Cardiff Metropolitan University

Prifysgol Fetropolitan Caerdydd

B.Sc. (Hons) Speech and Language Therapy

Normative data for the standardisation of an acute aphasia screening tool: influence of age, gender and educational level.

Sophie Reid

April 2017

Dissertation submitted in partial fulfilment of the requirements of Cardiff Metropolitan University for the degree of Bachelor of Science
DECLARATION

I hereby declare that this dissertation is the result of my own independent investigation under the supervision of my tutor. The various sources to which I am indebted are clearly indicated. This dissertation has not been accepted in substance for any other degree and is not being submitted concurrently for any other degree.

Candidate's signature: ____________________

RESEARCH DATA PRIVACY

I acknowledge the issue of research data privacy and undertake not to share research data in any form without the explicit approval of their supervisor.

Candidate's signature: ____________________
Acknowledgments

Firstly, thank you to my project supervisor, Kate Tucker, for lending me her knowledge and support throughout this process.

I am also very thankful the SLTs at ABUHB health board, who developed the screen, for the opportunity and the help they have given.

I am most grateful to the organisations which helped with participant recruitment and to all the people who participated in this study and gave up their time.

Finally, I would like to thank my family and friends for all their support throughout this degree. In particular, my grandfather for all the wisdom, inspiration and support he provided me with before he passed away last month.
Abstract

Background: Following the development of a new aphasia screening tool, the ABUHB CST, it is necessary to standardise it in order to be clinically useful. Administering the screen to a normative population can assist with the establishment of a number of the screen’s psychometric properties. Furthermore, demographic variables have shown to influence performance on language tests and should be taken into account when considering normative performance.

Aims: This study aims to create a normative database to be used in future research establishing the screen’s psychometric properties. Additionally, an objective was to analyse the influence of age, gender and education on performance and gather relevant information to further develop the screen.

Methods & Procedures: The ABUHB CST was administered to 50 participants, considered to be healthy normal individuals. These participants were divided into groups depending on their age, gender and level of education. Analysis was carried out using descriptive statistics, ANOVAs and a MANOVA, establishing an overview of normative performance on the screen and determining the influence of demographic variables.

Outcomes & Results: Results showed variation in performance across the screen, 28/50 participants made at least one error. In addition, each subsection was analysed to identify any consistently difficult test items in order for them to be reviewed. While there seemed to be a slight trend between gender and education, only age appeared to significantly influence performance (p=0.04).

Conclusions: This study has successfully obtained a normative database which can be referred to during future standardisation of the ABUHB CST. This data will be particularly useful when establishing validity and cut-off scores for the identification of aphasia post-stroke.

(Abstract structured in the style of Aphasiology)
Table of Contents

Declaration ........................................................................................................... 1
Acknowledgments .............................................................................................. 2
Abstract ............................................................................................................. 3
Table of Contents .............................................................................................. 4-5
List of Tables ..................................................................................................... 6
List of Figures .................................................................................................... 6

1. Introduction .................................................................................................. 7
2. Literature Review ........................................................................................... 8-27
   2.1 Stroke and Aphasia ....................................................................................... 8-10
   2.2 Screening for Aphasia .................................................................................. 10-14
   2.3 A Need for a New Screen? ........................................................................... 15-16
   2.4 Aims and Development of the ABUHB CST (Acute Stroke) ....................... 16-21
   2.5 Standardisation ............................................................................................ 22-23
   2.6 Demographic Variables and Language Tests ............................................. 23-27
3. Methods ......................................................................................................... 28-34
   3.1 Participants .................................................................................................. 28
   3.2 Materials ..................................................................................................... 28-29
   3.3 Procedure ................................................................................................... 29-31
   3.4 Statistical Analysis ...................................................................................... 31-32
   3.5 Ethical Considerations ............................................................................... 33-34
4. Results ........................................................................................................... 35-44
   4.1 Sample Description ...................................................................................... 35
   4.2 Latency Administering ABUHB CST (Acute Stroke) ................................ 36
   4.3 Overall Descriptive Statistics ..................................................................... 36-37
   4.4 Influence of Age ......................................................................................... 37-39
   4.5 Influence of Gender .................................................................................... 39-40
4.6 Influence of Education ................................................................. 40
4.7 Interaction between Age, Gender and Education ...................... 41
4.8 Analysis of Subsections ............................................................... 41-43
4.9 Summary of Key Findings .......................................................... 43-44

5. Discussion .................................................................................. 45-57
5.1 Influence of Demographic Variables ........................................ 46-49
5.2 Reviewing the ABUHB CST ...................................................... 49-52
5.3 Contribution to the standardisation process ........................... 52-54
5.4 Clinical Usefulness ................................................................. 54-55
5.5 Limitations ............................................................................... 55
5.6 Recommendations for future research .................................... 55-56
5.6 Conclusion .............................................................................. 56-57

6. References .................................................................................. 58-66

7. Appendices .................................................................................. 67-89
List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Comparison of subtests of current aphasia screens</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Description of comprehension subtests in the ABUHB CST and the information that can be identified from them.</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Description of expressive subtests in the ABUHB CST and the information that can be identified from them.</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>A comparison of the elements tested in the ABUHB CST compared to the FAST, SST and LAST</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>The normative sample used in validation of the SST, FAST and LASTen.</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>The influence of demographic variables on performance on aphasia screening tests, the SST, FAST and LASTen.</td>
<td>27</td>
</tr>
<tr>
<td>7</td>
<td>Overview of completed ABUHB CST</td>
<td>31</td>
</tr>
<tr>
<td>8</td>
<td>Demographic variables of the sample</td>
<td>36</td>
</tr>
<tr>
<td>9</td>
<td>Overall descriptive statistics</td>
<td>38</td>
</tr>
<tr>
<td>10</td>
<td>Influence of age on receptive and expressive mean scores and standard deviations.</td>
<td>40</td>
</tr>
<tr>
<td>11</td>
<td>Participant performance on the comprehension subsection</td>
<td>43</td>
</tr>
<tr>
<td>12</td>
<td>Participant performance on the expression subsection</td>
<td>43</td>
</tr>
<tr>
<td>13</td>
<td>Participant performance on the logico-relations and reasoning subsection</td>
<td>44</td>
</tr>
</tbody>
</table>

List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Descriptive Statistics - The influence of age on mean total scores, in conjunction with standard deviations.</td>
<td>39</td>
</tr>
<tr>
<td>2</td>
<td>Descriptive Statistics - The influence of gender on mean total scores, in conjunction with standard deviations.</td>
<td>41</td>
</tr>
<tr>
<td>3</td>
<td>Descriptive Statistics - The influence of education level on mean total scores, in conjunction with standard deviations.</td>
<td>41</td>
</tr>
</tbody>
</table>
1.0 Introduction

This study will begin the essential process of standardising a new aphasia screening test, the Aneurin Bevan University Health Board Communication Tool (Acute Stroke), otherwise referred to as ‘ABUHB CST’. Part of the Speech and Language Therapists (SLT) role on an acute stroke ward is to identify the presence of aphasia, a language impairment, in those admitted (RCP, 2016). To identify people with aphasia (PWA) formal screening tools are commonly used, however within the ABUHB it was found that there was not one such test which met all of their needs. The ABUHB CST was developed to tackle this with a focus on ensuring it efficiently gathered all the relevant information which the ABUHB SLTs recognised as essential for fulfilling their role in the acute post-stroke setting.

The next stage in development of the ABUHB CST is to standardise it, establishing psychometric properties (Ivanova and Hallowell, 2013). The collection of normative data can assist with this, contributing to validation and determining cut-off scores. This will help to develop the screen’s clinical usefulness. Moreover, as demographic variables, such as age, gender and education have shown to influence performance on language tests (Nakase-Thompson, Manning, Sherer, Yablon, Gontkovsky and Vickery, 2005; Syder, Body, Parker and Boddy, 1993 and Zec, Burkett, Markwell and Larsen, 2007) the impact of these variables will also be analysed in this study. This will further add to the usefulness of the data collected, allowing for background variables to be taken into account when considering if a person’s performance on the screen is due to the presence of aphasia.
2.0 Literature Review

2.1 Stroke and Aphasia

Every year in the UK approximately 152,000 people have a stroke (The Stroke Association, 2016), of stroke survivors around one-third are affected by aphasia (Bakheit, Shaw, Barrett, Wood, Carrington, Griffiths, Searle, and Koutsi, 2007; Stroke Association, 2015; Marsh, Bertranou, Suominen and Venkatachalam, 2010). Aphasia is considered to be an acquired language impairment, resulting from a focal brain lesion, most often caused by stroke (Papathanasiou, Coppens and Potagas, 2013; Enderby, Pickstone, John, Fryer, Cantrell and Papaioannou, 2009). Aphasia can affect expressive and comprehensive ability in all components of language across all modalities. Presentation and prognosis can greatly vary depending on the factors such as the size and site of the lesion (M.M. and S.A., 2015). Phonology, morphology, syntax, semantics and pragmatic systems can all be impacted to different degrees (Papathanasiou et al, 2013). While this is a result of the breakdown of the underlying cognitive skills needed for processing language other, unrelated cognitive abilities remain intact. Of those who present with aphasia post-stroke between 30-43% will remain severely affected in the long term (Bakheit et al, 2007).

The presence of aphasia post-stroke can result in considerable disability for patients and has been shown to have a number of far reaching consequences. Research has shown that aphasia is associated with a reduced return to social activity (Darrigrand, Dutheil, Michelet, Rereau, Rousseaux and Mazaux, 2011), and PWA are likely to have significantly lower social networks when compared to healthy older adults (Hilari and Northcott, 2016). These factors may contribute to the increased probability of PWA
developing depression (De Ryck, Fransen, Brouns, Geurden, Peij, Mariën, De Deyn and Engelborghs, 2014). There are also a number of economic implications, PWA often require longer hospital stays, resulting in an increased cost of patient care (Ellis, Simpson, Bonilha, Mauldin and Simpson, 2012) and are less likely to return to work than other stroke survivors (Graham, Pereira and Teasell, 2011).

Recovery from aphasia is believed to be related to neuroplasticity. Neuroplasticity refers to changes of neural functioning over time, associated with the person’s behaviours (Frackowiack, 1997). These changes in brain activity attempt to compensate for impaired language functioning. During the acute stage post-stroke spontaneous neural changes take place, in order to coincide and benefit from this early language intervention is often advocated (Robertson and Murre, 1999; Code, 2001; Godecke et al, 2012; Godecke et al, 2014). While more research is needed to determine optimal timing of aphasia intervention (Nouwens, Visch-Brink, Van de Sandt-Koenderman, Dippel, Koudstaal and de Lau, 2015), a number of studies support the recommendation to begin aphasia intervention as early as possible (Godeck, Hird, Lalor, Rai and Phillips, 2012; Mattioli, Ambrosi, Mascaro, Scarpazza, Pasquali,, Frugoni, Magoni, Biagi and Gasparotti, 2013). As a result, it is essential to identify the presence of aphasia in stroke patients as soon as possible.

As set out in a number of current clinical guidelines it is the responsibility of Speech and Language Therapists (SLTs) to identify the presence of aphasia in the acute stage post-stroke, and then to provide appropriate intervention if identified. The Royal College of Physicians (RCP, 2016) have described the role of SLTs in acute stroke care, recommending that an SLT should assess patients in order to diagnose and explain the nature and implications of a communication problem to the patient, their family
and the Multidisciplinary Team (MDT). From then their role in the first four months’
post-stroke is to provide PWA with the opportunity to practise their language and
communication. Guidelines provided by the National Institute for Health and Care
Excellence (NICE, 2013) further specify that screening for communication difficulties
should occur within 72 hours of onset of stroke symptoms. The Royal College of
Speech and Language Therapists (RCSLT, 2017) confirm the role of the SLT as being
involved with the diagnosis and assessment of communication problems in the acute
stages post-stroke.

2.2 Screening for Aphasia

The process of identifying aphasia should first begin using a valid and reliable tool
(National Stroke Foundation, 2010). While a communication impairment may be
obvious in some patients, systematic screening is recommended to ensure all patients
with aphasia are identified (Edwards, Hahn, Baum, Perlmutter, Sheedy and Dromerick,
2006). Indeed, RCP (2008) guidelines have previously suggested that a formal
screening tool should be used. There are a number of test batteries that can be useful
for assessing all language modalities and for classifying aphasia, such as the
Comprehensive Aphasia Test (Swinburn, Porter and Howard, 2005), the Boston
Diagnostic Aphasia Examination (Goodglass, Kaplan and Barresi, 2001a) and the
Western Aphasia Battery-Revised (Kertesz, 2007). However these may be too lengthy
and demanding for a patient in the initial stages post stroke, when additional factors
such as fatigue and depression are common (Wei, Zhang, Chen, Ma, Zhang and Hao,
2015). Instead SLTs may choose to use a brief screening tool may be, while these are
less detailed they are sufficient enough to identify the presence of aphasia and inform SLTs management decisions within the acute setting.

A number of screening tools have been developed, some are not regularly used in the UK such as the Mississippi Aphasia Screening Test (Nakase-Thompson et al, 2005), or like the BEST-2 (West, Sands, and Ross-Swain, 1998), have been designed with the purpose to not only identify aphasia but to rate its severity. Screening tests commonly used in the UK with the sole purpose of identifying aphasia, which is the focus here, include the Frenchay Aphasia Screening Test (Enderby, Wood and Wade, 2013), the Sheffield Screening Test (Syder et al, 1993) and most recently developed, the Language Screening Test (Flamand-Roze, Falissard, Roze, Maintigneux, Beziz, Chacon, Join-Lambert, Adams, Denier, 2011; Flowers, Heather, Flamand-Roze, Denier, Roze, Silver, Rochon, Stacey, Skoretz, Baumwol, Burton, Harris, Langdon, Shaw, and Martino, 2014), see Table 1 for a comparison of their subtests. Clinicians must make the decision as to which screen to use taking into account the purpose for assessment and the feasibility of using the proposed assessment in the setting (Salter, Jutai, Foley, Hellings, Teasall 2006).

The Frenchay Aphasia Screening Test (FAST) can be used by healthcare professionals other than SLTs in order to diagnose the presence of aphasia. While the full version includes an assessment of all four language modalities, including reading and writing as well as comprehension and expression of spoken language, it is possible to omit those subsections. This shortened version of the FAST takes around 3-10 minutes to administer. It assesses comprehension from single words to complex commands, and expression by asking patients to describe a picture, providing a score based on how many objects they name and their use of sentences and phrases. Expressive language
skills are further assessed using associative naming skills, asking patients to name as many animals as they can in 60 seconds. However, since the development of the FAST one limitation has been that it can result in false positives in patients with visual neglect due to its use of complex visual materials (Al-Khawaja, Wade and Collin, 1996).

The Sheffield Screening Test (SST) usually takes around 10 minutes to administer and was developed for the use of healthcare professionals to detect the presence of a high-level language disorder and assist with appropriate referral to SLT. As with the FAST, expressive and receptive language abilities are assessed but the SST includes further tasks which require a high level of language processing, such as recognising the differences in word meanings which requires patients to use the ability to differentiate between semantic fields from auditory input. Furthermore, the test encourages clinicians to consider the patient’s functional language. Al-Khawaja et al (1996) found there to be no cases of false positives as it does not require clinicians to make use of stimulus cards, ensuring patient performance is not affected by the presence of visual neglect and making it convenient for clinicians. However, without the use of stimulus cards the type of linguistic items that can be assessed are limited, indeed, one question requires the patient to point to the door, in an acute ward the screen will most likely take place behind curtains, making this is not possible. Furthermore, the questions used, while sensitive to identifying mild language impairments, requires a level of language processing which could be too high for some patients, particularly in the first week post-stroke when other cognitive functions may also be impacted (Sun, Tan and Yu, 2014). Considering these limitations, the SST may not always be the most appropriate choice of tool in the acute setting.
First developed in French (Flamand-Roze et al, 2011), the Language Screening Test (LAST) has since been translated into English (LASTe) (Flowers et al, 2014). The LASTe aims to be a rapid screening test, addressing some of the limitations found in previous ones. The LASTe uses tests which don’t rely on complex visual material as the FAST does, or tasks which may be influenced by attention or executive functioning abilities rather than language abilities, as in the FAST and SST. The LASTe takes approximately 2 minutes to administer and as a simple, rapid language test the LASTe is very convenient. However, as a result of being so rapid it is restricted as to how much information it can gather, which may make it harder for clinicians to make management decisions.

The FAST, SST and LASTe each present with their own limitations, which clinicians should be aware of when choosing between them.
<table>
<thead>
<tr>
<th>Sub-section</th>
<th>SST</th>
<th>FAST</th>
<th>LASTen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional language</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Receptive Language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 stage commands</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2 stage commands</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Complex commands</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Differences in meanings</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Short paragraphs</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Expressive Language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic Speech</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Picture naming (Word Finding)</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Word Finding</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstract word finding</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Definition of words</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Sequencing</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Reasoning</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Category Fluency (Associative Naming)</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Word Repetition</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 1: Comparison of subtests of current aphasia screens
2.3 A need for new screen?

Within the Aneurin Bevan University Health Board (ABUHB), where there are a number of different hospital sites, it became clear on investigation that the SLTs across the trust were using a range of screening tools. As a large number of patients will need to be transferred to different sites in the health board during their admission it would be most beneficial for clinicians and patients if only one screening tool was used. This would allow for the test to be repeated if required, assisting with monitoring changes in a patient’s communication. As well as ensuring compliance with RCP (2016) guidelines.

Considering the advantages and disadvantages of each of the currently available language screens being used within the health board the ABUHB SLT team developed their own. Doing this, they hoped to include all the features their clinical experience had shown to be beneficial on assessment while trying to avoid the limitations of the SST and FAST. In addition to diagnosing the presence of aphasia, it was intended that clinicians would be able to infer important functional information, assisting them in their role on the acute stroke ward to provide appropriate information, education and training to the MDT. Providing essential information needed to facilitate communication personalised to the patient, such as if they can reliably respond to yes/no questions. Furthermore, it would benefit the client possibly aiding rehabilitation by creating a positive communication environment, with plenty of opportunities to communicate (Horton, Lane and Shiggins, 2015; Hersh, Godecke, Armstrong, Ciccone and Bernhardt., 2016). Facilitating conversation between patients and the MDT may also minimise patient distress, allowing patients to understand and make their own clinical decisions (Rose, Worrall and McKenna, 2003; Ellis-Hill, Gordon and Ashburn,
With these additions the assessment would provide more useful information for SLTs in the acute ward setting than the LASTen can provide and continue to ensure efficient use of the SLT’s time.

2.4 Aims and development of the ABUHB CST (Acute Stroke)

Having identified that there was not a currently available screening tool without significant limitations, that obtained all of the information they considered relevant for SLTs to fulfil their role in the acute stage following stroke, the ABUHB SLT team developed the ABUHB CST. The screen targets areas of semantics, syntax, phonology and pragmatics as and Chapey (2008) recommend. In addition a number of items of varying difficulty are included in each subtest as endorsed by Goodglass, Kaplan and Barerresi (2001b). Moreover, the ABUHB CST considers the medical status of the patient, such as possible co-morbidities (e.g. visual/physical/cognitive impairments) and factors related to the setting of an acute ward.

The process of developing the ABUHB CST began by gathering information from experienced SLTs within ABUHB, establishing which elements of other assessments they had found useful and appropriate. This process highlighted the need for there to be an emphasis on gathering functional information to assist with care in early stages. Examples suggested by SLTs included yes/no reliability, picture recognition to consider use of communication book and recognition/use of objects to assist with activities of daily living (ADL). The importance of considering the medical status of patients and the setting were also areas raised during this part of the process. This feedback and the information gathered from reviewing existing assessments was used to inform the development of the ABUHB CST. Following its initial development the
screen was trialled by SLTs on wards across the ABUHB, receiving positive feedback.
A number of SLTs felt that the screen would benefit from the inclusion of instructions at a higher level and the assessment was amended in response to this.

The following aims of the ABUHB CST have been identified:

- **To gather information to inform clinicians in their decision making regarding the presence or absence of aphasia following a stroke.**
  - To help establish whether there have been any changes to the patient’s baseline communication following a stroke.
  - To provide guidance for further assessment to establish a differential diagnosis.

- **To gather information that may assist the Multidisciplinary Team (MDT) in the acute setting with respect to communicating effectively with their patient.**

A description of the comprehension and expression subtests can be found in tables 2 and 3 respectively. Detail on the thinking behind the subtests and information that it is possible to infer from them is also provided.

Following these subsections there is an additional subsection considering logical-relationships and reasoning abilities (LR). This subsection was included to screen for higher level language difficulties, thus informing necessary intervention or onward referral to an outpatient service. It should only be completed following adequate performance on preceding sections. Includes assessment of semantics, grammar and verbal reasoning.
Finally, speech intelligibility is considered. This section is not scored but used as a subjective measure to help inform future assessment. The patient is asked if they believe their speech sounds normal while the clinician is required to consider if the patient’s speech sounded slurred during the screen and whether they needed them to repeat any responses.

See appendix A for the complete ABUHB CST, made up of the comprehension, expression, LR and speech intelligibility subsections. Appendix B presents the uniform administration protocol and acceptable responses to test items.

For a comparison of the subtests found in the ABUHB CST to existing aphasia screening tool see table 4.
### Comprehension Subsection

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Purpose</th>
<th>Factors Considered</th>
<th>Additional Functional information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C1. Yes/No questions</strong></td>
<td>A person with aphasia may be unable to consistently respond correctly to closed questions which require a yes or no response. This subtest aims to establish a baseline of the patient’s ability.</td>
<td>Asks patients personal yes/no questions, with answers that should be highly familiar to them e.g. ‘is your name…’, as well as some which are abstract, requiring more linguistic processing.</td>
<td>Assists the MDT with providing care in the acute setting, for example by giving them advice on how to ask patients if they are in pain.</td>
</tr>
<tr>
<td><strong>C2. Commands:</strong></td>
<td>This subtest assesses the patients auditory comprehension at a number of levels.</td>
<td>The objects used in this subtest were chosen due to their high frequency as a result of them being used on the ward regularly. Body parts were included to help inform clinicians of any dyspraxic tendencies and establishes whether difficulties with object recognition are impacting on patient’s abilities to follow commands rather than the concept of the command itself.</td>
<td>Use of objects and body parts provides useful information to the MDT regarding ADL. Object function sub-test can help members of the MDT when considering ADLs.</td>
</tr>
<tr>
<td>• Single words</td>
<td>Identifying objects and a body parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Instructions involving 2 stages</td>
<td>Requires patient to process more auditory information, identifying two objects or body parts. Understanding of simple straight sequencing also assessed in these questions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Complex Instructions</td>
<td>A more complex linguistic structure including a subordinate clause that provides sequencing information, and requires the patient to determine the correct object using the linguistic cue ‘furthest to the right’.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Object function</td>
<td>The patients must identify the correct object by understanding the objects function, and demonstrates comprehension of verbs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Description of comprehension subtests in the ABUHB CST and the information that can be identified from them.
### Expressive Subsection

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Purpose</th>
<th>Factors Considered</th>
<th>Additional Functional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E1. Automatic Speech</strong></td>
<td>Identifying if automatic language is effected using a number of standard questions.</td>
<td>They are also asked to provide their name and address, language which should be highly familiar to them.</td>
<td></td>
</tr>
<tr>
<td><strong>E2. Phrase Completion</strong></td>
<td>Assesses the patient’s ability to make appropriate semantic word associations.</td>
<td></td>
<td>can provide an indication as to whether semantic cues would assist the patient.</td>
</tr>
<tr>
<td><strong>E3. Picture Identification:</strong></td>
<td>Assesses two areas:</td>
<td>Uses colour pictures, helps to identify any concerns with abstract concepts.</td>
<td>determine whether a communication book would be a helpful tool to facilitate communication for this patient.</td>
</tr>
<tr>
<td>- Naming</td>
<td>Assesses word finding ability for nouns.</td>
<td>Nouns considered to be everyday objects. Includes examples of 1, 2 and 3 syllable words to see effect of increasing complexity.</td>
<td></td>
</tr>
<tr>
<td>- Function</td>
<td>Evaluates patient’s ability to explain an objects function and verb production.</td>
<td></td>
<td>Can provide an increased sample of expressive language and assist the MDT when considering ADL.</td>
</tr>
<tr>
<td><strong>E4. Functional Sequencing</strong></td>
<td>Included to help identify any cognitive concerns that may require further assessment by the MDT. Also provides an insight into word finding ability and the use of syntax within continuous speech.</td>
<td>Asked to describe an everyday routine, making a cup of tea, which should be very familiar to most patients.</td>
<td></td>
</tr>
<tr>
<td><strong>E5. Category Fluency</strong></td>
<td>This is a high level semantic expressive task, using associative naming.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Description of expressive subtests in the ABUHB CST and the information that can be identified from them.
Clinicians are encouraged to consider the client’s functional language ability through informal conversation.

Table 4: A comparison of the elements tested in the ABUHB CST compared to the FAST, SST and LAST

<table>
<thead>
<tr>
<th>Sub-section</th>
<th>SST</th>
<th>FAST</th>
<th>LAST</th>
<th>ABUHB CST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional language</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗ *</td>
</tr>
<tr>
<td>Receptive Language</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Yes/No questions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 stage commands</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2 stage commands</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Complex commands</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Object Function (Verb comprehension)</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Differences in meanings</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Short paragraphs</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Expressive Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic Speech</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Picture naming (Word Finding)</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Word Finding</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phrase Completions (Semantic Associations)</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Abstract word finding</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Definition of words</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Sequencing</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Reasoning</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Category Fluency (Associative Naming)</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Word Repetition</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Speech Intelligibility</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Clinicians are encouraged to consider the client’s functional language ability through informal conversation.

21
2.3 Standardisation

In order for a language screen to be clinically useful it is beneficial to standardise it (Laska, Bartfai, Hellblom, Murray and Kahan, 2007). Ivanova and Hallowell (2013) have provided a detailed outline of the process of studying a language tests psychometric properties. Administering the test to a large sample of individuals with and without aphasia can provide information on psychometric properties such as norm referencing, validity and item analysis. This study intends to begin the process by administering the ABUHB CST to individuals who have no history of aphasia or neurological impairment.

Collecting data from individuals without aphasia can assist with the screen's development in a number of ways.

Firstly, the collection of normative data will contribute to establishing the screen's validity. Normative data can be useful in the process of establishing criterion validity, that is the screen's ability to estimate a behaviour external to the instrument, known as the criterion. In this case the criterion would be the presence of aphasia, this can be determined by establishing concurrent validity, the correlation between test scores and the criterion. While some existing aphasia tests have used scores from previously validated tests as the criteria (e.g. LAST), more commonly the objective measure used has been the presence of a language impairment, shown by significant differences in the test scores of people with aphasia and a control group of people without a language impairment, (e.g. SST and FIRST). It is this method to which normative data can contribute.

The data will allow for norm referencing by determining appropriate cut-off scores for normal performance on the screen, subsequently assisting with the identification of
aphasia in patients. Information on how people without a language impairment would function on this screen is needed because we cannot assume that they will perform errorlessly, as there is a known variability in normal linguistic performance (Ross and Wertz, 2004). Cut-off score for normal performance can be calculated by establishing the specificity, the proportion of normative sample which obtain results above the cut-off, and sensitivity, the percentage of PWA who perform below the cut-off score (Strauss, Sherman and Spreen, 2006). Once normative data has been collected it can be used to establish specificity, the screen's sensitivity can be established in future validation studies obtaining a sample of PWA.

Finally, the collection of normative data will help with continued development of the assessment, with the responses being used to evaluate item validity. If it becomes apparent that the normative sample are consistently having difficulty with an item on the screen, then it should be revised to reflect this. This can further the screen's construct validity, examining the test items' contribution to ensuring the screen behaves as it should (Ivanova and Hallowell, 2013).

2.6 Demographic Variables and Language Tests

When examining normative data it is also important to consider how demographic variables may be impacting on test performance. A number of variables have been shown to influence language abilities, by not taking them in to account it would be difficult to ascertain whether a lower score on the screen was related to the presence of mild aphasia or due to the person’s relevant background variables.

This study will analyse the impact of key known variables and the interaction between them, specifically age, gender and level of education. Other demographics have been
shown to possibly influence language test performance, such as socio-economic status or vocational achievements (Lezak et al, 2003), however at this stage in development such factors are not considered a priority.

Age is particularly relevant here as it the single most important risk factor for stroke with people most likely to have a stroke over the age of 55 (Stroke Association, 2017). It is important to remember that age has been shown to cause significant declines in the language abilities of healthy normal individuals (Mortensen, Meyer and Humphreys, 2007; Thornton and Light, 2006). Indeed, research has shown that a poorer performance on language assessments is related to an increased age (Enderby, Wood, Wade and Hewer, 1987; Kent and Luszcz, 2002; Snitz, Unverzagt, Chang, Bilt, Gao, Saxton, Hall and Ganguli, 2009; Syder et al, 1993), the possibility that this is also the case for the ABUHB CST should be explored. Research varies as to the age at which declines in language test performance begin, with a number suggesting that it is not until the age of 70 (Burke & Shafto, 2008; Snitz et al, 2009; Zec, Burkett, Markwell and Larsen, 2007). However, as recent research suggests that changes in language ability may begin from as early as 40 (Hartshorne and Germin, 2015) it would be valuable to consider if this is the case for the ABUHB CST in this initial validation study. Latency of response on language tasks, such as picture naming, have also shown to be effected by age (Feyereisen, Demeaght and Samson, 1998), this will not be analysed in this paper, however the time taken for participants to complete each subtest was recorded for later analysis if necessary.

While gender has been shown to have only a small effect on language test performance, if any (Flowers et al, 2014; Nakase-Thompson et al, 2005 Syder et al,
1993; Zec et al, 2007), if was felt that it would be useful to examine if the variable had any influence on the ABUHB CST at this stage.

Level of education was also identified as an important variable to investigate, SLTs in ABUHB subjectively reported that they experienced patients from a wide range of educational backgrounds including some who are illiterate. Research has suggested that level of education plays a significant role in determining the decline of cognitive functions as people age, in particular for language function the impact of education may be more important than age (Leibovici, Rithie, Ledesert and Touchon, 1996). This influence of education has been reflected in a number of studies examining its impact on language test performance (Flowers et al, 2014; Nakase-Thompson et al, 2005; Zec et al, 2007).

Tables 5 and 6 summarise the collection of normative data as described in the manuals of the FAST (Enderby, Wood, Wade and Hewer, 1987) and SST (Syder et al, 1993). The procedure of data collection described in the initial validation study of the LASTen (Flowers et al, 2014) is also included, although it should be noted that this is still in the process of being validated. All of the screens sample sizes exceed 100, which Franzen (2003) considers desirable. However, both the FAST omits to evaluate the impact of gender and, along with the SST, education. Only the LASTen considers the influence of age, gender and education. This could make it difficult for clinicians to identify whether a performance below the set cut-off scores would be in line with the patient’s pre-morbid ability, as a result of their gender or level of educational attainment. None of the screening tests considered the impact of multiple demographic variables interacting with each other.
The normative sample used in validation of the SST, FAST and LASTen.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Significant difference between groups identified.</td>
<td>Significant difference between groups identified.</td>
<td>No significant differences between groups identified.</td>
</tr>
<tr>
<td>Gender</td>
<td>No significant difference identified.</td>
<td>N/A</td>
<td>No significant difference identified.</td>
</tr>
<tr>
<td>Education</td>
<td>N/A</td>
<td>N/A</td>
<td>Significant discrepancies of error rates between those with and without postsecondary education.</td>
</tr>
</tbody>
</table>
This study will begin the essential process of standardising a new aphasia screening test. The ABUHB CST was developed out of the need for a screen which could be used across the health board, efficiently gathering all the relevant information which the ABUHB SLTs recognised as essential for fulfilling their role in the acute post-stroke setting. In order for the ABUHB CST to be clinically useful standardisation, the establishment of psychometric properties, is essential. The collection of normative data can assist with this, contributing to validation and determining cut-off scores. Moreover, the impact of the demographic variables, age, gender and education on performance will be considered to further the usefulness of the data.

While full standardisation of this screen is outside the remits of this paper the current study will hope to provide a starting point for the process by administering the ABUHB CST to a sample of normal healthy individuals. Broadly this study aims to create a normative database to be used in future research establishing the screen's psychometric properties, such as validity and identifying cut-off scores. The data collected in this process will be analysed with the following objectives in mind:

(1) Determine the influence of demographic characteristics on the performance of normal healthy individuals, as scores on language tasks have been shown to be related to age, gender and education;

(2) To gather information to further refine the screen.
3. Methodology

3.1 Introduction

To achieve these aims the ABUHB CST was administered to a sample of 50 normal healthy individuals. This collected quantitative data for the dependent variable, scores achieved while considering each of the independent variables; age, gender and education level. The data collected were then analysed using descriptive and inferential statistics to determine the influence of each factor individually and when interacting. Recommendations as to the cut-off score that would indicate the presence of aphasia can then be made from the results obtained.

3.2 Participants

The ABUHB CST was administered to 50 normal healthy individuals, aged between 19 and 92. While it has been proposed that a sample of at least 100 individuals is required in order to be rigorous in the standardisation process (Ivanova and Hallowell, 2013; Franzen, 2003) this was not possible in the remits of this study, as an undergraduate dissertation. Administering the screen to 50 individuals provides an adequate sample to analyse and can be added to at a later date if required. The sample was obtained using personal contacts of the researcher, supplemented by approaching organisations that allowed for access to the appropriate demographic.

Participants were organised into groups for each demographic variable being tested, age, gender and education. The age groups were designed to allow the results to be compared to those described in the manual for the SST, as well as taking into account that age-related changes in language ability have been shown to begin from the age of
40 (Hartshorne and Germain, 2015). The age groups used were; 39 and under, 40-49, 50-59, 60-69 and 70+. This study aimed for an equal distribution of participants across these age groups to allow for each group to be equally represented. For gender groups, an attempt was made to recruit an equal number of male and female individuals, across each age group. Education level is also being considered in this study, measured by years spent in formal education. Participants were divided into three groups, Basic Education (1-9 years), Post-16 Education (10-12 years) and Further Education (12+ years).

To be included in the study individuals had to meet certain criteria, this ensured that they were normal healthy individuals and that any changes in scores were a result of age, gender or education level differences. Individuals with a history of stroke, acquired neurological disorder, learning disability, a diagnosed memory deficit (e.g. dementia) or those who were not monolingual English were excluded as these variables could affect language ability (Ivanova & Hallowell, 2013). Additionally, people were excluded if they had a physical disability restricting their participation in the assessment or inadequately managed hearing and vision impairments. This ensured that performance on the ABUHB CST was related only to language. No exclusion was made in relation to the participant’s occupation and socio-economic status.

3.3 Materials

Prior to this study the screen had been piloted and refined by the ABUHB SLT team, resulting in the final version of the ABUHB CST used in this study. The ABUHB CST consists of 42 items divided into 8 subtests alongside a further subtest that encourages clinicians to consider speech intelligibility. These subtests can serve as an index of
three areas, comprehension, expression and logico-relations and reasoning, with subscores for each of these areas. The assessment is set out on 2 sides of paper for the assessor, with instructions on how to carry out the assessment and a place to record results. Table 7 provides an overview of the ABUHB CSTs layout, see appendix A for the full screen.

<table>
<thead>
<tr>
<th>Index</th>
<th>Subtests</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehension</td>
<td>C1. Yes/No Questions</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>C2. Commands</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td><strong>Total: 16</strong></td>
<td></td>
</tr>
<tr>
<td>Expression</td>
<td>E1. Automatic Speech</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>E2. Phrase Completion</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>E3. Picture Identification</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>E4. Sequencing</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>E5. Category Fluency</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total: 22</strong></td>
<td></td>
</tr>
<tr>
<td>Logico-Relations and Reasoning</td>
<td>LR1. Semantic/grammatical relationships, verbal reasoning</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total: 4</strong></td>
<td></td>
</tr>
<tr>
<td>Overall Language Ability</td>
<td>All above</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total: 42</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Overview of completed ABUHB CST
Administration of the assessment requires further materials. For subtest C1 a visual, aphasia friendly, prompt which participants could answer with by pointing was developed, this ensures results are not related to any expressive difficulties. C2 requires the use of 5 objects, these are a spoon, toothbrush, cup, pen and comb. A set of colour pictures are provided for E3, presented across one sheet of paper with equal space given to each. See Appendices C for these supplemental materials.

Additionally, a timer was used in this study to time how long it took for participants to complete the whole screen and each subtest.

For the purpose of this study guidelines for marking participant’s responses were produced by the ABUHB SLT team, to ensure scoring remains consistent. The scoring criteria can be seen in appendix B.

3.4 Procedure
The ABUHB CST was administered to participants in a controlled 1:1 environment, using a quiet and convenient room for the participant and researcher. The participant was first asked for their age and the years they had spent in formal education which was recorded alongside their gender at the top of a copy of the ABUHB CST. The ABUHB CST was then administered following the uniform administration protocol (see appendix B), with the researcher scoring responses as correct or incorrect. Each test item is worth 1 point making the maximum score 42. Specific responses were also recorded where appropriate in order to help with the future development of the screen. The researcher timed how long it took for participants to complete each subtest and the overall assessment. This data was obtained in order to help establish the average time needed to complete the screen, as well as to assist with any further research which may
not just consider participants score but also latency of responses. A completed example of the screen can be found in appendix D.

3.5 Statistical Analysis

Initially, the average and range of the time taken to administer the ABUHB CST to the normative sample was calculated. This is useful information for SLTs who plan to use the screen in the future, providing a baseline for the time needed to administer the ABUHB CST.

The collected quantitative data was then analysed using descriptive and inferential statistics, the calculations were carried out by SPSS version 22.0. Descriptive statistics comprising of the overall means and standard deviations were established for normative performance on the whole of the ABUHB CST and for each subtest. Mean scores and standard deviations where also used to compare performance within the separate age, gender and education groups.

An analysis of variance (ANOVA) was then carried out for each individual variable, to determine if the influence of age, gender or education on mean total scores proved to be statistically significant. If a variable proved to be statistically significant for determining the mean total score then an additional ANOVA was completed, this considered the influence of the variable on each subsection (comprehension, expression and logico-relations and reasoning).

Following this, a multivariate analysis of variance (MANOVA) was completed to determine if any of the independent variables, within their defined groups, interacted
together to have a significant impact on scores across each subsection of the ABUHB CST.

Finally, descriptive statistics (means and standard deviations) were obtained for each subtest within the three subsections. This was done to assist with the process of item validity, allowing for subtests that the normative sample performed poorly on to be isolated for re-evaluation.

3.6 Ethical Considerations

Ethical approval was sought from and granted by the Cardiff Metropolitan University Health Care and Food Ethics Panel (Ethical Approval Number: 8447, see appendix E). Written informed consent (see appendix F) was obtained after providing participants with a written information sheet (see appendix G) and the opportunity to ask any questions. Participants were able to consent for their data to be retained for future research purposes, which all opted to do.

Anonymity and confidentiality of participants was maintained during all stages of the project, with all documentation with potentially identifiable information securely stored. Unique identifying codes were assigned to participants when they entered the study and used in any subsequent documentation.

Participation was entirely voluntary and subjects could withdraw their consent and data at any time up to 2 weeks later without prejudice and without giving a reason, resulting in their data being destroyed. No data were withdrawn.
Data collection took place in quiet and convenient rooms where the safety of the participant and researcher, along with confidentiality, could be maintained. Close contact was maintained with the project supervisor throughout the process.
4. Results

4.1 Sample Description

The sample of 50 healthy normal individuals consisted of 25 men and 25 women with a mean age of 53.4 years (±20.9), with equal gender distribution of the 10 participants in each age band. The mean education level of participants was 14.1 years (±4.5).

Unlike age and gender the distribution of the sample was not equal across each education group, table 8 shows the breakdown of the sample into groups.

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Value Label</th>
<th>N (N=50)</th>
<th>% of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Under 40</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>40-49</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>50-59</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>60-69</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>70+</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Education</td>
<td>Basic Education 1-11 years</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Post-16 Education 12-15 years</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Further Education 15+ years</td>
<td>25</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 8: Demographic variables of the sample
4.2 Time taken to administer the ABUHB CST

The average time needed to administer the ABUHB CST to the normative sample was calculated, providing SLTs with clinically useful information regarding the time they should allow to administer the ABUHB CST during session with clients.

The average time needed to administer the ABUHB CST was 318.44 seconds or 5 minutes 31 seconds.

The time taken ranged from 220 - 439 seconds.

4.3 Overall Descriptive Statistics

Table 9 shows the means, range and standard deviation of the whole sample’s overall performance and across each subtest of the ABUHB CST. All 50 participants completed all parts of the screen. As the table shows, within each subsections there are participants that did not achieve perfect scores, with performance on the logical-relations and reasoning (LR) deviating the most. With less than half, 28 participants (42%), achieving 100%. Of those participants, 17 (60.71%) made 1 error, 6 (21.43%) made 2 errors, 3 (10.71%) made 3 errors and 1 (3%) made four errors.
<table>
<thead>
<tr>
<th>Subsections</th>
<th>Maximum Score Achievable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehension Score</td>
<td>16.00</td>
<td>14.00</td>
<td>16.00</td>
<td>15.76</td>
<td>0.48</td>
</tr>
<tr>
<td>Expression Score</td>
<td>22.00</td>
<td>20.00</td>
<td>22.00</td>
<td>21.92</td>
<td>0.34</td>
</tr>
<tr>
<td>Logical-Relations and Reasoning Score</td>
<td>4.00</td>
<td>1.00</td>
<td>4.00</td>
<td>3.40</td>
<td>0.76</td>
</tr>
<tr>
<td>Total Score</td>
<td>42.00</td>
<td>38.00</td>
<td>42.00</td>
<td>41.08</td>
<td>1.08</td>
</tr>
</tbody>
</table>

Table 9: Overall descriptive statistics

4.4 Influence of Age

The descriptive statistics shown in graph 1 demonstrates a steady decrease in performance as age increases, from the 40-49 years’ group. It appears that the lowest performance on the ABUHB was recorded by the oldest and youngest group.
Figure 1: Descriptive Statistics - The influence of age on mean total scores, in conjunction with standard deviations.

Following this, an ANOVA was carried out to determine whether age was a significant variable in determining the total score achieved. This resulted in an f-ratio of 4.5, at p=0.04 which suggests there is a statistically significant difference.

Further, post-hoc comparison using the Tukey HSD test indicated that the mean score for the 70 and over group (M=40.1, SD=1.52) was significantly different to the 40-49 (M=41.7, SD=0.48) and 50-59 (M=41.5, SD=0.71) age groups. Despite this statistical significance the actual differences in mean score between groups does not exceed 1.6, which is quite low.

Another ANOVA was completed, taking into account each subsection of the ABUHB CST and age groups in order to identify which showed significant differences. LR was the only subsection to demonstrate statistical significance, with an f-ratio of 3.75, at P=0.01. Post-hoc comparison indicated that the mean scores of the under 40 (M=2.9, SD=0.99) significantly differed from the 40-49 age group (M=3.8, SD=0.42).
While the influence of age on receptive and expressive subsections did not reach statistical significance, the mean scores achieved both began to reduce while standard deviation increased from the 60-69 age group. This is shown in table 10.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Receptive Score</th>
<th>Expressive Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 40</td>
<td>Mean 15.90</td>
<td>Std. Deviation 0.32</td>
</tr>
<tr>
<td></td>
<td>Mean 15.90</td>
<td>Std. Deviation 0.32</td>
</tr>
<tr>
<td></td>
<td>Mean 15.9</td>
<td>Std. Deviation 0.32</td>
</tr>
<tr>
<td></td>
<td>Mean 15.7</td>
<td>Std. Deviation 0.48</td>
</tr>
<tr>
<td>70 and over</td>
<td>Mean 15.40</td>
<td>Std. Deviation 0.70</td>
</tr>
</tbody>
</table>

Table 10: Influence of age on receptive and expressive mean scores and standard deviations.

4.5 Influence of Gender

Females achieved a higher mean total score (M=41.36, SD=0.91) to males (M=40.80, SD=1.19), this trend towards better performance by females is illustrated in graph 2. However, an ANOVA showed that with an f-ratio of 3.5 and P=0.07 this was not statistically significant. As a result, further investigation on this variable was not warranted.
4.6 Influence of Education

As groups increased in terms of years of education so did the mean total scores, this correlation can be seen in graph 3. The completion of an ANOVA showed, similarly to the gender variable, that the difference between the ‘basic education’ (M=40.54, SD=1.56), ‘post-16 education’ (M=41.17, SD=0.94) and further education (M=42.3, SD=0.75) was not statistically significant, with an f-ratio of 2.40 and P=0.10. For this reason, the influence of education level was not explored further.

Figure 2: Descriptive Statistics - The influence of gender on mean total scores, in conjunction with standard deviations.

Figure 3: Descriptive Statistics - The influence of education on mean total scores, in conjunction with standard deviations.
4.7 Interaction Between Age, Gender and Education Variables

A multivariate analysis of variance (MANOVA) was completed to determine if any of the independent variables interacted together and had a significant impact on scores across each subsection of the ABUHB CST. The MANOVA showed no significant interaction between the variables on any of the sub-scores.

4.8 Analysis of Subsections

The means and standard deviations for each sub-test were also determined in order to identify sub-sections that may be presenting as particularly problematic for participants. If this appears to be the case then it would suggest test items should be re-evaluated for potential confounds and possibly revised (Ivanova and Hallowell, 2013).

- Comprehension

  Analysis shows that all participants achieved 100% for C1 (comprehension of yes/no questions) and while the mean for C2 (command comprehension) is very close to the highest score achievable, some participants answered 1 or 2 items incorrectly, resulting in 24% of the sample making achieving below 100%. See table 11.
Subtest | Highest Score Achievable | Minimum Achieved | Maximum Achieved | Mean | Std. Deviation
--- | --- | --- | --- | --- | ---
C1 | 6.00 | 6.00 | 6.00 | 6.00 | 0.00
C2 | 10.00 | 8.00 | 10.00 | 9.74 | 0.48

Table 11: Performance on the comprehension subsection (N=50)

- **Expression**

For E1 (automatic speech) and E4 (sequencing) all participants achieved the maximum score, across E2 (phrase completion), E3 (picture identification) and E5 (category fluency) the mean remained very close to the highest achievable score with limited standard deviation shown. In total, only three participants produced errors in this subsection with 2 making one error and 1 making two errors. See table 12.

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Highest Score Achievable</th>
<th>Minimum Achieved</th>
<th>Maximum Achieved</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>4</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>0.00</td>
</tr>
<tr>
<td>E2</td>
<td>4</td>
<td>3.00</td>
<td>4.00</td>
<td>3.98</td>
<td>0.14</td>
</tr>
<tr>
<td>E3</td>
<td>12</td>
<td>11.00</td>
<td>12.00</td>
<td>11.96</td>
<td>0.20</td>
</tr>
<tr>
<td>E4</td>
<td>1</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>E5</td>
<td>1</td>
<td>0.00</td>
<td>1.00</td>
<td>0.98</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Table 12: Performance on the expression subsection (N=50)

- **Logico-Relations and Reasoning**

All participants achieved 100% for verbal reasoning 1. The mean of the semantic test item was very close to the maximum achievable score. In this
section grammatical and verbal reasoning 2 test items appear to be the most problematic for participants, with the percentage of participants making errors on these subtests being 32 and 22 respectively. Overall, only 54% of the sample achieved 100% across the LR subsection.

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Highest Score Achievable</th>
<th>Minimum Achieved</th>
<th>Maximum Achieved</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.96</td>
<td>0.20</td>
</tr>
<tr>
<td>Grammatical</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.68</td>
<td>0.47</td>
</tr>
<tr>
<td>Verbal Reasoning 1</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Verbal Reasoning 2</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.78</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Table 13: Performance on the logico-relations and reasoning subsection (N=50)

4.9 Summary of Key Findings

The first key finding of this study was that a score of 100% was not achieved by all participants, indeed over half made an error. This is useful information for establishing the ABUHB CST’s cut-off scores, allowing for it to be used for identifying the presence of aphasia.

In this study, the influence of key demographic variables on mean total scores achieved on the ABUHB CST has been identified. While there appears to be a correlation between level of education and gender, with those with higher levels of education and women performing slightly better, only age reached statistical
significance. Participants over the age of 70 performed significantly poorer when compared to those between the ages of 40-59. Further analysis considered the influence of age on each subsection, from this a statistical difference between how participants under the age of 40 and the 40-49 age group was identified.

Finally, analysis of normative performance has identified the test items which caused the most difficulty for the participants. This allows for items to be reviewed, a step towards developing the ABUHB CST’s construct validity.

Overall, this project has created a normative database, contributing to the ABUHB CSTs standardisation. Results from this study can be used to assist with developing appropriate cut-off scores to identify the presence of aphasia, and with evaluating the screens validity.
5. Discussion

This study has begun the standardisation process of the ABUHB CST, a newly developed aphasia screen for the use in an acute stroke ward. The screen aims to be a practical tool for the identification of aphasia in patients during the acute stage post-stroke. Moreover, it allows clinicians to infer important functional information which assists with patient management by SLTs and the wider MDT.

In this project, normative data has been collected from 50 healthy normal individuals to assist with the establishment of psychometric properties, as required in the standardisation of a newly developed aphasia test (Ivanova and Hallowell, 2013). In future studies, this normative database can be used to establish the ABUHB CSTs validity and to identify cut-off scores for normal performance.

Analysis of the data in this study focused on identifying if the demographic variables, age, gender and education, affected performance on the ABUHB CST by those without aphasia.

Additionally, by administering the screen to a normal healthy population further information has been obtained to refine the screen, assisting in establishing construct validity.

The findings in relation to these objectives, alongside their clinical implications are discussed here in detail. Limitations of the present study and areas for possible future research are also addressed.
5.1 Influence of Demographic Variables

Age

Overall, the results suggest a slight correlation between increased age and decreasing performance on the ABUHB CST. Results showed that from the age of 40 mean total scores on the screen gradually declined, with those in their 40s and 50s performing significantly better than the oldest group, 70 years and over. Additionally, although statistical significance was not reached, mean scores for the comprehension and expression subsections both decreased from the age of 60.

This trend is consistent with previous research suggesting language abilities decline with age (Mortensen, Meyer and Humphreys, 2007; Thornton and Light, 2006). In particular, the finding that a significant decline in language abilities emerges at the age of 70 is supported by a number of other studies (Burke & Shafto, 2008; Snitz et al, 2009; Zec et al, 2007). However, research by Snitz et al (2009) and Zec et al (2007), is able to show that performance on language tests may continue to significantly decline. This is done by forming further groups, sometimes referred to as ‘old old categories, to compare performance of those in their 70s, 80s and 90s. The present study cannot comment on whether performance would continue to significantly decrease past the age of 70, as performance between those in their 70s, 80s and 90s has not been distinguished. Now that significance has been identified, it would be appropriate to consider including an ‘old old’ category in future research.

However, when coming to a conclusion regarding the influence of age, it should be remembered that only a small statistical significance was identified. Furthermore, the difference in the mean total, comprehension and expression scores between age groups is minimal, equivalent to a difference of just 1 mark. It is possible that a larger sample
size may help with the interpretation of the data by improving the reliability of results with greater precision and power. Thus, increasing the likelihood that the true effect of age is identified (Button, Ioannidis, Mokrysz, Nosek, Flint, Robinson, Munafò, 2013).

In contrast to the other subsections, the trend did not continue in the logico-relationships and reasoning subsection. Analysis showed that it was the youngest group, those under the age of 40, which performed significantly poorer than the next older group consisting of participants aged 40-49 years. As an assessment of high-level language abilities, this subsection requires the use of more non-linguistic cognitive abilities than the others. Research has found that cognitive abilities continue to mature throughout adulthood, with some not reaching peak performance until the age of 40. It is possible that this significance finding is a reflection of this (Hartshorne and Germine, 2015). The validity of the test items as a measure of high-level language processing skills should also be considered, in particular it may be useful to review the appropriateness of using these items with younger participants.

**Gender**

No significant difference between female and male performance was identified. The results did show that females achieved a higher mean total score and lower standard deviation, although the difference in mean total scores is equivalent to less than one mark. This is generally consistent with a few similar studies which although not always favouring females, identify a slight trend in relation to gender (Nakase-Thompson et al, 2005 Syder et al, 1993, Zec et al, 2007).
Education Level

The results indicate that there is a slight correlation between performance on the ABUHB CST and years in education. The longer participants had spent in formal education the higher their mean total score, and lower their standard deviation. Yet, statistical significance was not achieved and again, the mean total scores reflected a difference of less than one mark.

However, analysis may be limited as, unlike for age and gender, equal distribution between level of education groups was not achieved. 50% of the participants had spent 15+ years in formal education while those who experienced 1-11 and 12-15 years made up just 12 and 13% of the sample respectively. By addressing this, and using a larger sample, it is possible that a clearer pattern would emerge.

In addition to examining the influence of each variable separately, they were also analysed to identify any interaction between them. Results showed there to be no significant interaction between the variables on overall performance or on any of the subsections.

This study has identified trends between performance on the ABUHB CST and the variables gender and education. However, only the age variable achieved statistical significance. From this, we can conclude that it might be useful to consider a lower cut-off score for patients over the age of 70. This would guard against false positives, ensuring that the patients performance on the screen is related to the presence of aphasia and not a result of normal ageing. Both the SST and FAST propose the use of
a sliding cut-off score to accommodate the influence of ageing. Both screens reduce their cut-off scores by one mark at 60 and then again at 70 years old. As with the SST and FAST, lowering the cut-off by one mark should be appropriate as there is only a small variation in scores across ages. Unlike the SST and FAST, these results suggest that the cut-off score should only be reduced for patients who are 70 years old or older.

5.2 Reviewing the ABUHB CST

The data collected was also analysed to review the performance of the normative population on each subtest. This was done to identify if any particular subtests consistently caused difficulty for the participants, requiring them to be reviewed. This contributes to establishing the construct validity of the ABUHB CST (Ivanova and Hallowell, 2013).

**Comprehension Subsection**

All participants achieved 100% is test item C1 (yes/no questions). However, there was some variability in performance across C2, (following commands), with 76% achieving 100%, 11 of the 50 participants made one error, and just one participant made 2 errors.

Despite the presence of a few errors, the overall mean score (9.74) is very close to the maximum score possible (10). Suggesting, further review of the comprehension section is likely not needed. However, a brief review of the errors made in C2 identified some things to be aware of.

6 of the errors were made when following the complex command and the rest were a result of participants asking for the commands to be repeated. It is possible that the
errors were due to a result of low attention or listening, rather than a reflection on the item as a test of receptive language processing abilities. Resulting in participants asking for repetitions or not responding to the second part of the complex command. Additionally, one participant responded to the command ‘point to the one you write with’ by pointing to their hand rather than the pen. As the participant explained, the previous inclusion of body parts had led them to believe that their writing hand was what the question was referring to. Clinicians should keep this in mind and use their clinical judgement should a similar situation arise on the ward.

**Expression Subsection**

Just three participants made errors in this subsection, suggesting further review is not necessary. However, a number of factors that were possibly related to the errors are worth mentioning.

Firstly, the only error made on subtest E2 (phrase completion), was the result of the participant completing the phrase ‘bread and…’ with “honey”. Honey is not included in the uniform administration guidelines so it may be worth adding it to the list of acceptable responses.

Secondly, the remaining errors, two in E3 (object functions) and one in E5 (category fluency), were made by the only two participants in their 90s. This could suggest that performance on the ABUHB CST would continue to decline past the age of 70, furthering the case for the inclusion of an ‘old old’ category in any future normative research.

In the meantime, it may be useful for clinicians to keep this in mind when assessing those in their 90s.
Logico-Relationships and Reasoning Subsection

The majority of error occurred in this subsection, with 46% of participants making at least one error. 17 participants made one error, 5 participants made two errors and 1 made three errors. As this appeared to be the most difficult subsection for participants it would be sensible to review the subtests.

No difficulties with Verbal Reasoning 1 were identified as every participant scored 100%. Additionally, the Semantic subtest also presented few problems with only three participants making mistakes. It is possible that they were simply not familiar with the task.

The greatest number of errors occurred in the Grammatical subtest, 16 out of the 50 participants answered incorrectly. The majority of the errors suggest the participants did not process the grammatical element, with subjects responding to ‘I watch Eastenders on the television after I had eaten my dinner, what did I do first?’ with “Eastenders” or “Watch television”. However, there were also a number of response which were incorrect as the participant did not understand that they should take cues from the question. Responses included “wash hands” and “turn on the telly”. In this case, clinicians should make a clinical judgement when scoring this section and it would be sensible to record the patient’s response for future reference.

Finally, 7 participants incorrectly answered test item Verbal Reasoning 2, ‘what is meant by letting the cat out of the bag?’. Incorrect responses included “to tell a lie” and “tell a tale on someone”, these answers show that participants had some inclination as to the meaning. However, other responses included a literal interpretation “Let something lose” and simply, “No idea”. It is worth noting that all of the participants who responded incorrectly were male and the majority were in the youngest age group.
under 40 years old. This suggests that gender or age influences familiarity with this particular idiom. Certainly, research by Hung and Nippold (2014) found that older participants in comparison to younger participants were more familiar with the meanings of idioms. When using the assessment in clinic, it should be remembered that it is possible the patient was unfamiliar with the phrase before the onset of stroke.

As there are only 4 marks available in this subsection it is important that the test items are valid and representative of what they hope to assess. In particular, the Grammatical subtest may benefit from review. With regards to Verbal Reasoning 2 it may be useful considering using an additional or alternative idiom that is more well known to men and younger generation may be useful.

None of the overall means, for total score and individual subsections, were less than 1 mark below 100%. These results suggest that there are a number of things that need to be considered moving forward, but overall the ABUHB CST appears to have good item validity.

5.3 Contribution to standardisation process

The normative data collected, and analysis of it, in this study can be used to ascertain a number of psychometric properties in continued standardisation of the ABUHB CST:
Validity

Firstly, this data can be used to when identifying the screens criterion validity, its ability to distinguish between people with and without aphasia. This can be done using concurrent validation methods, comparing this normative sample to a future sample of people with aphasia.

The collection of a normative sample has also allowed for an analysis of the proposed test items validity. The test items which healthy normal individuals struggled with were identified, allowing them to be reviewed. This contributes to construct validity, ensuring the ABUHB CST is measuring what it claims to.

Cut-off Scores

This project will also assist with establishing appropriate cut-off scores for clinicians to refer to when deciding if a person’s performance on the ABUHB CST indicates the presence of aphasia. Furthermore, the analysis of the influence of demographic variable further contributes to this. The results suggest that only age significantly impacted on ABUHB CST performance. As a result, it may be necessary to reduce the cut-off score slightly from the age of 70, to accommodate the influence of age.

One way of establishing cut-off scores is to use the lowest scores achieved by the normative sample (Borod, Goodglass and Kaplan, 1980), in this case, the proposed cut-off scores for the ABUHB CST would be:

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 70</td>
<td>39</td>
</tr>
<tr>
<td>70 and Over</td>
<td>38</td>
</tr>
</tbody>
</table>
However, the appropriateness of these cut-off scores will need to be reviewed following the collection of a sample with aphasia. As Ivanova and Hallowell (2013) explain, cut-off scores should be calculated considering specificity, the proportion of normative sample which obtain results above the cut-off, and sensitivity, the percentage of PWA who perform below the cut-off score.

5.4 Clinical Implications

This study has contributed to the development of a new screening tool for the identification of aphasia, which aims to address some of the limitations of those currently available. An emphasis has been placed on ensuring a large amount of functional information can be inferred from its use, assisting with future SLT and MDT management of the patient. Additionally, it takes into consideration the setting in which it is used and the presence of common co-morbidities in stroke patients.

It is important for aphasia assessments to be standardised (Laska et al, 2007; Patterson and Chapey, 2008) and for clinicians to be aware of the psychometric properties. Collecting normative data is part of this process and will assist clinicians when making a decision about which of the available screening tools they should use.

The ABUHB CST is presented as an alternative to the currently available screening tool, yet it is not likely to replace the need for the other options. For example, the ABUHB CST does not assess high-level language processing as much as the SST, while the newly developed LASTen is much quicker to administer making it useful when time is restricted. Additionally, it is worth noting that another new tool for identifying a language impairment in the acute stages of stroke has recently been made available, The Brisbane Evidence-Based Language Tests for Acute Stroke (Rohde,
Worrall, O’Halloran, Godecke and Farrell, 2017), at the time of writing details of its validation have not yet been released.

5.5 Limitations

As identified throughout this discussion there are a number of limitations related to the sample used in this study.

Due to the timeframe of data collection it was not possible to gather a larger sample than 50. A larger sample may have assisted with identifying significance, increasing effect size or decreasing measurement errors. However, the current sample size was enough to establish trends which provides valuable information.

As a result of difficulties obtaining a sample of this size in the time available the inclusion of an ‘old old’ category was omitted. The impact of age on total scores became significant at the age of 70, it would have been interesting, and useful for establishing cut-off scores to identify if performance continued to significantly decrease in later age categories.

Additionally, controlling for level of education, as well as age and gender would have made data collection much more difficult, yet the analyse of the influence of education on performance may have benefited from equal distribution across education groups.

5.6 Directions for Future Research

Future research should focus on completing the standardisation process. The next step towards achieving this will be to administer the ABUHB CST to PWA. This will allow for comparison with norms in order to calculate specificity and sensitivity and establish cut-off scores. Furthermore, a comparison between the two groups would
identify the screens criterion validity. Criterion validity could further be established by comparing PWAs performance on the ABUHB CST and on another validated aphasia screen.

Additionally, the reliability of the ABUHB CST needs to be evaluated. Inter-rater reliability can be established by two clinicians administering the ABUHB CST to the same individual and comparing the results. Test-retest reliability should also be assessed; this would be done by the same SLT administering the screen to the same patient on two separate occasions. A high correlation coefficient between the two scores would indicate strong reliability.

It may also be useful to explore the influence of demographic variables on test performance to a greater extent. Increasing the sample size, and distinguishing the age groups further would provide further information for consideration when determining cut-off scores. Furthermore, research considering the influence of other variables, such as socio-economic status or vocation may be of use. Finally, the current intention is for the ABUHB CST to be administered in a Welsh health board, a number of patients will be bilingual Welsh and English speakers. It would be appropriate to examine the influence of this on test scores.

5.7 Conclusion

This project hoped to determine normative performance on a newly developed aphasia screen in order to contribute to its standardisation. The data gathered has successfully established a normative database which can be referred to during future validation. It will be particularly useful for establishing criterion validity when compared to results from an aphasic population. Additionally, analyses of normative performance have
provided an opportunity to consider the screens construct validity, identifying test items which may be particularly problematic.

It is also possible to establish the ABUHB CSTs cut-off scores, for identifying the presence of aphasia, using this data. However, these should not be confirmed until a sample consisting of PWA has been obtained to compare to the normative sample. Once cut-off scores have been established this data will be able to identify their specificity.

The impact of key demographic variables, age, gender and education, have also been considered. Results suggest there is a slight trend towards females and those who spent longer in formal education achieving better scores. However, only age had a significant influence, when determining cut-off scores this age effect should be accommodated for.

Once validated the ABUHB CST, with its focus on surmising relevant functional information in addition to identifying the presence of aphasia, could become a very useful clinical tool for SLTs.
References


Appendices

Appendix A: Complete ABUHB CST, as used in study

ABUHB Communication Screening Tool (Acute Stroke)

Date of Screen: ____________________________ Time of Screen: ________________

Name of Examiner: ____________________________________________

Summary Scores:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehension</td>
<td>/ 16</td>
</tr>
<tr>
<td>Expression</td>
<td>/ 22</td>
</tr>
<tr>
<td>Logico-Relations and Reasoning</td>
<td>/ 4</td>
</tr>
<tr>
<td>Total</td>
<td>/ 42</td>
</tr>
</tbody>
</table>

Comments:

Comprehension

Say to the patient, “This section is about your understanding”

C1: Yes/No questions (Yes/No card required. Verbal or non-verbal response acceptable; 1 point per correct response) Say to the patient, “I am going to ask you some questions. You just need to reply yes or no, you can use your thumbs or point to the words if that is easier…”

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is your name Jack/Joan?</td>
<td></td>
<td></td>
<td>Is ice cream hot?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is your name (correct)?</td>
<td></td>
<td></td>
<td>Is a cat an animal?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you sitting in a chair?</td>
<td></td>
<td></td>
<td>Are squares round?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

/6
C2: Commands (you will need a spoon, toothbrush, cup, pen and comb; lay objects out in a row in the order listed, with the spoon on the patient’s left; 1 point per correct response) Say to the patient, “Now I am going to ask you to follow some instructions..” (Word the instructions as written below).

<table>
<thead>
<tr>
<th>Level</th>
<th>Instructions</th>
<th>Tick if correct</th>
<th>Comments</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 stage</td>
<td>Point to the pen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to your lips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to the toothbrush</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 stage</td>
<td>Point to the spoon &amp; the cup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to your nose and then the comb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to the pen &amp; the toothbrush</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex</td>
<td>Before you point to your nose, point to the object furthest right</td>
<td></td>
<td></td>
<td>/10</td>
</tr>
<tr>
<td>Function</td>
<td>Point to the one you eat with?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to the one you write with?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to the one you clean your teeth with?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Expression

Say to the patient, “Now we are going to look at your talking and whether you can find the words you want.”

E1: Automatic Speech (1 point per correct response)

<table>
<thead>
<tr>
<th>Ask the patient: “Can you…”</th>
<th>Tick if correct</th>
<th>Comments</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>…tell me your name</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>… tell me your address</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>…count 1-10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>…tell me the days of the week, starting with Monday</td>
<td></td>
<td></td>
<td>/4</td>
</tr>
</tbody>
</table>

68
**E2: Phrase Completion (1 point per correct response)** Say to the patient, "I am going to ask you to complete some phrases, for example 'bucket and spade'" (For acceptable responses, refer to assessment protocol)

<table>
<thead>
<tr>
<th>Phrase</th>
<th>Tick if Correct</th>
<th>Comments</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread and</td>
<td></td>
<td></td>
<td>/4</td>
</tr>
<tr>
<td>Knife and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pen and</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**E3: Picture Identification (using picture sheet provided; verbal response required - 1 point per correct response)**

Say to the patient, “Now we are going to look at some pictures.”

<table>
<thead>
<tr>
<th>Picture</th>
<th>Naming: ask the patient “what is this one called?” Tick if correct</th>
<th>Function: ask the patient “what do you do with this?” Tick if correct</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glasses</td>
<td></td>
<td></td>
<td>/12</td>
</tr>
<tr>
<td>Hat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banana</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scissors</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**E4: Sequencing**

Say to the patient: ‘Can you describe in order how you would make a cup of tea?’

**E5: Category Fluency**

Tell the patient: ‘I am going to give you one minute to tell me as many different animals as you can …. Ready?….Go’.
Logico-Relationships and Reasoning

LR1: 1 point per correct response. Say to the patient, "just a few more questions, if that’s ok?"

<table>
<thead>
<tr>
<th>Level</th>
<th>Question</th>
<th>Correct?</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic</td>
<td>Hot is to cold as wet is to…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grammatical</td>
<td>I watched Eastenders on the television after I had eaten my dinner. What did I do first?</td>
<td></td>
<td>/4</td>
</tr>
<tr>
<td>Verbal Reasoning</td>
<td>Why would you call &quot;999&quot;?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Reasoning</td>
<td>What is meant by &quot;let the cat out of the bag&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Speech Intelligibility

Ask the patient: ‘Does your speech sound normal to you? Do you have any concerns about your speech?

Did you notice the patient slurring their words? Did you have to ask the patient to repeat any of their answers?

<table>
<thead>
<tr>
<th>Tick if no concerns</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Tick if yes</th>
<th></th>
</tr>
</thead>
</table>
Appendix B: The uniform administration protocol including acceptable responses to test items.

**ABUHB CST (Acute Stroke): Uniform Administration Protocol**

The following information provides guidance for completing the ABUHB CST with patients following stroke and in an acute hospital setting. The screening tool is designed to be used in this setting, although clinical judgement can be used to decide whether it may be appropriate to use in other situations.

**Administration**

For guidance only, it is anticipated that the screen takes between 12-15 minutes to complete. This may need adjusting following collection of norms and the use the screen with a number of patients / participants.

Review medical information to establish whether the patient is previously known to Speech and Language Therapy Services, or has a known diagnosis that may impact on communication, for example, dementia. Pre morbid diagnoses do not preclude the use of the screen with the patient but may need to be taken into consideration when reviewing the scores and considering on-going intervention.

**Environment**

- Where possible, the patient should be upright, alert and as comfortable/well supported as possible.
- Where possible, the patient and the examiner should be sat facing each other.
- A 1:1 environment is ideal, closing the curtains around the bed if required.
- Background noise, visual clutter and other distractions should be at a minimum.
- A table or tray will be required to place objects and pictures in front of the patient.

**Engaging the patient in the session**

The clinician should introduce themselves to the patient (name and profession) and ensure (where possible) consent is gained for the assessment. Where consent is not possible, document that the patient was seen in best interests.

Engage the patient in functional conversation, for example, asking how they are feeling, whether they can remember the events preceding their admission, family, hobbies etc. This is not scored, but will give a subjective impression as to the communicative ability of the patient.

**Comprehension**
For this section:

- No repetition of the question or command is allowed
- No cueing / prompting is allowed unless otherwise stated in the following protocol
- Maximum score = 16

Say to the patient, “We are going to start the screen, this section is about your understanding”

C1 Yes/No Questions

- Say to the patient, “I am going to ask you some questions, you just need to reply yes or no. You can use ‘thumbs up/down’ or point to the words if that is easier. Place the yes/no card in front of the patient.
- Ask the biographical questions first, followed by the three abstract questions. All six questions should be completed.
- Verbal and non-verbal responses are acceptable. It would be pertinent to document the “method” of response, e.g. verbal / non-verbal. This can be noted in the comments section at the start of the assessment
- Make a note of the number of correct responses
- 1 point is given per correct response

C2 Commands

- You will need a spoon, toothbrush, cup, pen and comb.
- Lay the objects out in front, and in reach, of the patient. Ensure they are laid out in the order listed above, starting with the spoon on the patient’s left.
- Body parts and objects have been included which may help to identify the presence of:
  - dyspraxia (difficulty co-ordinating the movement to point to a body part)
  - difficulties with object recognition
- Say to the patient, “Now I am going to ask you to follow some instructions”
- Word the instructions as listed on the screening tool
- Always complete “stage 1” commands and “function”
- Discontinue stage and complex commands if the patient scores <2 (i.e. 0 or 1) on the preceding level.
- If the patient appears able to identify objects to one side of their visual field, but not the other, move the objects into their line of vision. Document that this has been the case, and consider whether the responses may have been impacted by visual neglect.
- No verbal response is required from the patient. If the patient is [physically] unable to point, you may point to the objects in turn and ask “this one?” Ensure you change the order of presentation so that the correct response is
not always the first or last object you point to. Document that the screen has been completed in this way.

- Score 1 mark for each command correctly carried out

**Expression**

For this section:

- Instructions can be repeated once for each stimulus. (The purpose of this section is to screen expressive difficulties, not receptive).
- Responses need to be semantically and phonemically accurate. Responses with phonemic errors should be marked incorrect; it maybe that the patient demonstrates no word finding difficulties but requires on-going therapy for dyspraxia, dysarthria or phonemic errors associated with aphasia.
- No cueing / prompting is allowed unless otherwise stated in the following protocol
- Maximum score = 22

Say to the patient, “**Now we are going to look at your talking and whether you can find the words you want.**”

**E1 Automatic Speech**

- Ask the patient, “**Can you tell me your name?**”
- Ask the patient, “**Can you tell me your address?**”
- Ask the patient, “**Can you count to ten?**”
- Ask the patient, “**Can you say the days of the week, starting with Monday?**”
- Score 1 point for each correct response

**E2 Phrase Completion**

- Say to the patient, “**I am going to ask you to complete some phrases, for example, ‘bucket and spade’**”
- Say to the patient “**Bread and ...**”
  - Acceptable responses: butter, cheese, jam, milk
- Say to the patient “**Knife and ...**”
  - Acceptable responses: fork
  - Do not accept “**spoon**” as this may be indicative of a semantic error
- Say to the patient “**Salt and ...**”
  - Acceptable responses: pepper, vinegar, chips
- Say to the patient “**Pen and ...**”
  - Acceptable responses: paper, ink, pencil
- Verbal responses are required; score 1 point for each complete phrase
E3 Picture Naming

- Use the set of 6 pictures provided with the screen. These should be presented as a single sheet.
- If the patient is able to name items to one side of the visual field, consider moving the sheet into their line of vision (consider whether patient may be experiencing visual difficulties)
- Pointing to the pictures 1 at a time, ask the patient, “What is this one called?”
- Acceptable VERBAL responses
  - Glasses (specs / spectacles)
  - Hat (trilby / panama; “cap” is not acceptable)
  - Key (no alternative)
  - Banana (no alternative, “fruit” may indicate word finding difficulty)
  - Watch (wrist watch; “clock” / “timepiece” not acceptable)
  - Scissors (no alternative)
- Pointing to the pictures 1 at a time, ask the patient “What do you do with this?”
- If the patient responds through gesture, this should be marked as incorrect but documented as this may help inform use of communication aids / intervention following the screen
- Acceptable VERBAL responses
  - Glasses: wear / see / read
  - Hat: wear it / put it on your head
  - Key: unlock a door / get in the house
  - Banana: eat it / peel it
  - Watch: wear it / tell the time
- Score 1 point per correct response (max 6 for naming; 6 for function, section total = 12)

E4 Sequencing

- Say to the patient, “Can you describe to me how you would make a cup of tea?”
- Score 1 mark for including at least 3 stages in the correct order

E5 Category Fluency

- Say to the patient, “Now I want you to name as many animals as you can in 1 minute.... Ready?....Go”
- Time for 1 minute
- Any animal / bird / insect can be accepted.
- Animals “within categories” (e.g. robin, sparrow, blackbird) can be scored as separate animals
• Make a note of the number of correct responses, ignoring any that are repeated or given more than once.
• Score 1 mark for naming 7 or more animals in 1 minute.
• *Logico-Relationships and Verbal Reasoning*

This section has been included to help exclude higher level language difficulties at the point of admission to the ward, thus helping to inform necessary intervention / onward referral to OP service.

This section should only be completed following **adequate** performance on the preceding sections.

**We need to define “adequate”**; however this may need to be addressed after results are collated from normative data. For the purpose of the collection of normative data, ALL three sections (receptive, expressive and logico-relationships) should be attempted.

Say to the patient, “*Just a few more questions if that is ok?*”

• Say to the patient *“Hot is to cold as wet is to….”*  
  o “DRY” is the only acceptable response
• Say to the patient, “*I watched Eastenders on television after I had eaten my dinner. What did I do first?*”  
  o Acceptable responses: “ate/had” “dinner/food/supper/tea”
• Say to the patient, “*Why would you call 999?*”  
  o Acceptable responses: fire / ambulance / police / emergency
• Say to the patient, “*What is meant by ‘let the cat out of the bag’?*”  
  o Acceptable responses: secret
• Verbal responses are required; 1 point per correct response

Say to the patients “*No more questions, do you have anything you want to ask me?*”

If you are happy at this point to offer some feedback to the patient, then do so. It is acceptable to tell the patient that you need to look through the scores / discuss with colleagues (particularly relevant for SLTa colleagues who have completed the screening process) prior to suggesting further assessment, on-going intervention or strategies and advice.

*Speech Intelligibility*

**This section is not scored**; there are no norms for this section. However, as a subjective measure, this can be used to gauge intelligibility or whether slurred speech is evident.

Ask the patient, “*Does your speech sound normal to you?*”
Then consider:

- Did the patient’s speech sound slurred during the screen?
- Did you have to ask the patient to repeat any of their responses?

If the patient is concerned, or answer to either of the above considerations is “yes”, then further investigation or assessment may be warranted.
Appendix C: Supplemental material for administration of the ABUHB CST (Yes/No prompt and pictures used)
### ABUHB Communication Screening Tool (Acute Stroke)

**Date of Screen:**

**Time of Screen:**

**Name of Examiner:**

**Summary Scores:**

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehension</td>
<td>16 / 16</td>
</tr>
<tr>
<td>Expression</td>
<td>22 / 22</td>
</tr>
<tr>
<td>Logico-Relations and Reasoning</td>
<td>4 / 4</td>
</tr>
<tr>
<td>Total</td>
<td>42 / 42</td>
</tr>
</tbody>
</table>

**Comments:**

Total Time - 4 min 38 secs

---

### Comprehension

Say to the patient, “This section is about your understanding.”

**C1:** Yes/No questions (Yes/No card required. Verbal or non-verbal response acceptable; 1 point per correct response) Say to the patient, “I am going to ask you some questions. You just need to reply yes or no, you can use thumbs or point to the words if that is easier…”

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is your name Jack/Joan?</td>
<td>✓</td>
<td></td>
<td>Is ice cream hot?</td>
<td></td>
<td></td>
<td>6 / 6</td>
</tr>
<tr>
<td>Is your name (correct)?</td>
<td>✓</td>
<td></td>
<td>Is a cat an animal?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you sitting in a chair?</td>
<td>✓</td>
<td></td>
<td>Are squares round?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**2.2 secs**

**C2:** Commands (you will need a spoon, toothbrush, cup, pen and comb; lay objects out in a row in the order listed, with the spoon on the patient’s left; 1 point per correct response) Say to the patient, “Now I am going to ask you to follow some instructions.” (Word the instructions as written below).

<table>
<thead>
<tr>
<th>Level</th>
<th>Instructions</th>
<th>Tick if correct</th>
<th>Comments</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 stage</td>
<td>Point to the pen</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to your lips</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to the toothbrush</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 stage</td>
<td>Point to the spoon &amp; the cup</td>
<td>✓</td>
<td></td>
<td>10 / 10</td>
</tr>
<tr>
<td></td>
<td>Point to your nose and then the comb</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to the pen &amp; the toothbrush</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex</td>
<td>Before you point to your nose, point to the object furthest right</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>Point to the one you eat with?</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to the one you write with?</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Point to the one you clean your teeth with?</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**4.3 secs**

### Expression

Say to the patient, "Now we are going to look at your talking and whether you can find the words you want."

#### E1: Automatic Speech (1 point per correct response)

<table>
<thead>
<tr>
<th>Ask the patient: &quot;Can you...&quot;</th>
<th>Tick if correct</th>
<th>Comments</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>... tell me your name</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>... tell me your address</td>
<td>✓</td>
<td></td>
<td>4/4</td>
</tr>
<tr>
<td>... count 1-10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>... tell me the days of the week, starting with Monday</td>
<td>✓</td>
<td></td>
<td>4/4</td>
</tr>
</tbody>
</table>

#### E2: Phrase Completion (1 point per correct response)

Say to the patient, "I am going to ask you to complete some phrases, for example 'bucket and spade'" (For acceptable responses, refer to assessment protocol)

<table>
<thead>
<tr>
<th>Phrase</th>
<th>Tick if Complete</th>
<th>Comments</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knife and</td>
<td></td>
<td></td>
<td>4/4</td>
</tr>
<tr>
<td>Salt and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pen and</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### E3: Picture Identification (using picture sheet provided; verbal response required - 1 point per correct response)

Say to the patient, "Now we are going to look at some pictures.

<table>
<thead>
<tr>
<th>Picture</th>
<th>Naming: ask the patient &quot;what is this one called?&quot; Tick if correct</th>
<th>Function: ask the patient &quot;what do you do with this?&quot; Tick if correct</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glasses</td>
<td></td>
<td>wear them</td>
<td>1/12</td>
</tr>
<tr>
<td>Hat</td>
<td></td>
<td>use on your head</td>
<td></td>
</tr>
<tr>
<td>Key</td>
<td></td>
<td>open a door</td>
<td></td>
</tr>
<tr>
<td>Banana</td>
<td></td>
<td>eat it</td>
<td></td>
</tr>
<tr>
<td>Watch</td>
<td></td>
<td>tell the time</td>
<td></td>
</tr>
<tr>
<td>Scissors</td>
<td></td>
<td>cut paper</td>
<td></td>
</tr>
</tbody>
</table>

#### E4: Sequencing

Say to the patient: 'Can you describe in order how you would make a cup of tea?

Score 1 point if 3 or more stages described in the correct order | 1/1

#### E5: Category Fluency

Tell the patient: 'I am going to give you one minute to tell me as many different animals as you can. Ready?...Go.

Score 1 point if 7 or more animals named in 1 minute. | 1/1

### Logico-Relationships and Reasoning

**LR1: 1 point per correct response.** Say to the patient, "just a few more questions, if that’s ok?"

<table>
<thead>
<tr>
<th>Level</th>
<th>Question</th>
<th>Correct?</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic</td>
<td>Hot is to cold as wet is to...</td>
<td>✓</td>
<td>4/4</td>
</tr>
<tr>
<td>Grammatical</td>
<td>I watched Eastenders on the television after I had eaten my dinner. What did I do first?</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Verbal Reasoning</td>
<td>Why would you call &quot;999&quot;?</td>
<td>✓</td>
<td>4/4</td>
</tr>
<tr>
<td>Verbal Reasoning</td>
<td>What is meant by &quot;let the cat out of the bag&quot;</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

### Speech Intelligibility

Ask the patient: 'Does your speech sound normal to you? Do you have any concerns about your speech?'

Did you notice the patient slurring their words? Did you have to ask the patient to repeat any of their answers?

Tick if no concerns

Tick if yes

Appendix E: Ethical Approval Letter

Monday, 14 November 2016
cshs/ethics /approved - interim/

BSc (Hons) Speech & Language Therapy
Cardiff School of Health Sciences

Dear Applicant

Re: Application for Ethical Approval: Normative data for the standardisation of an acute aphasia screening tool: influence of age, gender and educational level.

Ethics Reference Number : 8447

Your ethics application, as shown above, was considered by the Health Care and Food Ethics Panel on 16/11/2016

I am pleased to inform you that your application for ethical approval was APPROVED, subject to the conditions listed below – please read carefully.

Standard Conditions of Approval

- Your Ethics Application has been given a Project Reference number as above. This MUST be quoted on all documentation relating to the project (E.g. consent forms, information sheets), together with the full project title.

- All documents must also have the approved University Logo and the Version number in addition to the reference and project title as above.

- A full Risk Assessment must be undertaken for this proposal, as appropriate, and be made available to the Committee if requested.

- Any changes in connection to the proposal as approved must be referred to the Panel/Committee for consideration without delay quoting your Project Reference Number. Changes to the proposed project may have ethical implications and so must be approved.

- Any untoward incident which occurs in connection with this proposal must be reported back to the Panel/Committee without delay.

- If your project involves the use of human samples, your approval is given on the condition that you or your supervisor notify the HTA Designated Individual of your
intention to work with such material by completing the form entitled “Notification of Intention to Work with Human Samples”. The form must be submitted to the PD BEFORE any activity on this project is undertaken.

This approval expires on **16/11/2017**. Please set a reminder on your Outlook calendar or equivalent if you need to continue beyond this approval date. It is your responsibility to reapply / request extension if necessary.

Yours sincerely

Chair of Department of Healthcare and Food Ethics
Panel Cardiff School of Health Sciences

Cc: Project Supervisor

PLEASE RETAIN THIS LETTER FOR REFERENCE
PARTICIPANT CONSENT FORM

Reference Number: 8447

Participant name or Study ID Number:

Title of Project: The collection and analysis, in relation to demographic variable, of normative data for the standardisation of an acute aphasia screening tool.

Name of Researcher: Sophie Reid

Participant to complete this section: Please initial each box.

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

3. I agree to take part in the above study.

4. I agree to the data collected today being retained for future research purposes

____________________________________   ___________________
Signature of Participant

____________________________________   ___________________
Date

_______________________________________  ___________________
Name of person taking consent

____________________________________   ___________________
Signature of person taking consent
Reference number: 8447

Participant Information Sheet

Title of Project: Normative data for the standardisation of an acute aphasia screening tool: influence of age, gender and educational level.

Background

Speech and language difficulties often occur after stroke. One of the Speech and Language Therapists’ (SLT) roles in hospital is to assess these difficulties. The SLT team in the Aneurin Bevan Health Board (ABUHB) have developed a new assessment, The ABUHB Communication Screening Tool (Acute Stroke), to help them identify if patients on the stroke wards have a speech or language difficulty. This will allow them to consider and plan therapy that will be most beneficial for the patient’s recovery.

This project is concerned with collecting data on how normal healthy individuals perform on the ABUHB Communication Screening Tool (Acute Stroke). This is useful to know as it allows SLTs to find out who has speech and language difficulties and whose language abilities are in line with those who haven’t had a stroke.

There are a number of areas that this project will consider when collecting data, looking at if they have an influence on how a participant would perform:

(i) Gender
(ii) Age
(iii) Level of Education

The results will be presented as a student undergraduate project in Cardiff Metropolitan University. The report will also be given to the SLTs involved in developing the assessment and might also be published.
Your participation in the research project

Your participation in this project is entirely voluntary. You should not feel obliged to take part. If you decide to stop, you can do so at any time. You do not need to give a reason why. If you change your mind you can ask to withdraw your data at any time before the project is finished.

Why you have been asked

You have been invited to take part in this project. You are suitable to take part if you are someone who has no history of a:

- stroke,
- acquired neurological disorder,
- learning disability,
- diagnosed memory deficit (e.g. dementia),
- physical disability that will restrict your participation in the assessment.

Additionally you have adequate hearing and vision and you will be a monolingual English Speaker.

These criteria have been put in place as such factors have been known to influence performance on similar language assessments. There are no exclusion criteria for education level. I am aiming to recruit 60 participants, above 18, across a wide range of ages.

What would happen if you agree to participate in the project?

If you agree to participate in this study it will be arranged for you to meet with the researcher who will administer the ABUHB Communication Screening Tool (Acute Stroke) to you. This will involve simple language tasks, including both talking and understanding of speech. Testing will take place in a quiet room so that confidentiality can be maintained. The room will be in a convenient and safe place for you. Testing will take about ten to fifteen minutes.

Are there any risks?

We do not think there are any significant risks to taking part in this study.

What happens to the results of the assessment?

Your anonymity will be protected at every stage in the process. The data collected will be stored securely in locked filing cabinets at the University or in a password encrypted computer. We will present all the participants data together, and there will be no description that would identify individuals. The results will be written about in a student project report. We will also present a report outlining the results to the therapists involved in developing the assessment. Data collected may be securely stored for future research purposes. You may opt out of this without it influencing your participation in the research.
study. If you choose to opt out your data will be destroyed following completion of the student project study.

**Are there any benefits from taking part?**

You will be contributing to improving care for stroke patients.

**What happens next?**

There is a form with this sheet for you to give consent to participate in this research. Please take your time to make sure you understand all aspects of this research before completing this. This form must be completed prior to participation in any data collection. The consent forms will be stored securely by the project supervisor at the University for five years after completion of the project.

**How we protect your privacy:**

Everyone working on the study will respect your privacy. We have taken very careful steps to make sure that you cannot be identified from any of the information that we have about you. All the information about you will be stored securely away from the consent forms. At the end of the study we may securely store it for future research purposes. However you may opt out of this, if so all information will be destroyed following completion of the student project.

**For more information**

If you have any questions about the research or how we intend to conduct the study, please contact the project supervisor:

Project Supervisor name and title

Phone:

E-mail:
Appendix H: E-mail sent to organisations for participant recruitment

To Whom It May Concern,

I am a Speech and Language Therapy student at Cardiff Metropolitan University. As part of my degree I am conducting a research project and am writing to you to request if there is any way you could support me in the recruitment of people aged 50+ in the Cardiff and Vale or Milton Keynes area, either by circulating the information or by allowing me to attend meetings of your organisation in order to approach possible participants there.

Following a stroke, speech and language difficulties often occur. One of the Speech and Language Therapists' (SLT) roles in hospital is to assess these difficulties. The SLT team in the Aneurin Bevan Health Board (ABUHB) have developed a new assessment, The ABUHB Communication Screening Tool (Acute Stroke). This is to help them identify if patients on the stroke wards have a speech or language difficulty. This will allow them to consider and plan therapy that will be most beneficial for the patient’s recovery.

This project is concerned with collecting data on how normal healthy individuals perform on the ABUHB Communication Screening Tool (Acute Stroke). This is useful to know as it allows SLTs to find out who has speech and language difficulties and whose language abilities are in line with those who haven’t had a stroke.

There are a number of areas that this project will consider, looking at if they have an influence on how a participant would perform. These are gender, age and level of education.

As age is a significant factor that may influence the results, it is important that data is collected from a number of people across a wide variety of age ranges.

Participants that would be suitable for involvement in this project would be monolingual English speakers, with no history of stroke, acquired neurological disorder, learning disability, diagnosed memory deficit, or physical disability. They also need to have adequate hearing and vision.

I have included the participant information sheet which includes more details on what is required from participants.

Thank you for your time and consideration, any assistance in participant recruitment would be greatly appreciated. Should you have any questions please do not hesitate to contact me or my project supervisor.

Yours sincerely,
CONFIDENTIALITY CHECKLIST

Speech and Language Therapy

Student number: St20036916 Date: 19/04/17
Module leader: Robert Mayr Module number: 6080
Assignment: Project

Evaluate your submission and any supporting documentation, appendices etc. by answering the following questions:

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Have you identified any person by their real name?</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>2  Has any organisation been identified by its real name?</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>3  Has any place been identified by its real name?</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>4  Have any exact dates of birth been stated?</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>5  Have any addresses and / or postcodes been included?</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>6  Have any identifiable logos or letterheads been included which might identify any individuals, places or organisations?</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>7  Has any other documentation been included with this submission that might enable any individuals, places or organisations to be identified?</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

If you have answered 'yes' to any questions, please explain why you feel this does not constitute a breach of confidentiality in the space below:

I have identified the people I need to thank in my acknowledgments, as is appropriate for this project.

The health board ABUHB has been referred to a number of times, this was unavoidable as it is included in the name of the screen I am validating, the focus of my study. Furthermore, it was relevant to describe the background behind the screen and credit needed to be given to those responsible. In the body of the text no further personal information was given.

The Cardiff Metropolitan University address and letter header is included in the appendices, this is the organisation that the project is to be submitted to.
Appendix K: Word Count

<table>
<thead>
<tr>
<th>Section</th>
<th>Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>259</td>
</tr>
<tr>
<td>Literature Review</td>
<td>3,841</td>
</tr>
<tr>
<td>Methodology</td>
<td>1,347</td>
</tr>
<tr>
<td>Results</td>
<td>1,130</td>
</tr>
<tr>
<td>Discussion</td>
<td>3,416</td>
</tr>
<tr>
<td>Total</td>
<td>9,993</td>
</tr>
</tbody>
</table>