The Irish 'Boston Naming Test' Can quantitative or qualitative analysis of BNT errors more accurately identify anomia?

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Abstract

Background:

The Boston Naming Test (BNT) is one of the most frequently administered confrontation naming tests used to assess naming ability. The number of errors made during assessment distinguishes between normal non-naming and anomia. Recent research on a Maltese population (Grima & Franklin 2012) has suggested that a crossover in number correct may exist between BNT scores of people with aphasia (PWA) and people without aphasia (PWithoutA), which questions the utility of the BNT to establish impairment.

Aims:

This study investigates if numbers of errors can differentiate between PWA and PWithoutA in an English speaking population and establishes whether error-type analysis would more accurately identify between these groups. Further, this research aims to establish if the overlap between groups is explicable in terms of particular items being likely to elicit errors across both groups.

Methods & Procedures:

35 PWA were referred by local speech and language therapists. The complete BNT was administered, along with the word repetition and spoken word-to-picture matching subtests of the CAT. The BNT was also administered to 17 older subjects without aphasia. This data was added to previously collected BNT results from 51subjects (James, 2012).

Outcomes and Results:

A significant overlap was found between scores of PWA and PWithoutA. Analysis indicates that neither variables (age and education) nor errors on particular items can account for this overlap. Analysis of error-types indicates that some specific error types were made only by PWA. Both groups made particular subtypes of errors, however frequency of these errors was significantly higher in PWA.

Conclusions:

Examination of BNT scores alone may not be the most accurate measure of naming deficits. Qualitative and quantitative analysis of error-types can be used to more accurately differentiate between PWA and PWithoutA.

Introduction

Object naming is a fundamental skill that individuals use to communication (Terrace 1985). The ability to name objects with ease is often under-appreciated, however the affect that lexical retrieval deficits can have on communication is extensive. Lexical retrieval difficulties are one of the most pervasive characteristics of language breakdowns in aphasia (Dell et al 1997). Individuals with aphasia have different patterns of language impairments, however often a difficulty in producing spoken language is one of the most troubling problems to overcome (Nickels 2001). Naming deficits have a negative impact on the ability to communication and can lead to breakdowns in communication (Herbert et al 2008). Naming ability is particularly sensitive to age related degradation (Dell et al 1997). Confrontation naming test are utilized to identify lexical retrieval deficits, and to differentiate between impaired naming ability and normal naming. Picture naming activities have been identified as providing rich information regarding the nature of lexical retrieval deficit (Herbert et al 2008) for those with cognitive or neurological impairments. The use of confrontation naming tests enables a clinician to obtain an score of naming ability, to assess the severity of an naming impairment and also to analyse the types of errors produce by participants along with any psycholinguistics factors which could impact on the scores obtained (Ellis, Lum & Lambon Ralph 1996).

The BNT

The BNT is one of the most commonly administered confrontation naming assessments used to assess naming performance. It is utilized in areas of neuropsychology and communication disorders (Hawkins & Bender 2002). The first edition of the BNT contained 85-items (Kaplan at al 1978), however an amended version was published in 1983 containing 60 pictures which are presented to the client and are arranged in increasing order of difficulty. The popularity of the BNT has led to its translation into other languages and the collection of normative data from Greek, Swedish, Spanish, Australian-English and Canadian-English speakers.

Table 1: BNT Norms for Adults (Kaplan et al 1983)

Age Group	N	Education		BNT Score	
		Mean	SD	Mean	SD
18-39	21	15.1	2.3	55.8	3.8
40-49	11	15.1	2.5	56.8	3.0
50-59	49	13.5	2.1	55.2	4.0
60-69	56	13.5	2.3	53.3	4.6
79-79	41	13.9	3.0	48.9	6.3

Normative Data

Table 1 shows the normative data provided in the BNT, which was established from an American population across 5 age ranges from 18-79 years of age (Kaplan et al 1983). According to Barker-Collo (2007), when neuropsychological assessments are conducted on populations other than those to which it has been standardized, the results extrapolated from the normative data may be misleading or inaccurate. Despite this statement, the BNT and its normative data are utilized continually in clinical settings to assess the naming abilities of PWA and other neurodegenerative disorders. Patricacou et al (2007) indicated the need for normative data for specific populations and continual adjustment of these norms to account for cultural changes *within* a population. The BNT presents pictures of increasing difficulty based on the norms of the American population, however cultural and linguistic differences in non-normative populations may present variations in levels of difficulty in the BNT.

These studies have indicated some of the problems associated with using standardized assessments on populations for which it was not originally developed. 'It is imperative that representative group normative data be used to adequately interpret performance on the BNT' (Kohnert et al 1998). The adaptation of confrontation naming tests for different cultures should be considered carefully as 'lexical items do not always share the same lexical-semantic frequency cross-linguistically or cross-culturally' (Von Studnitz & Green 1997).

It is evident, from examination of the literature that a number of variables can impact on the validity of administering the BNT on non-normative populations. For this reason, one aim of this research study will be to further obtain normative data from the non-aphasic Irish population to supplement data collected by James & Franklin (2012).

Demographic Variables

Normal and impaired lexical retrieval has been an area widely researched with particular emphasis on the variables that impact on naming, frequency of errors and types of errors made by people with aphasia (PWA) & people without aphasia (PWithoutA). Age has been identified as a factor that impacts on naming ability, with a normal decline in naming correlating with an increase in age. A number of cross-sectional studies have identified that ageing, as well as other factors including education (Neils et al 1995, Worrall et al 1995) and gender (Marien et al 1998) impact on lexical-retrieval. Albert et al (1988) examined the age-related naming differences of healthy individuals and found that the frequency of error types increased with age, however this only became a prominent factor in age groups of 70 and above. Similar findings were reported in other studies (Ross et al 1995, Mackey et al 2002). Longitudinal studies examining the impact of ageing on naming ability have also found a decline in naming occurring only within the oldest cohort of participants, in the 70+ age group (Zec et al 2005).

The impact that years of education can have on naming performance has been widely researched and a positive relationship has been found between naming performance and education. Thompson & Heaton (1989) and Hawkins et al (1993) identified that a correlation existed between naming ability and education. Recent research by Grima & Franklin (2012) found that age and years of education had a significant impact on naming performance in the Maltese population. Education in particular was found to be the most accurate predictor of naming ability. Likewise, James & Franklin (2012) found that age did not have a significant correlation to BNT naming performance however levels of educational attainment were found to have a positive correlation with BNT scores. Hawkins & Bender (2002) report that

BNT norms should be categorised by variables including age, education, gender and ethnicity in order to account for the impact these variables have on naming ability.

Significance of Error analysis

As previous research studies have identified, a number of factors can impact on the naming performance of individuals. While limited research was found regarding the existence of overlaps in the original American English population, studies establishing normative data for additional populations have found that PWithoutA can obtain scores that overlap with scores obtained by PWA. This may indicate a lexical-retrieval deficit. Therefore, it has been suggested that scores for older, often less educated individuals may indicate pathology despite a 'lack of neurological or cognitive problems' (Patricacou et al 2007). Similarly, PWA have obtained scores within the normal range of naming ability.

Other studies examining the scoring performance of PWA and PWithoutA have also found the existence of overlapping BNT scores between these groups (Grima & Franklin 2012, James & Franklin 2012). This overlap in scores calls into question the utility of the BNT in identifying individuals with naming impairments and those without. Grima & Franklin (2012) suggested that analysis of error type production may more accurately identify between these groups. Specific error types were found to be produced by PWA alone which can be utilized to differentiate between those with aphasia and those without.

Error type analysis and reliability

'The paraphasia in aphasic patients does not differ from the incorrect use and the distortion of words which the healthy person can observe himself in states of fatigue or divided attention (Freud, 1891, 1953). According to Dell et al (1997) continuity thesis, PWA make the same errors as those with typical naming abilities and it is the frequency of errors which differs amongst groups. This theory would suggest that impaired naming could be identified merely by comparison of the number of errors made by individuals. Examination of the literature suggests that this theory is too limited and does not accurately reflect the types of errors made by PWA. As has been previously identified, crossover between BNT scores obtained by PWithoutA and PWA may lead to misdiagnosis of naming impairments. For this reason, this research study will examine the types of errors made by PWA and aims to establish if this is a more reliable and accurate means of identifying anomia. Research has found that various types of naming errors have been associated with different neurological disorders. It has been suggested that a qualitative analysis looking at the type and frequency of errors made by PWithoutA would provide more accurate differentiation between errors made by different clinical groups (Tombaugh & Hubley 1997) and normal non-naming. PWithoutA make more semantically related errors than PWA (Albert et al (1988), Marien et al (1998), Tallberg (2005)). Tombaugh & Hubley (1997) identified seven categories of errored responses in PWithoutA; non-responses (15%), circumlocutions (23%), semantic (50%), phonemic (4%), visual (5%), perseveration (2%) and miscellaneous response. The semantic category was further subdivided into subordinate, related exemplars, associated exemplars and neologisms. Multiple studies have identified similar errors in naming ability amongst people without aphasia and people with aphasia (Nickels 2001, Cuetos et al 2002) and further error types have been identified including; portmanteau words, verbal morphological paraphasias, verbal paraphasias, foreign words, empty words (Marien et al 1998), contextual associations, synonyms according to the lexicon (Tallberg, 2005), phonologically related real words, self-correction (Grima & Franklin 2012), multiword, phonologically related non-words and mixed errors (James & Franklin 2012).

A number of atypical errors have also been identified which could be utilized to accurately identify errors in aphasia from normal naming errors. PWA make error types which can be classified into three broad categories; semantic errors, phonological errors and unrelated errors (Nickels 2001). These atypical errors include successful & unsuccessful conduit d'approche, perseverations, gesture/no verbal response, compound word errors, sequential mixed errors, unrecognized correct responses, unrelated errors & morphological alterations (Nickels 2001, Ruml et al 2005, Grima & Franklin 2012, James & Franklin 2012). Limited research is available examining the use of types of errors made by PWA and PWithoutA to establish if a naming impairment is present. Based on examination of the literature and the existence of an overlap between normal non-naming and naming impairments, it is suggested that further research be conducted comparing error types made by these two groups. An investigation into the reliability of using this method to identify lexical-retrieval deficits should also be conducted.

Frequency of Error in Analysis

Word naming impairments are a common characteristic for PWA. However, PWithoutA also often have difficulty retrieving words. It is the number of errors that occur (Martin, 2012) that enables clinicians to differentiate between normal non-naming and anomia. Ellis (1985) states that the naming errors produced by PWA mirror the errors produced by PWithoutA, however the frequency of error production differentiations between groups. Recent research (Grima and Franklin 2012) has identified that number of errors can identify between these two cohorts. However, the same study also identified that PWA, who present with mild naming impairments, produced relatively few errors. Therefore, while number of errors produced may identify individuals with more severe naming impairments, analysis focusing on the number of errors alone, may not be an entirely effective means of establishing individuals with a naming impairment, particularly those with mild impairments. Where total errors analysis cannot differentiate between these groups, error type analysis has been suggested as an appropriate method of analysis, combining both qualitative and quantitative approaches.

Aims of Research

- To establish further normative data for the BNT on an Irish Population.
- To establish if an overlap exist between PWA and PWithoutA in an Irish population.
- If an overlap is found to exist in this study, variables, such as age, gender and education will be examined to ascertain if these variables explain any overlap in scores seen between PWA and PWithoutA.
- To examine whether error types analysis can more accurately identify between PWA and PWithoutA.
- To investigate if the frequency of error type production can effectively differentiate between groups.
- To establish if specific items are likely to produce errors across both groups.

Method

Participants

People Without Aphasia (PWithoutA)

17 participants without aphasia were recruited for assessment through word of mouth. A detailed information sheet was provided before assessment (Appendix A) containing information regarding the nature of the study and a consent form. Inclusionary criteria included participants over the age of 60 who spoke English as their primary language. Exclusionary criteria included a third level education, bilingualism and a history of CVA/TIA or any known neurological impairment that may impact on naming ability. The Clock Drawing Test (CDT) was administered to assess for any cognitive impairments and those with impairments were to be excluded from the study. Research has found that the CDT has a high correlation with the Mini Mental State Examination (MMSE) in identify neuropsychological impairments including Alzheimer's, dementia and visual dysfunction (Agrell & Dehlin 1998).

These participants were combined with an additional 51 participants without aphasia recruited through a previous study (James & Franklin 2012). Table 1 provides combined data from both studies and presents detailed information regarding participant gender, age and levels of education. The age-range for the additional participants were 50-81 years, with a mean age 65.2, SD 8.5 and education attainment ranged from 7-27 years, mean years 14.76, SD 3.6 (James & Franklin 2012, pp11).

Table 1: PWithoutA Demographic Information

	Age Group	**Education 7-10 yrs.**	**Education 11+yrs**	**Total Group**
Males	50-57 years	0	6	6
	58-65 years	2	7	9
	66-74 years	1	8	12
	75-85 years	0	5	5

	86-95 years	0	0	0
	Totals	**3**	**26**	**29**
Females	50-57 years	1	7	8
	58-65 years	2	12	14
	66-74 years	2	10	12
	75-85 years	1	3	4
	86-95 years	0	0	0
Totals		6	32	38

People with Aphasia (PWA)

Participants with aphasia (PWA) were recruited through Speech and Language Therapists working in hospital settings in the Dublin area include The Adelaide and Meath Hospital incorporating the National Children's Hospital (AMNCH), Beaumont Hospital, The Mater Misericordiae University Hospital, Connolly Hospital Blanchardstown and St Mary's Hospital. Additional participants were recruited through community settings including HSE Community services in Tallaght, Ballymun and North Clarence Street. The study was introduced to all participants prior to researcher contact by the relevant speech and language therapist.

The study was explained to all participants prior to assessment by the researchers and an aphasia friendly information pack was also provided (Appendix B). Consent forms were completed prior to assessment, and where a written signature was not appropriate, participants marked with an 'X' and verbal consent was recorded by the researcher.

Demographic information including ages, years of education and gender are provided in Table 3. Ages ranged from 54-91, mean age = 74.29, SD=9.72, with years of education ranging from 7-23, mean age = 11.69, SD=3.88.

Table 3: PWA Demographic Information

	Age Group	Education 7-10 yrs.	Education 11+yrs	Total Group
Males	50-57 years	0	2	2
	58-65 years	1	2	3
	66-74 years	2	2	4
	75-85 years	5	4	9
	86-95 years	3	0	3
	Totals	**11**	**10**	**21**
Females	50-57 years	0	1	1
	58-65 years	1	0	1
	66-74 years	2	2	4
	75-85 years	1	5	6
	86-95 years	1	1	2
	Totals	**5**	**9**	**14**

Materials

The second edition of the Boston Naming Test (Kaplan et al 1983) was used during all assessments. Demographic information sheets, the Clock Drawing test (Appendix C) and consent forms (Appendix D) were provided to each participant. Correct/incorrect responses were transcribed online. A Dictaphone was used to record assessments and for transcription of responses verbatim post assessment. Dictaphone recordings were used to verify correct/incorrect responses and for inter-rater reliability.

Procedure

All Participants

The researcher met with the participant on one occasion individually (when a home visit was necessary two researchers met with the participant for health and safety reasons). The study was explained to each participant along with the reasons for recording each session and each participant was ask to sign a consent form. Demographic details were obtained and the CDT was administered prior to assessment. The researcher then administered the complete 60-item Boston Naming Test (BNT). Correct responses were marked with a tick, any incorrect responses were marked and the recording was played back post assessment with responses being transcribed verbatim. If the client expressed that they did not know a picture or the picture was visually misperceived, a stimulus cue was given. If an incorrect response was given or the participant further expressed they did not recognized the picture, a phonemic cue was given. As latency times were not of priority for this study, the timing of the phonemic cueing was not recorded. No feedback was given post assessment, however the results for the PWA group were sent to the related speech and language therapist upon request.

The 60-item BNT is arranged in order of difficulty, with a steady progression of more challenging pictures being presented to the client. Analysis of data found this to be true, with both groups producing fewer correct responses during the latter half of the assessment. On analysis of data from both groups, culturally inappropriate items (Table 1); item 19 'Pretzel', item 29 'Beaver' and item 35' Dominoes' were removed from scoring. All scores were then adjusted and scored out of a possible 57.

Table 1: Correct/Incorrect Response for Item 19, 29 & 35

BNT Items	**PWA (n=35)**		**PWithoutA (n=67)**	
	Correct	Incorrect	Correct	Incorrect
Pretzel	2	33	18	49
Beaver	5	30	20	44
Dominoes	8	27	35	32
Overlapping Scores	**PWA (n=14)**		**PWithoutA (n=13)**	
	Correct	Incorrect	Correct	Incorrect
Pretzel	1	13	0	13
Beaver	1	13	1	12
Dominoes	3	11	4	9

In addition, a number of culturally appropriate responses were noted from this Irish population. In particular item 12 'Broom' was referred to as 'Brush, and item 20 'Bench' was referred to as 'Garden Seat'. Given the regularity of these responses, these two responses were considered correct for this sample. Similarly lenient scoring was seen in a previous study conducted by James & Franklin (2012), therefore it was considered appropriate to adjust scoring for these responses. The non-aphasic data from this study was then combined with data from James & Franklin (2012) in order to establish a larger Irish sample group for analysis. In this study, responses including 'Clothes Hanger' for item 15 'Hanger' and 'Tennis Racquet' for item 21 'Racquet' were considered correct and marked as such throughout assessments. Similar scoring methods were utilized by Tallberg (2005) stating that use of subordinate errors such as 'Tennis Racquet' for 'Racquet' could indicate a higher knowledge of the picture or a habit to be more specific when naming and should not represent an incorrect response.

Analysis

BNT responses were analysed initially for each participant, with self-corrections being considered a correct response. Responses were also recoded in order to analyse the errors made on each item of the BNT and the frequency/likelihood of an error occurring for a specific item.

23 error types (Table 4) were used to analyse error produced by both groups. These error types were used in similar research studies analyzing naming abilities (Grima & Franklin 2012, James & Franklin 2012). Explanations of error types combined with examples were provided to all researchers to ensure consistency across scoring (Appendix E).

102 participants made a total of 2,096 errors across both groups 899 errors (692 excluding self-corrections) were made by PWithoutA & 1197 errors (1120 excluding self-corrections) were made by PWA). First responses only were utilized for analysis, however all responses were noted post assessment. Self-corrections were considered to be a correct response if preceded by one error only. The error produced prior to a self-correction was noted and combined with pure error types during analysis.

In order to assess the homogeneity of scoring and error analysis, 16 participant audio-files (PWA=8, PWithoutA=8) and scoring sheets were divided amongst four student researchers. Each researcher was requested to listen to the audio-files and independently score and distinguish error types produced. Errors were to be described using Table 4 errors types. Results were then compared with the primary researcher's original data. The most common difference amongst scoring was found to be related to semantic responses; in particular differences were noted between coordinate and super-ordinate responses, and semantic associations. An average inter-rater reliability score of 90% was established on data analysed by this researcher. According to Jackson (2011), this rate of reliability is considered to be fairly high and suggests that data analysis is reliable in this study.

Table 4: Error Types produced during assessment

1. Don't Know	**9.Unrelated**	**17.Perseverations**
2. Forgot	**10.Multiword**	**18.Visual Associations**
3. Self-Corrections	**11.Phonologically Related Real Word**	**19. Unrelated/Unrecognised**
4. Coordinate	**12.Phonologically Related Non Word**	**20.Gesture**
5. Superordinate	**13.Neologism**	**21.Compound Errors**
6. Subordinate	**14.Conduite D'Approche (CDA)**	**22. Mixed Errors**
7. Semantic Association	**15. Unsuccessful Conduite D'Approche (UCDA)**	**23.No Response**
8. Circumlocution	**16.Morphologically Error**	

Results

BNT Score Analysis:

In order to ascertain if BNT scores were normally distributed across both groups (n=102), a Kolmogorov- Smirnov test was conducted. Results obtained indicate that the data violates the normality distribution as the $p<0.05$ (d (102); 0.153). Further analysis was conducted to assess the normality of distribution by individual groups. A Shapiro- Wilk test was used to analyse PWA (n=35) due to the smaller sample size. This test is most appropriate for samples containing less than 50 cases. Results found that mean scores of 27.57, SD: 12.953 were obtained by PWA compared to a mean score of 48.75, SD: 6.929 by PWithoutA. An independent sample t-test was conducted on adjusted scores and the significance of scores remained similar. PWA scored significantly lower than PWithoutA in the BNT where $p< .05$ (t (100): -10.775, p=. 000 (two-tailed)). This suggests that both the complete 60-item BNT and the adjusted 57-item BNT are both appropriate in identifying significance of scoring differences between groups.

While scores differed between groups, a marked overlap (Figure 1) was noted during analysis of the range of scores. Scores for PWA ranged from a minimum of 2 to a maximum of 56 with PWithoutA scoring a minimum of 30 and a maximum of 57. As can be seen from Figure 2 below, a distinct overlap exists between the scores of 30-43, this overlap was found both in the complete 60-item BNT scores and the adjusted score of 57. The overlap indicates that PWA can obtain scores within the range of normal naming.

Figure 1: Mean BNT Scores (Adjusted Score)

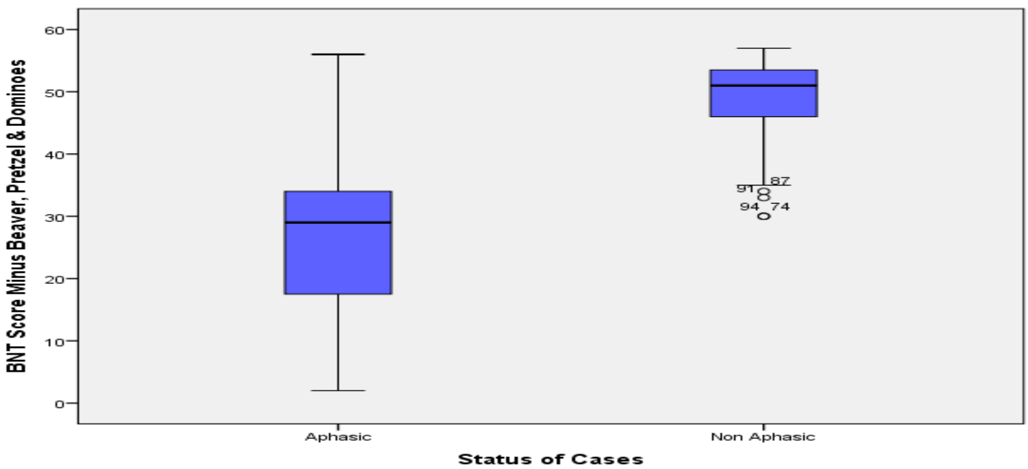
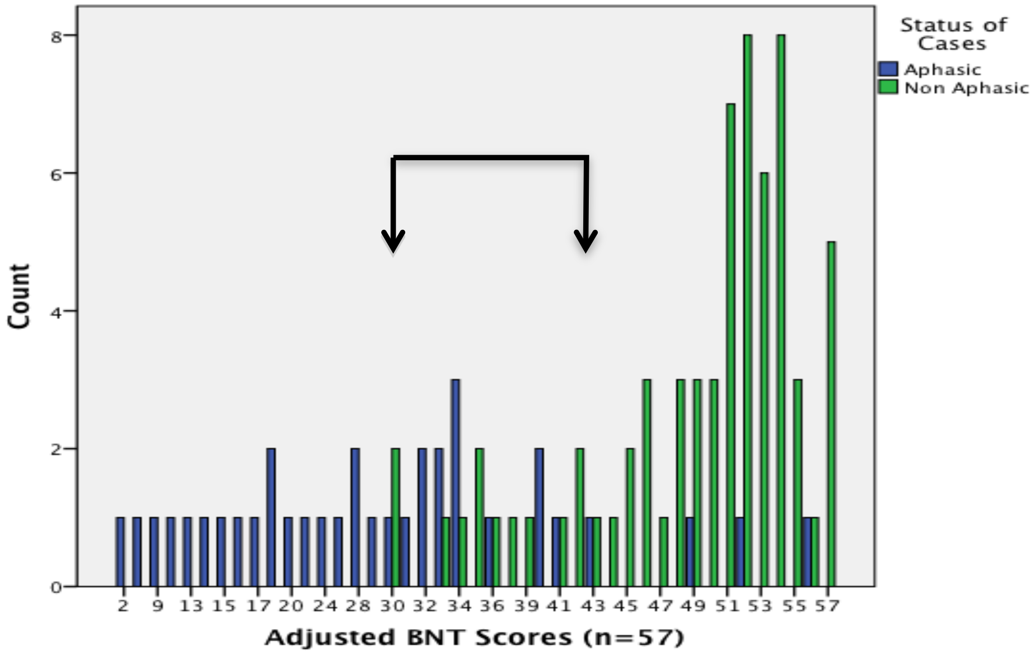


Figure 2: Mean Adjusted BNT Score



Further analysis was conducted on the overlapping group only (scores between 30 –43) to ascertain if any effect of gender, age or education could explain the overlap in scores between those with impaired naming and those without. Appendix F outlines the demographic variables among the 27 participants in this overlap group. No relationship was found between levels of education, participant age or gender, which suggests that these variables have not impacted on the naming ability of participants in this study.

Table 2: Examination of variables in overlap group

	High Ed (12yrs+)	**Lower Ed (7-11yrs)**
Younger Group (50-70yrs)	8 (1 PWA, 7PWithoutA)	4 (2 PWA, 2 PWithoutA)
Older Group (71-90yrs)	6 (2 PWA, 4 PWithoutA)	9(9 PWA)

Inspection of Figure 1 indicates that, in addition to the overlapping scores, there are three people with aphasia who score so highly that they appear to be outliers. These outliers were examined considering the variables of age and years of education. This examination yielded no significance. A wide range of ages existed between participants (56 yrs., 60 yrs. & 81 yrs.) and these three participants fell into both low and high educational categories (10 yrs., 11 yrs. & 12 yrs.). Examination of the outlier scores found no correlation between age and levels of education which is in line with overall analysis of variables on BNT scores in this research.

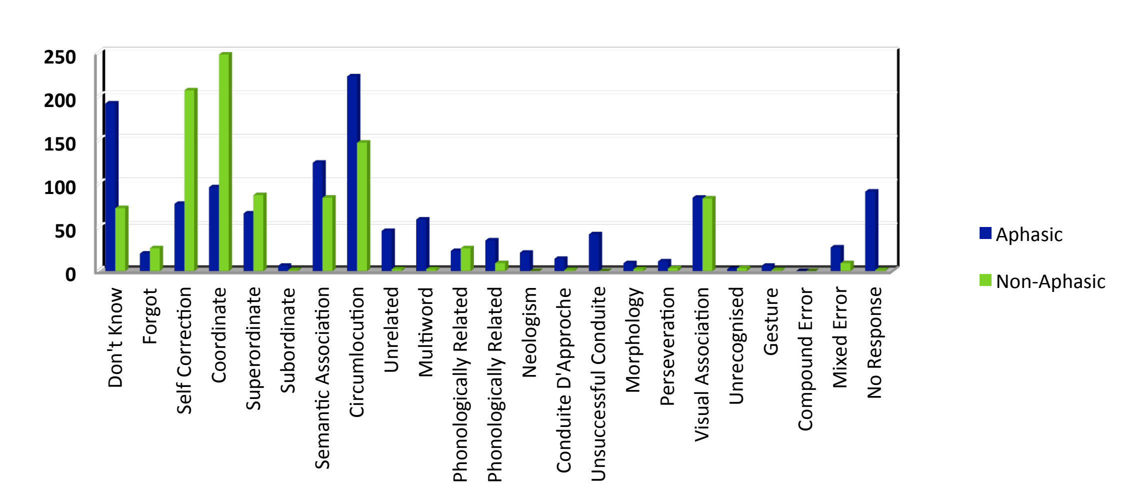
Analysis of Error type production across groups

Cross tabulation analysis was conducted to assess error production across groupings. Results of error production analysis found that PWA produced significantly more errors than PWithoutA. Collation of error production found that PWA produced 57.11% of the total errors compared to 42.89% of errors produced by PWithoutA. Scores excluding self-corrections found that the proportion of errors produced by PWA increased, with 61.81% of errors compared to 38.19% produced by PWithoutA. This is expected, as analysis of error types found that PWithoutA produced significantly more self-corrections than the impaired group. It is important to note that differences in total number of errors produced need to be interpreted with caution as significantly more PWithoutA participated in this study.

Equal variances were not assumed, therefore a Mann Whitney test was conducted to assess for normal distribution of error production. This test found that differences in error production maintained their significance ($p<. 05$)

Table 3 outlines the mean number of each error type produced by each group. Results found that PWA produced more errors using more error types per BNT assessment than PWithoutA. Specific errors types were found to be produced only by PWA; Unsuccessful Conduit D'Approche (UCDA) and Neologisms (atypical errors). Common errors made by both groups were produced more frequently by PWA, with the exception of self-corrections, coordinate and super-ordinate errors. PWithoutA produced a smaller subset of errors, with a mean of 5.7, range of 2-8 error types being found. PWA produced a mean error number of 8.5, with a range of 6 – 14 errors being produced. Both participants groups produced errors from phonological, semantic and mixed error categories, which suggest that classification of error types alone may not be an appropriate means to differentiate between groups.

Figure 3: Frequency of Error Types



It is significant to note that while PWithoutA produced a number of atypical errors (highlighted in bold in Table 4 below), these errors were only produced by a minority of the group therefore further research would need to be conducted to assess the frequency of PWithoutA producing atypical error types in a larger sample.

<u>Table 4: Mean number of productions per error type:</u>

Error Type	PWA (mean productions)	PWithoutA (mean productions)
Don't Know	5.49	1.07
Forgot	.57	.39
Self-Correction	2.20	3.09
Co-Ordinate	2.74	3.70
Super-Ordinate	1.89	1.30
Sub-Ordinate	.17	.01
Semantic Association	3.54	1.25
Circumlocution	6.37	2.19
Unrelated	1.31	.48
Multiword	1.69	.09
Phonologically Related Real Word	.66	.39
Phonologically Related Non-Word	1.00	.13

Neologism	.60	.00
CDA	.40	.01
UCDA	1.20	.00
Morphological Alterations	.26	.03
Perseveration	.31	.04
Visual Association	2.40	1.24
Unrecognised Correct	.06	.04
Gesture	.17	.01
No Response	2.60	.01
Compound Word Error	.00	.00
Mixed Error	.77	.13

Analysis was conducted to assess the viability of utilizing mean number of error productions as a means of differentiating between PWA and PWithoutA. Cross-tabulation analysis was conducted on the mean number of errors produced by both groups. Results found that while a significant difference existed between error productions across both groups, an overlap of error production existed.

Analysis was conducted on the frequency of error types produced to ascertain if this could differentiate between individuals with aphasia and those without. It was found that a significant differences existed in the number of don't know responses produced by PWA compared to those without aphasia. In addition, significant differences were also reported in the production of the following error types; subordinates, semantic associations, circumlocutions, unrelated errors, multiword errors, phonologically related non-words (PRNW), successful Conduit d'Approche (CDA), morphological errors, perseverations, visual associations, gestures, mixed errors and no response. Table 5 present the number of errors produced for each of this fourteen error types along with the mean productions and significance values. As can be identified in this table, a significant difference emerged in the number of productions of these specific error types across groupings.

Table 5: Stats regarding production frequency of significant error types (p<0.05)

Error Type	Number of productions		Mean productions		Sig. (2-tailed)
	PWA	PWithoutA	PWA	PWithoutA	
Don't Know	192	72	5.49	1.07	.000
Subordinate	6	1	.17	.01	.032
Semantic Associations	124	84	3.54	1.25	.000
Circumlocution	223	147	6,37	2.19	.000
Unrelated	46	32	1.31	.48	.003
Multiword	59	63	1.69	.09	.000
PRNW	35	9	1.00	.13	.000
CDA	14	1	.40	.01	.007
Morphological Errors	9	2	.26	.03	.005
Perseveration	11	3	.31	.04	.035
Visual Associations	76	82	2.40	1.24	.005
Gesture	6	1	.17	.01	.004
Mixed Errors	27	9	.77	.13	.000
No Response	9	1	2.60	.01	.01

It is important to note, when comparing number of errors produced and examining Table 5, that 65% of the participants assessed during this study were non-aphasic. While, initial analysis of results in Table 5 may indicated that PWithoutA produced more multiword errors and visual association, equal variances were not assumed and these were accounted for in analysis of independent sample t-test results. Neologisms and Unsuccessful Conduit D'Approche (UCDA) were not included in this table as previous analysis identified that theses errors were made by PWA alone and can be utilised independently to identify between PWA and PWithoutA, regardless of the frequency of productions.

Error Production in Overlap Group

Further error type analysis was conducted on the overlap group (n=27) to ascertain if error type production could further distinguish between PWA and PWithoutA. Six error types were produced exclusively by PWA in this overlap group; CDA, UCDA, Gesture, Subordinate errors, No Response (NR) and Neologisms. Table 5 outlines the production frequency of these error types by PWA (n=14). 71% of PWA in the overlap group produced at least one aphasia specific error type, however no participant produced all aphasia specific error types and 4 participants produced no aphasia specific error types.

As only two error types were found to be specific to PWA in the analysis of the entire database, frequency of error production in the overlap group was re-analysed using only these two error types; 'Neologisms' and 'UCDA'. 42.85% of participants produced one of these errors types however no participants produced both errors & 8 participants produced no aphasia specific errors.

Table 5: PWA Specific Error Production in Overlap group (PWA n=14)

Participants	Total No. of Errors	PWA Specific Errors	Participant	Total No. Of Errors	PWA Specific Errors
1	27	0	20	25	0
3	29	1	21	31	2
11	28	0	23	32	1
12	28	1	24	30	1
13	32	2	24	29	2
16	19	0	27	26	1
17	37	20	29	32	1

Analysis of Specific BNT Items

Further analysis was conducted to exam the impact of BNT items on overlapping scores. It was suggested that specific items, which produced a correct response three times or less by all participants in the overlap group, be removed. Four items were selected; Item '56 Yoke', Item 58 'Palette', Item 59 'Protractor' & Item 55 'Sphinx'. Table 6 outlines correct/incorrect responses for the overlap group. Scores in the overlap group were adjusted accounting for new maximum score of 53. Removal of these items did not eliminate the overlap between

PWA and PWithoutA. Implications of these findings will be discussed in detail in the final section.

Table 6: Correct/Incorrect Response for Item 55, 56, 58 & 59

	PWA (n = 35)		**PWithoutA (n=67)**	
BNT Items	**Correct**	**Incorrect**	**Correct**	**Incorrect**
Yoke	1	34	14	50
Palette	3	32	31	36
Protractor	3	32	16	51
Sphinx	4	31	27	40
Overlap Group	**PWA** (n=14**)**		**PWOA** (n=**13)**	
BNT Items	**Correct**	**Incorrect**	**Correct**	**Incorrect**
Yoke	0	14	1	12
Palette	0	14	3	10
Protractor	0	14	1	12
Sphinx	0	14	2	11

Discussion

Summary of Findings

Analysis found that a significant difference existed in the scores of PWA and PWithoutA. While a significant difference was identified, this research also found that a marked overlap existed between the scores of PWA and PWithoutA. Variables including age, years of education and gender had no impact on BNT scores for PWA and PWithoutA. A number of culturally inappropriate items were removed from scoring however this had no significant impact on the scores obtained by the overlap group. For this reason, analysis was also conducted into the error types produced by both groups and the frequency of these error types. Two error types were produced exclusively by PWA; 'Neologism' and 'Unsuccessful Conduite D'Approche' (UCDA). Analysis also found that PWA produced a significantly higher amount of errors per assessment and produced a wider variety of error types. A significant difference in the number of errors produced by PWA compared to PWithoutA was reported for 14 error types. Analysis of errors produced by BNT items yielded no significant results however it was found that four additional items (sphinx, palette, yoke and protractor) are likely to yield a high rate of incorrect responses across both groups. BNT scores are successful in identifying between PWA and PWithoutA, however error profiling is a valid tool in identifying between individuals who fall into the upper scores for PWA and lower scores for PWithoutA (excluding outliers).

BNT Scores

Analysis of BNT scores found that PWA did obtain scores that were significantly lower than PWithoutA, however a significant overlap was found between both groups, with 14 PWA and 13 PWithoutA scoring within a range of 30-43 on assessment. As highlighted in Figure 2, outliers were found in the aphasic group only. These outliers did not impact on the overlap group and cannot explain the significant overlap in BNT scores.

As previous research suggests, PWithoutA can obtain scores which overlap with scores obtained by PWA which may suggest the presence of a naming impairment with no correlating cognitive or neurological difficulties (Patricacou et al 2007). In this study, 4 PWithoutA obtained scores which were 2 SD below the mean and a further 7 obtained scores which were more than 2 SD below the mean obtaining scores within the range obtain by PWA. This overlapping pattern in BNT scores has been found in other studies examining, in part, the differential strength of the BNT. James & Franklin (2012) found that a subset of PWithoutA scored 1 or 2 SD below the mean, obtaining scores which overlapped with PWA. Similarly, Grima & Franklin (2012) found that while PWA obtained scores that were significantly lower than PWithoutA, an overlap existed across groups. Outliers could not explain these overlaps and this study suggests that BNT scores alone might not be the most effective tool in identifying lexical retrieval deficits, particularly with older cohorts.

Variables

A significant body of research exists examining the impact of the variables age, years of education and gender on naming ability (Neils et al 1995, Worrall et al 1995, Marien et al 1998). Previous research found that while age did not impact on naming ability, high educational attainment was correlated with better performance on the BNT (James & Franklin 2012). Grima & Franklin (2012) completed a study on a Maltese population and found that the variables, age and education, did not account for the overlap in BNT scores across groupings. Results of this current study also found that no correlation existed between performance on the BNT and any of the variables examined (age, education or gender). While it is normal for people without cognitive or neurological impairments to have difficulty retrieving words at times, this study has found that age and levels of education do not impact on naming performance, in a structured, assessment based activity.

However, it is significant to note that inclusionary criteria for recruitment of PWithoutA in this study included those with lower levels of education, particularly those who had not attended a third level institution. Therefore, it is suggested that further research, including participants with a wide variety of educational levels be examined, in order to more thoroughly investigate the impact of educational attainment on naming ability in this population.

Culturally Appropriate Items

As previously mentioned, the BNT was standardized on a North American population. Multiple research papers have highlighted the importance of establishing normative data for additional populations to increase the accuracy and reliability of the BNT in identifying lexical retrieval deficits (Kohnert et al 1998, Tallberg 2005). Cultural appropriateness and the linguistic features of BNT items may not be comparable across populations and these variables may impact on the validity of administering the BNT on non-normative populations. Studies conducted on non-normative populations suggested the removal or reordering of BNT items in order to improve the validity of using this test on non-normative populations (Allegri et al 1997, Grima & Franklin 2012). Accordingly, in this study, three items, which were deemed to be culturally inappropriate, were removed post assessment. The presentation of BNT items is based on increased level of difficulty in naming, however these three items were found to violate this principle (James & Franklin 2012), which also supports removal of these items.

Error Type Production

Research has found that it is the type of errors produced only by PWA that further helps to differentiate this group from the non-aphasic population (Cuetos et al 2002, Grima & Franklin 2012, James & Franklin 2012). 23 error types were utilised to analyse responses based on error types identified in a previous research paper (James & Franklin 2012). James & Franklin 2012 found that 8 error types were specific to PWA. This study found that only two error types were specific to PWA; Neologisms and Unsuccessful Conduite D'Approche (UCDA). 11 PWA produced at least one neologism with 7 PWA producing at least one UCDA during assessment. However, it was found that 22 PWA produced neither of these errors during assessment; therefore error type production alone cannot differentiate between these groups.

Further analysis of error types found that coordinate errors, circumlocutions and semantic associations were produced most frequently by PWithoutA. Self-corrections were also produced at a high frequency however these are not considered a true error type and were not considered during analysis. The most commonly produced errors by PWA were also coordinate errors, semantic associations and circumlocutions. Further error types common to this group included super ordinate errors, 'don't know' responses and visual associations. This analysis suggests that on an Irish population, both PWA and PWithoutA are more likely to produce semantically related errors than phonological or mixed error types. This finding is in line with other research which identified that semantic error productions are the most frequently produced error types in confrontation naming tests (Tallberg 2005, Strauss-Hough 2007). However, the specific level of breakdown in the aphasic population was unknown in this study. This data contains pertinent information regarding the likelihood of particular error type productions occurring. It is suggested that further research include analysis of aphasia types along with error production in order to ascertain the impact that level of breakdown has on error productions in an Irish population.

Analysis of the three outliers within the aphasic population found that the variables, age and education did not impact on naming performance and cannot explain the high scores obtained by these participants. It was hypothesized that the use of pictures may have provided a cue for these participants to stimulate naming. Alternatively, it was suggested that level of naming impairment may have occurred at sentence level rather than word level with these participants. Further research into the type of aphasia and level of breakdown for these participants is suggested to ascertain factors that may have impacted of high scores obtained.

Limitations

Validity and necessity of using the Clock Drawing Test (CDT)

Previous studies have found the CDT to be a valid tool in screening clients for neurological and cognitive dysfunction including dementia, Alzheimer's and neglect (Agrell & Dehlin 1998). This test is considered to have a high correlation with the Mini Mental State Examination (MMSE). The CDT was administered to all participants during this research. While the CDT proved to be a valid, non-intrusive tool in identifying cognitive dysfunction in the non-aphasic population, questions arose as to the validity and benefit of administering this test on the aphasic population. Difficulties arose with patients with hemi-paresis on their dominant side which led to complications in completing the task and required researcher facilitation in order to complete the activity. In addition, as recent research has shown, multiple varying regions of the brain are accessed during the Clock Drawing Test, both cortical and sub cortical regions (Eknoyan et al 2012). As the area of impairment for each participant was not outlined in this study, the impact which the site of the lesion may have had on the client's CDT is unknown. Further research into the validity of using the CDT on an aphasic population is suggested in order to ascertain the impact of the site of the lesion on clock drawing abilities.

PWA

PWA were sourced from with a small region in Dublin from both public acute settings and community clinics. The status of participants also differed, with some participants receiving therapy during the assessment period and others having completed successful therapy blocks. In addition, a wide variety of time post onset was identified in the study, with a range of 2 months to 16 years being identified. It is suggested that these variables be controlled for in future studies as failure to account for variables, which may impact on scores, could compromise the validity of results obtained. In addition, research indicates that participants should be grouped by the variables; gender, age and years of education, prior to analysis to limit the impact these variables may have on the internal validity of findings. Further, a wider area for participant recruitment would provide researchers with a more representative sample of the Irish population. In addition, the sample size of PWA was smaller than those PWithoutA (n=35, n=67) in this study.

PWithoutA

The data obtained by researchers in this study was utilised to supplement data previously obtained on a non-aphasic Irish population. However, the criterion for selection in this study was narrow, with particular emphasis on lower years of education. Participants were recruited from two areas, Dublin and Cork. It is suggested that future research enlists participants from different areas and with different demographic backgrounds, in order to establish a more representative sample for analysis.

Conclusion

BNT scores alone can identify between groups of PWA and PWithoutA, with PWA scoring significantly worse than those without. However, a marked overlap exists in BNT scores which cannot be explained by variables such as gender, age or education in this study.

It is suggested that alterations be made to the BNT when administering this assessment on an Irish population, including the removal of culturally inappropriate items 'Pretzel', 'Beaver' and 'Dominoes'.

Analysis of scores, error type production and frequency are a valid measure of naming ability and the presence of high numbers of error types combined with atypical error productions can indicate that a higher risk of naming impairment exists. It has been found that no method of analysis; BNT scores, error type production or error frequency can 100% accurately identify between those with lexical retrieval deficits and those with normal naming ability. However this study has identified a number of pertinent factors that can be utilised to improve the accuracy of BNT analysis and can further supplement BNT score analysis. Both quantitative and qualitative examination has a place in the identification and analysis of lexical retrieval deficits. Differential diagnosis including standardised assessment results, additional testing and informal assessments remains the most effective and comprehensive method of identifying PWA.

Recommendations

In order to facilitate equal comparison of data, further data collection should be conducted for an Irish aphasic population. In addition, it is suggested that a culturally appropriate Irish BNT be utilized when assessing participants in order to reduce the impact of culturally inappropriate pictures on the accuracy of naming. Additional data collected should be analysed accounting for variables such as age, education and gender in order to ascertain the impact these variables may have on naming ability in a wider Irish sample.

It is recommended that further research be conducted into the levels of breakdown and correlation to error production in PWA.

References

Agrell, B & Dehlin, O. (1998) 'The clock-drawing test' *Age and Ageing,* 27(3), 339-403.

Albert, M.S., Heller, H.S. & Milberg, W. (1988) 'Changes in naming ability with age' *Psychology and Aging*, 3(2), 173-178.

Allegri, R.F., Mangone, C.A., Fernandez Villavicencio, A., Rymberg, S., Taragano, F.E. & Baumann, D. (1997) ' Spanish Boston Naming Test Norms', *The Clinical Neuropsychologist*, 11(4), 416-420.

Au, R., Joung, P., Nicholas, M., Obler, L.K., Kass, R., & Albert, M.L. (1995) 'Naming ability across the adult life span' *Aging and Cognition,* 2(4), 300-311.

Barker-Collo, S.L. (2001) ' The 60-item Boston Naming Test: Cultural Bias and possible adaptions for New Zealand', *Aphasiology*, 15(1), 85-92.

Barker-Collo, S.L.(2007) 'Boston Naming Test Performance of older New Zealand adults', *Aphasiology*, 21(12), 1171-1180.

Cuetos, F., Aguado, G., Izura, C. and Ellis, A. (2002) 'Aphasic naming in Spanish: Predictors and Errors', *Brain and Language*, 82, 344-365.

Dell, G., Schwartz, M., Martin, N., Saffran, E. and Gagnon, D.(1997) 'Lexical access in aphasic and nonaphasic speakers', *Psychological Review*, 104(4), 801-838.

Ellis, A.W. (1985) 'The Production of Spoken Words: a cognitive neuropsychological perspective.' in Ellis, A.W., eds., *Progress In The Psychology Of Language*: *Volume 2,* London: Lawrence Erlbaum.

Ellis, A.W., Lum, C., & Lamdon Ralph, M.A.(1996) 'On the use of regression techniques for the analysis of single case aphasic data' *Journal of Neurolinguistics*, 9(3), 165-174.

Eknoyan, D., Hurley, R.A., & Tabher, K.H. (2012) 'The Clock Drawing Task: Common Errors and Functional Neuroanatomy' *Journal of Neuropsychiatry and Clinical Neuroscience*, 24, 260-265.

Freud, S. (1953). *On Aphasia: A critical study* (E.Stengel, Trans.). Madison, CT: International Universities Press. (Original work published in 1891).

Grima, R. & Franklin, S. (2012) 'The performance of Maltese-Speaking adults on the Boston Naming Test' Unpublished PHD thesis, University of Limerick.

Hawkins, K.A. & Bender, S. (2002) 'Norms and the relationship of BNT performance to vocabulary and education: A review.' *Aphasiology*,16 (12), 1143-1153.

Herbert, R., Hickin, J., Howard, D., Osborne, F. & Best, W. (2008) 'Do picture-naming tests provide a valid assessment of lexical retrieval in conversation in aphasia?' *Aphasiology*, 22(2), 184-203.

Jackson, S.L. (2011) *Research Methods and Statistics: A Critical Thinking Approach*, USA, Cengage Learning.

James, E. & Franklin, S. (2012) ' What's in a Name? The Irish 'Boston Naming Test' Unpublished MSc thesis, University of Limerick.

Kaplan, E., Goodglass, H., Weintraub, S. (1983) *Boston Naming Test*, Philadelphia: Lea & Febiger.

Kohnert, K. J., Hernandez, A.E. & Bates, E. (1998) 'Bilingual Performance on the Boston Naming Test: Preliminary Norms in Spanish and English', *Brain and Language,* 65 (3), 422-440.

Mackay, A.J., Tabor Connor, L., Martin, A.L. & Obler, L.K. (2002) ' Noun and verb retrieval in healthy aging' *Journal of the International Neuropsychological Society*, 8 (6), 764-770.

Marien, P., Mampaey, E., Vervaet, A., Saerens, J. and DeDeyn, P. (1998) ‘Normative data for the Boston Naming Test in native Dutch-speaking Belgian elderly’, *Brain and Language*, 65(3), 447-467.

Martin, N. (2012) ‘Disorders of Word Production’ in Papathanasiou, I., Coppens, P. & Potagas, C. *Aphasia and Related Neurogenic Communication Disorders.* USA: Jones & Bartlett Learning, 131-157.

Neils, J., Baris, J., Carter, C., Dellaria, A., Nordloh, S. Weiler, E. and Weisiger, B. (1995) ‘Effects of age, education, and living environment on Boston Naming Test performance’, *Journal of Speech and Hearing Research*, 38 (5), 1143-1149.

Nickels, L. (2001) ‘Words fail me: Symptoms and causes of naming breakdown in aphasia’, in Berndt, R. (ed.) *Handbook of Neuropsychology*, 2nd ed., Amsterdam: Elsevier Science, 115-135.

Patricacou, A., Psallida, E., Pring, T. and Dipper, L. (2007) ‘The Boston Naming Test in Greek: Normative data and the effects of age and education on naming’, *Aphasiology*, 21(12), 1157-1170.

Ruml, W., Caramazza, A., Capasso, R. and Miceli, G. (2005) ‘Interactivity and continuity in normal and aphasic language production’, *Cognitive Neuropsychology,* 22(2), 131-168.

Strauss-Hough,M. (2007) ‘Incidence of Word Finding Deficits in Normal Aging’, *Folia Phoniatrica et Logopaedica,* 59, 10-19.

Tallberg, I. M. (2005) ‘The Boston Naming Test in Swedish: Normative data’, *Brain and Language*, 94 (1), 19-31.

Terrace, H.S. (1985) ‘In the beginning was the 'name’.’ *American Psychologist*, 40, 1011-1028.

Thompson, L. & Heaton, R. (1989) ‘Comparison of different versions of the Boston Naming Test.’ The *Clinical Neuropsychologist*, 3,184–192.

Tombaugh, T. and Hubley, A. (1997) ‘The 60-item Boston Naming Test: Norms for cognitively intact adults aged 25-88 years’, *Journal of Clinical and Experimental Neuropsychology*, 19(6), 922-932.

Von Studnitz, R.E. & Green, D.W. (1997) ‘Lexical Decision and Language Switching’. *International Journal of Bilingualism*, 1(1), 3-24.

Worral, L.E., Yiu, E. M.L., Hickson, L.M.H. & Barnett, H.M. (1995) ‘Normative data for the Boston Naming Test for Australian Elderly’, *Aphasiology*, 9(6), 541-551.

Zec, R.F., Markwell, S.J., Burkett, N.R. & Larsen, D.L. (2005) ‘ A longitudinal study of confrontation naming in the “normal” elderly’. *Journal of the International Neuropsychological Society*, 11(6), 716 – 726.

Appendix A

UNIVERSITY of LIMERICK

OLLSCOIL LUIMNIGH

Participant Information Sheet

Study Title:

What's in a Name? The Irish Boston Naming Test

Student Researchers:

Patrick Troy
Jean-Marie Smith
Rachel Kennedy
Claire Johnstone

Research Supervisor:

Professor Sue Franklin

What is the purpose of the study?

People with acquired language difficulties (aphasia) often have difficulty accessing the right word at the right time (word-finding). This can be a long-lasting effect of aphasia and impacts on communication as well as frustration.

The Boston Naming Test is used to check the level of difficulty people with aphasia have with word-finding. It has been shown that people without aphasia can make a similar number of errors on the test. In order to get a clear picture of who has word-finding difficulty and who doesn't, it is important to look at the types of errors rather than just the number.

It is proposed that people with aphasia make distinctive errors when compared to people without aphasia.

What does it involve?

A student researcher will meet you on one occasion. She will gather some basic information such as age and years of education. Then, she will administer 'The Boston Naming Test', a test of picture naming. The test contains 60 pictures and takes approximately 30 minutes. A word to picture matching and word repetition test will also be administered during the meeting. The test portion of the session will be audio recorded for later transcription.

Do I have to take part? What if I change my mind?

You are under no obligation to take part. You can read this information sheet, direct any questions you may have to the student researcher and then decide whether you want to participate.

You are free to withdraw at any time without consequence.

Are there any disadvantages to participating?

You will be giving your time. The testing will be carried out as efficiently and conveniently as possible.

What are the advantages to participating?

The information obtained from this study will increase knowledge in the field of aphasia research. Specifically, how word-finding difficulties in people with aphasia are accurately diagnosed.

Who will have access to my information?

All information gathered is strictly confidential. Participant's names will be removed from any information once it is obtained by the student researcher.

How do I find out the results of the study?

The completed study will be submitted in partial fulfillment of the MSc. in Speech and Language Therapy (professional qualification). Participants will be offered the chance to access a summary report via e-mail.

Thank you very much for taking the time to read this information sheet. Your participation in this research would be greatly appreciated.

This research has received ethical approval from the University of Limerick Research Ethics Committee. If you have any concerns regarding this study, please contact: Chairman, Education and Health Sciences, Research Ethics Committee, EHS Faculty Office, University of Limerick, Tel: (061) 234101. Email: ehsresearchethics@ul.ie

Appendix B

Clinical Therapies Department

University of Limerick

INFORMATION BOOKLET

Testing word finding in aphasia: the use of the Boston Naming Test in Ireland

The student researchers are called 

Patrick Troy

Claire Johnstone

Rachel Kennedy

Jean-Marie Smith

They are Speech and Language Therapy MSc students at the University of Limerick

And are supervised by **Professor Sue Franklin**

This **information booklet** tells you about the **research** and

how **you can help**  

What is the research project about?

The **research** is about **picture naming.** We are especially interested in the **types of errors** people make.

What will happen?

You will attend be seen by an **SLT student**.

It will take **60-90 minutes**.

You will:

Name some pictures  **"owl"**

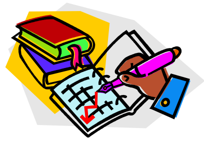
Point to some pictures

Repeat some words

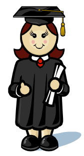
(Just like in your SLT sessions)

We will **record** your naming and repetition

What will the researchers do with the information?

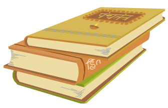
They will **write reports** 

They will **give** them to the **University of Limerick**



This is part of a **Masters of Science**

This report will go into a **journal** for other SLTs to **read**



The results will help SLTs to assess **naming** difficulties

Confidentiality and privacy

All **information** is kept **private** and **safe** 

Your **name** will not be used 

Taking part in the programme

You are **free** to decide if you want to **take part**

If you **agree** you need to **sign** a **consent form** 

You are **free** to **stop** at any time

You **do not** have to give a **reason** for stopping

Other Information

You can contact

Sue Franklin, Professor of Speech and Language Therapy

061 234274

Thank you for reading this!

If you have any concerns about this study and want to contact someone independent you may contact:

Chairman Education and Health Sciences Research Committee

EHS Faculty Office

University of Limerick

Tel 061 234101

Email: ehsresearchethics@ul.ie

CLINICAL THERAPIES DEPARTMENT
University of Limerick

I ____________________________ of ______________________ hereby,

Consent to **participate** in a research project:

'Testing word finding in aphasia: the use of the Boston Naming Test in Ireland'

Date _____________________

Signature ________________

The **purpose** of the **programme** was explained to me by

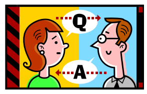
______________________________________.

PTO

YES NO

I **read** the **information leaflet** 

I had an **opportunity** to ask **questions** 

I was **satisfied** with the **answers** to **my questions**. 

I **understand the reason** for the **research** 

I understand what is **involved**

I understand that **information** is kept **safe** and **private** 

I would like my speech and language therapist to get my **test results**

<u>Testing:</u>

I **agree** to be **tested**

I agree to be **recorded** on an **audio recorder** 

The **recording** will be **kept** safe and private 

Only the researchers will listen to it

I know I can **STOP** doing the research at any time 

Appendix C

Basic Information Collection:

Date:
Participant:
Gender:

DOB/Age:

Years of Education:

Age of Finishing Education:

Qualification:

Occupation:

Primary Language:

History of CVA/TIA: Y/ N

Clock Drawing:

Appendix D

UNIVERSITY of LIMERICK

OLLSCOIL LUIMNIGH

Consent Form

Name of Researcher: Claire Johnstone B.A, MSc student in Speech and Language Therapy

Study Title: What's in a Name? The Irish Boston Naming Test

1. I confirm that I have read and understood the information sheet for the research study. I have had an opportunity to consider the information, ask questions and have these questions answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time.
3. I understand that the test will be audio recorded for transcription and later destroyed.
4. I, the undersigned, agree to participate in the study.

____
Participant Signature

____
Date

____
Researcher Signature

____
Date

This research has received ethical approval from the University of Limerick Research Ethics Committee. If you have any concerns regarding this study, please contact: Chairman, Education and Health Sciences, Research Ethics Committee, EHS Faculty Office, University of Limerick, Tel: (061) 234101. Email: ehsresearchethics@ul.ie

Appendix E

Error Types and explanations

Error Type	Description	Example	Error Type	Description	Example
0 Don't Know	Pt states that they don't know the item name	Target: Yoke Response: I don't know	**11 Phonologically Related Non-word**	A non-word that is phonologically related to the target	Target: Stethoscope Response: /stɛtəkɑp/
1 Forgot	Pt states that they can't remember the item name	Target: Protractor Response: I can't remember	**12 Neologism**	A non-word that has less than 50% of the target phonemes	Target: Palette Response: /swɛs/
2 Self-correction (must be preceded by only ONE error)	Pt immediately corrects an incorrect response	Target: Canoe Response: Boat...Canoe	**13 Successful Conduite D'approche**	Repeated approximations of word resulting in correct production of target	Target: Camel Response: /papəl...kapəl... kaməl/
3 Co-ordinate	A response in the same semantic category	Target: Beaver Response: Otter	**14 Unsuccessful Conduite D'approche**	Repeated approximations of word not resulting in correct production of target	Target: Helicopter Response: /halkɑptəɹ... halətɹaptəɹ... hɛlɪksəpa:/
4 Superordinate	A response in the broader semantic category	Target: Canoe Response: Boat	**15 Morphological Alteration**	Alteration to the target word's morphological structure	Target: Tongs Response: Tong
5 Subordinate	A response that is more specific than the target	Target: Volcano Response: Mt. Etna	**16 Perseveration**	The production of an earlier target	Target: Hanger Response: Toothbrush
6 Semantic Association	A one-word response that is semantically associated to the target	Target: Compass Response: Geometry	**17 Unrecognised/ Visual Association**	Pt states they don't recognise the item or names an item that is visually associated	Target: Pretzel Response: Worm
7 Circumlocution	A multiword response that describes the target	Target: Pyramid Response: You find it in Egypt/It starts	**18 Unrecognised**	Correct response given but not recognised by pt and further	Target: Flower Response: Flower... Daisy

		with a ‘p’		responses given	
8 Unrelated	A real word that is not related to the target	Target: Volcano Response: Children	**19 Gesture/No Verbal Response**	Pt gives a non-verbal response	Target: Escalator Response: Pt mimics using an escalator
9 Multiword	A multiword response that does not describe the target	Target: Tongs Response: I have it at home	**20 Compound Word Error**	An error made on a compound word	Target: Briefcase Response: Risk case
10 Phonologically Related Real Word	A real word that is phonologically related to the target	Target: Stilts Response: Sprints	**21 Mixed Error**	A combination of 2 or more of the error types	Target: Trellis Response: Lattice (mixed 6 & 10)
			22. No Response	PT makes no attempt at identifying a picture.	

(James & Franklin, 2012)

Appendix F

Table 3: Demographic information in Overlap Group

Participant	Status	Age	Education	Gender	Score (Adjusted)
1	Non-Aphasic	53	12	M	41 (41)
2	Non-Aphasic	72	13	F	43 (42)
3	Non-Aphasic	73	14	F	35 (35)
4	Non-Aphasic	69	16	M	30 (30)
5	Non-Aphasic	74	13	M	36 (36)
6	Non-Aphasic	52	16	F	37 (37)
7	Non-Aphasic	59	12	F	42 (42)
8	Non-Aphasic	58	9	F	34 (34)
9	Non-Aphasic	63	14	M	34 (33)
10	Non-Aphasic	62	17.5	F	43 (43)
11	Non-Aphasic	69	12	M	31 (30)
12	Non-Aphasic	64	11	F	39 (39)
13	Non-Aphasic	79	15	M	36 (35)
14	Aphasic	63	10	F	37 (36)
15	Aphasic	57	10	M	31 (30)
16	Aphasic	78	15	F	34 (33)
17	Aphasic	75	11	M	32 (32)
18	Aphasic	54	14	F	40 (40)
19	Aphasic	82	15	M	43 (43)
20	Aphasic	75	11	M	33 (33)
21	Aphasic	90	10	M	41 (40)
22	Aphasic	85	8	M	35 (34)
23	Aphasic	85	8	F	34 (34)
24	Aphasic	81	8	M	32 (31)
25	Aphasic	75	8	M	41 (41)
26	Aphasic	74	8	M	34 (34)
27	Aphasic	86	7	M	32 (32)