanation for this finding can be found in the community dynamics generally observed in this older group. What is most often found with this group is that: (1) if they are not living with their children, older Sri Lankan Tamils live in seniors' residences that are predominantly shared by other Sri Lankan Tamils. (2) If they are grandparents, they view themselves as a critical means of preserving and transmitting Tamil to their grandchildren. (3) They frequent cultural and religious centres more often because of availability of time. (4) They generally travel more often to Sri Lanka[2] than the younger group. In short, all these factors – even if all are not relevant for all members – present older Sri Lankan Tamils with greater opportunities to converse and socialize in Tamil.

Participants' performance within each age group (50-69 and 70-89) was analyzed against the variables discussed earlier and a few significant correlations were found. Years of education was significantly correlated with better performance on both versions, on the Tamil-English section and on the total score by those participants in the 70-89 age group.

[2] In this sample, roughly half of the participants left for Sri Lanka in December for 3-5 months.

For those within the 50-69 age group, analyses showed that as age increased within the group, participants performed better on the Tamil version of the BAT. This could be explained by the fact that older members in the 50-69 age group are merging into the community dynamics of the older group (70-89). Participants who are closer to 65 years of age, or above this age, perhaps now have the time to engage in the same kinds of activities as the older group, while the younger participants (50-55 years of age) are more likely to be employed and, consequently, to have fewer opportunities to speak Tamil.

Although the number of participants was low, gender analyses were still conducted. The men performed slightly better on the English version than the women. One could speculate that this result is attributable to gender roles: perhaps male participants have greater responsibilities outside the home, and more opportunities for using English. We must bear in mind that most men and women in this sample are educated and have, or have had professional occupations. Within each group, interesting correlations were observed. Among men, as age increased, scores on the Tamil version increased. Also, age and age of acquisition of English significantly correlated with superior performance on the Tamil-English section. Among the women, years of education correlated with a higher score on the English version and on the total score.

4.1 Subtest Performance

When performance on subtests of the BAT was reviewed, I observed that participants did not perform very well on the two tasks involving derivational

morphology on the English version. For explanatory purposes, the morphological opposites subtest will be discussed first followed by the derivational morphology subtest, despite their appearance in reverse order on the BAT.

The morphological opposites task requires participants to provide the antonym of the word they hear without using a word with a different root. An example is provided for the participant at the outset of the task: "if I say 'polite' you would say 'impolite'," (Paradis and Libben, 1987). Participants performed well on some questions and received lower scores on others, particularly on the following: trust/distrust; just/unjust; probable/improbable; regard/disregard and precise/imprecise. One could attribute this to frequency effects as discussed below and as seen in Table 17.

Table 17: Morphological Opposites task – Difficult words for participants (bolded)

Word Provided	Frequency count/million		Word Produced	Frequency count/million	
	SubtlexUS	COCA		SubtlexUS	COCA
Trust	178.18	76.63	**Distrust**	**0.75**	**3.14**
Just	4749.14	3268.27	**Unjust**	**1.16**	**1.99**
Probable	3.27	7.31	**Improbable**	**0.73**	**3.26**
Visible	4.96	33.51	Invisible	12.35	15.68
Regard	7.35	36.09	**Disregard**	**3.51**	**2.79**
Precise	5.20	8.20	**Imprecise**	**0.16**	**0.31**
Believable	1.41	3.34	Unbelievable	29.41	23.84

The word given on the BAT is listed under the "Word Provided" column and the expected response from the participant labelled as "Word Produced". These words are followed by a frequency per million count taken from two corpora.

To explore the role played by frequency, two databases were consulted, SubtlexUS (Brysbaert and New, 2009) and the Corpus of Contemporary American English (COCA) (Davies, 2008-). SubtlexUS is a database that consists of 51 million words collected from subtitles from television series' and films – samples taken from contemporary films and

television ought to represent contemporary English quite faithfully. COCA is a compilation of 450 million words derived from journals, newspapers and magazines; for this study I used a 95 million-word sub-corpus based on a spoken language database within this corpus. Once frequencies were cross-referenced across databases, we found that, in many cases, the words participants were given were of a higher frequency than the words they were expected to produce (antonyms). For instance, participants heard the word "trust" and were expected to produce "distrust"; "distrust" is a far less frequent word than "trust." Perhaps participants performed well on the adjective "visible" because its antonym is the far more frequent "invisible." To further confirm this hypothesis, I reviewed the frequencies of the words found in the semantic opposites tasks.

If frequency effects do play a role in performance, then participants should have performed better on words with higher frequencies. The words and word pairs found in the semantic opposites task are highly frequent. For instance, the first word given is "true" and the expected response is "false". This word pair is a highly frequent and familiar opposite pair; the same is true of other adjective pairs that make up this subtest: e.g. poor-rich; slow-fast, tall-short. Therefore, examining the semantic opposites task did not adequately support the frequency effect hypothesis. However, what should be noted is that when looking at frequency effects and corpora, we must keep in mind that the corpora are more representative of the frequency of words used in the broader English-speaking community, and is not necessarily representative of what is commonly heard in the Tamil-English community.

The role of frequency was explored as a possible explanation of poorer performance on the morphological opposites task, but there may be a structural factor at play also. As mentioned in the linguistic sketch of Tamil above, Tamil is a highly agglutinating language, represented overwhelmingly by suffixation, as is the case of Dravidian languages more generally (cf. Lehmann, 1989; Steever, 1998). Given the emphasis on right-of-the-stem affix placement in Tamil, the morphological opposites task, made up exclusively of English prefixation, may simply present a native speaker of Tamil with a greater structural challenge. In the end, it may be the typological distance between English and Tamil morphology in this case that explains the poorer performance of participants on this specific task.

The derivational morphology task requires participants to change the word they hear to an adjective and are provided with an example – "if I say 'softness' you would say 'soft'" (Paradis and Libben, 1987). For the most part, those who received formal training in English knew the correct allomorph needed to derive the adjectival form for each noun. However, for those who did not receive instruction in English this was difficult because some participants were not comfortable with the term "adjective" itself, and appeared not to understand the instructions. When specifically looking at performance on each question within the task, five adjectives (bolded in Table 18) were particularly difficult for participants.

Table 18: Derivational Morphology task

Word provided by administrator	Expected response from participant	Percentage of Correct Answers (%)
Nobility	**Noble**	**52**

Calmness	**Calm**	**52**
Nature	**Natural**	**60**
Pride	**Proud**	**60**
Youth	**Young**	**40**
Power	Powerful	92
Wisdom	Wise	84
Silence	Silent	88
Noise	Noisy	92

No frequency effects could be hypothesized for these items upon examining the same corpora mentioned above. However, a possible explanation for lower scores on these items may be found again in the typological distance between Tamil and English in this instance. The five English adjectives in question display considerable morphological opacity. With the exception of "calmness-calm" that shows an adjective formed by the removal of a neutral affix (i.e., one that does not alter the phonology of the base morpheme), these noun-adjective pairs involve the use of non-neutral affixes. The pairs nature/natural and nobility/noble involve phonological changes – changes in stress patterns above all – between the base and derived form. The pair pride/proud involves a vowel alternation; the pair youth/young involves a vowel alternation in addition to other stem changes. In short, the relationship between these nouns and adjectives is an opaque one. In comparison to the equivalent task on the Tamil version, the English subtest represents a demanding task. In Tamil, participants merely add a suffix to the noun and assimilate the attached morphemes, which is a simple and relatively transparent process. As mentioned above, Tamil has morpheme-boundary allomorphy, but the relatively opaque morphophonology of English may present significant difficulties. Therefore both morphological opacity and the simplicity of Tamil morphology may be causing participants some difficulty in producing the adjective form of these words.

The spontaneous writing and speech tasks were used to calculate the type/token ratio for each participant as a measure of lexicon in each language. The type/token ratio was calculated by dividing the number of different content words from the total number of words in the samples each participant provided. Clinically, if the performance on these tasks were recorded prior to the onset of aphasia, a comparison of performance before and after the onset of aphasia would help determine if the patient's lexicon was damaged and to what extent. The writing and speech scores were characterized by a much lower type/token ratio in English than Tamil (Tables 9 and10). This can be attributed to the morphological richness of the Tamil language in comparison to English. It was expected that a significant difference between type/token ratios between the two languages would be observed. However, this was not the case. Initially, I thought it could potentially be a result of the direct translations some participants provided. These participants produced writing samples that were direct translations of each other. The number of words used in the English sample was reduced when translated to Sri Lankan Tamil due to its morphological density. Therefore, participants had longer English samples and shorter Tamil samples. However, for the speech scores in which participants did not provide direct translations, similar type/token ratios to the writing scores in both languages were still observed and so it remains unclear why the difference was not significant.

Having come across different observations with the Tamil-English group, I was interested to find out about the performance of other ethno-linguistic groups in comparison to the Tamil-English group. A comparison between Muñoz and Marquardt's (2008) study assessing the performance of non-impaired Spanish-English bilinguals on

the shortened version of the BAT and the performance of the non-impaired Tamil-English population reveals some key differences. First, the Tamil-English bilinguals in this study did not perform well on two subtests of the English version: derivational morphology and morphological opposites. Performance by the Spanish-English bilinguals on these subtests could not be compared to the Tamil-English group because these subtests were not part of the shortened version of the BAT used by Muñoz and Marquardt. The subtests the Spanish-English bilingual group did not do well on were subtests that the Tamil-English group did not have difficulty with. Muñoz and Marquardt stated that participants from their study obtained high scores on both versions of the BAT, but overall performed better in English than in Spanish, with average scores of 95% on the English version and 90% on the Spanish version. The opposite was observed with the Tamil-English group: participants performed slightly better on the Tamil version than on the English version. Although the Spanish-English participants performed well, the range of scores obtained for the English and Spanish versions was much greater than those for the Tamil and English versions obtained by the Tamil-English bilinguals. The lowest score obtained by the Spanish-English bilinguals on the English version was 79% and 72% on the Spanish version. The lowest score obtained by the Tamil-English bilinguals on the English version was 91% and 96% on the Tamil version. Though the Tamil-English bilinguals in this group did well on this version of the BAT, years of education still influenced performance and needs to be further examined.

The performance of Tamil-English bilinguals was examined as a means of validating the claims made by Paradis. The results suggest that years of education

influences participants' performance on the BAT, contrary to the purpose of the test. Therefore, modifications besides the ones listed below need to be made to eliminate possible biases in results and ensure that potential aphasics are assessed using the most appropriate tool by clinicians.

4.2 Modifications

The risk of using the current Tamil-English version is the potential of an incorrect diagnosis, which could lead to wasted money, emotional and psychological stress of the patient and their family and an unneeded use of therapeutic resources. It could also result in an inaccurate assessment of an aphasic's language abilities, which would greatly affect the therapeutic program that has been set out for them, targeting the wrong areas or, missing areas that truly need work. The results and the comments made by participants of this study helped identify what aspects of each section were unclear and difficult. Having sampled participants with a high level of education, suggested that the items they found difficult would definitely be difficult for those who have less education. I would strongly encourage that these changes be implemented and for the observations provided to be in a reference tool. This will ultimately make this a more useful tool for a wider Tamil-English population. Below are suggestions on how to modify questions that had low correct response rates or were ambiguous to participants. This is followed by a list of observations on typical performance by participants on particular subtests. Numbers refer to the item/question number on the BAT.

English version

Verbal Auditory Discrimination

Participants hear a word and are asked to point to the picture that represents the word out of four options. This task assesses auditory comprehension and phonemic discrimination. Participants earn one point for each correct answer.

Item 51. BREW

Most participants were familiar with the term. However, among Sri Lankans, this word is heavily associated with coffee. Participants rarely relate witches with the term "brew" and consequently pointed to the "X" to represent that there was no picture representing this word. Therefore, replacing the current picture with one that best reflects their understanding of the word by this group would be recommended.

Item 52. THICK

All participants were familiar with this term, which was confirmed by participants verbalizing the meaning of the word. Yet, the picture poorly depicts this word and so participants again most often pointed to the "X", indicating that they did not perceive a picture that corresponded to the meaning of the word.

Item 56. SHIN

Most women were not familiar with this term, while most men were from playing sports. This word should be replaced by another word to avoid biases of this sort.

Item 58. CRAMP

Two of the four visual stimuli provided for this word were easily confused to both represent cramp. This resulted in only half the participants pointing at the correct picture, though everyone knew the term itself. The picture that is not the correct representation of this word should be completely eliminated and replaced by another visual that is more readily identifiable.

By altering or replacing these particular items, this task becomes more accessible to a wider educational population and a more accurate assessment of the patient's phonemic discrimination and auditory comprehension.

Synonyms

Participants hear a word and four options afterwards from which they select the word that has the most similar meaning to the first word. This task tests participants' knowledge of associations and relationships between words. Participants earn one point for each correct answer.

Item 162. CANOE

Although the majority of participants were familiar with this term, there were a few that were not. We can hypothesize that if this test were administered to a larger population, this term would not be familiar to less educated persons. The Boston Naming Test (Kaplan, Goodglass, & Weintraub, 1978) also uses the word "canoe". A study conducted by Tombaugh and Humbley (1997) showed that out of 219 non-impaired

adults, only four participants answered incorrectly. However, a study conducted by Randolph, Lansing, Ivnik, Cullum and Hermann (1999) showed gender biases in performance on this test. Men performed significantly better in naming particular words including "canoe" than women. Therefore, replacing this word with a generic term is recommended.

Tamil version

Semantic Acceptability

Participants hear sentences and state whether or not they are semantically correct. This task assesses the participant's world knowledge and associations. One point is earned for each correct answer. These sentences are selected as semantically acceptable based on the personal associations of each patient and is therefore not truly assessing world knowledge accurately.

Item 188. English translation – "They pull the horse to work"

Participants were unsure whether to apply this sentence in a Canadian context or a Sri Lankan context. This is important because those who understood it and applied to what they would expect to see in Canada, said this sentence was semantically unacceptable, whereas those who applied this sentence to what they would typically see in Sri Lanka said this sentence was semantically acceptable. Therefore, this sentence should either be modified or eliminated to remove the ambiguity.

Item 192. English translation – "At lunch, he drinks milk"

Some participants associated drinking milk with breakfast or with a bedtime activity and those who did, said that this sentence was semantically unacceptable. Others who did not specifically associate drinking milk to a particular time of the day said that this was semantically acceptable. To avoid confusion, this sentence should be modified or replaced.

Repetition and Lexical Decision

Participants hear a word, repeat it and are asked to identify whether or not the word is a lexical item. This task assesses articulatory and listening skills. Participants earn 2 points for each question; one point for repeating the item correctly and another point for the lexical decision. The following words were not terms familiar to most participants and resulted in participants identifying these as non-lexical items. These terms should be replaced with common terms so as to render the test more suitable for the population in question.

Item 201. The arrow belonging to the bow and arrow system

Item 203. Type of rock – claimed by some participants to be the shortened version of [sɛli] which refers to pebbles

Item 207. Type of farming equipment

Item 213. Alcoholic beverage

Reading Comprehension of words

Participants read a word and point to the picture that best represents the term. This task assesses reading comprehension and one point is earned for each correct answer.

Item 411. [la:du] - unknown

None of the participants knew the meaning of this term and, thus, it should be eliminated or replaced.

Tamil-English (Part C) Section

Word Recognition

Item 434. English translation – "Snow"

Participants are required to point to the Tamil translation of this word from a list of 10 Tamil words. As discussed above, there is no equivalent for "snow" in the list provided. The Tamil translation of snow must be added to the list.

Word Translation

Most participants were not able to generate the correct English translation of the following Tamil words because the Tamil terms are not commonly used.

Item 444. [korəm] – ugliness

Item 446. [vɪsənəm] – sadness

4. 3 Observations

This section provides clinicians and administrators with performance on several tasks by a non-impaired population and the factors that affected their performance. This will give clinicians the opportunity to establish whether the patient's performance is affected by external factors or possibly be a symptom of aphasia, by referring to this data.

The administration of the BAT on a non-impaired individual took roughly three hours. Therefore it is estimated that it would take much longer to administer this assessment to an aphasic patient.

English version

Antonyms: 168 – 172

These words require participants to provide the correct antonym in the correct grammatical class. For those participants who did their schooling in Tamil, this was quite a difficult task to complete due to their lack of familiarity with formal English grammar.

Item 168. UGLY a. beauty b. beautiful c. beautifully

English and Tamil Versions

Verbal fluency task

This task has participants hear a phoneme and generate as many words as they can in one minute that begin with that phoneme. On average, participants generated 10 words per sound for both English and Tamil. Almost all participants produced words beginning

with the right sound, while a couple would associate the sound 'p' with the letter p itself and generate a word that began with the letter p, but was the incorrect phoneme such as /f/ in 'phone'. The number of words produced ranged from 5 to16 words. Most often, younger participants were able to generate more words than the older adults. This could be explained by aging adults' difficulty with word-retrieval as mentioned in the language aging section in the introduction. Aging adults would benefit from additional time or phonological cues to assist with lexical retrieval.

Sentence Construction

This task requires participants to use the words given in Table 18 and to create a grammatical sentence. It assesses the participant's grammatical accuracy, syntax and semantics. All participants were able to produce grammatically correct sentences using all stimulus words. In some instances participants inflected the verbs provided in the question. Participants used more words in English than in Tamil, a result of Tamil's morphological density.

Table 19: Sentence Construction Task – Performance in both languages

Question	**Average number of words used in English**	**Average number of words used in Tamil**
289. House/cat	5-6	3
294. Chair/doctor/sit	6-7	4
299. Desk/open/drawer (English) Vegetable/pot/put (Tamil)	6-7	3-4
304. Tree/green/leaf/see	4-5	5-6
309. Pencil/write/blue/paper	7-9	6

Tamil Version

Series

Item 262. English translation: Name the months of the year

Participants sometimes struggled to produce one or two months in the year in Tamil. Many participants mentioned that they generally refer to the months of the year in English and rarely in Tamil.

5.0 Conclusion

This study was able to provide performance on the assessment by a non-impaired population as well as determine what changes needed to be made to make the test more reliable. However, further research can be done to better understand the BAT itself as well as the populations it can be used on.

As explained in the discussion section, the participants used in this study did not display much diversity in educational profile. Immigrants who are less educated and who haven't had much exposure to English prior to coming to Canada may be reluctant to participate in such a study, perhaps for fear of not performing well. Aruliah (1994) observed that at the beginning of Sri Lankan migration to Canada, the level of education of Tamil immigrants was high. As the years passed, nearing the mid 1990s, the level of education decreased. Those individuals who arrived during the latter part of this period were primarily young adults, who at this time did not meet or just missed the age bracket to participate in this study. It is possible that there immigrants would not do as well on this assessment as those who participated in the study.

Another issue to consider is how Indian Tamils would perform on this test. Though both Sri Lankan Tamil and Indian Tamil are mutually intelligible, some lexical and morphological differences do exist. It would be desirable to know how such differences would affect test performance. We do not know if this version is suitable for the entire Tamil-speaking community in Canada. Further validation of the Tamil-English version of the BAT is needed.

Another useful study would be to compare performance across ethno-linguistic groups in Canada. This is to identify whether or not different ethnic groups have difficulty with the same subtests. After collecting data from different populations, overall modifications to the BAT can be implemented to make the assessment a more reliable tool.

Overall, the Tamil-English version of the BAT is a valid test requiring minor modifications. As stressed earlier, it is highly recommended that these modifications be implemented to make the BAT a more reliable tool that can be used on the general Tamil and English speaking community in Canada. It seems that years of education may affect performance and thus needs to be further examined to produce an assessment that can be confidently used in clinical settings.

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7.0 Appendix

7.1 Appendix A – English Poster Advertisement

PARTICIPANTS NEEDED FOR
TO VALIDATE A LANGUAGE TEST USED IN HEALTHCARE

ARE YOU BETWEEN THE AGES OF 50 AND 80?

DID YOU EMIGRATE FROM SRI LANKA AS A TEENAGER OR ADULT?

DO YOU STILL SPEAK TAMIL AT WORK OR AT HOME?

IF YOU ANSWERED YES TO THE ABOVE QUESTIONS, YOU MAY BE INTERESTED IN THIS STUDY!

Your participation would involve approximately a 1½ hour session
or two shorter sessions (your choice).

In appreciation for your time, you will receive $20.

For more information about this study, or to volunteer for this study,
please contact:

Teenu
Department of Linguistics and Languages
905-525-9140 Ext. 23762
Email: sanjeet@mcmaster.ca

This study has been reviewed and received ethics clearance,
by the McMaster Research Ethics Board.

7.2 Appendix B: Tamil Poster Advertisement

McMaster University

சுகாதார பராமரிப்பு சம்பந்தமான மொழி ஆற்ல் ஆய்விற்கு உங்கள் பங்களிப்பை வேண்டுகிறம்

- நீங்கள் 50 வயது அல்லது அதற்கு மேற்பட்ட வயதினரா?
- நீங்கள் இலங்கையிலிருந்து குடிபெயர்ந்த போது பதின்ம வயதினரா? அல்லது வயது வந்தவரா?
- நீங்கள் இன்னமும் தொடர்ந்து தமிழில் வேலைதளத்திலோ ? அல்லது வீட்டிலோ ? கதைகின்றீர்களா ?

நீங்கள் இவற்றிற்கு ஆம் என்று பதிலளிப்பின், நீங்கள் இதில் ஆர்வமுடன் பங்குபற்றலாம் !!!!!

நீங்கள் இவ் ஆய்வில் பங்குபற்றும் போது அண்ணளவாக 1 1/2 மணித்தியாலங்கள் செலவிட வேண்டும் அல்லது இரு சிறிய தவணைகளாக செலவிடலாம் .

உங்களின் முயற்சிக்கு அன்பளிப்பாக $20 தரப்படும் .

இந்த ஆய்வு பற்றி மேலதிக விபரங்கட்கு, நீங்கள் தொடர்பு கொள்ள வேண்டிய முகவரி

Teenu
Department of Linguistics and Language
(905) 525-9140 ext. 23762
Email : sanjeet@mcmaster.ca

இவ்ஆய்வு
McMaster பல்கலைகழகத்தின் ஆராய்ச்சி பிரிவினால் மீள்பார்வை செய்து அங்கீகரிக்கபட்டுள்ளது .

7.3 Appendix C: Screening questionnaire

Screening Form

Participant Demographic Information & Screening Form:
A study of the validity of the Tamil-English Bilingual Aphasia Test

Protocol: _____ Subject Number:

This information is strictly confidential and will not be shared with anyone.

First name: _____ Last name:

Age: _____ Level of Education: _____

First Language: _____

Do you speak both English and Tamil: Yes No

When did you learn English? _____

When did you come to Canada? _____

Do your parents speak English? Yes No

Have you been diagnosed with severe hearing loss? Yes No

If yes, are you required to wear a hearing aid? Yes No

Have you ever had any neurological or psychological problems? Yes No
(Stroke, brain or severe head injury; depression, anxiety disorder)

Are you taking any medication that affects your alertness? Yes No

If yes, please rate your current state of alertness on a scale from 1 to 5: (I = extremely alert & 5 = extremely tired)

1 2 3 4 5

How many hours did you sleep last night? _____

7.4 Appendix D: English Letter of Information and Consent

DATE: _____

LETTER OF INFORMATION / CONSENT

A Study of the validity of a Language Test on Tamil-English Bilinguals

Investigators:

Principal Investigator:
Teenu Sanjeevan
Department of Linguistics and Languages
McMaster University
Hamilton, Ontario, Canada
(905) 525-9140 ext. 23762
E-mail: sanjeet@mcmaster.ca

Faculty Investigator:
Dr. Anna Moro
Department of Linguistics and Languages
McMaster University
Hamilton, Ontario, Canada
(905) 525-9140 ext. 23762
E-mail: moroal@mcmaster.ca

What am I trying to discover?

This research is for my thesis that I am completing at McMaster University. The purpose of the research is to see if the Bilingual Aphasia Test (hereafter BAT) is a useful test for diagnosing language difficulties in older bilingual speakers of Tamil and English in Canada. This test is not being used to test your language difficulties, but rather to validate the BAT, which is used to do this. I am hoping to find out what type of difficulties, if any, people have in doing these tests, so that we can see if any changes should be made in order to make them more reliable.

What will happen during this study?

I will be the only individual conducting the research. In the instance that you request the study to be conducted in your home, I will be assisted by another graduate or undergraduate student familiar with the type of research being conducted or by my supervisor, Dr. Moro. You will be given the option of either completing the assessment in one sitting with a break in between at a duration you decide, or in two sessions conducted on consecutive days; two mornings, two afternoons or two evenings. With your permission, the data will be collected in the form of written notes and audio recordings for accuracy.

The BAT has three parts. In Part A you will be asked questions about your language background, such as when you learned each language, which language you use in different everyday situations and which languages you learned in school.

Part B will have to be done in both Tamil and English. In this part of the test, you will be asked to follow simple instructions, to give the meanings of words and sentences, and to do other language tasks, such as giving the opposite of a word. Please do not worry about your answers being right or wrong, I just want you to try your best. Part B will take an hour to do. If you opt to do the study in two sessions, we would end here and continue with the rest the following day.

Part C is the last part of the test. In this part you will do translation exercises and you will be asked to say whether the sentences I read to you in Tamil or English sound right to you. This part of the test will take about 1/2 an hour.

Are there any risks involved in this study?

It is not likely that there will be any harm from this study. Due to the length of the assessment, you may feel fatigued or bored. The option of having a break during the session or having the study completed in two sessions was provided to help alleviate this issue. Also, you may worry about being unable to answer one or more questions on the assessment. It is very likely that you will not be the only person unable to do so. You can be assured that I am not looking at individual scores but at overall group performance. Do not worry about your answers being right or wrong, just do your best.

Are there any benefits to doing this study?

The research will not benefit you directly. I hope that what is learned as a result of this study will help us to better understand how normal older Tamil-English speakers do on these medical tests. This information will help us to make the tests more reliable for use with bilingual people who suffer from aphasia, dementia or other brain impairments.

Who will know what I said or did in this study?

You are participating in this study confidentially. I will not use your name or any information that would allow you to be identified. No one but me or other members of the research team such as the research assistant will know whether you participated unless you choose to tell them. The only piece of documentation that will have your name is the consent form. Upon the signing of the consent form, you will be assigned a random code number (A- woman/B- man and a number). All paperwork, the assessment and audio recordings will be labeled using this code. These codes will also be used during data analysis and be published in the study findings.

The data collected will be stored in a locked cabinet in a secure location on the floor of the linguistics and languages department at McMaster University and any data stored on a computer will be password protected. Only the researcher and the principal supervisor will have access to the consent forms, written records and audio tape recordings. After the study is complete and the data is no longer needed, it will be destroyed appropriately.

What if I change my mind about being in the study?

Your participation in this study is voluntary. It is your choice to be part of the study or not. If you decide to be part of the study, you can decide to withdraw, at any time, even after signing the consent form or part-way through the study. If you decide to withdraw, there will be no consequences to you. In cases of withdrawal, any data you have provided will be destroyed.

Payment or Reimbursement

In appreciation for your participation, you will be compensated $20.00. If you chose to withdraw, you will still be compensated entirely.

How do I find out what was learned in this study?

I expect to have this study completed by approximately August 2012. If you would like a brief summary of the results, please let me know how you would like it sent to you.

Questions about the Study

If you have questions or need more information about the study itself, please contact me at: sanjeet@mcmaster.ca or (905) 525-9140 ext. 23762

This study has been reviewed by the McMaster University Research Ethics Board and received ethics clearance.

If you have concerns or questions about your rights as a participant or about the way the study is conducted, please contact:

McMaster Research Ethics Secretariat
Telephone: (905) 525-9140 ext. 23142
c/o Research Office for Administrative Development and Support
E-mail: ethicsoffice@mcmaster.ca

CONSENT

I have read the information presented in the information letter about a study being conducted by Teenu Sanjeevan of McMaster University.

I have had the opportunity to ask questions about my involvement in this study and to receive additional details I requested.

I understand that if I agree to participate in this study, I may withdraw from the study at any time. I have been given a copy of this form. I agree to participate in the study.

Signature: _____

Name of Participant (Printed) _____

1. I agree that the interview can be audio recorded.
   Yes
   No

2. Yes, I would like to receive a summary of the study's results.
   Please send them to this email address _____
   or to this mailing address: _____
   _____
   _____

   No, I do not want to receive a summary of the study's results.

7.5 Appendix E: Tamil Letter of Information and Consent

தகவல் படிவம் / ஒப்புதல் படிவம்

தமிழ் - ஆங்கிலம் பேசுவோரின் மொழி ஏற்புடமை பற்றிய ஆய்வு

ஆய்வாளர்கள் :

பிரதான ஆய்வாளர் :
தீனு சஞ்சீவன்
மொழியியல் மொழிகளுக்கான துறை
மக்மாஸ்டர் பல்கலைகழகம்
ஹமில்டன் , ஒன்ட்டாரியோ , கனடா
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பல்கலைகழக ஆய்வாளர் :
Dr . அன்னா மோரோ
மொழியியல் மொழிகளுக்கான துறை
மக்மாஸ்டர் பல்கலைகழகம்
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நான் எதனை கண்டறிய முயலுகிறேன்?

மக் மாஸ்டர் பல்கலைகழகத்தில் எனதுமுதுநிலை பட்டபடிப்பை பூர்த்தி செய்வதற்கான ஆராய்ச்சிக்குரிய படிப்பகவே இந்த ஆய்வு அமைகிறது. கனடாவில் தமிழ் - ஆங்கிலம் பேசும் முதியவர்களின் மொழி சம்பந்தமான பிரச்சினைகளை இரு மொழி பேச்சுத் தடுமாற்றப் பரீட்சை (Bilingual Aphasia test) மூலம் கண்டறிவதற்காக இம்முயற்சி மேற்கொள்ளப்படுகிறது . இச்சோதனகளில் பங்குபற்றுவோர் என்ன பிரச்சினைகளை எதிர்கொள்கின்றார்கள் என்பதை அறிந்து கொள்வதோடு

அதற்கான மாற்றங்களை நம்பிக்கையூட்டும் விதத்தில் மேற்கொள்ள முடியுமா என பார்த்தல் ஆகும்.

இப்பரிசோதனைகள் எவ்வாறு மேற்கொள்ளப்படும் ?

நான் மட்டுமே இந்த ஆராய்ச்சியில் ஈடுபடுவேன். நீங்கள் விரும்பின் உங்கள் வீட்டிலேயே இந்த சோதனையை மேற்கொள்ள முடியும். என்னுடன் இன்னுமொரு பல்கலைகழக மாணவரோ அல்லது என்னுடைய மேற்பார்வையாளர் Dr . Moro எனக்கு உதவியாக இருப்பார். நீங்கள் இச்சோதனையை ஒரு நாளில் ஒரே தடவையிலோ

(சிறு இடைவேளையுடன்) அல்லது இரண்டு தொடர்ச்சியான நாட்களில் காலை, பிற்பகல் அல்லது மாலையிலோ செய்து முடிக்கலாம்.
உங்களின் ஒப்புதலுடன்,உங்கள் தரவுகள் எழுத்து மூலமும், குரல் பதிவுகள் மூல மும் அவற்றின் உண்மை தன்மைக்காக பதிவு செய்யப்படும்.

இந்த சோதனை (BAT) மூன்று பகுதிகளை கொண்டது. முதற் பகுதியில், உங்களின் மொழியறிவு சம்பந்தமான விடயங்கள் கேட்கப்படும்.

அவையாவன 1 . ஒவ்வொரு மொழியையும் எப்போது கற்றீர்கள்?

2 . உங்கள் நாளாந்த வாழ்வின் வெவ்வேறு சந்தர்பங்களில் நீங்கள் உபயோகிக்கும் மொழி எது?

3 . நீங்கள் பாடசாலையில் படித்த மொழிகள் எவை?

இரண்டாவது பகுதி தமிழிலும் ஆங்கிலத்திலும் நடைபெறும். இதன்போது உங்களிற்கு சுலபமான அறிவுறுத்தல்களை பின்பற்றகூ டியதாக உள்ளதா என அவதானிக்கப்படும்.சொற்கள், வசனங்களிற்கு பொருத்தமான அர்த்தங்களை கூறும்படி கேட்கப்படுவீர்கள். மொழி பற்றிய வேறு வினாக்களும் கேட்கப்படும். (உ+ ம்) சொற்களிற்கு எதிர்சொல் கூறுதல்.

உங்கள் விடைகள் சரியானதோ அல்லது பிழையானதோ என்று கவலைப்படத் தேவையில்லை. உங்களால் இயன்ற அளவு முயற்சி செய்வதையே நான் விரும்புகின்றேன். இப்பகுதி சோதனை ஒரு மணித்தியாலம் வரை நீடிக்கும். நீங்கள் இப்பகுதியை இரண்டு தடவைகளில் செய்ய விரும்பினால் இத்துடன் இப்பகுதியை முடித்து மறுநாள் தொடரலாம்

இச்சோதனையின் கடைசிபகுதி மூன்றாம் பகுதி ஆகும். இப்பகுதியில் நீங்கள் மொழிபெயர்ப்பு பயிற்சிகளை செய்ய வேண்டும். நான் கூறும் தமிழ் / ஆங்கில வசனங்கள் சரியாக பொருள்படுகின்றனவா என கூற வேண்டும். இச்சோதனை 1/2 மணித்தியாலம் வரை நீடிக்கும்

இந்த ஆய்வினால் ஏதாவது பாதிப்புகள் ஏற்படுமா?

இந்த ஆய்வினால் எதுவித பாதிப்பும் ஏற்படாது. ஆய்வு நேரம் கூடுதலாக இருப்பதால் உங்களிற்கு களைப்பு அல்லது சோர்வு ஏற்படலாம். ஆதலால்தான்

சிறு இடைவேளை அல்லது இரு தடவைகளில் சோதனை செய்தல் ஊக்குவிக்கப்படுகிறது.

மேலும் நீங்கள் ஒன்று அல்லது அதற்குமேற்பட்ட கேள்விகளிற்கு விடையளிக்க முடியாது போனால் விசனபடத்தேவையில்லை. உங்களைபோல் வேறு பலரும் இருப்பர். எனது ஆய்வு பெறுபேறுகள் தனிபட்டவர்களில் எவ்வித பாதிப்பும் ஏற்படுத்தாது. நான் முழுக்குழுவின் செயல்திறன் பெறுபேறுகளிலேயே அக்கறை கொண்டுள்ளேன். உங்கள் விடைகள் சரியானவையோ அல்லது பிளையானவையோ என கவலைப்பட வேண்டாம். உங்களால் முடிந்தமட்டும் திறமையாக செய்யுங்கள்.

இந்த ஆய்வினால் உண்டாகும் நன்மைகள் என்ன ?

இந்த ஆய்வு உங்களிற்கு நேரடியான பலன்கள் எதனையும் தராது. இதிலே பெற்றுக்கொண்ட தகவல்களின்படி, தமிழ் - ஆங்கிலம் பேசும் சாதாரண முதியோர் எவ்வாறு மருத்துவ பரிசோதனைகளின் போது பதில் அளிகின்றார்கள் என விளங்கி கொள்ள முடியும். இந்த ஆய்வின் பெறுபேறுகள் இரு மொழி பேசும் மக்களின்பேச்சுத் தடுமாற்றம், ஞாபகமறதி மற்றும் மூளை சம்பந்தப்பட்ட நோய்களிற்கான மருத்துவ பரிசோதனைகளை சரியாக செயல்படுத்துவதற்கு உதவும்.

இந்த ஆய்வின் போது நான் பெற்றுக்கொண்ட தகவல்கள் அல்லது செயன்முறைகளை அறிந்து கொள்பவர்கள் யார் ?

நீங்கள் இந்த ஆய்வில் பங்குபற்றுவது அந்தரங்கமாக பேணப்படும். உங்கள் பெயரையோ அல்லது உங்கள் அடையாளத்தையோ நான் வெள்ளிப்படுத்தபோவதில்லை. நானோ என் ஆய்வுக் குழுவில் இருக்கும் ஏனைய அங்கத்தவர்களையோ தவிர வேறெவர்க்கும் உங்களின் பங்களிப்பு பற்றி தெரிய வராது. (நீங்களாக சொல்வதை தவிர). உங்களின் ஒப்புதல் படிவம் மட்டும் தான் உங்கள் பெயரை கொண்டிருக்கும். நீங்கள் இப்படிவதில் கை ஒப்பமிட்டபின் உங்களிற்கு ஒரு குறியீடு எண் இடப்படும்.

A என்பது பெண்ணையும் B என்பது ஆணையும் அத்துடன் ஒரு இலக்கமும் கொடுக்கப்படும். எல்லா விதமான எழுத்து வேலைகளிலும், மதிப்பீடுகளிலும், குரல் பதிவுகளிலும் இந்த எண்ணே பயன்படுத்தப்படும். இந்த குறீயீடு எண்,

தரவுகளின் ஆய்வின் போதும், மதிப்பீடுகள் வெளியிடப்படும் போதும் உபயோகிக்கப்படும்

இந்த ஆய்வில் பெறப்பட்ட தகவல்கள் யாவும் McMaster பல்கலைகழகத்தின் மொழியியல் துறை காப்பகத்தில் பாதுகாப்பாக பூட்டி வைக்கப்படும். கணணி பதிவுகள் கடவுச்சொல் மூலம் பாதுகாக்கப்படும். ஆய்வாளர் அல்லது மேற்பார்வையாளர் மட்டுமே ஒப்புதல் பத்திரங்களையோ அல்லது எழுத்து ஆவணங்களையோ அல்லது குரல் பதிவுகளையோ பார்வையிட முடியும். இந்த ஆய்வு பூர்த்தியானவுடன் இந்த தரவுகள் தேவைபடாவிடின் இவை தகுந்த முறையில் அழிக்கப்படும்.

இந்த ஆய்விலிருந்து விடுபட விரும்புவோரிற்கு

நீங்கள் உங்கள் சுயவிருப்பின் பேரிலேயே இவ்வாய்வில் பங்குபற்றுகிறீர்கள். நீங்கள் பங்குபற்றியபின் எந்த நேரத்திலாவது , நீங்கள் ஒப்புதல் படிவத்தில் கை ஒப்பமிட்டபின்னரோ அல்லது ஆய்வின் நடுவிலோ விலகிக்கொள்ள விரும்பின் நீங்கள் ஆய்விலிருந்து விலகலாம். நீங்கள் விலகுவதானால் உங்களிற்கு ஒரு பாதகமும் இல்லை. நீங்கள் கொடுத்த தரவுகள் உரிய முறையில் அழிக்கப்படும்

கொடுப்பனவுகள் அல்லது மீளளிப்புகள்

இந்த ஆய்வில் பங்குபற்றுவதற்காக உங்களிற்கு $20 சன்மானமாக கிடைக்கும். நீங்கள் ஆய்விலிருந்து விலகினாலும் உங்களிற்கு இச்சன்மானம் கிடைக்கும்.

இந்த ஆய்வில் கண்டறியப்பட்ட விடயங்களை எப்படி அறிந்து கொள்ள முடியும்?

இந்த ஆய்வு 2012 ஆண்டு ஆவணி மாதத்தில் பூர்த்தியடையும் என்று எதிர்பார்கின்றேன். இவ்வாய்வின் சுருக்கமான பெறுபேறுகளை அறிய விரும்பினால், உங்களிற்கு எவ்வாறு தெரியப்படுத்த வேண்டுமென அறியத்தருமாறு வேண்டுகிறேன்.

இந்த ஆய்வு பற்றிய கேள்விகள்

இவ்வாய்வு பற்றிய கேள்விகள் அல்லது மேலதிக விபரங்கள் தேவைப்படின் கீழே தரப்படுள்ள மின் அஞ்சலில் அல்லது தொலை பேசியில் என்னுடன் தொடர்பு கொள்ளலாம். sanjeet@mcmaster.ca or (905) 525 – 9140 ext 23762

இந்த ஆய்வு McMaster பல்கலைகழகத்தின் ஆராய்சிபிரிவினால் மீள்பரிசீலனை செய்யப்பட்டு அங்கீகாரம் வழங்கப்பெற்றது.

நீங்கள் இந்த ஆய்வில் பங்குபற்றும் போது உங்களிற்கு உள்ள உரிமைகள் பற்றியும் அல்லது எவ்விதம் இந்த ஆய்வு நடத்தப்படுகிறது என்பது பற்றியும் அறிய விரும்பின் கீழே உள்ள முகவரியில் தொடர்பு கொள்ளவும்.

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ஒப்புதல் படிவம்

McMaster பல்கலைகழகத்தில் தீனு சஞ்சீவன் என்பவரால் நடாத்தப்படும் இந்த ஆய்வின் விபரங்களை நான் வாசித்து அறிந்துள்ளேன்.

இந்த ஆய்வில் நான் ஈடுபடும் போது கேள்விகள் கேட்பதற்கும் மேலதிக விபரங்கள் பெறுவதற்கும் எனக்கு சந்தர்பம் வழங்கப்பட்டுள்ளது.

நான் இந்த ஆய்வில் பங்குபற்ற ஒப்புக்கொண்ட போதிலும் எந்நேரத்திலும் என்னால் இதிலிருந்து விலகிக்கொள்ள முடியும் என்பதனை அறிந்துள்ளேன்.

இப்படிவத்தின் பிரதி ஒன்று எனக்கு கொடுக்கப்படுள்ளது. நான் இந்த ஆய்வில் பங்குபற்ற சம்மதிக்கிறேன்.

கையொப்பம் : ----------

பங்குபற்றுபவரின் பெயர்: ----------

1 . என்னுடைய நேர்காணலை குரல் பதிவு செய்ய ஒப்புதல் அளிக்கின்றேன்

ஆம்

இல்லை

2 . ஆம், இந்த ஆய்வின் பெறுபேறுகளின் தொகுப்பினை பெற்றுக்கொள்ள விரும்புகிறேன். கீழே உள்ள

மின்னஞ்சல் ----------

தபால் முகவரியிற்கு ----------

அனுப்பும்படி கேட்டுக்கொள்கின்றேன்.

இல்லை, எனக்கு இந்த ஆய்வின் பெறுபேறுகளின் தொகுப்பை பெற விருப்பம் இல்லை