An Audit of Clinical Practice and the Implementation of Aphasia Language Impairment and Functioning Therapy (LIFT) in an Inpatient Rehabilitation Setting

by

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List of Abbreviations

CI	Chief Investigator
PWA	Person with aphasia
PD	Parkinson's disease
TPO	Time post-onset
MND	Motor Neurone Disease
QOL	Quality of life
LOS	Length of stay
NSF	National Stroke Foundation
SP	Speech Pathology
ICAP	Intensive Comprehensive Aphasia Program
CILT	Constraint Induced Language Therapy
LIFT	Language Impairment and Functioning Treatment
AAC	Augmentative and Alternative Communication
CETI	Communication Effectiveness Index
HREC	Southern Adelaide Clinical Human Research Ethics Committee
HRC	Hampstead Rehabilitation Centre
BNT	Boston Naming Test
WAB	Western Aphasia Battery
AQ	Aphasia Quotient
Yo	Year old
MCA	Middle Cerebral Artery
L	Left sided
CVA	Cerebrovascular Accident
CAT	Comprehensive Aphasia Test
ALA	Assessment for Living with Aphasia
FQ	Fatigue Questionnaire
AHA	Allied Health Assistant
PT	Physiotherapy
OT	Occupational Therapy
BoSS	Bank of Standard Stimuli
SFA	Semantic Feature Analysis

PCA	Phonological Component Analysis
GAS	Goal Attainment Scaling
FCTP	Functional Communication Therapy Planner
ICH	Intracranial Haemorrhage
WH	Participant One
KL	Participant Two
VAS	Visual Analogue Scale

Abstract

Background

Aphasia is a language disorder that can have devastating effects on an individual's ability to communicate. There are currently many different forms of aphasia therapy techniques used by speech pathologists to treat this acquired disorder. Presently, there is no universally accepted treatment approach; however, there has been a growing interest in intensive programs.

Two studies were conducted to explore: (1) the service provision to patients with acquired aphasia post stroke and (2) the effectiveness of an intensive aphasia intervention in an inpatient rehabilitation centre.

Study 1 was a clinical audit of service delivery of aphasia rehabilitation in a metropolitan rehabilitation hospital in Australia. The aim of the study was to investigate adherence to the National Stroke Foundation (NSF) Clinical Guidelines and the Australasian Rehabilitation Outcomes Centre (AROC) database of benchmarks. The aim of the audit was to identify the average length of stay and average therapy provision time, and to investigate adherence to stroke and aphasia rehabilitation guidelines. It is important that clinical services align with the AROC benchmarks and only when they align, novel intervention can feasibly be explored. The findings of the audit informed the appropriateness of implementing an Intensive Comprehensive Aphasia Program (Study 2) in the same rehabilitation hospital. This program was the Aphasia Language Impairment and Functioning Therapy (LIFT) and the clinical implications of its implementation in an inpatient rehabilitation setting were investigated.

Methods

Study 1 comprised a retrospective audit of 34 discharged patients with aphasia. The analysis of discharge reports, Functional Independence Measure (FIM) scores and staff clinical time statistics took place between March 2012 and July 2013.

Study 2 occurred from January to June 2016 and comprised a single subject design that included two participants. LIFT treatment comprised impairment-based language therapy, functional communication therapy, group and computer therapy. The treatment consisted of 3 hours of therapy intervention per day, 5 days a week, for 3 weeks; totalling 45 hours. The effects regarding language impairment, functional communication, intensity and quality of life (QOL) were investigated.

Results

Results from the clinical audit revealed that the mean length of stay for patients with aphasia was 60 days, significantly longer than the calculated average AROC benchmark of 32.8 days. Patients with aphasia received an average of 4.25 hours direct speech pathology therapy per week, more than twice the minimum amount of therapy time recommended by the NSF Guidelines.

Results of the LIFT study showed that Participant 1 demonstrated substantial, clinically meaningful improvements in the domains of language impairment, functional communication, and QOL. In particular, participant 1 demonstrated improved naming accuracy on both treated and untreated items, the Boston Naming Test (BNT), the naming subtest of the Western Aphasia Battery (WAB) and also in overall language function measured using the WAB Aphasia Quotient (AQ). She was able to cope with the high intensity of LIFT.

Participant 2 made clinically meaningful improvements in overall language recovery (WAB Aphasia Quotient), QOL measures and functional communication. However, he did not demonstrate improved naming accuracy in either the WAB, or the BNT. He was able to tolerate the high intensity of LIFT.

Conclusion

The clinical audit is the first speech pathology audit investigating adherence to stroke and aphasia rehabilitation guidelines set forth by the NSF clinical guidelines and AROC benchmarks in Australia. The average length of stay and service provision within a local hospital were established, which informed the appropriateness of the LIFT study to be implemented within the same hospital.

Results from the LIFT study were encouraging. Both participants demonstrated clinically meaningful improvements in overall language function. Furthermore, one participant showed greater improvement in naming accuracy beyond that expected by spontaneous recovery alone. The effect of spontaneous recovery was considered, however the overall findings demonstrated the effectiveness of the LIFT program in at least one participant, highlighting that the LIFT program could be considered as a service delivery option in an inpatient rehabilitation setting.

Declaration

I certify that this thesis:

1. does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and

2. to the best of my knowledge and belief, does not contain any material previously published or written by another person except where due reference is made in the text.

I acknowledge that copyright of all material contained in my thesis resides with the copyright holder(s) of that material. Where appropriate I have obtained copyright permission from the copyright holder to reproduce material in this thesis.

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Chapter 1- Introduction

1.1 Background

This research was borne out of the clinical experiences of the Chief Investigator (CI) who worked in the area of aphasia rehabilitation for over twelve years. During this time, it became increasingly apparent that the public health system was demanding improved outcomes for inpatients while simultaneously cutting expenditure by reducing length of stay. This posed a challenge to the CI, for instance, to consider what therapy options were available for people with aphasia that could expedite recovery within a short timeframe. As a result, the current levels of service delivery were explored with a Clinical Audit (see Chapter 2) which informed the suitability to investigate one specific evidence based aphasia program, called Aphasia Language Impairment and Functioning Treatment (LIFT), which is described in more detail in this chapter. Aphasia LIFT has previously been explored in group studies in the community setting (within university clinics). To the best of my knowledge, this thesis presents the *first exploration of the application of LIFT within an established inpatient (sub-acute) rehabilitation setting* in order to evaluate the clinical implications and whether it benefited a person with aphasia (PWA).

1.2 Introduction

Aphasia is an acquired language impairment that has a greater prevalence in Australia than Parkinson's disease (PD), yet the average Australian is unfamiliar with the condition (DeLoitte Access Economics, 2014). Given the high prevalence, aphasia requires greater research efforts to determine treatments that are effective and clinically viable, to guide consistent and evidence-based service delivery amongst clinicians. With rising health care costs and the growing need for clinicians to be accountable for their services, it is prudent to ensure that funds are being spent on services that are evidence based to achieve the best result; in this case, improved language ability and communication.

1.3 Definition of Aphasia

Aphasia is an acquired multi-modality language impairment following damage to the language dominant cerebral hemisphere, typically the left hemisphere (Bhogal, Teasell, & Speechley, 2003). It is referred to as "multimodal" because it can impair an individual's ability

to produce and comprehend language by affecting verbal and/or written expression, auditory and/or reading comprehension. Additionally, it can affect gesture, arithmetic and other cognitive processes such as, but not limited to, memory, problem solving and attention (Chapey, 2008). Aphasia is most commonly caused by stroke and has a sudden onset. The latter differentiates it from other types of language impairment that are progressive and may be caused by dementia (Bhogal et al., 2003). The content of this thesis is focused on stroke-induced aphasia in the sub-acute phase of recovery. The different and often conflicting phases of aphasia recovery will be defined in chapter 1.4.

1.4 Definition of Acute, Sub-acute and Chronic

The terms acute, sub-acute and chronic are used in medicine to explain the different stages of a disease. There are conflicting opinions regarding the interpretation of the time post-onset of stroke when using these terms.

Originally, Robey (1994) defined the *acute* stage as less than 4 months (<4) post-onset and the *chronic* stage commencing at 4 months onwards (≥4). However, he revised these definitions in a later publication (Robey, 1998), when he changed the acute stage into less than 3 months (<3) post-onset, the post-acute stage as greater than or equal to 3 months and up to 12 months (≥3 – 12), and the chronic stage as equal to or greater than 12 months (≥12). There is no mentioning of a sub-acute phase (see below).

Linebaugh, Baron, and Corcoran (1998) also refer to the terms *acute* and *chronic* as defined by the time post-onset of cerebral insult and, like Robey, they do not mention a *sub-acute* phase. Consistent with Robey (1998), they also define the acute stage as less than 3 (<3) months post-onset and chronic as greater than or equal to 3 months post-onset (≥3).

On the other hand, Godecke (2008) mentions a subacute phase in her PhD thesis, defining the acute, sub-acute and chronic stages of recovery as follows:

Acute Phase:	From time of stroke onset to four weeks post-stroke (< 4 weeks)
Sub-acute Phase:	(overlapping with the acute phase) Starting from four days post-stroke to four months (4 days – 4 months)
Chronic Phase:	From 4 months onwards (> 4 months)

Sickert, Anders, Munte, and Sailer (2014) defined the sub-acute phase as 1-4 months post-onset, which relatively concurs with Godecke's (2008) definition. Despite the lack of overall conformity regarding the time window of the different stages during recovery after stroke, there seems to be some consistency regarding the sub-acute phase of recovery, namely from 4 days to 4 months post-onset (Godecke, 2008; Marsh & Hillis, 2006; Sickert et al., 2014).

Therefore, for the purpose of this study, the sub-acute phase will be defined as 4 days to 4 months (4 days – 4 months) time post-onset (TPO) of stroke. This phase coincides with spontaneous recovery, the early recovery period following onset of stroke. The entire period of spontaneous recovery is not clearly defined, however, it can span up to 12 months post stroke (Pulvermüller, Hauk, Zohsel, Neininger, & Mohr, 2005; Robey, 1998).

1.5 Awareness of Aphasia

Prevalence indicates how many individuals are affected by a condition in a given population at a given point in time. In Australia, it is estimated that around 80,000 individuals present with aphasia (Australian Aphasia Association, 2010). Interestingly, aphasia is more prevalent than Parkinson's disease (PD), with an estimated Australian prevalence of 69,208 individuals in 2014 (Deloitte Access DeLoitte Access Economics, 2014) and also far more prevalent than Motor Neurone Disease (MND), with an estimated prevalence of 2,094 people in Australia in 2015 (Deloitte Access Economics, 2015).

Despite the high prevalence of aphasia, there is still a poor level of awareness of the condition when compared to these better-known diseases of lower prevalence/incidence (Code et al., 2001; Elman, Ogar, & Elman, 2000; Flynn, Cumberland, & Marshall, 2009; Simmons-Mackie, Code, Armstrong, Stiegler, & Elman, 2002). For instance, Simmons-Mackie et al. (2002) conducted a face to face survey in Australia, USA and England to establish whether the participants '*had heard of aphasia*' and/or '*had basic knowledge of aphasia*'. Out of the 978 participants surveyed, only 13.6% (n=133) had heard of aphasia and only 5.4% (n=53) had basic knowledge of aphasia. A similar survey conducted in Australia showed that 12% of participants had heard of aphasia and 7.6% had basic knowledge of aphasia. Similar findings have been shown by other researchers (Code et al., 2001; Flynn et al., 2009; Mavis, 2007). Elman et al. (2000) pointed out that the general shroud of mystery that surrounds the term aphasia and what it entails is due to the poor advocacy of carers, health professionals and the general inability of PWAs to advocate for themselves, rather than secondary to the (relative) prevalence of aphasia.

The above highlights the urgent need for aphasia advocacy and understanding, as aphasia is as prevalent as (if not more than) many other neurological disorders. Lack of awareness of aphasia also has implications for PWAs, their significant others and their health professionals. This national lack of awareness can lead to reduced services being available to help support recovery of PWAs, with service provision remaining reactive and highly inconsistent between individuals (Rose, Ferguson, Power, Togher, & Worrall, 2013). This, in turn, leads to reduced funding towards research and services for PWAs (Elman et al. (2000). Researchers, clinicians, health professionals, carers and friends of PWAs may need to actively support and promote the awareness of aphasia, so we may contribute to treating, managing and supporting PWAs and their loved ones.

The aim of this thesis is to contribute to the growing awareness and understanding of aphasia, with the view to promote improved services for PWAs. The following sections will highlight the impact of aphasia and the need for clinical research of the effectiveness of aphasia therapy in the subacute phase.

1.6 Impact of Aphasia on Quality of Life

Stroke-induced aphasia has devastating long term effects for the individual and their significant others. It is common for PWAs to have persisting communication deficits for the remainder of their lives (Davidson, Howe, Worrall, Hickson, & Togher, 2008). The quality of life (QOL) of PWAs is greatly compromised and this can ultimately lead to depression and low psychological wellbeing. PWAs are likely to also experience higher levels of anxiety compared to, for example, stroke survivors without aphasia (Hilari, 2011; Hilari & Byng, 2009). Specifically, it has been shown that there is a correlation between aphasia severity and degree of impact on QOL in individuals with either severe (Hilari & Byng, 2009) or mild to moderate aphasia (Hilari, Byng, Lamping & Smith, 2003). This is in keeping with other studies examining the adverse effects on the QOL of PWAs (Dalemans, de Witte, Wade, & van den Heuvel, 2010; Davidson et al., 2008; Hilari, 2011).

Not only is there a reduced social network (and in turn, reduced QOL) for PWAs, but also for their primary carers. For example, several studies have shown that aphasia significantly increases stress on carers (Christensen & Anderson, 1989; Hilari & Northcott, 2006; Howe et al.; McGurk & Kneebone, 2013; McGurk, Kneebone, & Pit ten Cate, 2011). In particular, carers of PWAs have higher levels of stress and burden of care, compared to carers of stroke survivors without aphasia (Bakas, Kroenke, Plue, Perkins, & Williams, 2006).

Because of the demonstrated negative impact on QOL, it is critically important that

aphasia is addressed as efficiently and effectively as possible, in order to reduce the burden on PWAs and their carers. The QOL of PWAs will also be addressed in this thesis, namely with PWAs who are in the sub-acute phase of recovery and were inpatients at the time of the study.

1.8 Application of aphasia programs in the Clinical Setting

Aphasia is an independent indicator of prolonged length of stay (LOS) in inpatient facilities and requires increased rehabilitation services, which in turn, results in a larger financial burden to the health care system (Dickey et al., 2010). However, global shifts in resource/cost *reductions* combined with patients' requests for *more* and effective aphasia treatments are a growing trend in healthcare (Worrall et al., 2011). Given that patients are requesting more therapy and the health system is demanding reduced LOS levels, research into effective service delivery and the development of innovative and effective treatments for aphasia rehabilitation are urgently needed.

An intensive aphasia program may be ideal in the sub-acute setting as it addresses both the patients' and health care system's needs by empowering patients to reach their communication goals sooner (for instance, with intensive treatment), and thus, may enable earlier discharge from hospital, as demonstrated by Jette, Warren, and Wirtalla (2005).

1.9 Optimal Timing of Intensive Therapy

Intensive therapy for aphasia is an area of great interest to PWAs, clinicians and researchers. Although studies have demonstrated that while intensity may be a key ingredient to language recovery, it is not the single factor (Barthel, Meinzer, Djundja, & Rockstroh, 2008; Cherney, Patterson, Raymer, Frymark, & Schooling, 2010; Dignam et al., 2016). It is also important to consider the *timing* of implementing a treatment program in order to obtain maximum language recovery.

Researchers often investigate the therapeutic effect of treatments in the chronic stages of aphasia to demonstrate that treatment - rather than spontaneous recovery - stimulated language recovery (Barthel et al., 2008; Bhogal et al., 2003; Lendrem & Lincoln, 1985). While the chronic stage of aphasia is an ideal time to investigate treatments (for researchers), it may not result in maximum language recovery for the participant. Instead, there may be a window of opportunity for PWAs to engage in intensive rehabilitation in the early days/months post-stroke when the greatest speed of (spontaneous) recovery is occurring. Participants therefore may achieve improved language recovery when intensive rehabilitation is implemented during

this time. However, this raises an ethical dilemma: whilst studying treatment effectiveness after the spontaneous recovery period is more ideal for researchers, this may result in participants missing out on the opportunity to achieve their language recovery potential when not exposed to the treatment in an earlier timeframe.

Results of a meta-analysis conducted by Robey (1998) indicated that aphasia rehabilitation had greatest therapeutic effect when implemented within 0-3 months post-stroke. Treatment during this period of spontaneous recovery produced an average effect size that was almost twice of the effect size for spontaneous recovery alone (without treatment).

Lazar et al. (2010) also demonstrated that patients with aphasia who received rehabilitation within the first 3 months post stroke, recovered up to 73% of their maximal potential recovery. Studies on neuroplasticity further support that the timing of intense aphasia treatment within the sub-acute recovery phase is crucial as reorganisation of the brain most rapidly occurs in the subacute phase (Marsh & Hillis, 2006). This was built upon by Kleim and Jones (2008) who defined the ten principles of neuroplasticity and in particular highlight the 6th principle, Time Matters, stating that rehabilitation therapy is most effective when provided soon after injury, rather than in the chronic phase (see Table 1).

In summary, when considering the best time to implement intensive rehabilitation, TPO (in days and months) needs to be considered, rather than the ambiguous clinical phases that are used to refer to aphasia, such as: (a) acute (when the PWA is immediately in hospital post stroke), (b) sub-acute (inpatient or outpatient rehabilitation) and (c) chronic (ongoing and in the community). In addition, the combined findings strongly suggest that intensive aphasia treatment, ideally implemented in the sub-acute recovery phase, defined as 4 days to 4 months post-stroke, may result in the greatest language recovery. Therefore, the objective of this research project was to explore the therapeutic effect of an aphasia program implemented during this recommended time frame as a Phase I exploratory study.

1.10 Therapy during the Spontaneous Recovery Period

It is considered advantageous to study treatment effects on language function in the chronic stages of aphasia (after 12 months post stroke) to avoid the effects of spontaneous recovery (Hartman, 1981; Pulvermüller et al., 2005). As a result, most PWAs considered to be within the spontaneous recovery period have been excluded from many aphasia treatment studies.

However, one should not fail to take into consideration the effect of spontaneous recovery during aphasia efficacy studies. Robey (1998, p 183) recommends between group

statistical testing to demonstrate potential differences between treatment effects and the effect of spontaneous recovery. T-test scores exceeding an effect size of 0.68 (when tested at <3month post onset of stroke) would demonstrate treatment effectiveness; as scores less 0.68 are considered primarily due to spontaneous recovery. He further concludes that "the criterion for meaningful change from pretest to posttest should exceed the d value one could expect from treatment on average (i.e., d > 1.15)". In order to apply these group statistical tests to establish treatment effectiveness, it has also been recommended that any study design includes large sample sizes to account for spontaneous recovery and demonstrate treatment effects in addition to spontaneous recovery (Basso, 2005; Robey, 1998).

However, novel treatments should first be shown to be effective at an individual level and within a controlled setting before they can be applied to larger populations. Furthermore, clinically significant gains may not reach statistical significance but still be of great value to the individual participant. Such exploratory studies are considered to be Phase I studies, based on Robey's 5 phase model of clinical research (2004). As such, this (Phase I) project will study the single case treatment effects of a novel aphasia program implemented during 4 days to 4 months post stroke, which is considered to be within the spontaneous recovery period. Due to the small sample size in single study designs, group inferences cannot be made, affecting the generalisation of the results. However, such findings will still be beneficial as they may inform future (larger) aphasia studies.

1.11 Intensity of Therapy

A second factor influencing the effectiveness of therapy after a stroke is the intensity of the treatment. Emerging literature supports the implementation of intensive aphasia treatment within the early stages post stroke (Robey, 1998; Basso, 2005; Kleim & Jones, 2008). The advantages of harnessing the rapid neuronal reorganization of the brain during this time were discussed in section 1.9.

Cherney, Patterson, and Raymer (2011) updated a previous systematic review of treatment studies comparing high and low intensities, results of which, were conflicting for intensive treatment programs provided in the acute and chronic stages of aphasia. Their systematic review did not reveal overt benefits in terms of treatment effectiveness for intensive therapies. They also highlighted inconsistencies with the definitions of acute and chronic aphasia (see Chapter 1.4 regarding the inconsistent definitions of stages of aphasia). They suggest that future research should be focussed on investigating the *ideal time* (in days/months

post onset of injury) to commence intensive treatment, thereby supporting the theory that optimal timing may have a greater impact than intensity alone.

Aphasia therapy is a complex and dynamic process that needs to be carefully tailored to meet the needs of PWAs. The optimal amount of aphasia therapy has not been quantified and a universally accepted aphasia treatment regime does not exist but continues to be of great interest to clinicians and researchers (Foley et al., 2012; Kelly, Brady, & Enderby, 2012). Despite the lack of universally accepted treatments, national clinical guidelines are currently used to guide service delivery practices. The Australian National Stroke Foundation (NSF) clinical guidelines (2010) recommend a minimum of two hours of aphasia therapy per week which is considered representative of most clinical practices in Australia and England (Bakheit et al., 2007; David, Enderby, & Bainton, 1982; Vogel, Maruff, & Morgan, 2010).

Despite the fact that 2 hours of aphasia treatment per week is representative of clinical practice in these countries, this benchmark is considered to be *non-intensive* based on Bhogal et al's (2003) systematic review, in which the findings showed non-intensive treatments to yield poorer treatment effects. They found that a significant treatment effect occurred when treatment was provided intensively for an average of 8.8 hours per week, for 11.2 weeks. In contrast, non-intensive treatments of approximately 2 hours per week were found to have insignificant effects on language recovery (Bhogal et al., 2003). These findings are supported by other research studies that yielded similar results (Bakheit et al., 2007; Basso, 2005; Bowen et al., 2012; Lincoln et al., 1984). Clinicians may wish to consider the NSF guidelines as recommendations only, rather than a target (or key performance indicator), as 2 hours of therapy per week has not consistently produced significant results to warrant benchmarking.

Bowen et al. (2012) compared aphasia therapy to resourced social contact in a randomised controlled trial in the United Kingdom, with a sample size of 170 participants. Resourced social contact was provided by employed visitors with excellent social skills, who were trained to deliver social attention without therapy. Both aphasia therapy and resourced social contact were provided at an average of 1.4 hours per week (comparable to the NSF guidelines for best practice) over 4 months. The treatment group did not yield better results than the control group on outcome measures, indicating that therapy provision provided at this low intensity is insufficient to warrant language recovery greater than can be achieved via social interaction alone. This is an area for service providers to consider; that service provision at the NSF recommended frequency (2 hours per week) may be on par to receiving no therapy and only social interaction.

Unfortunately, the minimum amount of treatment intensity that will stimulate neural reorganisation required for language recovery is not yet known. However, it has been demonstrated that unless a certain threshold is met, language recovery results are comparable,

regardless of whether the treatment was considered intensive or not (Bakheit et al., 2007; Bhogal et al., 2003; David et al., 1982). For instance, Bakheit et al. (2007) used a randomised control trial to investigate whether the amount of therapy provision influences language recovery (commencing) in the sub-acute stage of aphasia. They compared 51 participants receiving what was defined as intensive treatment in their study (5 hours of therapy per week, for 12 weeks) with participants (n=46) receiving 2 hours per week. However, participants in both groups (intensive and non-intensive treatment group) did not achieve statistically significant improvements in language function. The hours of intensive therapy received (5 hours per week) was still well below Bhogal's (2003) recommendation of effective, intensive therapy (8.8 hours per week).

Sage, Snell, and Lambon Ralph (2011) compared the naming accuracy of 8 participants who received two courses of therapy, intensive and non-intensive. Both treatments comprised 10 sessions of unknown duration. Intensive was defined as one session per day for 2 weeks compared with non-intensive defined as two sessions per week for 5 weeks. At immediate post-treatment testing, Sage et al. (2011) found that both groups had improved their naming accuracy, however without a significant difference between the groups. At one-month follow up, 7 of the 8 participants retained a degree of improved naming accuracy, favouring non-intensive treatment, and therefore suggesting that the defined *intensive* aphasia treatment was not superior to non-intensive.

These findings strongly suggest that there may be a threshold of treatment intensity that needs to be reached before a significant improvement in language function is observed, for instance, more than 8.8 hours per week (Boghal, 2003). Each of the studies in Boghal's (2003) meta-analysis reported on treatment provision at an intensity level below the one found to be effective. Providing treatment at an intensity that is less than this threshold may lead to sub-optimal use of available resources and could result in compromised outcomes negatively impacting both clinicians and PWAs. Clinicians may need to reconsider the amount of service delivery as several studies have demonstrated that the current recommended guidelines by the NSF (approximately 2 hours per week) may not be sufficient. To further complicate matters, the intensity of language interventions alone (i.e., simply increasing the hours) may not always lead to improved patient outcomes. Rather, the content of the intervention and its application within a particular setting must also be considered (Baker, 2012).

In summary, the combined findings emphasise that consideration toward timing of implementing aphasia programs and a comprehensive program are both required in order to meet the necessary intensity threshold and the needs of each individual.

An Intensive Comprehensive Aphasia Program (ICAP) is a recent treatment approach that incorporates most of the issues mentioned, including intensive therapy, use of technology, massed practice and education. ICAPs are highly structured but also allow for individualised treatment for the PWA, making them a novel, yet comprehensive treatment approach. One such ICAP is the Aphasia LIFT program that has been developed in Australia.

1.12 Intensive Comprehensive Aphasia Programs and Aphasia Language Impairment and Functioning Therapy (LIFT)

There are two major approaches to *intensive* treatment strategies in aphasia rehabilitation: *focused* approaches such as Constraint Induced Language Therapy (CILT) and *holistic* approaches such as Intensive Comprehensive Aphasia Programs (ICAPs). Both approaches have common features such as: (a) a range of therapy approaches (including individual and group therapy), (b) a minimum of three hours of therapy a day, (c) five days a week for two weeks, and (d) the incorporation of neuroplasticity principles (Rose, Cherney et al, 2013). Both ICAPs and CILT studies have yielded positive and enduring language outcomes, regardless of treatment type (Dignam et al., 2015; Meinzer, Rodriguez, & Gonzalez Rothi, 2012; Persad, 2013; Pulvermüller et al., 2001; Rodriguez et al., 2013; Winans-Mitrik et al., 2014). However, ICAPs are more closely aligned with the recommendations regarding best practice by the National Stroke Foundation Guidelines (2010). Unlike CILT, ICAPs are more holistic as the treatment approach includes family/patient education with groups, individual and technology based therapy. Furthermore, communication is not solely limited to verbal expression but all forms of successful communication are encouraged within ICAPs, including written expression, drawing and gesture.

LIFT is a recently developed ICAP and stands for Language Impairment and Functioning Treatment. It was originally designed in Queensland, Australia by a team of researchers and clinicians and is based on three core principles: 1) partnership with PWAs and their family members, 2) individualised treatment based on the principles of neuroplasticity, and 3) a positive approach (i.e., therapy provision is conducted in a highly supportive and encouraging environment) (Rodriguez et al., 2013).

1.12.1 Partnership with a Person with Aphasia

PWAs and their family members/friends are encouraged to participate in the LIFT program. One key family member/friend (when available) is asked to formally consent to participate in LIFT and is then required to complete a short assessment (the Communicative Effectiveness Index - CETI) (Lomas et al., 1989). They are also encouraged to attend therapy

sessions and to access training, support and education regarding stroke and aphasia. For instance, they may be taught strategies to support a PWA during a communication breakdown (i.e., provision of yes/no questions).

1.12.2 A Positive Approach

The inclusion of family and friends, and fostering an aphasia friendly environment via the use of holistic communication approaches is referred to as a 'positive approach'. This is a core element of LIFT and is demonstrated by maintaining positivity at all levels of the program and by all involved. Elements of positivity can include the involved individuals being supportive, empathetic and encouraging toward the PWA. For example, the CI ended each therapy session by highlighting and praising a key accomplishment achieved by the PWA during the session; such as the ability to produce a target word that had been particularly challenging.

1.12.3 Individualised Treatment

Therapy is provided according to each participant's needs, to target their communication breakdowns and in line with their goals. For instance, while the impairment-based therapy is primarily aimed at single word retrieval level, participants who have higher language functions may work on sentence level production during computer based and functional therapy. Table 1 demonstrates how LIFT incorporates the relevant principles of neuroplasticity as outlined by Kleim and Jones (2008).

Table 1.

Principles of neuroplasticity associated with aphasia LIFT

(Adapted from Kleim and Jones, 2008)

Principles	**How they relate to Aphasia LIFT**
1. Use It or Lose It	Treatment is delivered daily for 3 weeks (15 days in total) as soon as possible after stroke (within 4 days – 4 months TPO) thus providing the PWAs with substantial communication opportunities.
2. Use It and Improve It	Treatment is delivered daily for 3 weeks (15 days in total). Treatment is delivered in different contexts, impairment based therapy versus

	computer or group therapy. Treatment Probes are included to explore generalization of treatment effect to non-treated items to demonstrate improvement in language recovery.
3. Specificity	Therapy is provided in relevant contexts and involves participant specific goals.
4. Repetition Matters	Participants have repeated exposure to target stimuli across a range of settings and modalities (i.e., the same targets used in impairment based therapy are also used in computer therapy but in a different format). In addition, participants have many opportunities for verbal repetition during the impairment-based treatment.
5. Intensity Matters	LIFT reaches and exceeds the minimal threshold intensity (8.8 hours per week) as defined by Bhogal (2003) and provides 15 hours of therapy per week.
6. Time Matters	Providing LIFT in the sub-acute phase of aphasia may be within an opportunistic time window that can allow for greater neural reorganization, which can lead to enhanced language recovery.
7. Salience Matters	Relevant personal stimuli is chosen by the participant and is used as target stimuli during therapy. Meaningful target stimuli can also provide positive reinforcement upon achievement, further reinforcing saliency.
8. Age Matters	Age (and gender) have not been linked to improved outcome measures of language impairment and functional communication. Previous studies demonstrate that all adult participants benefit to some degree from participation in an ICAP (Persad, 2013; M. L. Rose, L. R. Cherney, & L. Worrall, 2013a)
9. Transference	Therapy on word retrieval of treated items may generalise to untreated items (determined by Probes) and may further generalise across other domains of language (i.e., auditory and written comprehension and expression).

10. Interference	To reduce the possibility of interference through the acquisition of learned non-use, AAC (Augmentative and Alternative Communication) forms of communication are not core elements of LIFT subsequently reducing the likelihood of participants becoming dependent on AAC communication and focusing primarily on verbal expression as the principal mode of communication.

1.13 Application of LIFT in the inpatient rehabilitation setting

PWAs often require a greater number of rehabilitation services resulting in prolonged LOS at inpatient facilities; which in turn, gives rise to a higher cost to the health care system (Dickey et al., 2010). Enderby (2012) states that clinical time and resources are limited in rehabilitation settings and discusses strategies to increase intensity of therapy while minimising further expenditure in the health system, such as the use of computer programs, utilising family members/volunteers, group therapy and self-management. Therefore, a program such as Aphasia LIFT, may be ideal in the inpatient rehabilitation setting as it addresses both the patient's needs, as well as the requirements of the health care system by potentially empowering patients to reach their communication goals sooner through intensive treatment, which in turn may enable earlier discharge, as demonstrated by Jette et al. (2005).

The findings from key studies regarding intensive treatment suggest that intensive treatment defined as more than 8.8 hours per week, utilising a broad range of methods including individual, group and computer therapy; and provided in the sub-acute phase of recovery may be an opportune system and time for service provision. These findings form the basis of further research of the application of LIFT within the inpatient rehabilitation setting (Bhogal et al., 2003; Dignam et al., 2015; Dignam et al., 2016; Godecke, Hird, Lalor, Rai, & Phillips, 2012; Martins et al., 2013; Meinzer et al., 2012; Pulvermüller et al., 2001; Rodriguez et al., 2013).

The aim of Study 2 was to explore the clinical implications of LIFT being applied within this setting and its potential to be offered as a therapy program, i.e., a service delivery option rather than it being part of a research study.

1.14 Modifications to LIFT for its application to an Inpatient Rehabilitation Setting

LIFT has been trialed in different formats across Australia, and to date, only with participants in the chronic phase of aphasia (Dignam et al., 2015; Dignam et al., 2016; Rodriguez et al., 2013). The application of LIFT in the inpatient setting with participants in the earlier phases of aphasia (sub-acute) was explored in Study 2 and where possible, the author of this study has adhered to the LIFT manual and protocols. Permission for use of the manual and its protocols was granted by the LIFT developers and followed the principles outlined in Rodriguez et al. (2013). In the event of changes to research design that differed from the origin LIFT program, permission was granted by the developers namely, Dr Amy Rodriguez, Prof Linda Worrall and Prof David Copland (Rodriguez et al., 2013). The single subject design of this LIFT study differed from the cohort design of the original program. A single subject design was used to recruit inpatients at a rehabilitation hospital, because the current study of LIFT was conducted in an existing clinical setting.

One deviation from the program manual was a change to group therapy provision. In the original LIFT program, group therapy followed a pre-designed structure and included the cohort of participants and their families/friends. In this study, LIFT participants were able to join in the group therapy already offered at the time in the hospital. This group therapy contained features similar to the original LIFT program (in terms of education, support and therapy) however included other aphasic inpatients participating in the group therapy, i.e., inpatients who were not recruited for the LIFT study. In the original LIFT study, several clinicians were used in the provision of Impairment and Functional based therapies. A single clinician (the CI) was used in the current study for the therapy in one of the participants (WH) and two clinicians (the CI plus the manager of Speech Pathology) in the second participant (KL). Students and allied health assistants were occasionally used during group and computer based therapies as consistent with the LIFT protocols. With permission from the original developers of LIFT, this study explored the feasibility of applying LIFT in an established clinical setting (a local rehabilitation hospital).

In short, this research project comprises two single subject designs to investigate whether LIFT could be feasibly and successfully applied within an established inpatient setting. However, a first study was designed to explore the current levels of service delivery compared to the recommended national benchmarks to ascertain whether LIFT could be implemented within this setting in terms of LOS limitations. Once the first study was completed, it was determined that LIFT had the potential to be applied in the inpatient rehabilitation setting, as

the average and recommended LOS levels exceeded the requirements for LIFT. This provided the necessary support for commencement of the second part of the study. The second study then applied the LIFT program within a local inpatient rehabilitation hospital to further investigate its feasibility and the therapeutic effect on participants.

1.15 Purpose of the overall study

This Master's thesis includes two studies, referred to as Study 1 and Study 2:

- **Study 1:** Aphasia Rehabilitation Service Delivery in a Stroke Rehabilitation Unit: A Clinical Audit of Speech Pathology Practices.
- **Study 2:** An Exploratory Study of the Implementation of Aphasia LIFT in an Inpatient Rehabilitation Setting.

1.15.1 Study 1

Aphasia Rehabilitation Service Delivery in a Stroke Rehabilitation Unit: A Clinical Audit of Speech Pathology Practices.

Objective:

Study 1 was conducted as part of a broader research project evaluating the feasibility of applying LIFT within an inpatient rehabilitation setting to determine whether the current and recommended LOS levels were conducive to the application of LIFT within this setting.

Study 1 was a Clinical Audit in which existing service delivery was evaluated and compared to the NSF's Clinical Guidelines (2010) for best practice of stroke management, with a focus on the recommendations for aphasia treatment and management.

An audit of the current trends in Speech Pathology (SP) aphasia rehabilitation practices in the inpatient rehabilitation setting had not previously been conducted and published. Study 1 addressed this gap by investigating existing practices of SP aphasia rehabilitation at a local level, using the available data in the electronic patient database and medical records. The results of this clinical audit, and the recommendations for service improvement, were published in 2016 (Rej, Doeltgen, Rodriguez, & van Steenbrugge, 2016).

Aims:

Specific aims of the audit included the investigation of:

a. Data regarding Speech Pathology intervention for patients with aphasia.
b. Aphasia outcome measures.
c. Documentation of those aphasia outcome measures.

1.15.2 Study 2

An Exploratory Study of the Implementation of Aphasia LIFT in an Inpatient Rehabilitation Setting.

Objective:

To date, the vast majority of studies involving intensive treatment approaches have targeted individuals with chronic aphasia living in the community. Few studies have investigated the therapeutic effect of these programs in an inpatient rehabilitation setting, for individuals with early onset aphasia. This research addressed the feasibility of LIFT for the first time in:

a. The inpatient rehabilitation setting and
b. With participants with aphasia in the sub-acute phase of recovery (4 days – 4 months post onset of stroke)

Aims:

The aim of this study was to investigate the therapeutic effectiveness and clinical implications of the LIFT program in an inpatient stroke rehabilitation unit by addressing 3 research questions.

1.16 Research Questions & Hypotheses

Research Question 1

For patients with stroke-induced aphasia in the sub-acute phase (4 days – 4 months post-onset) in the inpatient rehabilitation setting, will participation in LIFT result in improvements in measures of language impairment, functional communication and quality of life?

Research Question 2

For patients with stroke-induced aphasia in the inpatient rehabilitation setting, will the implementation of LIFT be clinically viable?

Research Question 3

Will patients with stroke-induced aphasia in the inpatient rehabilitation setting be able to cope with the high intensity of LIFT therapy?

Hypothesis 1

Participants in a 3-week LIFT program will demonstrate a therapeutic effect in measures of:

a. **Language impairment,** as reflected by
    a. a statistically significant post-intervention change in the mean aphasia quotient of the Western Aphasia Battery that is equal to or greater than 5 points as defined by Katz and Wertz (1997).
    b. a change equal to or greater than 2 standard deviations on the Boston Naming Test as defined by Difrancesco, Pulvermüller, and Mohr (2012) and Maher et al. (2006).

b. **Functional communication,** as reflected by a statistically significant change in the pre- and post- scores of the Communication Effectiveness Index (CETI), demonstrated by a mean change in score of equal to or greater than 11.4 as defined by Lomas et al. (1989) and;

c. **Quality of life,** as reflected by a positive change in the (communication-related) quality of life assessment, the Assessment for Living with Aphasia as defined by Kagan et al. (2008).

Statistically significant post-intervention changes of these magnitudes are considered clinically significant, i.e., the nominal changes observed in outcome measures reflect functional changes (Shewan & Donner, 1988).

Justification:

These hypotheses are supported by and based on previous studies of intensive aphasia programs that demonstrated therapeutic effects across these domains or similar (Code, Torney, Gildea-Howardine, & Willmes, 2010; Denes, Perazzolo, Piani, & Piccione, 1996; Godecke et al., 2012; Hoover, Caplan, Waters, & Carney, 2013; Pulvermüller et al., 2001; Rodriguez et al., 2013; Sickert, Anders, Munte, & Sailer, 2013).

Hypothesis 2

A 3-week LIFT program will be clinically viable in this setting. The clinical implications of the application of LIFT will be reflected by documented observations of barriers and facilitators to treatment implementation and within survey results.

Justification:

This hypothesis is supported by previous studies of intensive aphasia programs that have demonstrated feasibility of implementation within a clinical setting (Godecke, 2008; Hoover et al., 2013; Kirmess & Maher, 2010; Martins et al., 2013; Sickert et al., 2014).

Hypothesis 3

Participants of LIFT will be able to cope with the intensive treatment, as measured using the Fatigue Questionnaire.

Justification:

This hypothesis is supported by and based on previous studies of intensive aphasia programs that have demonstrated participant toleration of high intensity treatments with minimal to no participant withdrawals (Basso, 2005; Code et al., 2010; Dignam et al., 2015; Godecke et al., 2012; Hoover et al., 2013; Rodriguez et al., 2013).

Chapter 2 - Study 1

2.1 Background

This chapter will address the methodology, results and outcomes for Study 1: *Aphasia Rehabilitation Service Delivery in a Stroke Rehabilitation Unit: A Clinical Audit of Speech Pathology Practices.*

The study described in this chapter has been published as:

Rej L., Doeltgen S., Rodriguez A., & W, van Steenbrugge. (2016). Aphasia Rehabilitation Service Delivery in a Stroke Rehabilitation Unit in Australia: A Clinical Audit of Speech Pathology Practices. *The Internet Journal of Allied Health Sciences and Practice. 14*(2). (peer-reviewed)

Ethical Consideration

Ethics approval was granted from the Royal Adelaide Hospital Research Ethics Committee (RAH PROTOCOL number 130908) and from Southern Adelaide Clinical Human Research Ethics Committee (Application Number: 492.13).

Research Support

This study was supported by a grant from the Allied and Scientific Health Office (ASHO) and the International Centre for Allied Health Evidence (iCAHE), 'Contributing to Best-Evidenced Care through Clinical Audits Initiative'.

2.2 Abstract

Purpose: To investigate service delivery of aphasia rehabilitation in a metropolitan rehabilitation hospital by Speech Pathologists and assess adherence to both the National Stroke Foundation (NSF) Clinical Guidelines and the Australasian Rehabilitation Outcomes Centre (AROC) database of benchmarks. **Method:** A retrospective audit of 34 discharged patients was conducted within a dedicated stroke rehabilitation unit from March 2012 to July 2013. Discharge reports, Functional Independence Measure (FIM) scores and clinical time statistics derived from the organization's electronic database were studied and compared with NSF's Clinical Guidelines for best practice recommendations and AROC benchmarks. **Results:** Patients with aphasia were admitted to inpatient rehabilitation at an average of 21

days post stroke, 2 days beyond the AROC benchmark for inpatient rehabilitation. The mean length of stay of patients with aphasia was 60 days, significantly longer than the average AROC benchmark of 32.8 days. Patients received an average of 4.25 hours of direct speech pathology therapy per week, more than twice the minimum amount of therapy time recommended by the NSF Guidelines. A strong correlation was found ($r=0.58$, $p< 0.001$) between the intensity of therapy and total FIM scores at discharge. A moderate correlation was found between the intensity of therapy and the two FIM sub-measures of language: Comprehension ($r=0.49$, $p< 0.001$) and Expression ($r=0.48$, $p< 0.001$). **Conclusion:** The current clinical audit is the first known speech pathology audit investigating adherence to stroke and aphasia rehabilitation guidelines set forth by the NSF clinical guidelines and AROC benchmarks in Australia. By comparing current care with advocated best practice, we identified strengths in service delivery, as well as priority areas for quality improvement.

2.3 Introduction

Stroke is the second leading cause of death amongst Australians (Australian Bureau of Australian Bureau of Statistics, 2011). Every year, approximately 60,000 new or recurrent strokes occur nationally, and approximately one third of all stroke survivors will present with aphasia (Engelter et al., 2006; (National Stroke National Stroke Foundation, 2010). Stroke is the leading cause of aphasia, an acquired, multi-modality language impairment following damage to the language-dominant cerebral hemisphere (Bhogal et al., 2003).

It is estimated that there are approximately 80,000 individuals in Australia with aphasia at any one time (Code & Petheram, 2011). However, the prevalence of stroke survivors has risen by over 10% during the last decade (ABS, 2011), mainly because of *decreasing* mortality rates secondary to stroke ((National Stroke National Stroke Foundation, 2010). This may be due to enhanced health care and medical intervention, including timely provision of thrombolytic drugs (Wardlaw, Murray, Berge, & del Zoppo, 2009). Better survival rates have led to an increase in stroke survivors in need of health care services for the sequelae of motor, sensory and cognitive deficits, imposing a rising financial burden to the healthcare system. The NSF reported the total cost of stroke in 2012 to be approximately AUD 5 billion. The Australian Government was accountable for AUD 1.5 billion of expenditure and a breakdown of costs revealed almost AUD 1 billion was secondary to lost wages of those affected. The healthcare costs of stroke survivors with aphasia are even higher (Ellis, Simpson, Bonilha, Mauldin, & Simpson, 2012). Stroke and subsequent aphasia have a significant financial impact on the community, the workforce and the nation, as well as on the individual and their families.

Due to the significant implications on health, quality of life and socioeconomic burden, clinical guidelines have been developed to ensure that services are provided adequately and efficiently. For example, the Australasian Rehabilitation Outcomes Centre (AROC) developed a national benchmarking system for clinical rehabilitation in all health areas, including stroke. The outcome measure most commonly used in stroke rehabilitation research is the Functional Independence Measure (FIM) (The Australasian Rehabilitation Outcomes Centre (AROC), 2014; Frattali, 1998). The NSF of Australia has developed clinical guidelines, which provide recommendations for best practice of stroke management and rehabilitation. Together, AROC benchmarks and NSF guidelines can inform service delivery in areas such as length of stay and clinically significant FIM improvement, as well as minimum therapy times for specific deficits post stroke, respectively. Therefore, combining the information from both sources will guide clinicians in both discipline specific and unit-based service delivery.

The availability of clinical guidelines is an important step in promoting best practice. However, it is also important to determine whether or not professionals are adhering to the guidelines. Clinical audits have been shown to influence service delivery practices and they also enhance adherence to clinical guidelines with resulting improvements in health outcomes (Cadilhac, Pearce, Levi, & Donnan, 2008; Irwin, Hoffman, Lowe, Pearson, & Rudd, 2005; Ivers et al., 2012; Schwamm et al., 2009).

However, there continues to be limited research documenting the relationship between health outcomes of stroke survivors and adherence to clinical guidelines of stroke rehabilitation (Hubbard et al., 2012). Furthermore, the evidence is even scarcer regarding discipline specific audits and adherence to NSF clinical guidelines. Investigations of current service delivery in stroke rehabilitation are crucial to ensure effective treatment and management of aphasia. Therefore, the main aims of the current audit were to survey the speech pathology practices in relation to aphasia rehabilitation within a dedicated stroke rehabilitation unit and to compare this against the AROC database for stroke benchmarks and the NSF's clinical guidelines. To address these aims we:

a. Calculated speech pathology intervention for patients with aphasia
b. Identified the outcome measures used for patients with aphasia
c. Identified the documentation practices of SLPs with regard to aphasia outcome measures

2.4 Methods

The current study was a retrospective clinical audit of the last 120 consecutive admissions to an inpatient Stroke Rehabilitation Unit (SRU). The SRU was a 21 bed ward that was South Australia's only dedicated stroke unit at the time (as opposed to a neurology unit). The unit admitted adult patients, 18 years and over, who lived in the central Adelaide region. The SRU was led by a Geriatrician and typically included a Registered Medical Officer, an intern Doctor and medical students. The unit was part of a teaching hospital and students across disciplines were frequently involved in direct patient care and treatment (under supervision). The Speech Pathology department serviced the entire hospital and comprised four speech-language pathologists (SLPs) working 3.4 FTE (Full Time Equivalent) in total and one Allied Health Assistant (AHA) working 0.5 FTE. The SRU was allocated 2.2 FTE of Speech Pathology direct clinical times and 0.5 FTE AHA direct clinical times. The SLP's worked on weekdays (weekend services were not provided at any level) and treated a range of disorders including aphasia, dysphagia, dyspraxia, dysarthria, and voice. Treatment included individual and group therapy, computer-based therapy, and individual and group education sessions. The inclusion and exclusion criteria were designed to characterize a typical patient with aphasia, who received uninterrupted inpatient rehabilitation care.

2.4.1 Inclusion Criteria

Patient records were included if they were within the last 120 consecutive discharged patients of the stroke rehabilitation unit, if the patient had a primary diagnosis of aphasia, and if more than an average five minutes of direct speech-language therapy was provided during their inpatient stay.

2.4.2 Exclusion criteria

Patient records were excluded from this audit if the patient had passed away during their inpatient rehabilitation stay or developed medical complications and consequently were transferred offsite to an acute care hospital.

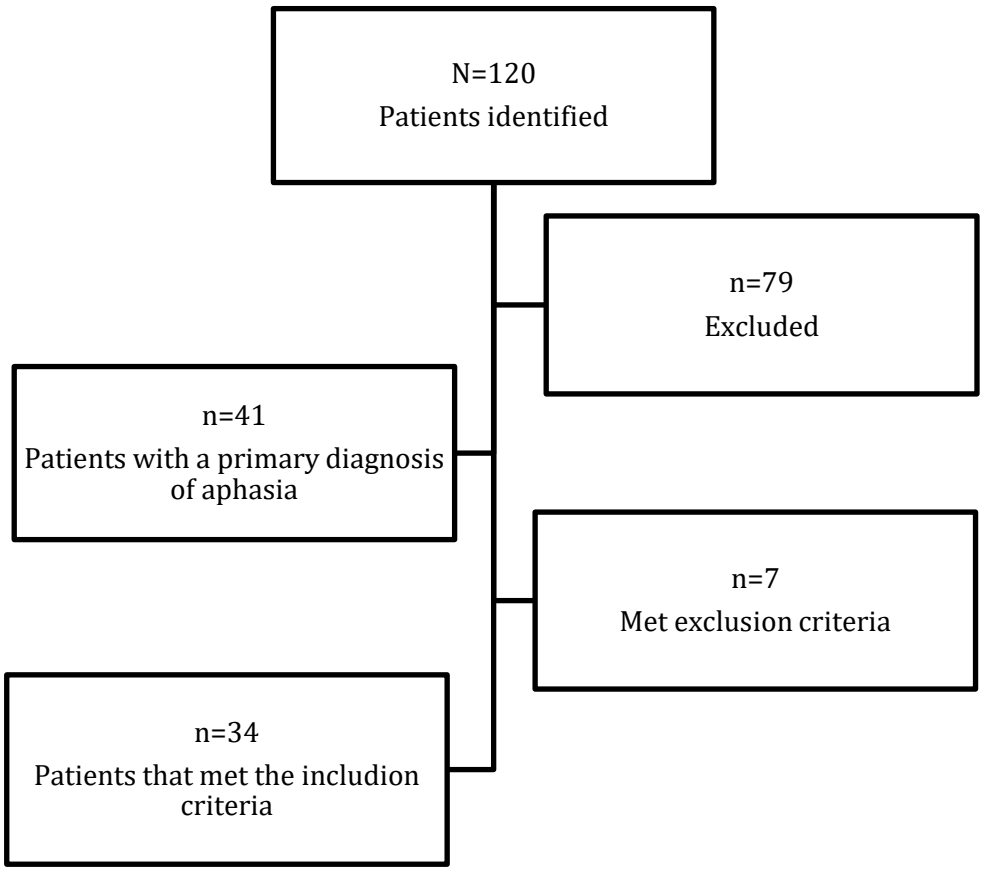


Figure 1. Flowchart of Participant Selection and Recruitment

An admission was defined as every patient admitted into the SRU and subsequently discharged, regardless of their primary diagnosis. Inpatients admitted to the SRU at the time of the study were not included in the audit. Based on previous data regarding incidence and prevalence of stroke and aphasia, it was anticipated that approximately one third of the 120 admitted patients would be diagnosed with aphasia, and would thus be eligible for inclusion in the audit (approx. n=40) (Engelter et al., 2006). The sample size of 40 cases was guided by the NSF's recommended sample size of n=40 for Rehabilitation Audits (National Stroke Foundation, 2012). Forty-one patients with a primary diagnosis of aphasia were admitted between March 2012 and July 2013, and 34 patients met the inclusion/exclusion criteria (see Figure 1). Ethics approval was obtained for the study by the local human research ethics committees.

2.4.3 Outcome measures

FIM scores were collected within 72 hours of admission and discharge. FIM scores can range from a minimum of 18 to a maximum of 126 points. The FIM measures are divided into a scale for motor abilities and a scale for cognitive abilities. These scales are used to define a clinically change in function due to rehabilitation based on the degree of the patient's independence carrying out a range of motor and cognitive functions.

Outcome measures and their documentation were obtained from hospital discharge reports only. Information about time spent by SLPs engaged in direct therapy with patients was obtained from the organization's electronic database. Direct therapy was defined as individual therapy provision by a speech-language pathologist to a patient.

2.4.4 Data analysis

The first author collected the data retrospectively using the electronic statistical database and subsequently retrieved the relevant information from discharge reports in the medical records. The data were de-identified before analysis.

2.5 Results

2.5.1 Descriptive analysis

General patient demographics included 23 males and 11 females with an average age of 70 years (standard deviation of 14.2: range of 26-94 years). Stroke patients with aphasia were admitted to rehabilitation on average 21 days post onset of stroke and had a mean length of stay (LOS) of 60 days (Table 2).

Table 2.

Demographic Characteristics of Stroke Patients with Aphasia

	Mean (SD)	Median	Range
Rehabilitation Time Post Onset (TPO) (days) [a]	21.1 (12.47)	20.5	3-66
LOS (days)	59.8 (60.06)	41.0	6-317
Therapy Days [b]	41.1 (40.07)	30.1	5-223
Admission FIM	67.0 (26.75)	70.0	27-119
Discharge FIM	94.0 (24.82)	102.0	38-122
Change in FIM	27.0 (19.71)	22.0	3-80
Direct (1:1) Therapy (minutes/day/patient) [c]	51.1 (19.15)	53.6	5-90

Note:

[a] Time (days) that rehabilitation commenced post onset of stroke

[b] Therapy days are calculated as weekdays only as patients did not receive therapy on weekends

[c] Direct individual (1:1) SLP therapy provision per day, per patient

2.5.2 Functional Independence Measure scores and aphasia rehabilitation

The data showed that the average improvement in the FIM scores (from admission to discharge) of patients with aphasia was 27.26 (SD19.71) [$t_{(33)} = 8.07$, $p<0.001$; mean at admission: 67.21 (SD26.75), mean at discharge: 94.47 (SD24.82)]. This average improvement is greater than the AROC benchmark of 24.5 difference points, the average of haemorrhagic and ischemic FIM change scores used to define a clinically significant change ("Length of stay and functional improvement of completed episodes of rehabilitation in Australia," 2013).

Aphasia rehabilitation time received was found to be strongly positively correlated with FIM score upon discharge, $r=0.58$, $p< 0.001$, with longer direct intervention times resulting in greater total FIM scores. With regard to the FIM subscale scores, total aphasia rehabilitation time was moderately positively correlated with change in FIM scores for comprehension ($r=0.49$, $p< 0.001$) and expression ($r=0.48$, $p< 0.001$).

2.5.3 Intensity of therapy

The findings from the current clinical audit revealed that the average direct therapy time was 51 minutes per patient, per day, which equates to an average of 4.25 hours of weekly therapy provision per patient.

2.5.4 Outcome Measures

The consistency of the use and documentation of language impairment outcome measures was also investigated in this study. According to discharge reports, 85% (n=29) of patients were formally assessed with a standardized aphasia test on admission. The WAB was the most frequently used assessment (n=15), followed by the BNT (n=10) and the Boston Diagnostic Aphasia Examination (n=9).[16-18]) (Kertesz, 1982); (Kaplan, Goodglass, & Weintraub, 1983). However, at discharge, none of the patients were formally reassessed.

2.6 Discussion

This clinical audit provides insight into the standard of care provided to stroke patients with aphasia at a metro rehabilitation hospital in South Australia. It highlights areas of good practice, including adherence to minimum guidelines for intensity of aphasia rehabilitation and correlation of treatment intensity to improved FIM scores on discharge. It further highlights areas in need of improvement, specifically the application and documentation of specific aphasia outcome measures and adherence to LOS guidelines. Although this audit was completed in one Australian metropolitan rehabilitation centre, the information derived from this analysis may be of relevance for other (Australian) rehabilitation centres that provide services to a similar population.

2.6.1 Identified areas of good practice

The rehabilitation hospital adhered to the NSF guidelines for best practice by providing the minimum aphasia therapy provision. The guidelines recommend a minimum of 2 hours of aphasia therapy per week, based on current evidence (National Stroke Foundation, 2010). However, most patients received more than double the recommended time and this aligns with a systematic review by Bhogal et al. (2003) that demonstrated a strong relationship between more intensive aphasia treatment and greater language recovery. That is, when greater than 8.8 hours of weekly therapy (for 11.2 weeks) was provided, there were greater treatment effect than when only two hours of weekly therapy (the minimum as recommended by the NSF) was provided. Furthermore, in the present audit, aphasia

rehabilitation time per patient was found to be correlated with higher FIM discharge scores, suggesting improved patient outcomes at discharge. Whilst acknowledging that correlations do not necessarily show a *cause and effect* relationship, the findings still exhibit a relationship between intensity of therapy and improved FIM scores.

Although FIM scores have been reported to lack sensitivity to functional change in the speech and language domains, it is important to note that FIM scores remain the most widely used national rehabilitation measure and the sizable database of FIM scores compensates for its lack of sensitivity (Ottenbacher, Hsu, Granger, & Fiedler, 1996). Small but consistent changes in FIM scores within a large patient population may reflect a clinically significant change in these domains (Frattali, 1998; Ottenbacher, Hsu, Granger, & Fiedler, 1996). The finding that the correlation between total rehabilitation time and total FIM score was stronger compared to the correlation of total rehabilitation time with FIM comprehension and expression sub-scores is likely a result of the total FIM score being influenced by changes in motor activities and activities of daily living which are addressed in additional rehabilitation time provided by other health care professions. This highlights the limitations of the FIM score as a meaningful outcome measure for an audit of specific language tasks; however, it was the only outcome measures consistently used across all included patient records. The audit revealed a need for consistent administration of standardized tests of aphasia impairment at admission and discharge, a change in practice that is currently being implemented in the local rehabilitation unit.

2.6.2 Identified areas requiring improvement

Comparison to AROC

For public sector benchmarks, the mean LOS for haemorrhagic and ischemic stroke impairment groups combined, was 32.8 days (Australasian Rehabilitation Outcomes Australasian Rehabilitation Outcomes Centre, 2013). This audit revealed that the unit had a mean LOS of 59.8 days, nearly twice as long as the benchmark but in line with previous reports of patients with aphasia requiring increased rehabilitation services and longer LOS (Dickey et al., 2010). This audit included one outlier that impacted on the LOS averages. The patient concerned was waiting for external government funding for full time care and as such, their LOS was unavoidably 317 days. When the outlier was removed from the dataset, the mean LOS equated to 52 days. Nonetheless, the outlier was included in the analysis to demonstrate the variation in LOS that may occur in a typical rehabilitation unit. It is also worth mentioning that the range of LOS varied significantly across all patients. It could, therefore, be argued that evaluating the median LOS is a more accurate reflection of the LOS

of this cohort, which was 41 days (Table 1). However, median LOS data are not available from AROC to serve as a comparison for this audit.

The recommended AROC benchmark is for 75% of all stroke patients to be admitted to a rehabilitation unit at 19 days post onset ("AROC Outcome Target Report (Inpatient - Pathway 3)," 2013). Our findings demonstrate that patients with aphasia were admitted at an average of 21 days post onset, marginally later than the recommended benchmark. The longer than recommended LOS in the acute care setting is an area for potential improvement that was highlighted; however, the cause of long LOS is unclear and likely multifaceted. Delayed admission to rehabilitation can result in poorer outcomes for patients. Indeed research in stroke rehabilitation has consistently suggested that intensive therapy post stroke (namely, rehabilitation commenced as early as tolerated) can result in greater recovery of lost function (Biernaskie, Chernenko, & Corbett, 2004; Hermann & Chopp, 2012; Kleim & Jones, 2008; Lazar et al., 2010). This is likely due to the brain's greater capacity for plasticity early after stroke (Kleim & Jones, 2008).

2.6.3 Outcome measures

Due to unavailable data demonstrating the change in language impairment scores (based on standardized aphasia test-retest scores), a correlation between intensity of therapy and changes in language impairment could not be ascertained. The discharge reports revealed inconsistent practices of documenting outcome measures and most reports included neither numerical aphasia quotients (for the WAB) nor total test scores. Furthermore, discharge reports did not specify whether or not the same measure(s) were repeated informally prior to discharge. As such, a quantifiable measure of change in language impairment was unattainable. It is likely that clinicians chose to omit scores of outcome measures in discharge reports and opted instead to provide descriptive analyses of language impairment and recovery. Clinical judgment can be considered a reliable method of detecting change in language impairment; however, caution should be used when applying this judgment universally because variables such as experience and skill may affect reliable clinical judgment (Shewan & Donner, 1988). The use of a standardized measure of language impairment and documenting pre- and post-treatment performance on the same measure (preferably by the same clinician) provides a better, more objective measure of language recovery. The latter was identified as an area of quality improvement in clinical practice and changes have been implemented in the form of departmental and unit action plans.

2.6.4 Recommendations for practice

This clinical audit informed the development of department and unit level action plans defined as activities required to promote improvements in service delivery. Changes to practice included: 1) administration of formal measures by the SLP to diagnose aphasia at admission and to assess change in language impairment level over time (at discharge); 2) documentation of formal test results, including numerical test scores, at admission and discharge; 3) development of a set of minimum expectations for reporting results to ensure more consistency in discharge reports; and 4) recording of maintenance care dates and reasons for discharge delay. Furthermore, the audit results were disseminated and discussed with the rehabilitation unit with a recommendation to continue the current intensity of aphasia rehabilitation.

2.6.5 Limitations & future research

This study was conducted within one stroke rehabilitation unit, with a central-city catchment area and did not include data from other local metropolitan rehabilitation units or rural service providers. Therefore, caution must be taken with the interpretation and generalization of the current findings to other sub-acute clinical services and/or other individuals with aphasia.

Given that this audit evaluated practice patterns in the acute care setting, it is possible that functional improvements are at least in part due to spontaneous recovery. The outcomes of this audit will therefore need to be interpreted in this context. It is worth noting, however, that there may be an interaction of intervention and spontaneous recovery and that early intervention facilitates spontaneous recovery processes.

In rehabilitation facilities, maintenance care is a term applied to a patient who is clinically ready for discharge but unable to be discharged due to internal or external reasons (e.g., awaiting care funding, residential placement or home modifications). These patients remain inpatients of the unit and often continue to receive therapy until discharge, albeit often at a reduced intensity. Analysis of the duration of maintenance care was beyond the scope of this study, as the rehabilitation unit did not routinely collect these data at the time. However, these data would have shown the true discharge dates that could have been achieved if not for unavoidable barriers. Additionally, dates of maintenance care implementation would have identified the internal/external delays that negatively impact timely discharge and this information could reveal trends in the causation of discharge delays.

It is suggested that future studies also include an analysis of duration in maintenance care and reasons for discharge delay, which can then be compared with actual discharge dates. It is

further suggested that clinicians and researchers consider using the median to calculate LOS data as this calculation is not influenced by atypical outliers.

Direct speech-language pathology time (in minutes per week day) can include managing aphasia and/or other co-morbidities such as dysarthria, dyspraxia, voice and dysphagia. This study could not isolate the exact time dedicated solely to aphasia therapy per se due to the manner in which the episodes of treatment are entered into the electronic database. For instance, clinicians can enter a single occasion of service under multiple diagnoses. Thus, it is possible that patients with aphasia showed one or more co-morbidities and that these were addressed in the rehabilitation time that was logged.

2.7 Conclusion

This clinical audit provides valuable insight into speech-language pathologists' practices of aphasia rehabilitation and adherence to relevant sections of the AROC benchmarks and NSF Clinical Guidelines. By comparing current care with best practice, these findings have identified priority areas that require clinical change in addition to practices that should be maintained.

Chapter 3 – Study 2

3.1 Introduction

This chapter will address the method and intervention for Study 2: *An Exploratory Study of the Implementation of Aphasia LIFT in an Inpatient Rehabilitation Setting*. The results for the two participants recruited to this study will be presented separately in Chapters 4 and 5.

Briefly, this study took a practical approach towards exploring the institution-specific identification of the clinical implications of implementing LIFT in an inpatient rehabilitation setting. While the application of LIFT has been demonstrated in individuals with *chronic* aphasia in a research setting (Rodriguez et al., 2013), this has not yet been explored in the inpatient rehabilitation (sub-acute) setting. Sickert et al. (2014) demonstrated the feasibility of an ICAP in this setting, albeit for a different approach. Therefore, this study is the first of its kind to explore the clinical implications of the application of LIFT in an inpatient rehabilitation hospital.

3.2 Ethical Approval

Ethics approval was granted by the Southern Adelaide Clinical Human Research Ethics Committee (HREC approval number: 13/SAC/386). A Site Specific Governance approval was granted by the Royal Adelaide Hospital for the research to be conducted at Hampstead Rehabilitation Centre (a campus of the Royal Adelaide Hospital), approval number: SSA/15/RAH/538.

3.3 Research Support

This research was supported by a Clinical Research Grant of $30,000 for Allied Health, Pharmacy and Nursing, provided by the Royal Adelaide Hospital Research Foundation.

3.4 Methods

3.4.1 Study Design

A single subject design with multiple probes was used in the study. An ABA type design was employed with a post-intervention measure for maintenance, comprising two phases: the baseline and maintenance phase referred to as A and the intervention phase referred to as B.

3.4.2 Participant Selection

All inpatients admitted to the Stroke Rehabilitation Unit at Hampstead Rehabilitation Centre (HRC) from January to June 2016 were screened by their treating Speech Pathologist (SP) for possible inclusion into the study. The *treating SP* was defined as any HRC employed SP, who initially screened the patient and would ordinarily become their primary therapist for a range of speech pathology services. Participants of LIFT continued to receive other Speech Pathology services by their treating SP, for example swallowing assessments. The CI of this research is the author of this thesis and was the sole provider of the LIFT therapy.

An initial screen of all new inpatients within 24 hours of admission was standard clinical practice on the ward. This provided an opportunity for a potential participant to be approached by their treating SP and the project explained to them via holistic communication strategies, such as using key words, gesture and short concise sentences.

After a potential participant expressed an interest in the study, the CI met with each participant and their family/friends, and further explained the research aims, design, requirements of participation, provided a participant information sheet (see Appendix 5), and an *aphasia friendly* information sheet (see Appendix 6). The term “aphasia friendly” is used to signify resources that had been modified to suit individuals with a language disorder and this included (but was not limited to) simplified text, highlighted key words and pictorial representations.

All potential participants and their family/friends were provided with an opportunity to ask questions regarding the research and the requirements of participation prior to agreeing to participate in the project.

3.4.3 Inclusion criteria

- Left-sided (L) hemispheric cortical stroke identified by CT or MRI imaging;
- Between 4 days to 4 months post-stroke;
- Aphasia as the primary language impairment with a WAB Aphasia Quotient score of < 93.8, characterised by word finding difficulties (anomia);
- A score of ≥ 6 and up to 2 standard deviations below the predicted test score (established as the cut off for determining the presence of a naming deficit) on the Boston Naming Test (Difrancesco et al., 2012; Maher et al., 2006);
- English as the primary language;
- Vision and hearing adequate for participation (determined by the treating SP).

3.4.4 Exclusion criteria

- Co-existing neurological disease (e.g., Parkinson's, Dementia);
- Fatigue as determined by the treating SP;
- Severe dysarthria as determined by informal observation/assessment by treating SP;
- Severe apraxia of speech as determined by informal observation/assessment by treating SP;
- Untreated medically diagnosed depression.

3.4.5 Withdrawal criteria

Participants were informed that their participation was voluntary, they were free to withdraw from the study at any time and that withdrawal would not affect their access to current or future treatment provision.

3.4.6 Participant Consent

All potential participants were considered to have the capacity to give informed consent, unless otherwise determined by the consulting geriatrician. Where this capacity was in question, a next of kin (proxy) was consulted. Consent given by a proxy was considered legally adequate if prior informal arrangements between the participant and their proxy had been in place successfully and without conflict.

Potential participants (or their proxies) were required to sign a Participant Consent Form (see Appendix 7 and 10, respectively) and their participating family member/friend was also required to sign a Consent Form for Communication Partners (see Appendix 9). Once a

potential participant gave informed consent to participate, their language impairment was assessed to determine eligibility into the study.

Eligibility for inclusion in the study was based on (1) a primary diagnosis of aphasia characterised by (2) word finding difficulties – anomia as demonstrated by a score of ≥ 6 (and up to 2 standard deviations below the predicted test score) on the Boston Naming Test (BNT) and an aphasia quotient score of < 93.8 on the Western Aphasia Battery (WAB) (see 3.4.3).

3.4.7 Participants

Participants 1 and 2 met the inclusion/exclusion criteria and were included in the study, as illustrated in Figure 1. Participants 3 – 8 consented to participation in the study but were excluded as they failed to meet the inclusion criteria:

Participant 3: 80 year-old (yo) male with L) Middle Cerebral Artery (MCA) Cerebrovascular Accident (CVA). Very motivated for LIFT study. Scored 49/60 on BNT, therefore not eligible.

Participant 4: 52 yo male with L) Intracranial Haemorrhage (ICH), scored 2/60 on BNT; too severely dyspraxic and anomic, therefore not eligible for the study.

Participant 5: 73 yo male with L) basal ganglia CVA with haemorrhagic transformation. Ineligible for the study as he had mild anomia, scored 20/24 on a similar naming test - The Comprehensive Aphasia Test (CAT) - and on further testing was subsequently diagnosed with an additional speech impairment (dysarthria).

Patient 6: 65 yo female with L) MCA CVA, presenting with anomia. She was made aware of the LIFT study whilst awaiting a rehab bed and consented to participate but passed away in acute care prior to transfer to HRC.

Patient 7: 58 yo male with L) MCA CVA, scored 1/60 on BNT and therefore ineligible for the study.

Participant 8: 79 yo female with L) MCA CVA, declined participation in the LIFT on the day of pre-treatment assessments, stating that she felt the program would be too intense for her (3 hours per day of speech therapy) and wished to have a speedy discharge and participation in LIFT would have delayed the estimated discharge date.

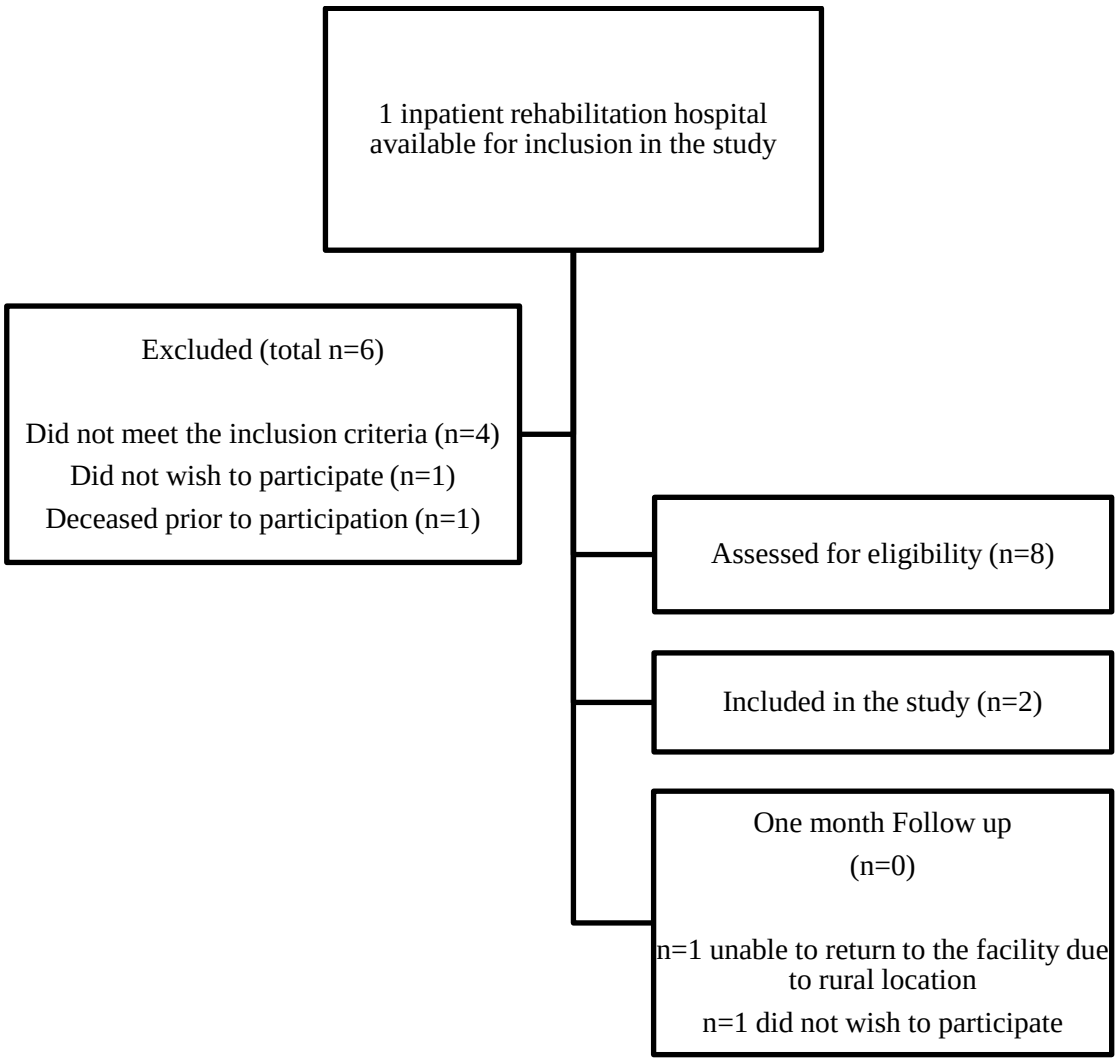


Figure 2. Flow chart of the inclusion/exclusion process

3.4.8 Outcome Measures

Primary outcome measures used in this study were:

1. Naming : treated and untreated Bank of Standard Stimuli (BoSS) items (Brodeur, Guérard, & Bouras, 2014).
2. The Boston Naming Test (BNT) (Kaplan et al., 1983).
3. The naming sub-test in the Western Aphasia Battery (Kertesz, 1982).

Secondary Outcome measures:

4. The Western Aphasia Battery (WAB), the Aphasia Quotient (Kertesz, 1982) .
5. The Communication Effectiveness Index (CETI) (Lomas et al., 1989).
6. Assessment for Living with Aphasia (ALA) (Kagan et al., 2010).
7. Fatigue Questionnaire (FQ) (Chalder et al., 1993).

Additional outcome measures:

8. Daily and Overall Participant Satisfaction Questionnaire.
9. Survey to Other Health Professionals.
10. Daily diary.
11. Length of stay (LOS).
12. Functional Independence Measure (FIM) scores.

Table 3 demonstrates how each outcome measure was used to address a separate research question across the domains of language impairment, functional communication, QOL, feasibility, intensity and rehabilitation measures. The three key research questions that were addressed in this study were:

Research Question 1

For patients with stroke-induced aphasia in the sub-acute phase (4 days – 4 months post-onset), will participation in LIFT result in improvements in measures of language impairment, functional communication and quality of life?

Research Question 2

For patients with stroke-induced aphasia in the sub-acute inpatient rehabilitation setting, will the implementation of LIFT be clinically viable?

Research Question 3

Will LIFT participants be able to cope with the high intensity of therapy?

Table 3.

Outcome Measures for LIFT

Domain	Outcome Measure	Addresses research question
Language Impairment	Treated and untreated BoSS items BNT The naming sub-test in the WAB WAB Aphasia Quotient	1
Functional Communication	CETI	1
QOL	ALA	1
Feasibility	Daily and Overall Participant Satisfaction Questionnaire (see Appendix 1 and Appendix 10). Survey to Other Health Professionals (see Appendix 2). Daily diary (for recording barriers and facilitators)	2
Intensity	FQ	3
Rehabilitation Measures	LOS FIM scores	Tertiary Outcome Measures

3.4.9 Assessments

The participants were assessed for baseline performance as soon as possible after recruitment to the study. They were also re-assessed following completion of the LIFT program. These outcome measures will be referred to as *pre-* and *post-treatment assessments*. The Daily Participant Satisfaction surveys were completed around the same time every day. The Overall Participant Satisfaction Survey and the Survey of other Health Professionals were post-treatment outcome measures. LOS and FIM scores were routinely collected and obtained from the medical records after the participant was discharged from the center.

A third follow-up assessment was planned after one-month post-completion of the study. However, neither participant was able to take part due to limited rural services and non-attendance; see sections 4.7, 5.7 and 5.8.

3.4.9.1 Assessors

Each participant was assessed by a qualified SP employed by HRC. The same SP completed both the pre- and post-treatment assessments. Each assessor received group and individual training, which included a thorough outline of the research project and the assessment tools as per instructions in their respective manuals (i.e. for the WAB, BNT, ALA). The CETI & FQ were self-rated assessments and assistance from the treating SP (not the CI) was provided if the participant had difficulty independently completing these assessments. The CI provided the assessor training to ensure consistency between Speech Pathologists' assessment and scoring.

3.4.10 Intervention

3.4.10.1 LIFT Therapy

Both participants completed the LIFT program. Therapy provision was scheduled for 3 hours per day, 5 days a week, for 3 weeks, totalling 45 hours of therapy. The LIFT treatment was provided by the CI. During computer therapy, occasional support was provided by a final year SP student or an AHA. Participants joined the existing group therapy already provided at HRC (for stroke inpatients), which was run by an AHA or a SP student. Additionally, all participants were required to attend a family meeting within the first 2 weeks of their inpatient admission as an opportunity to meet with the entire treating rehabilitation team, receive education on stroke and aphasia, and discuss goals and plans for life after discharge.

Participants continued to receive normal, scheduled treatment from other disciplines including (but not limited to): medical treatment, nursing, physiotherapy (PT), occupational therapy (OT), social work and dietetics, for the duration of their inpatient stay. After participation in the study, participants continued to receive usual care speech pathology input from their treating SP (See Table 4 for the LIFT program schedule).

Table 4.

Weekly Schedule for the LIFT Program

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Impairment Therapy	1 hour	45 min	1 hour	45 min	1 hour
Functional Therapy	1 hour	45 min	1 hour	45 min	1 hour
Computer	1 hour	45 min	1 hour	45 min	1 hour
Group		45 min		45 min	

3.4.10.2 Treatment sets

Prior to the LIFT program, each participant was presented with a *baseline probe*: 100 items from the BoSS (Brodeur, 2014). These were selected from a total of 1468 items that were normalised across 15 domains. One particular domain was *concept familiarity*. The 1468 items were ranked in order of their familiarity rating and from this, 300 items were randomly chosen based on an equal spread of high and low familiarity. To reduce this number further, duplicates were discarded and 100 items were selected at random.

The participant was asked to rate their familiarity for each stimulus on a rating scale of 1-5, with 1 indicting very unfamiliar and 5 very familiar. The participant was presented with these 100 items on a laptop in an automated slideshow, allowing a response time of 15 seconds per item. They viewed the slideshow twice and their responses were recorded. Based on the procedures of the LIFT protocol, available with permission from the LIFT developers (Rodriguez et al., 2013), of these 100 items, 60 items were selected: 48 items that the participant was unable to name on both trials and 12 items that they were able to name accurately on both trials. Of these 60 items (48 unable to name and 12 able to name), 30 were randomly allocated to a control set and 30 to a treatment set (see Figure 3). The treatment set comprised items used within LIFT therapy. The control set comprised items not used in therapy but used during testing to investigate generalisation of naming ability.

Additionally, 12 personally relevant items were chosen by the participant and included in the treatment set. The treatment set - now comprising 42 items - was randomly distributed to 3 treatment sets: A, B and C (Figure 3). The treatment sets were used in Impairment and Computer based therapies. The treatment set and the control set formed the Probes for each participant.

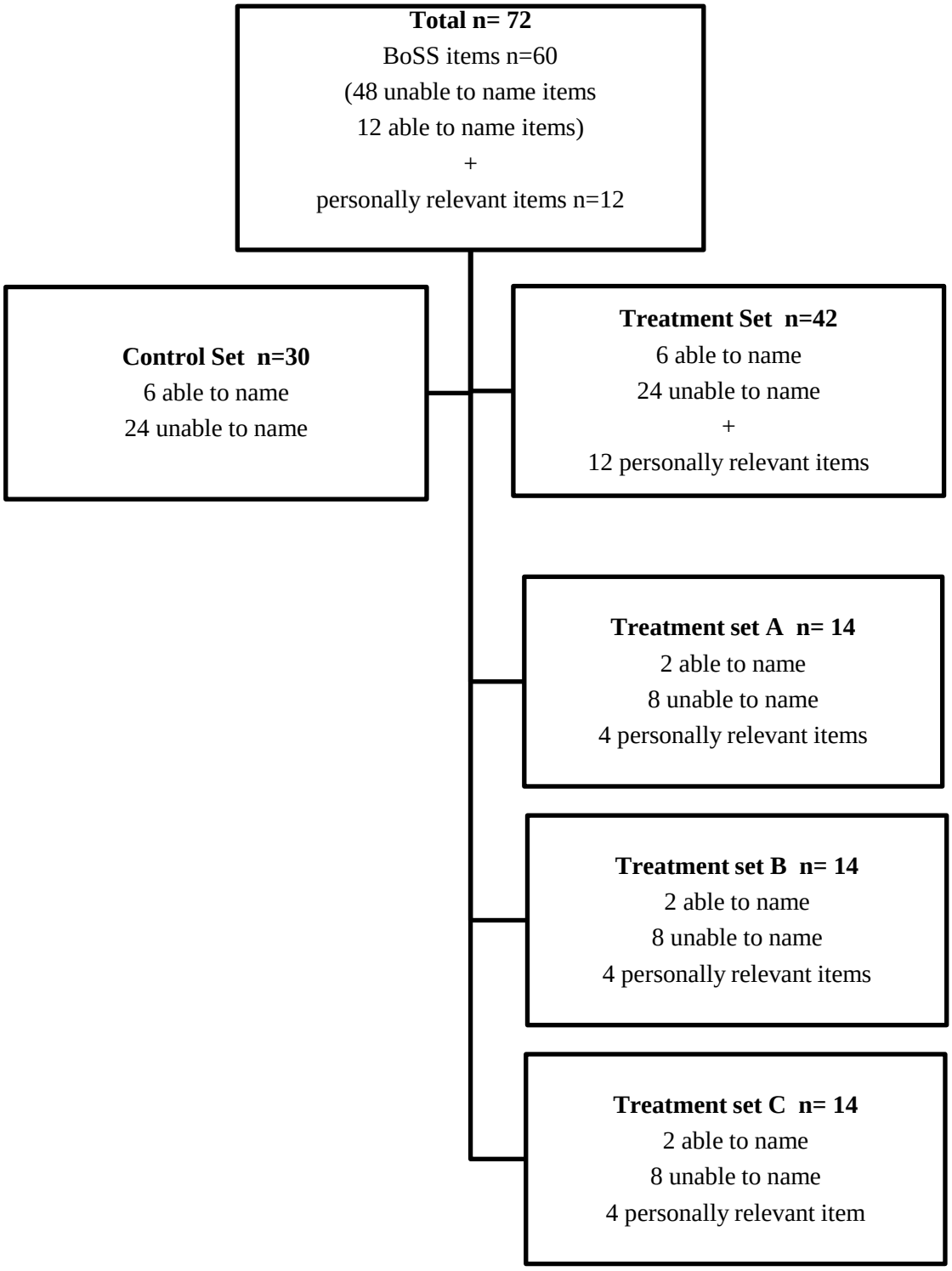


Figure 3. Treatment and Control Sets selected from the BoSS Items.

During impairment based therapy, i.e. naming, the treatment sets were provided as individual items on the Impairment Therapy Stimulus sheet (Appendix 3). As per the LIFT manual, the participant was asked to name the picture. If the participant was able to name the picture, the CI reinforced it and continued to the next step. If the participant was unable to name the picture, the target word was modeled by the CI and the participant was asked to try

and repeat it. The CI then guided the participant through the generation of the target words' semantic/phonological features on the stimulus sheet (using cues) (Boyle, 2010). The participant was asked to generate, via speech, if possible, the semantic/phonological features of the target picture. For instance, if the target picture was 'bed', the semantic feature for group (or category) would be 'furniture'. After the generation of each semantic or phonological feature, the target word was modeled and again the participant was asked to repeat it and the responses were scored for accuracy. As per Table 5, only one set per week (set A, B or C) was presented during impairment based therapy and then the sets were rotated. For instance, when set A was used in impairment based therapy, a different set would be used in computer therapy (i.e., set C). During impairment based therapy, one set (comprising of 14 items) was presented for the duration of the one-hour session. Initially, both participants struggled to complete a whole set during an impairment based session, due to the severity of their aphasia. However, as their aphasia improved, they were able to work through the entire set and on occasion, the set was repeated if time permitted.

3.4.10.3 Treatment Probes

The Treatment Probes comprised of the participants control and treatment sets, as depicted in Figure 4. At the completion of every 3 days of LIFT, a Treatment Probe was conducted, resulting in a total of 4 Probes throughout the program. Scoring of correct responses was classified according to the LIFT protocol; a revised procedure of the scoring method of the Philadelphia Naming Test (Moss Rehabilitation Research Institute, 2012). For instance, responses were considered correct if they were produced correctly within 10 seconds, self-corrections were produced within 10 seconds and/or an appropriate synonym was produced e.g., (couch) 'sofa'. The Fatigue Questionnaire was also re-administered during the same 4 time points.

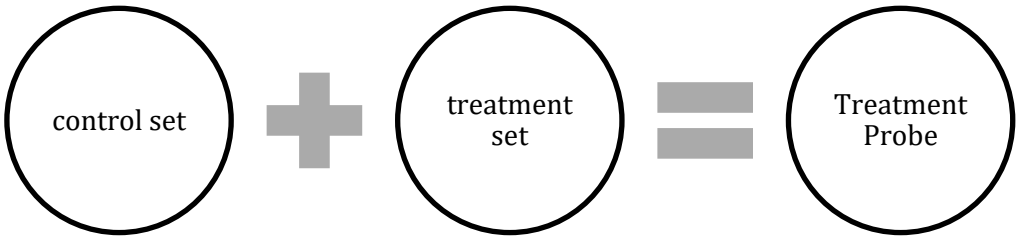


Figure 4. The structure of the Treatment Probes

Table 5.

LIFT schedule of tests and sets

Day (within LIFT program)	Tests to complete	Sets in Impairment and Computer Therapy
(-3 days) Pre LIFT	Baseline Probe - BoSS items	
(-2 days) Pre LIFT	Pre-treatment assessments: WAB, CETI	
(-1 day) Pre LIFT	Pre-treatment assessments: BNT, ALA, FQ	
Day 1	Commence LIFT*	Set A & Set B
2		Set A & Set B
3		Set A & Set B
4	Treatment Probe 1	Set A & Set B
5		Set A & Set B
6		Set B & Set C
7	Treatment Probe 2	Set B & Set C
8		Set B & Set C
9		Set B & Set C
10	Treatment Probe 3	Set B & Set C
11		Set C & Set A
12		Set C & Set A
13	Treatment Probe 4	Set C & Set A
14		Set C & Set A
15		Set C & Set A
1 day post LIFT	Post-treatment assessments: WAB, CETI	
2 days post LIFT	Post-treatment assessments: BNT, ALA, FQ, Surveys**	
3 days post LIFT	Study completed	

*Daily Participant Satisfaction Survey (to be completed every day of the LIFT program)

**Overall Participant Survey and Survey to Other Health Professionals

3.4.10.4 Impairment based therapy

Impairment based therapy comprised individual treatment sessions (1:1) focused on regaining lost language functions, specifically word finding difficulties (anomia), which is the most common symptom of aphasia.

The impairment based therapy was targeted at the single word level. Therapy comprised two methods: Semantic Feature Analysis (SFA) and Phonological Component Analysis (PCA) (Boyle, 2010; Leonard, Rochon, & Laird, 2008). Semantic Feature and Phonological Component Analyses are two word-finding therapy techniques. Semantic Feature Analysis focuses on the meaning-based properties of the target word (e.g., Category: "what *group* does this word belong to?"), whereas PCA focuses on the sound components in the word (e.g., First Sound: "this word starts with..."). Both treatments are designed to facilitate target word production. Efficacy of both treatment approaches has been demonstrated in a meta-analysis of 44 individual studies by Wisenburn and Mahoney (2009).

Whilst the provision of impairment based therapy was standard across participants, the target items were *different* for each individual. The target items comprised 30 BoSS items (selected during baseline testing) and 12 personally relevant items chosen by the participant. The personally relevant items were objects that had a specific meaning to the individual participant, e.g., church items or photographs of their grandkids. These items (n=42) were divided into three sets of stimuli: A, B and C. Each set then comprised 14 items: 4 personally relevant items, 2 items that the participant named correctly on two attempts (at baseline) and 8 items that the participant was unable to name during baseline testing (Figure 3). Each set (either set A, B or C) was used for 5 days of LIFT and then a new set was introduced. For instance, whilst one set was used in impairment based therapy, a different set was used simultaneously during computer therapy. The sets were rotated to ensure that all sets were treated in both computer and impairment based therapies (see Table 5).

3.4.10.5 Functional Therapy

Functional therapy in LIFT was focused on context-specific tasks, necessary to achieve participant goals. They included: impairment based therapies, use of iPads as therapy tools, exercise books and therapy in other modalities (e.g., writing).

Goal setting in this study deviated from the original LIFT program due to a variation in setting and time post onset (TPO). In the original LIFT study, goal setting occurred 2 weeks prior to the commencement of LIFT as it was a community based study comprising participants with chronic aphasia (Rodriguez et al., 2013). Consequently, goals were discussed with the participant (and their family member/friend) during pre-treatment assessments and they were

asked to consider short-term achievable goals to be targeted during the program. In contrast, goal setting occurred on the first day of functional therapy in the current study. Each participant set language based goals with the support of the CI. Participant goals were documented using Goal Attainment Scaling (GAS), which was provided to the participant and also recorded in their medical file for viewing by the treating rehabilitation team (as part of standard clinical practice in inpatient rehabilitation). GAS is a tool frequently used in rehabilitation as it does not have a floor/ceiling effect (avoiding the issues faced by many standardised assessments) and this tool is sensitive as each GAS is applied to the participant selected goals. GAS contained a 5-point scale. When a participant met their goal, they received a score of 0. When they achieved better than expected, they were given a score of +1 (moderately better) or +2 (significantly better). Likewise, if they failed to achieve the goal, they were given a rating of -1 (moderately worse) or -2 (significantly worse) (Kiresuk & Sherman, 1968). In addition, their functional goals were broken down into sub goals that made up that activity and were documented in the Functional Communication Therapy Planner (FCTP) as per procedure (Worrall, 1999).

A challenge goal (i.e., a personally relevant and difficult goal) was also chosen by the participant to be completed on the final day of the LIFT program, in front of a small audience including the chief investigator, therapists and family members (when available).

3.4.10.6 Computer Therapy

Computer-based therapy was an integral part of LIFT. Two software programs – 'Step By Step' and 'Aphasia Scripts' - are core components of the computer based component of LIFT, and are used to further enhance the skills targeted in impairment based therapy. The treatment sets (A, B & C) were uploaded into the Step By Step program so that the participant could continue to work on these sets in other domains (auditory comprehension, verbal expression, reading comprehension and written expression). Step By Step was mostly aimed at the single word level but did encapsulate some phrase and sentence level tasks. Aphasia Scripts is a program that uses an avatar to assist the participant to practise verbal expression of scripts (either pre-recorded or individually uploaded scripts) ranging from easy to difficult. Cues can be added, reduced or removed altogether, creating a challenging environment for all participants regardless of their impairment level.

The computer therapy was provided by the CI and occasionally by an AHA. The AHAs were provided with group and individual training prior to their involvement.

3.4.10.7 Group Therapy

Group therapy in this study deviated from the original LIFT study and permission was granted by the original designers of the program prior to the commencement of this project. In the original LIFT study, there was a cohort of participants who partook in group therapy together with their friends and family. These sessions were aimed to educate participants and their friends/family about aphasia whilst promoting social interaction and holistic communication strategies.

Participants in the current project were studied singularly and therefore, a cohort of LIFT participants was not achievable. As a result, participants joined the existing Speech Group that was offered at HRC (twice a week for 45 minutes) for stroke patients with the same aim of promoting social interaction and holistic communication. However, family and friends were discouraged to attend as most patients found this distracting. Alternatively, education regarding stroke, aphasia and rehabilitation goals was provided during a 'family meeting'. All patients and their significant others were given the opportunity to attend their own family meeting at HRC, typically arranged within the first 2 weeks of their admission.

The Speech Group at HRC was run by an AHA and/or SP students, and the participants joined this group to receive the LIFT component of group therapy.

3.4.10.8 Daily Therapy

Up to 3 hours of LIFT therapy was provided to the participant on a weekday basis. LIFT therapy had to accommodate all other therapy sessions and appointments (e.g., physiotherapy, medical etc.). As such, sessions were provided as the participants' schedule permitted. On days without group therapy, therapy was provided in one-hour blocks, either consecutively or scattered throughout the day. On days with group therapy, sessions were in blocks of 45 minutes and again, provided at times suitable for the participant.

The next two chapters (Chapters 4 and 5) contain the findings regarding the two participants (WH and KL) who were included in the current study. Both were English speaking, right-handed and presented with aphasia following an ischemic stroke in the left middle cerebral artery.

Chapter 4 - Results for Participant 1

As described in Chapter 3, each outcome measure addressed a separate research question across the domains of language impairment, functional communication, QOL, feasibility, intensity and rehabilitation measures.

Therefore, the following two chapters will be organised according to the domain in question.

4.1 Participant characteristics

The demographics of participant 1 (WH) are summarised in Table 4. WH was a 61-year-old female who experienced a first ischemic stroke resulting in severe expressive aphasia, characterised primarily by word finding difficulty (WFD) and a mild to moderate receptive aphasia. Initially, she presented with a non-fluent aphasia that included perseverations, phonological paraphasias, unreliable yes/no production and moderate to severe difficulty with reading and writing. She also presented with mild motor deficits but remained independently mobile.

WH was highly motivated, had a supportive husband who visited frequently and she maintained a positive attitude throughout her inpatient admission. She was able to rapidly achieve her other physical and cognitive goals, such as meal preparation, safe transfers and safe showering. She subsequently required limited input from both physiotherapy and occupational therapy. Her LOS was 35 days at the rehabilitation hospital during which she completed a total of 40.3 hours of LIFT (out of a maximum of 45 hours). Reduced attendance during the LIFT was due to a combination of factors, commonly an issue in inpatient rehabilitation, including: conflicting therapy appointments, an outpatient cardiology appointment and infrequent late attendance to sessions secondary to previous appointments running overtime. Demographic characteristics are summarised in Table 6.

Table 6.

Summary of Participant Characteristics for WH

Participant	Age	Gender	stroke	TPO[2] (days)	LOS[3] (days)	LIFT hours (total = 45 hours)
WH	61	Female	Ischemic, L) MCA CVA[1]	11	35	40.3 hours

[1] L) MCA CVA: Left Middle Cerebral Artery Cerebrovascular Accident

[2] TPO: Time post onset

[3] LOS: Length of stay

4.2 Differential Diagnosis of Aphasia

The differential diagnosis of aphasia for WH was based on the *WAB-R Aphasia Classification Criteria Table* (Kertesz, 2007). The Aphasia Quotient encompasses the performance on four aspects of language within the Classification Table (Fluency, Auditory Verbal Comprehension, repetition and Naming & Word Finding). Performance on the first three aspects was then used in Table 7 to differentially diagnose an aphasia type. Based on her performance profile, the type of aphasia was Broca's Aphasia. This was also consistent with a pre-assessment clinical presentation of non-fluent speech and superior auditory comprehension relative to her poor expressive ability.

Table 7.

WAB-R Aphasia Classification Criteria Table

(Kertesz, 2007)

Aphasia Type	**Scores**			
	Fluency	**Auditory Verbal Comprehension**	**Repetition**	**Naming & Word Finding**
Global	<5	<4	<5	<7
Broca's	<5 (4)	>3 (9.55)	<8 (2.1)	<9 (3.9)
Isolation	<5	<4	>4	<7
Transcortical Motor	<5	>3	>7	<9
Wernicke's	>4	<7	<8	<10
Transcortical Sensory	>4	<7	>7	<10
Conduction	>4	>6	<7	<10
Anomic	>4	>6	>6	<10

4.3 Domain: Language Impairment and Functional Communication

4.3.1 Language Impairment - Treatment Probes

During the LIFT program, Probes were conducted every 3 days and included:

a. A picture-naming task of 72 BOSS items - unique to each participant - that comprised 30 treated items, 30 untreated items and 12 personally relevant stimuli (see Figure 5) and,

b. A repeat of the Fatigue Questionnaire (see section 4.4).

One of the outcomes from the original LIFT study (Rodriguez et al., 2013) was a suggestion for future studies to collect probe data to determine whether any treatment effect

also generalised to non-treated items. This recommendation was incorporated into this study and the treatment set was compared to the control (untreated) set. However, there was an unequal number of items within the sets: the treatment set included 42 items (30 BOSS Items *and* 12 items personally chosen by the participant) and the un-treated/control set included only 30 BOSS items, as depicted in Figure 5.

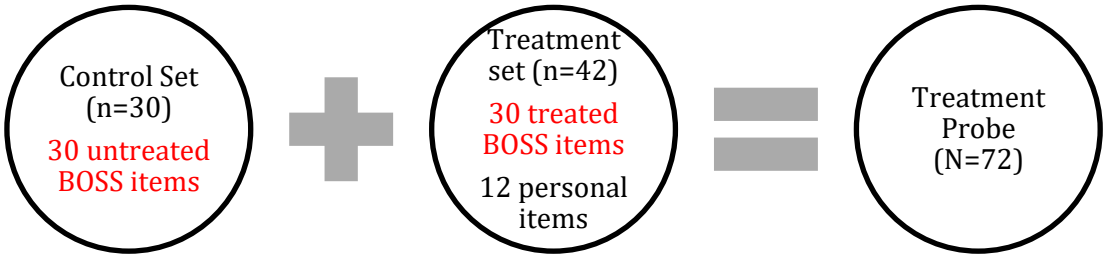


Figure 5. Flowchart depicting the process in which the treatment sets were created

For reasons of equivalence and compatibility - only the 30 treated (BOSS) items were compared to the 30 untreated items. The 12 personally relevant items (chosen by the participant) were excluded from this comparison as these were not BOSS items and therefore incompatible to the rest of the stimuli. However, the results regarding these 12 personally relevant items are reported in section 4.3.2.

Naming performance is displayed in Figure 6 as the number of items named correctly during the baseline Probes. Baseline Probes were completed prior to the LIFT program and Treatment Probes 1-4 were completed during the program, after every 3 days of completed LIFT treatment. The final assessment probe data was collected in the last week of the LIFT program. The black trend lines (see Figure 6) show an upward trend for treated items, which would be expected given that they were treated during the LIFT intervention. Furthermore, an upward trend was observed for untreated items, indicative of a potential treatment effect.
To consider if LIFT had an effect on treated and untreated BoSS items, the McNemar statistical test was applied to the data set. The McNemar test is a nonparametric test that compares correctly and incorrectly named items at the initiation and completion of an intervention; in this case from Treatment Probe 1 to 4. It has a critical value / cut-off value of 3.84; values above this critical value indicate that a treatment effect has occurred (Siegel, 1956). Appendix 11 represents the raw data entered for the McNemar test and shows the tally of correct versus incorrect responses for **treated** BoSS items. The calculated McNemar value was $X^2 = 5.44$ ($p < 0.05$), which is indicative of significance as the value is well above the

critical value of 3.84. Thus, a significant treatment effect occurred regarding the treated BoSS items.

The McNemar test was also applied to **untreated** BoSS items (see Appendix 12) and revealed a McNemar value of $X^2 = 11$ ($p < 0.05$). Again, this is significantly greater than the critical value of 3.84. This also demonstrates a significant improvement in WH's ability to name untreated items, i.e., a significant generalisation effect to untreated items.

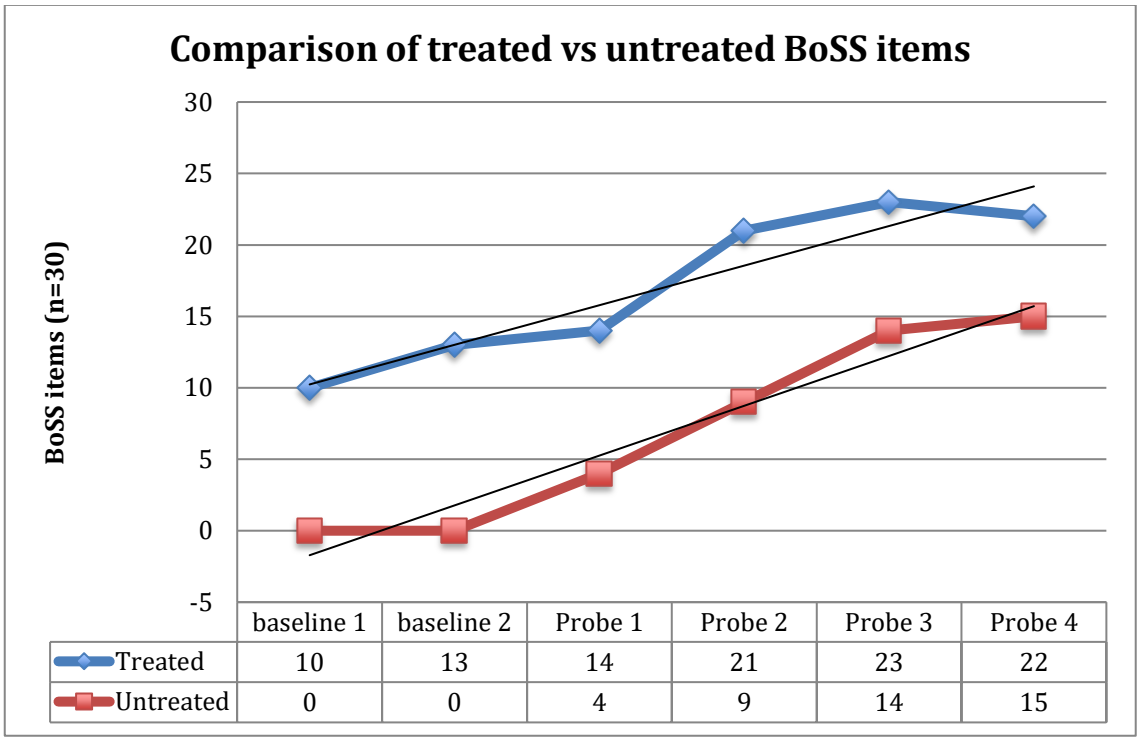


Figure 6. Comparison of treated versus untreated BoSS items

4.3.2 Personally Relevant Items

Each participant chose 12 personally relevant items that they wanted to work on during LIFT. For instance, WH's items included: church, cat and phone. These 12 items were included in the treatment set and also in the Treatment Probes given on every third day of LIFT (see Figure 5). WH's increased performance, from naming 9/12 to 11/12 of the personally relevant chosen items is displayed in Figure 7. The high score at baseline (9/12) may have impacted the ability to recognise significant improvement post therapy given the small degree of potential improvement from baseline (maximum 3/12), therefore representing a ceiling effect. The improvement was expected given the participant chose target items that were salient to the individual as well as familiar items tending to elicit greater recall and naming accuracy (Brodeur et al., 2014).

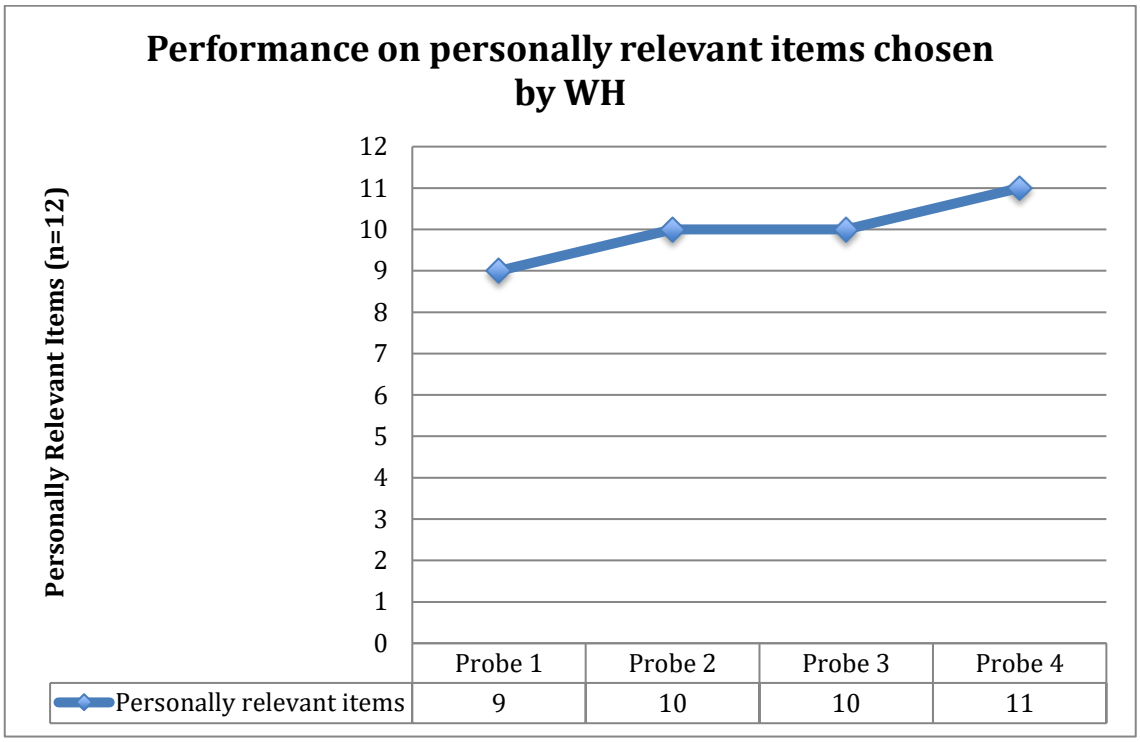


Figure 7. Performance in the Treatment Probes on the 12 Personally Relevant Items

4.3.3 Language Impairment – Naming Accuracy

As described, naming accuracy is the main impairment-based treatment component within LIFT. WH also demonstrated a substantial improvement in the naming and word finding subtests of the WAB assessment (see Table 9). Pre and post-performance on the WAB Naming subtest (20 items) was again analysed using the McNemar test (Siegel, 1956) (see Appendix 13), resulting in a calculated value $X^2 = 18$ ($p < 0.05$), well above the critical value of 3.84. This demonstrates a significant treatment effect on the WAB naming subtest. More importantly, this showed a substantial generalisation of a treatment effect, i.e., improved overall naming ability (as measured using the WAB naming subtest) rather than a treatment effect confined to treated items.

4.3.4 Language Impairment – Performance on Outcome Measures

Pre- and post-treatment assessments were conducted within two days prior to commencement and within 2 days after completion of the LIFT program. The same clinician, not the CI, completed the pre and post assessments to ensure consistency. WH's scores for each outcome measure, relating to the four domains being investigated, are presented as the pre-treatment score, the post-treatment score and a change in score (See Table 8). The primary outcome measures for *language impairment* included the BNT and the WAB. The

BNT has a maximum score of 60. The WAB score presented is the Aphasia Quotient. The cut off score is 93.8 and any score below this is indicative of a language impairment, i.e., aphasia (Kertesz, 1982). The CETI was a secondary outcome measure for *functional communication*. It is an indirect measure of *change* in language impairment, as rated by a primary communication partner. It has a maximum change in score of 160, with an increase in score reflecting improved communication effectiveness.

Table 8.

Summary of assessment results

Outcome Measures	**Domain**	**WH**		
		Pre-treatment score	**Post-treatment score**	**Change in score**
BNT[1]	Language Impairment (primarily focused on naming)	6/60	39/60	+33
WAB[2] AQ	Language Impairment (verbal expression and auditory comprehension)	49	75.4	+26.4
CETI[3]	Functional communication (completed by a communication partner)	44	79	+35

[1] Boston Naming Test
[2] Western Aphasia Battery Aphasia Quotient
[3] Communication Effectiveness Index

4.3.4.1 Boston Naming Test

The Boston Naming Test (BNT) comprises 60 items of increasing naming difficulty. A change in performance equal to or greater than 2 standard deviations is considered clinically and statistically significant (Difrancesco et al., 2012; Maher et al., 2006). The mean BNT score for WH's age group (60 – 69 years) without aphasia is 53.3 with a standard deviation of 4.60 (Kaplan et al., 1983). WH demonstrated a significant increase in naming accuracy with a change in score of +33 points: far greater than 2 standard deviations (9.2), illustrating her improvement in naming ability to be statistically and clinically significant. Again, this demonstrates the generalisation of naming ability, with WH showing an improvement in overall naming ability on the BNT as well as the WAB naming subtest (see above).

4.3.4.2 Western Aphasia Battery

The Western Aphasia Battery (WAB) is a test for the diagnosis of aphasia comprising 8 subtests. Overall performance (severity of aphasia) is measured using the AQ, a composite score for the 4 **spoken** language subtests: fluency of spontaneous speech, auditory verbal comprehension, repetition, naming and word finding. A statistically significant (post-intervention) change in the aphasia quotient is equal to or greater than 5 points, as defined by Katz and Wertz (1997). WH performance on the WAB showed an increased change in the AQ of +26.4, showing a substantial statistical and clinically meaningful change in her overall expressive and receptive language ability. Furthermore, the WAB AQ is based on several subtests, used to measure language abilities in auditory comprehension and verbal expression. Table 9 provides a breakdown of pre and post-treatment performance in these subtests plus the change in performance (expressed as a percentage).

Table 9.

Subtests of the WAB for WH

WAB subtests	Pre-treatment score	Post-treatment score	Change in score (%)
Spontaneous speech	9/20	15/20	6/20 (30%)*
Auditory verbal comprehension	191/200	194/200	3/200 (1%)
Repetition	21/100	54/100	33/100 (33%)*
Naming & Word Finding	39/100	83/100	44/100 (44%) *
AQ	49.2	76.8	27.6*

* Indicates a clinically meaningful result

As reflected in WH's scores, there was a general trend of improvement in language ability across all four subtests. She demonstrated a significant overall improvement in her language ability, evidenced by a positive change in her AQ (+27.6). A change in AQ of greater than 5 points is considered to be statistically significant, as defined by Katz and Wertz (1997). Therefore, this substantial change in overall language ability demonstrates a strong degree of language recovery across the two language modalities (auditory comprehension and verbal expression). However, the greatest improvement was observed in the *Naming (& Word Finding)* subtest(s) of the WAB.

Naming was the main component of LIFT treatment. This finding is consistent with the improvements in treated and untreated naming items as well as the improvement in her BNT performance. The combination of a treatment-specific effect for naming (with generalisation to untreated items and the BNT) and a greater effect for WAB-naming compared with WAB-

subtests, suggests that the therapy effects relating to overall naming ability are not entirely explained by spontaneous recovery. This finding will be further discussed in Chapter 7.

4.3.4.3 The Communicative Effectiveness Index

The CETI is a questionnaire rated by a primary communication partner and is designed as a measure of *change* in language impairment/ communication ability. A number of elements of effective communication are rated by the communication partner on a visual analogue scale (a line of 10cm with the end points defined). The rating is expressed as a millimetre value (between 1 and 100 mm). An increased change in score is reflective of improved communication effectiveness.

A statistically significant change as measured on the CETI is defined by a mean change in the ratings to, or greater than 11.4 (Lomas et al., 1989). The partner's pre and post treatment ratings showed that WH achieved a positive overall change in her ratings by 35 points. Thus, showing a substantial, statistically significant improvement in her functional communication.

4.4 Domain: Intensity

The domain of intensity was explored by measuring the fatigue of participants during the LIFT program using the Fatigue Questionnaire (FQ). The FQ has a score range of 0-11 with scores of greater than 4 indicating significant fatigue (Chalder et al., 1993), and scores below 4 considered to be within normal limits.

This measure was used to investigate whether participants felt they could cope with the greater intensity of the program, which was triple the aphasia therapy provision of usual intervention in this hospital (Rej et al., 2016). The FQ was administered at several points in time (pre and post LIFT treatment) and was also administered during the treatment phase after every 3 days of completed LIFT treatment.

The combined results represent varying levels of fatigue throughout the program as displayed in Figure 6. WH's scores demonstrate an initial incidence of high fatigue (at pre-treatment and probe 1), which fell within normal limits, (scoring between 1-4 on the FQ) for the remainder of the LIFT program. This may be explained by WH becoming accustomed to the high intensity of the program as well as the benefit of an afternoon nap which helped manage her fatigue.

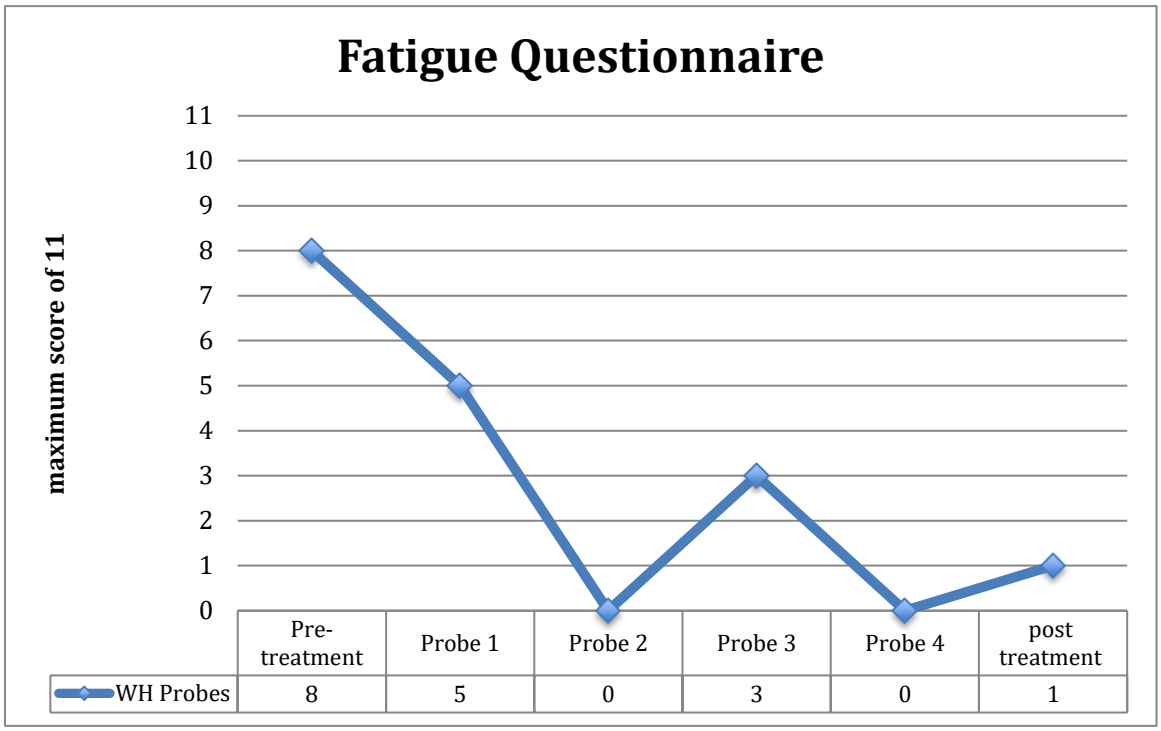


Figure 8. FQ results at different time points for WH

4.5 Domain: Quality of Life

Quality of Life was investigated as a secondary outcome measure: the Assessment for Living with Aphasia (ALA). It has a maximum score of 148 whereby a higher score reflects ones improved ability to manage and live with aphasia (Kagan et al., 2010). The ALA comprised the following subtests:

Aphasia domain

The participant rates their severity of language impairment, in terms of reading, writing, speaking and comprehension ability.

Participation domain

The participant rates their ability to participate in their environments (such as home and work) as well as their ability to socialise and converse with others in order to remain included.

Environment domain

The participant rates their perceived communication support in the home and community.

Personal domain

The participant rates their mood and perception of how they are managing to live with aphasia.

Wall question

This question challenges the participant to consider whether they feel they are living successfully with aphasia. In this question only, they are encouraged to use the pictorial scale provided in the subtest to reflect how they perceive their ability.

WH demonstrated a sizeable, overall improvement in her pre to post-treatment score of 27 points (19%) (see Table 10). The subtests and her corresponding results are displayed in Table 11.

Table 10.

Overall Scores of the ALA

Outcome Measures	**Domain**	**WH**		
		Pre-treatment score	**Post-treatment score**	**Change in score**
ALA[1]	QOL	75/148	102/148	+27

Table 11.

WH scores in the subtests of the ALA

ALA subtests	**Baseline (%)**	**Post Treatment (%)**	**Change in percentage**
Aphasia domain	9/20 (45%)	10/20 (50%)	5%
Participation domain	31/64 (48%)	50/64 (78%)	30%*
Environment domain	8/16 (50%)	8/16 (50%)	No change
Personal domain	25/44 (57%)	32/44 (73%)	16%*
Wall question	2/4 (50%)	2/4 (50%)	No change
Total score	75/148 (51%)	102/148 (70%)	19%

* Indicates a clinically meaningful result

The subtests that reflect significant positive changes include: the *Participation Domain* and the *Personal Domain*. Improvements in these specific domains may be multi-factorial and insight into her other assessment results (namely, expressive and receptive language ability) may provide reasonable grounds for explaining the results of these ALA subtests. Her increased ratings in the Participation Domain may be the result of her improved

expressive language ability (confirmed by her improved WAB and BNT scores) and confidence with her communication skills for functional tasks (demonstrated by improved CETI scores).

However, there seemed to be no clear relationship between improved performance on this assessment and her *receptive* language (comprehension), as WH already displayed high levels of comprehension at baseline testing which remained consistent until post-treatment testing (see pre and post WAB scores). Her improvement in the *Personal Domain* may again be attributed to her improvement in expressive language, possibly resulting in an increased feeling of self-worth and confidence.

4.6 Domain: Rehabilitation Measures

Rehabilitation measures were *secondary* outcome measures and data collected included the FIM scores and LOS in the rehabilitation hospital (see Table 12). These data are routinely collected by the hospital staff and can be used to compare participants' results against a pool of local and national standards. WH's FIM scores and LOS were compared to the findings gathered in the Clinical Audit study described in chapter 2.

Table 12.

LOS and FIM scores for WH

LOS (days)	FIM admission score	FIM discharge score	Change in FIM score
35	107	124	17

The AROC Benchmarks for Australia and New Zealand recommend an average LOS of 32.8 days for stroke patients within an inpatient hospital ("The Australasian Rehabilitation Outcomes Centre (AROC)," 2014). WH's LOS of 35 days was almost in line with the recommended mean LOS, and significantly less than the hospital's average of 59.8 days (Rej et al., 2016). It is possible that her participation in LIFT enabled her to achieve her goals sooner, allowing for earlier discharge when compared to the hospital's average LOS of PWAs.

WH achieved a change in FIM score of 17, which is lower than the AROC benchmark of 24.5 points used to define a clinically significant change (the combined average of haemorrhagic and ischemic FIM change scores). The observed change in FIM score was not considered sufficiently large enough to suggest that WH experienced a clinically significant improvement

in her functional independence at the end of the LIFT program. However it is likely that a 'ceiling effect' occurred as her admission FIM score (n= 107) was already high and close to the highest achievable score (n=126). Regardless, her discharge FIM score does reflect a very high level of recovery/change during her inpatient admission (124/126 points). WH did not achieve the maximum FIM discharge score (126) because she required assistance with expressive communication due to her residual aphasia.

4.7 Follow up Assessments

A one-month follow up assessment could not be completed for several reasons:

a. WH was discharged home to a remote rural property and was unable to return to the facility (HRC) for follow up assessments.
b. Speech Pathology services were limited in her area and she was unable to access these services for approximately 8 weeks post discharge.
c. She had no access to transport and was unable to drive as her driver's license was medically suspended.
d. Alternative transport could not be accessed, as taxi services did not exist in her town.
e. Tele-rehabilitation was not considered as an option because the hospital (or its Day Rehab Centre) was not equipped with that technology at the time.

Hence, she was unable to participate in follow-up assessments.

A summary of WH's assessment results presented in this chapter are displayed in Table 13. This table demonstrates that a treatment specific effect was observed in regards to naming, as demonstrated with positive change in scores in the BNT, WAB and WAB naming subtests, indicative that these changes were not entirely due to spontaneous recovery. Further improvements were reported in the CETI and the ALA, as well as low fatigue responses. In summary, a positive overall outcome was achieved during the LIFT intervention,

Table 13.

Summary of WH's Assessment Results that Depict a Clinically Meaningful Improvement

Domain	Outcome Measure	WH results*
Language Impairment	WAB AQ	✓ (Positive change in score of +26.4)
	WAB Naming Subtest	✓ (Positive change in score of +16)
	BNT	✓ (Positive change in score of +33)
Functional Communication	CETI	✓ (Positive change in score of +35)
QOL	ALA	✓ (Positive change in score of +27)
Feasibility	Daily and Overall Participant Satisfaction Questionnaire	✓ (positive response)
Intensity	FQ	✗ (low fatigue response)
Rehabilitation Measures	FIM	✗

Chapter 5 - Results for Participant 2

5.1 Participant characteristics

Participant KL was a 58 year old male who suffered a first ischemic stroke. He presented with mild to moderate expressive and receptive aphasia characterised by anomia and difficulty with repetition, especially with multisyllabic words and phrases of increasing length and complexity. He had fluent yet often tangential speech, resolving dysarthria, provided yes/no reliable answers, as well as mild to moderate difficulties in reading and writing, however remained able to communicate at a conversational level.

KL was previously independent in all activities of daily living. He lived alone in the metropolitan area but had a long-term partner. He had a prior history of alcohol and drug abuse and was unemployed at the time of his stroke, having previously worked as a baker. He displayed improving insight into his speech deficits and would frequently become frustrated with his language difficulties. He did not present with significant motor deficits and therefore had limited physiotherapy input. KL showed difficulties with sequencing, planning and problem solving subsequently raising concern about his safety. Consequently, he received occupational therapy to assist with returning home safely and living independently. His motivation and mood fluctuated as he was keen to be discharged home. Nevertheless, he participated well in sessions.

KL received the LIFT program by two speech pathologists, the CI and the manager of the Speech Pathology department. This variation was due to limited grant funding as the allocated time for clinical trials was almost expended and therefore additional clinical support was required to complete the LIFT program. The manager of the SP department assisted in LIFT therapy provision and received extensive training from the CI to ensure consistency of treatment.

KL's LOS was 30 days within the rehabilitation hospital and he completed a total of 40.1 hours of LIFT (out of a maximum of 45). The reduced attendance was attributed to KL arriving late to sessions and/or the early termination of sessions at his request, often when he became frustrated by his language limitations. KL's demographic characteristics are summarised in Table 14.

Table 14.

Summary of Participant Characteristics for KL

Participant	Age	Gender	stroke	TPO[2] (days)	LOS[3] (days)	LIFT hours (total = 45 hours)
KL	58	Male	Ischemic, L) MCA CVA[1]	10	30	40.1 hours

[1] L) MCA CVA: Left Middle Cerebral Artery Cerebrovascular Accident

[2]TPO: Time post onset

[3] LOS: Length of stay

5.2 Differential Diagnosis for Aphasia

The differential diagnosis of aphasia type in this participant, conduction aphasia, was based on the WAB-R *Aphasia Classification Criteria Table* (Kertesz, 2007). The diagnosis of conduction aphasia was supported by KL's reasonably fluent speech, good comprehension, difficulty with repetition, and insight into his speech errors, as evidenced by attempts at self-correction.

Table 15.

WAB-R Aphasia Classification Criteria Table

Aphasia Type	Scores			
	Fluency	Auditory Verbal Comprehension	Repetition	Naming & Word Finding
Global	<5	<4	<5	<7
Broca's	<5	>3	<8	<9
Isolation	<5	<4	>4	<7
Transcortical Motor	<5	>3	>7	<9
Wernicke's	>4	<7	<8	<10
Transcortical Sensory	>4	<7	>7	<10
Conduction	>4 (5)	>6 (8.15)	<7 (6)	<10 (6.1)
Anomic	>4	>6	>6	<10

5.3 Domain: Language Impairment & Functional Communication

5.3.1 Language Impairment – Treatment Probes

During the LIFT program, probes were conducted every 3 days and included:

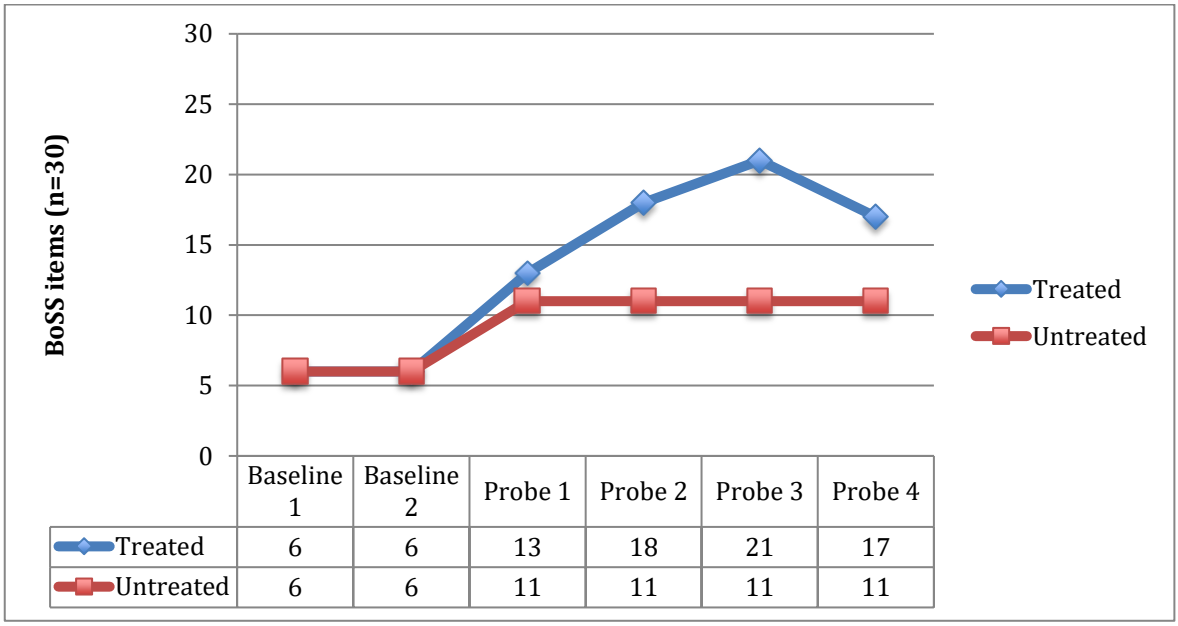
a. A picture naming task of 72 BOSS items - unique to each participant - that comprised 30 treated items, 30 untreated items and 12 personally relevant stimuli (see Figure 5) and,

b. A repeat of the Fatigue Questionnaire (see section 5.4).

The Treatment Probes were analysed following the methods outlined in Chapter 4 (section 4.3.5). As previously, the 30 treated (BOSS) items were compared to the 30 untreated items. The 12 personally relevant items were analysed separately – see section 5.3.2. Naming performance is displayed in Figure 9 as number of items named correctly per baseline probes and Treatment Probes. Baseline Probes were completed prior to the LIFT program and Treatment Probes 1-4 were fulfilled during LIFT at the completion of every 3 days of treatment. Post Treatment Probes were not gathered in this study and therefore could not be analysed.

The data set was analysed using the McNemar test to consider if LIFT resulted in a significant treatment effect on *treated* BoSS items (see Appendix 14). The McNemar value obtained ($X^2 = 0.69$, *ns*) was not significant for improvement in BoSS treated items, as this value was lower than the critical value of 3.84 ($p < 0.05$).

The McNemar test was also applied to *untreated* BoSS items. The calculated McNemar value of $X^2 = 0$ again showed no improvement in KL's ability to name untreated BoSS items (see Appendix 15). As seen in Figure 9, KL's naming performance did not show a generalisation in the absence of a significant treatment effect for targeted items. Nevertheless, KL's performance slightly improved on the targeted naming items, especially during Probe 3.

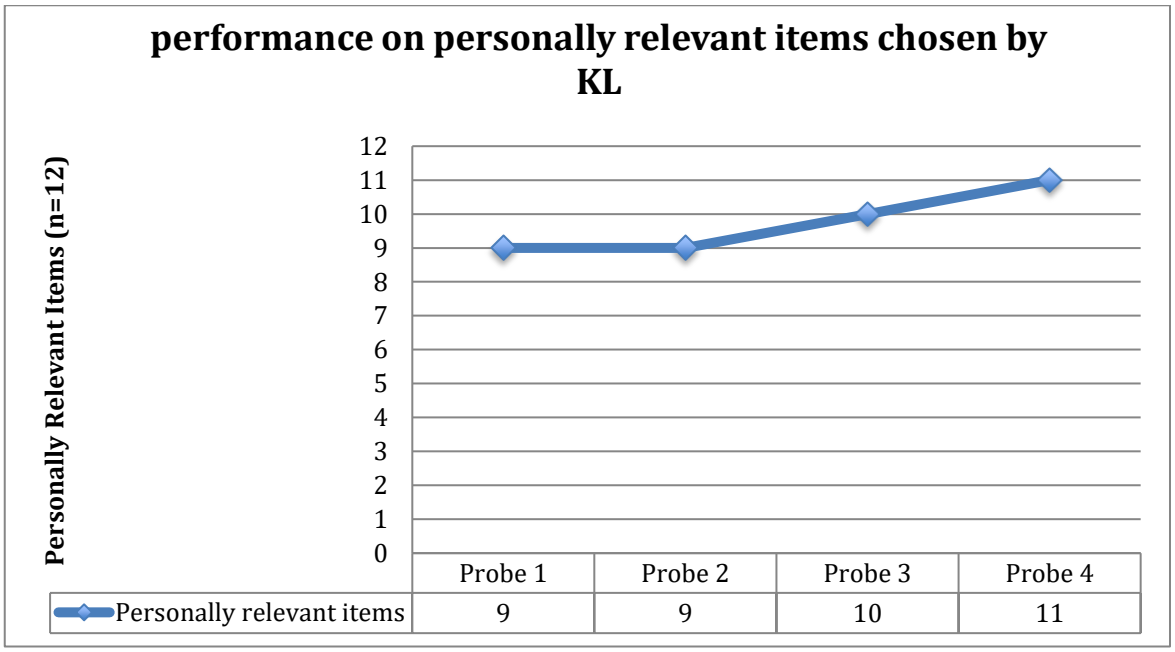


	Baseline 1	Baseline 2	Probe 1	Probe 2	Probe 3	Probe 4
Treated	6	6	13	18	21	17
Untreated	6	6	11	11	11	11

Figure 9. Comparison of Treated Versus Untreated BoSS Item

5.3.2 Personally Relevant Items

KL chose 12 personally relevant items to work on during LIFT and they included: keys, chocolate and smokes. These 12 items were included in the treatment set and also in the Treatment Probes given on every third day of LIFT. KL's performance on these items are displayed in Figure 10.



	Probe 1	Probe 2	Probe 3	Probe 4
Personally relevant items	9	9	10	11

Figure 10. Performance in the Treatment Probes on the 12 Personally Relevant Items

5.3.3 Language Impairment – Naming Accuracy

As described, naming accuracy is the main treatment component within LIFT. Yet, KL also did not demonstrate a substantial improvement in the Naming subtest of the WAB assessment (see Table 16). Pre and post-performance on the WAB Naming subtest (20 items) were analysed using the McNemar test (Siegel, 1956) (see Appendix 16). The McNemar did not show a significant improvement for WAB naming ($X^2 = 3.57$, $p < 0.05$).

5.3.4 Language Impairment – Performance on Outcome Measures

KL's pre- and post-treatment assessments were completed 2 days before initiation of therapy and 2 post completion of therapy respectively. The same clinician completed the assessments to ensure consistency. Performances on each outcome measure, relating to the four domains being investigated in this study, are presented in Table 16.

Table 16.

Summary of assessment results

Outcome Measures	Domain	KL		
		Pre-treatment score	**Post-treatment score**	**Change in score**
BNT[1]	Language impairment (primarily focused on naming)	35/60	42/60	+7
WAB[2]	Language Impairment (verbal expression and auditory comprehension)	60.5	75.3	+14.8
CETI[3]	Functional Communication (completed by a communication partner)	79/148	93/148	+14

[1] Boston Naming Test
[2] Western Aphasia Battery
[3] Communication Effectiveness Index

The results for each of the three assessments are as follows:

5.3.4.1 Boston Naming Test

The mean BNT score for his age group (50-59 years) is 55.2/60 with a standard deviation of 4.0 points (Kaplan et al., 1983). A change in score of equal to or greater than 2 standard deviations (therefore >8 points) is considered statistically and clinically significant (Difrancesco et al., 2012; Maher et al., 2006). KL had a change in score of +7 points, an obvious increase, but the change in score did not reach the threshold considered to be clinically and statistically significant.

5.3.4.2 Western Aphasia Battery

A statistically significant post-intervention change in AQ score of the WAB is equal to or greater than 5 points as defined by Katz and Wertz (1997). KL achieved an increased in AQ score of +14.8, a statistically and clinically significant change in his expressive and receptive language ability.

Furthermore, the WAB Aphasia Quotient is based on several subtests, which measure language abilities in auditory comprehension and verbal expression. Table 17 provides a breakdown of these subtests including pre and post-treatment performance plus a change in performance (expressed as a percentage).

Table 17.

Subtests of the WAB for KL

WAB subtests	**Pre-treatment score**	**Post-treatment score**	**Change in score (%)**
Spontaneous speech	10/20	16/20	6/20 (30%)**
Auditory verbal comprehension	163/200	175/200	12/200 (6%)
Repetition	60/100	61/100	1/100 (1%)
Naming & Word Finding	61/100	68/100	7/100 (7%)
Sentence completion	8/10	4/10	-4/10 (-40%)**
Responsive speech	6/10	5/10	-1/10 (-10%)**
AQ	60.5	75.3	14.8**

** Indicates a clinically meaningful finding

KL's WAB subtest results show a significant change in the spontaneous speech sample only, with very moderate generalised improvements across the other subtests. In addition to these findings, there was no significant change in *Naming* accuracy, which is the main focus of LIFT treatment, suggesting no significant treatment effect. In the absence of a therapy-specific improvement in naming ability, any improvement of overall language ability

is likely to be largely due to spontaneous recovery (see Chapter 7 for further discussion). A statistical analysis of the Naming subtest is demonstrated in Section 5.3.3.

5.3.4.3 The Communicative Effectiveness Index

A statistically significant change as measured on the CETI is defined by a mean change in ratings of equal to or greater than 11.4 (Lomas et al., 1989). KL achieved a positive change of 14 points indicating that a statistically significant change occurred in his functional communication.

5.4 Domain: Intensity

The results of the repeated FQ represent varying levels of fatigue throughout the program as displayed in figure 11. The FQ has a score range of 0-11 with scores of greater than 4 indicative of significant fatigue (Chalder et al., 1993).

The results of the FQ showed fluctuating levels of fatigue with all Probes, bar one, indicating high fatigue levels (>4). On that particular day (Day 6), KL was visited by a friend (not his partner) resulting in an improved mood as reflected by a positive score on the Daily Satisfaction Survey (see Figure 11). This suggests that KL experienced significant levels of fatigue most of the time during the LIFT program. Yet despite the reported fatigue levels, he managed to complete 89% (40.1 hours) of the total LIFT hours.

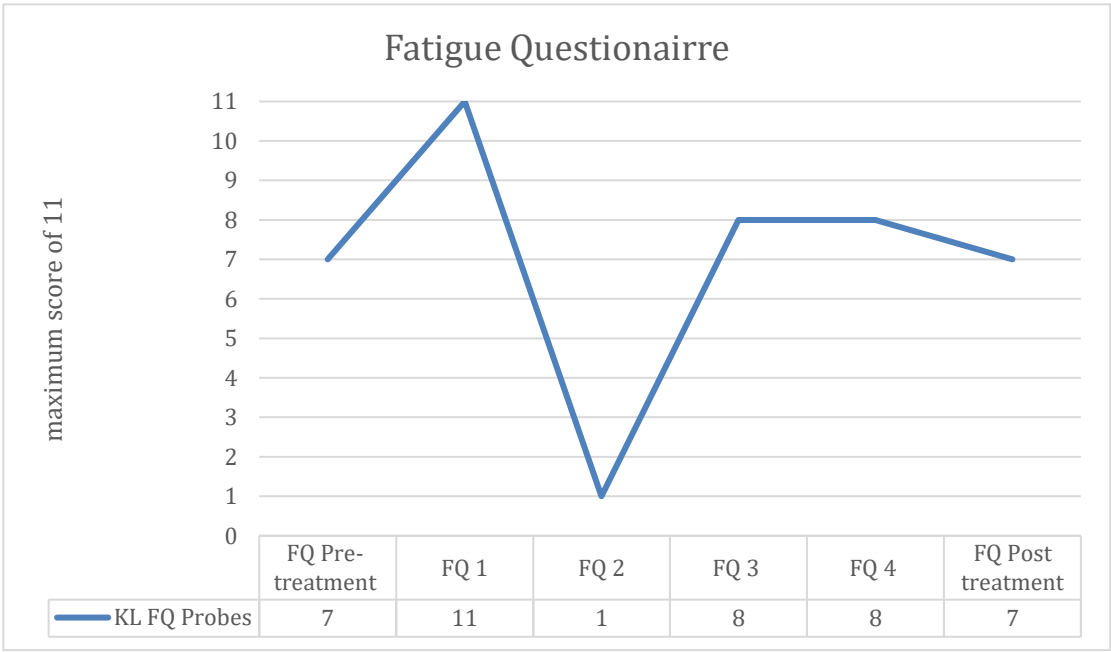


Figure 11. FQ Results at Different Time Points for KL

5.5 Domain: Quality of Life

Quality of Life was investigated using a secondary outcome measure: the Assessment for Living with Aphasia (ALA). It has a maximum score of 148, with a higher score reflecting improved ability to manage and live with aphasia (Kagan et al., 2010). KL was unable to complete all the subtests in the ALA during the pre-treatment assessment, reflected by incomplete assessment results. The reasoning behind the incomplete subtests are clarified within this section (5.5).

Table 18.

Overall scores of the ALA

Outcome Measures	**Domain**	**WH**		
		Pre-treatment score	**Post-treatment score**	**Change in score**
ALA[1]	QOL	51/134	85/148	+34

He demonstrated a sizeable overall improvement (Table 18) in pre to post-treatment scores of +34 points (19%). However, the ALA has several subtests that explore various communication domains. These subtests and his corresponding results are displayed in Table 19.

Table 19.

Subtest Scores of the ALA for KL

ALA subtests	**Pre-treatment (%)**	**Post-treatment (%)**	**Change in score (%)**
Aphasia domain	2/20 (10%)	10/20 (50%)	8/20 (40%)**
Participation domain	21/54 (39%)	32/54 (59%)	11/54 (20%)**
		38/64 (59%)	
Environment domain	6/12 (50%)	7/12 (58%)	1/12 (6%)
		9/16 (56%)	
Personal domain	20/44 (45%)	26/44 (59%)	6/44 (14%)
Wall question	2/4 (50%)	2/4 (50%)	No change

** Indicates a clinically significant finding

The subtests that reflect significant positive changes include: the *Aphasia Domain* and the *Participation Domain*. The Aphasia Domain explores how a participant perceives their own language abilities. KL self-rated his language function as significantly improved. This was consistent with his improved CETI and AQ scores (WAB). However, it was not consistent with his score on the Wall question which remained unchanged (he scored 2/4 on both pre and post-treatment assessments). This may indicate that whilst he felt his ability to communicate had improved, he did not feel that it assisted him in a functional way in living with aphasia.

The improvement in the *Participation Domain* can be explained by his ability to have weekend leave during his inpatient admission. The pre-treatment score is lower because KL was unable to answer all the subtest questions regarding his ability to manage at home because he had not yet experienced aphasia in his home environment. Consequently, he was unable to answer some of the questions during the pre-treatment assessment and these were subsequently omitted from the total score (see Table 19 for score of 32/54). However during LIFT treatment, he received medical clearance to return home for the weekends and therefore he was able to complete this subtest in its entirety during post-treatment assessments (see Table 19 for score of 38/64), hence the variation in pre and post-treatment scores. Using the set with the pre-treatment questions omitted, there was a 20% improvement in KL's perceived participation in his environment in which he scored 32/54. His greatest areas of improved satisfaction included his ability to 'get out' (leave the hospital), greater understanding of aphasia and improved perceived learning and education. Interestingly, when all the questions were included in the post treatment score, he still scored a 20% improvement (38/64).

5.6 Domain: Rehabilitation Measures

Rehabilitation measures were *secondary* outcome measures and data collected included the FIM scores and LOS in the rehabilitation hospital, as displayed in Table 20. KL's FIM scores and LOS were compared to the findings gathered in the Clinical Audit study in chapter 2.

Table 20.

LOS and FIM scores for KL

LOS	FIM admission	FIM d/c	Change in FIM
30	110	120	10

KL 's LOS was 30 days, which was marginally less than the recommend LOS of 32.8 days for stroke patients within an inpatient hospital ("The Australasian Rehabilitation Outcomes Centre (AROC)," 2014) and almost half the time of an average stroke patients admission within this rehabilitation hospital (Rej et al., 2016).

A clinically significant change in FIM score is defined as a change greater than 24.5 points. KL's change in FIM score was 10 points, which did not reach the level considered clinically significant. However, the lack of a significant improvement in FIM score may be explained by a ceiling effect given the participants high FIM score (110/126) on admission which meant improvement beyond the clinically significant value was limited.

5.7 Follow up Assessments

KL was discharged to his home in the metropolitan area and follow up services were organised through an outpatient rehabilitation clinic. Therapists reported that KL repeatedly did not attend review sessions at the clinic, leading to home based (domiciliary) services being organised as an alternative. However, domiciliary services were ceased due to risks to therapists for reasons including excess clutter and dangerous pets. Due to this non-attendance to clinic and the inability of domiciliary services to be provided, a one-month follow up assessment could not be completed.

5.9 Summary of KL and WH's assessment results

The assessment results for both participants were detailed in Chapters 4 and 5. A summary of the assessment results for both participants, displayed in Table 21, illustrate which test scores represented a clinically meaningful result. These findings are further elaborated upon in chapter 7. Table 21 shows that a treatment specific effect on naming was not observed for KL, as a positive change was only observed in the WAB AQ and no other measures of language. However, a positive change in score was observed in the CETI and the ALA despite high levels of fatigue during the LIFT intervention.

Table 21.

Combined summary of assessment results that depict a clinically meaningful improvement

Domain	Outcome Measure	WH results*	KL results*
Language Impairment	WAB aphasia quotient (AQ)	✓ (Positive change in score of +26.4)	✓ (Positive change in score of +14.8)
	WAB Naming Subtest	✓ (Positive change in score of +16)	×
	BNT	✓ (Positive change in score of +33)	×
Functional Communication	CETI	✓ (Positive change in score of +35)	✓ (Positive change in score of +14)
QOL	ALA	✓ (Positive change in score of +27)	✓ (Positive change in score of +34)
Feasibility	Daily and Overall Participant Satisfaction Questionnaire	✓ (positive response)	✓ (neutral to positive response)
Intensity	FQ	× (low fatigue response)	✓ (high fatigue response)
Rehabilitation Measures	FIM	×	×

* ✓= significant, × = not significant

Chapter 6 – Participants' and clinicians' experiences with the implementation of Aphasia LIFT

The primary aim of this study was to investigate any positive treatment effects of the LIFT program. The secondary aim of this study was to explore any implications of implementing this program in a real-life acute rehabilitation setting. This chapter focuses on both the *quantitative* and *qualitative* data collected regarding the implementation of Aphasia LIFT in a subacute rehabilitation setting. The quantitative data concerning the feasibility of LIFT included three surveys:

a. Daily Satisfaction Survey
b. Overall Participant Satisfaction Survey
c. Survey of Health Professionals

Topics that were explored in the three surveys included: participant satisfaction of LIFT, its impact on other therapy commitments and its impact on other treating clinicians.

The qualitative data regarding the feasibility of LIFT comprised the documentation of any *barriers and facilitators* observed by the CI. The documentation of barriers and facilitators explored the topics of participant and organisational factors that influenced the feasibility of LIFT implementation.

6.1 Quantitative data - Surveys

6.1.1 Survey 1: daily satisfaction survey

The daily satisfaction survey was provided to participants (see Appendix 1) at the start of each therapy day (n=15). Each survey question comprised a Likert Scale where each point was defined by icons and verbal labels, as displayed in Figure 12.

A five-point scoring system was formulated and applied to the Likert scale:

Scoring System for Surveys

- Very dissatisfied (pictured as a double thumbs down) as a score of -2
- Somewhat dissatisfied (pictured as a single thumbs down) as a score of -1
- Not satisfied/not dissatisfied (pictured as a neutral hand) as a score of 0
- Somewhat satisfied (pictures as a thumbs up) as a score of +1
- Very satisfied (pictured as a double thumbs up) as a score of +2

Figure 12. The Visual Likert Scale Used in the Surveys

This scoring system, ranging from -2 to +2, was applied to measure the results from the Likert scale. WH rated an average score of +1.8, demonstrating a high and consistent level of daily satisfaction as depicted in Figure 13. The obvious decrease in satisfaction on day five might be explained by her partner's absence, otherwise present on all other days of the LIFT program. WH's mood was low on day five when her partner was unavailable. When he returned the following day, her mood improved, as did her satisfaction with LIFT, which remained consistently high until the end of the program.

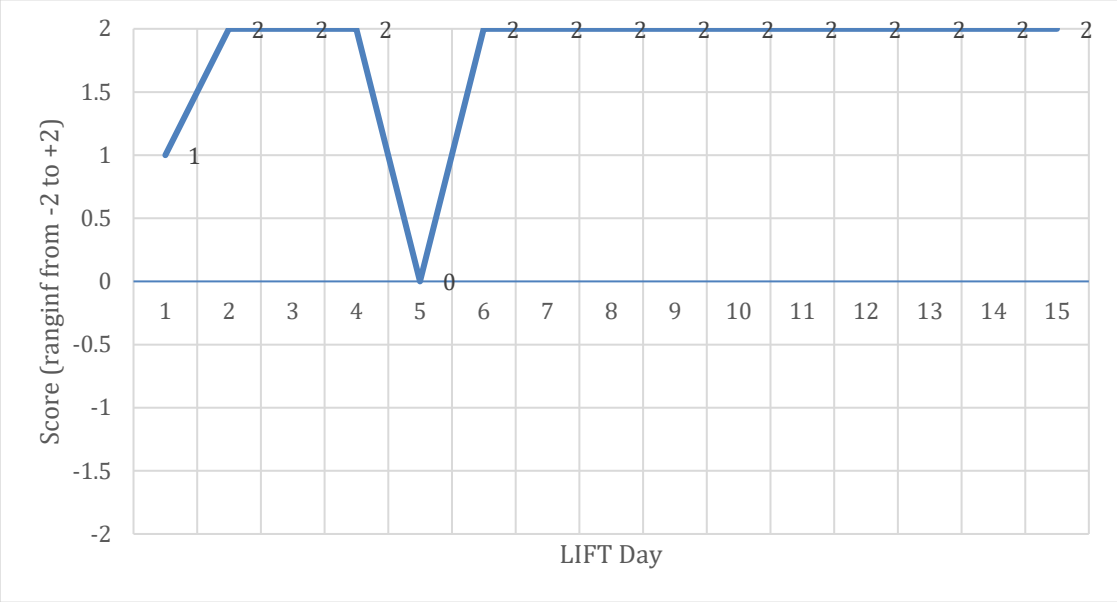


Figure 13. Daily Satisfaction Survey for WH

By applying the same scoring system to KL's Daily Participant Satisfaction Survey, he gave an average score of 0.3, indicating an almost neutral level of daily satisfaction (yet mildly positive) to LIFT (see Figure 14). KL's general mood and satisfaction, as observed by the CI, tended to be quite low. He often appeared frustrated as he reported feeling unsupported (and lonely) as his partner was unavailable for the entire LIFT program. This might explain his satisfaction scores of -1 and 0 on numerous occasions.

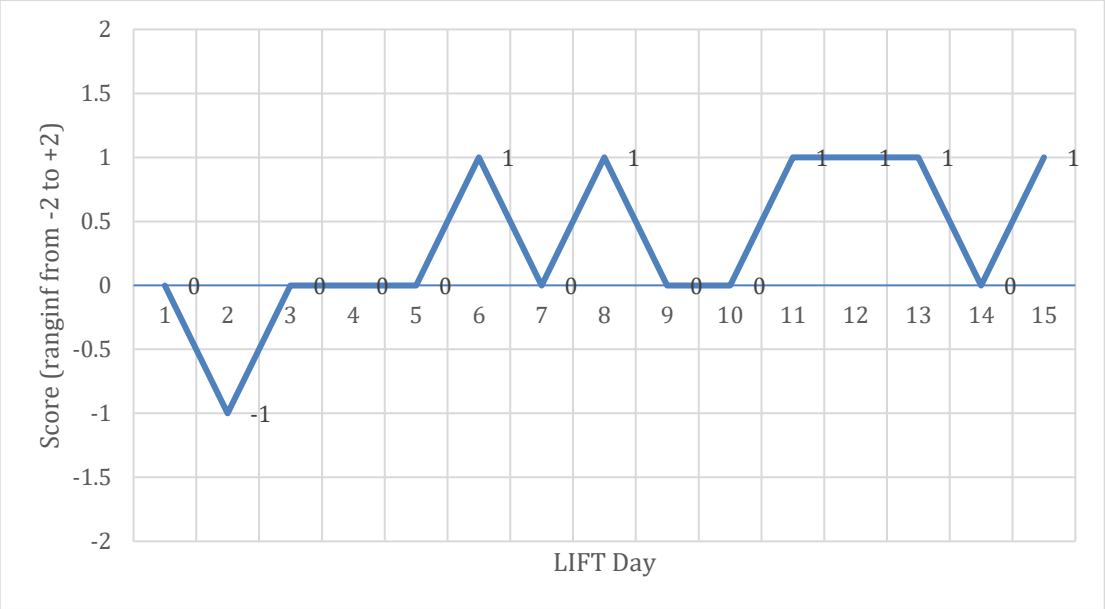


Figure 14. Daily Satisfaction Survey for KL

6.1.2 Survey 2: Overall Participant Satisfaction Survey

The Overall Participant Satisfaction Survey (Appendix 10) used the same Likert scale and scoring system (see Figure 12). WH gave an average score of +1.8, of a maximum

obtainable score of 2 (see Table 22), demonstrating a *high overall* satisfaction for the LIFT program. KL gave an average score of +0.7 (Table 23), demonstrating a greater overall satisfaction with the LIFT program when compared with daily scoring.

Table 22.

Overall Participant Satisfaction Survey for WH

Survey Questions	**Score***
Has your communication improved since being in aphasia LIFT?	2
Was 3 weeks a good amount of time for aphasia LIFT?	2
Was 3 hours a day a good amount of time?	2
Would you recommend aphasia LIFT to others?	2
Did aphasia LIFT fit well with your other therapy sessions?	1
Overall, were you satisfied with the aphasia LIFT program?	2
Average score	**1.8**

*See Scoring System for Surveys

Table 23.

Overall Participant Satisfaction Survey for KL

Survey Questions	**KL***
Has your communication improved since being in aphasia LIFT?	1
Was 3 weeks a good amount of time for aphasia LIFT?	0
Was 3 hours a day a good amount of time?	0
Would you recommend aphasia LIFT to others?	1
Did aphasia LIFT fit well with your other therapy sessions?	1
Overall, were you satisfied with the aphasia LIFT program?	1
Average score	**0.7**

*See Scoring System for Surveys

6.1.3 Survey 3: Survey of Other Health Professionals

At the conclusion of the LIFT intervention, the online Survey of 'Other Health Professionals', (see Appendix 2) was presented via Survey Monkey to the allied health staff (n=18) employed within the Stroke Rehabilitation Unit at the time of the study. Allied Health staff comprised of physiotherapists (n=5), occupational therapists (n=5), speech pathologists (n=5), dieticians (n=1) and allied health assistants (n=2). Seven staff members (39%) completed the survey. The survey was intended to be easily accessible and require minimal

time to complete. It was designed in this way to promote participation. The survey questions were phrased in a manner relevant to all disciplines of allied health. The results of the online survey are displayed in Table 24.

Table 24.

Survey of Other Health Professionals in the Stroke Rehab Unit

1. The CI of the Aphasia LIFT project liaised with me regarding shared patients who were participants of the project.

	Not enough	**Almost adequate**	**Adequate**	**Very high**	**Total**
Input received from the CI was	0	0	43% (3)	57% (4)	7

2. Aphasia LIFT impacted my ability to schedule appointments for patients who were participants.

	No impact at all–	**Mild impact–**	**Moderate impact–**	**Severe impact–**	**Total**
Difficulty scheduling appointments	71% (5)	29% (2)	0	0	7

3. Aphasia LIFT made it difficult for me to provide the optimum amount (duration and/or frequency) of therapy sessions.

Yes	**No**
0	100% (7)

4. Participants appeared fatigued in my therapy sessions as a result of their participation in Aphasia LIFT.

Yes	**No**
71% (5)	29% (2)

5. If Aphasia LIFT became a service delivery option for patients requiring Speech Pathology input, how much impact would this have on your practice?

	None	**Mild negative impact**	**Moderate negative impact**	**Severe negative impact**	**Positive impact**
The impact on my practice would be	43% (3)	28.5% (2)	0	0	28.5% (2)

The survey results show that more than half of the respondents (57%) felt the CI had communicated adequately with them in regards to the LIFT program and its participants. The majority of respondents also felt that LIFT did not impact their ability to schedule appointments for the patients who were also LIFT participants. This was reinforced by 100% of the respondents reporting no difficulties in being able to provide the optimum amount of therapy provision for their own discipline (i.e., physiotherapy). The majority of respondents (71%) observed that participants of LIFT appeared fatigued in their therapy sessions however they also reported that if LIFT were to be offered as a service delivery option, it would have little to no impact on their practice (71.5%).

In summary, the findings of this survey show that LIFT had a moderately negative impact on other therapists' ability to schedule appointments. However, despite the majority of respondents reporting that LIFT participants appeared fatigued during their sessions (71.4%), this did not seem to impact their ability to provide the optimum amount of therapy in terms of session duration and frequency.

6.2 Qualitative Data - Barriers and Facilitators to LIFT Implementation

The barriers and facilitators with respect to the implementation of the LIFT were documented on a daily basis. Entries comprised direct observations made by the CI during the study and are summarised below:

6.2.1 Facilitators:

Participant related factors

a. A supportive partner appeared to be a strong facilitator of improved participant mood and may have contributed to greater scoring accuracy in the CETI. WH had a very supportive partner who was often in attendance during sessions and would also provide support between sessions. Consistent presence and care seemed to have a positive impact on WH, which in turn had a positive effect on her participation in the LIFT. WH reported that overall, having her partner's support in an unfamiliar setting contributed to her positive attitude towards LIFT and rehabilitation in general. A supportive partner will also have increased opportunities to observe the participants functional communication, which may in turn result in a more reliable CETI score. This finding is consistent with other studies investigating the reliability of proxy ratings, defined as the level of consistency between proxies to participant agreement. Accuracy of ratings improved with proxies who were in more frequent contact with the PWA (Hilari, Owen, & Farrelly, 2007; Pickard et al., 2004).

Organisational factors

b. The implementation of LIFT for the two participants was made more achievable because of the limited input required from the other rehabilitation services. For instance, both participants were able to mobilise and transfer independently, and therefore, required minimal physiotherapy (PT) and occupational therapy (OT) input. This led to increased available therapy time between 9am – 5pm, making it easier to schedule the daily 3 hours of LIFT therapy.

c. The CI regularly liaised with the other clinicians involved in the participants' rehabilitation. This positively impacted on survey result with more than half the clinicians' (57.14%) expressing satisfaction with the communication they received about the LIFT program.

This regular contact with other clinicians assisted in discussions regarding therapy time allocation and formed an understanding of the impact of LIFT on additional therapies. For example, if an OT required an early appointment time to complete a shower assessment, then the CI would negotiate a later time slot for the LIFT sessions. Alternatively, PT's would often run group programs that the participant was able to attend later in the evening, leaving the mornings available for LIFT sessions. Frequent communications such as these, facilitated the successful implementation of LIFT.

d. Therapy provision by multiple Speech Pathologists may have facilitated the feasibility of LIFT implementation. KL received the LIFT therapy from *two* clinicians: the CI and the SP manager. This was due to exhausted grant funding resulting in limited CI capacity. However, it was managed by the increased support of the SP manager who provided LIFT therapy in conjunction with the CI. Permission for this variation in treatment provision was also sought and granted from one of the LIFT developers (Ms A. Rodriguez). Therapy provision to KL from two therapists became a facilitator as he often reported that the variation in clinician kept him engaged in a positive way.

6.2.2 Barriers:

Participant related factors

a. Reduced ward staffing affected participants' timely attendance to LIFT sessions, causing a barrier to LIFT implementation. Participants required the support of a ward clerk to transfer them to appointments. Occasionally, the ward clerks were unavailable or busy with other patients, resulting in the participants being late to LIFT sessions. When the ward clerks were unavailable, the CI would often attempt to find the participants. However, this became a challenge because the ward clerks had access to the daily therapy schedules, whereas the CI had to search several therapy areas before locating the participant, which would lead to further delays. While this affected timely attendance to LIFT sessions, late attendance seemed to have had only a minor impact, since both participants attended 90% of total LIFT hours.

Organisational factors

b. Early discharge from inpatient rehabilitation could pose as a barrier to the implementation of the LIFT program as a research study. Participants of LIFT need to remain

as inpatients for approximately one month to allow program completion, including pre and post assessments. Therefore, it is vital that assessments are administered in a timely manner immediately before and after LIFT treatment, to limit discharge delay or participant withdrawal. A shorter LOS may act as an overt barrier to successful LIFT implementation as a research study. However, if LIFT were to be implemented as a clinical program (rather than a research study), early discharge could be considered a positive outcome as it reflects the participant's fast recovery. In this study, both participants remained inpatients for approximately one month, long enough to complete participation in the study.

c. Lack of a designated CI may pose a barrier to the successful implementation of LIFT. In this study, the CI was an addition to the employed staff and therefore had the capacity to focus solely on participants of the LIFT project. Future studies of LIFT may also benefit from an appointed CI to ensure its successful application. Alternatively, if LIFT were to be applied as a service delivery option, staffing resources would need to be considered to determine if clinicians have adequate time and support to dedicate to LIFT treatment (Babbitt, Worrall, & Cherney, 2013). In the event LIFT is implemented in a subacute setting, the program would benefit from a dedicated case manager as the main contact person for the participant, their significant others and other treating staff.

The combined qualitative and quantitative data revealed that the application of LIFT within an established inpatient rehabilitation hospital was feasible in terms of:

a. Ability to schedule the required time for LIFT within participants' busy therapy schedules
b. LIFT did not negatively impact the scheduling of other competing therapies
c. Both participants reporting neutral to positive satisfaction levels of LIFT

Neither participant withdrew from the study despite some identified barriers. Furthermore, both participants completed the majority of the program (90%) and made substantial clinical gains in at least two domains. This demonstrated that LIFT was successfully applied within a local rehabilitation hospital to the benefit of the participants, without adversely affecting their other rehabilitation commitments.

Chapter 7 - Discussion

The aims of the present research were two-fold. The first aim was to investigate, through a clinic audit, the standard practices of aphasia rehabilitation by speech pathologists within a Stroke Rehabilitation Unit (SRU). This first study identified how standard clinical practice aligned with the national benchmarks, results of which were discussed in Chapter 2. The data collected in Study 1, such as LOS, staffing levels and current practices, determined the suitability to proceed with Study 2 (LIFT), as it was deemed that the implementation and effectiveness of LIFT would offer clinical potential within an inpatient rehabilitation hospital (i.e., within HRC).

The second aim was to investigate the effectiveness and the clinical implications of the implementation of LIFT in an inpatient rehabilitation hospital, with participants in the sub-acute phase of recovery. This is the first time a LIFT program has been implemented during the sub-acute phase of recovery, defined as within 4 days to 4 months post onset of stroke. The study comprised two participants who completed 40 hours of the intensive LIFT program (up to 15 hours per week for 3 weeks). Participants' responses to treatment were investigated across the domains of language impairment, functional communication, QOL, feasibility, intensity and rehabilitation measures.

The outcomes of Study 1 have already been discussed in Chapter 2, therefore this chapter will be solely focused on the findings of Study 2. Section 7.1 addresses the major findings of Study 2 regarding the effectiveness of LIFT and section 7.2 covers the practical and clinical implications of the findings of the LIFT program. Sections 7.3-7.6 address the domains of functional communication, intensity, QOL and the clinical implications of LIFT. Section 7.7 covers the clinical application of LIFT and section 7.8 explores the limitations and implications for future research. Finally, section 7.9 covers the overall conclusions that can be drawn from this thesis.

7.1 Summary of the Major Findings of Study 2

The effectiveness of LIFT during language recovery and the clinical implications of its application in an inpatient hospital setting were investigated. Both participants showed clinically meaningful improvements in language function in at least one domain of language impairment: naming accuracy and/or functional communication.

One participant (WH) demonstrated significant improvements in naming accuracy of both treated and untreated BoSS items. In particular, the improvement in the untreated BoSS items reflected a measure of generalisation of naming accuracy. WH also showed clinically significant improvements in other generalisation measures, including in all measures of naming

ability, as reflected in improved post-treatment scores in the BNT and the WAB naming subtest. Furthermore, her overall language ability improved as reflected by the increased WAB AQ score post-treatment.

The second participant (KL) demonstrated improvements in *overall* language ability, as seen by a positive change in WAB AQ score. However, there was no significant improvement when assessing for naming accuracy alone. In particular, there were no significant improvements in naming accuracy of treated and untreated BoSS items, nor did he significantly improve in naming accuracy of the WAB naming subtest or the BNT. Furthermore, there was no carry-over of skills across the generalisation measures (untreated BoSS items).

Functional communication was investigated using the CETI. Both participants demonstrated improved CETI ratings indicating improved functional communication skills as perceived by their primary communication partner. However, a key observation in this study was the importance of having a communication partner who was readily available and physically present. A communication partner who was accessible and involved in the participant's rehabilitation would likely provide greater scoring accuracy due to having more opportunities to observe communication attempts (Hilari et al., 2007; Pickard et al., 2004). It was also observed by the CI that a supportive communication partner provided the participant with emotional support, which in turn, positively impacted their mood and may have contributed to improved treatment outcomes.

Experiences of the other allied health professionals within the SRU and participant views were investigated via surveys. Participants fatigue levels were captured using the FQ. The two participants reported varying responses on the FQ: WH reported low levels of fatigue (within normal limits) whereas KL reported high levels. Results of the surveys showed moderate to high levels of participant satisfaction of the LIFT.

Health professionals reported that participants appeared fatigued during their sessions due to LIFT. However, this did not impact their ability to schedule the required amount of therapy for their discipline (i.e., physiotherapy), in terms of session duration and frequency. This demonstrated that whilst LIFT caused participant fatigue, it did not affect their ability to participate in their broader rehabilitation program, supporting the view that the LIFT program can be realistically implemented within a subacute setting.

Quality of life was measured using the ALA and both participants demonstrated minor improvement in QOL measures. However, some inconsistency in self-scoring was observed; this may be due to the variability in the participant's perception of their own language ability. For instance, WH self-scored poorly in the aphasia domain whereas she showed significant and noticeable improvements in language recovery. Contrastingly, KL rated his language ability

more highly but did not demonstrate a statistically significant improvement (see section 7.5 for further details).

The findings across both participants show that LIFT could be successfully and realistically implemented in sub-acute rehabilitation settings (i.e., those with an inpatient stroke rehabilitation ward). In addition, suggestions are made below for the refinement of the LIFT inclusion criteria for future studies. Recommendations will also be offered for clinical practice, including considerations to participant's therapy schedules and their estimated discharge date from hospital.

7.2 Domain: Language Impairment

7.2.1 Treatment Probes & Naming Accuracy

Both participants demonstrated different levels of language improvement in response to LIFT. Effectiveness of naming accuracy in response to LIFT treatment was measured by:

a. improved naming of treated therapy items;
b. generalisation of improved naming to untreated therapy items; and
c. generalisation to other (standardised) naming tests, i.e., BNT and WAB naming sub-test.

WH demonstrated improved naming ability across all modalities. Specifically, with the Treatment Probes, she showed improved ability in naming both treated and untreated BoSS items. Her improved ability to name *untreated* BoSS items showed that within-task generalisation of naming ability occurred. The significant improvements of naming accuracy for treated and untreated items have also been found in previous LIFT studies, albeit that these are group studies (Dignam et al., 2015; Rodriguez et al., 2013(Nickels, 2002).

As naming accuracy is a core focus of LIFT, the effectiveness of the treatment was also measured using additional naming tests, including the BNT and (the naming subtest of) the WAB. WH again showed improved naming ability post-treatment as evident in the BNT and WAB naming subtest. These increases in naming accuracy were clinically and statistically significant. In other words, the direct treatment effect of naming treatment seemed to have generalised to overall naming ability.

However, while significant treatment and generalisation effects in naming accuracy were observed, it is difficult to determine whether these improvements were solely due to treatment effect given the possibility of spontaneous recovery during the time which the LIFT program was implemented. Spontaneous recovery up to 3-6 months post stroke has been well documented. Nevertheless, one could argue in favour of a treatment specific effect as the

improved WAB AQ score was largely due to improvement in the WAB *naming subtest*. If a treatment effect had not occurred and the results were largely due to spontaneous recovery, then similar improvements across all subtests would be expected, not just naming. Yet, WH's WAB profile shows that specifically her naming accuracy was the domain that showed the greatest improvement, as evidence by her scores in the naming subtest (44% improvement/change in score) compared with other measures of language tested with the WAB. This is reinforced by her improvements in the other naming tests (i.e., BNT, Treatment Probes). The fact that the significant improvement in the WAB-AQ was largely driven by improved naming suggests that the overall treatment effect for naming was not entirely caused by spontaneous recovery.

Participant Two (KL) showed a small improvement in naming ability on the treated and untreated BoSS items. However, neither improvement was statistically significant. Similarly, his improved performance on the BNT was not statistically significant, nor did it reach the threshold considered to be clinically significant (Difrancesco et al., 2012; Maher et al., 2006). Furthermore, the degree of KL's improvement, seen on the *naming subtest* of the WAB, did not reach statistical significance. Yet, he did demonstrate a small clinically significant improvement in *overall* language ability on the WAB, defined as ≥ 5 points on the AQ (Katz and Wertz (1997). Given that KL demonstrated a small overall improvement in language ability (as per the WAB AQ) that was largely driven by improved mean, the likelihood of spontaneous recovery effect rather than a treatment affect cannot be ruled out.

Varying/inconsistent findings regarding the effectiveness of treatment is not uncommon in the aphasia literature (Code et al., 2010; Dignam et al., 2016; Mackenzie, 1991; Rodriguez et al., 2013). For example, in the LIFT study by Rodriguez et al. (2013), they showed variable patterns and effects in naming accuracy between participants. In particular, 3 participants in their study showed no improvement on the BNT, whereas only a small significant, overall improvement was observed at a group level (n=11). However, Rodriguez et al. (2013) did not include Probes to measure generalisation from treated to untreated items, therefore conclusions cannot be made in that regard. However, Probes were included in the study by Dignam et al. (2016), which compared participants in intensive versus distributed (non-intensive) LIFT programs. This study also demonstrated inconsistent effects across participants' response to naming untreated items. At the group level, there were significant improvements in naming accuracy of untreated items at post-treatment and follow-up. However at individual level, only nine out of thirty-two participants showed improved naming accuracy post-treatment with respect to untreated items which was maintained for six out of thirty-one participants at one-month follow-up. This demonstrates that it is common for participants' responses to treatment to vary across individuals with aphasia.

In summary, the findings of the current study revealed that WH likely showed a substantial treatment effect as demonstrated by: (a) improvement in naming of treated items, (b) generalisation of skills, as shown by improved naming accuracy of untreated items, (c) generalisation to other naming tests (BNT & WAB naming subtest), and (d) a clinically and statistically significant overall language improvement as measured using the WAB. Informal observations were also observed by, and reported to, the CI from other health professionals who noted improved understanding, following of instructions and improved expression during WHs participation in the LIFT program.

In contrast, KL's outcome measures did not show a significant improvement in language ability especially in regards to his naming ability, which is the primary focus of LIFT. Furthermore, he was not observed by the CI to demonstrate improvements in language ability in areas that were unable to be captured by means of formal assessment. For instance, other health professionals (allied health and nursing staff) working closely with KL did not report greater language improvement in keeping with observations by the CI and formal testing.

7.3 Domain: Functional Communication

Both participants demonstrated improvement in overall functional communication on the CETI, which was clinically meaningful, as defined by a mean change in score of equal to or greater than 11.4 (Lomas et al., 1989). WH achieved a change of +35 points and KL a change of +14 points. It is possible that WH's higher CETI scores post treatment may be secondary to her language recovery as reflected in the significant improvements in her primary outcome measures. On the other hand, KL's lower CETI scores seem to be related to his limited language recovery.

Additionally, the difference in the magnitude of improvement on the CETI may be attributed to the level of involvement by the main communication partner. KL's partner was mostly unavailable during the LIFT program whilst WH's husband was highly involved. As such, he had greater opportunities to observe WH's communication attempts and these numerous experiences would have informed his reporting on the CETI. Communication partners that have greater involvement in the LIFT program are likely to receive more opportunities for education on aphasia and this may enhance scoring accuracy on the CETI (Hilari, Byng, Lamping, & Smith, 2003; Persad, 2013).

The differing levels of involvement by the main communication partner are consistent with the findings in other studies regarding LIFT and ICAPs (Dignam et al., 2015; Rodriguez et al., 2013; Rose, Cherney et al. 2013). In light of this, future researchers or clinicians may wish to consider the availability of the communication partner and ensure they have had adequate opportunities to observe the participant in a variety of communication settings to

warrant their suitability to score the CETI. Greater involvement of the communication partner could also be encouraged by the treating therapists.

The Functional Domain also included a 'challenge task' to be completed by the participant at the end of the LIFT program. Both participants were asked to consider a challenge task that was meaningful to them. WH completed her challenge task, and opted to read the Lord's Prayer aloud to her husband as well as in front of the CI and the Manager of the SP department. She declined to perform the challenge task in front of a larger audience as she found this too confronting. KL refused to participate in the challenge task, as he found the concept too overwhelming and reported that he did not want that level of attention and pressure. In summary, both participants declined to partake in the challenge task as stipulated in the LIFT Manual as they found the whole experience too confrontational. Therefore, it should be noted that whilst the challenge task is designed to empower participants, some participants may not want to partake in this task and, of course, their choice should be respected.

7.4 Domain: Intensity

7.4.1 Coping with the LIFT therapy schedule

The LIFT program encompassed 45 hours of therapy divided into 3 hours of therapy per day. Neither participant managed to complete the total hours for a number of reasons, such as conflicting appointments and illness. However, both participants completed the majority of the program, approximately 90% (40 hours).

The ability of each participant to cope with the intensive treatment was measured using the Fatigue Questionnaire (FQ) (Chalder et al., 1993). Both participants showed high levels of fatigue during the pre-treatment assessments. However, during post-treatment assessments, only KL indicated a high level of fatigue. Yet, he responded *neutrally* in the Overall Participant Survey when answering questions relating to his ability to cope with the intensity of the program, demonstrating that he was neither satisfied, nor dissatisfied with the LIFT program. It might be reasonable to expect that a participant with high levels of fatigue would more likely report dissatisfaction with the LIFT program. However, KL did not report this and his contradictory rating (high fatigue levels with neutral satisfaction) may indicate little to no relationship between his fatigue level and his ability to cope with LIFT's intensity.

Both participants demonstrated satisfaction with LIFT on a daily level, as per scoring on the Daily Participant Surveys, with a mean score of 0.3 (KL) and 1.8 (WH). In addition, neither participant withdrew from the study. This finding is consistent with the most recently published LIFT trial by Dignam et al. (2015), who recorded nil participant withdrawals. This is in contrast to a Cochrane review by Brady et al. (2012), who found that significantly more participants withdrew from intensive programs than non-intensive therapies. It is acknowledged

that both this study and that by Dignam et al. (2015) had total treatment hours of 45 and 48 hours respectively. This is significantly less than the mean 101 treatment hours reported for ICAPs, a finding from an international survey conducted by Rose et al., 2013.

Therefore, participants in this study may have had lower fatigue levels given the reduced number of total treatment hours, resulting in their ability to complete the program.

In summary, participants were satisfied with the LIFT program despite feeling occasionally fatigued. Whilst fatigue in intensive programs may lead to withdrawal, both participants completed the program (Kelly et al., 2012). Based on the findings of the current study, implementation of LIFT (at 3 hours per day, 5 days per week for 3 weeks) appears to be achievable within an inpatient rehabilitation hospital. However, more research on LIFT implementation within an inpatient rehabilitation hospital is required as there were only two participants in this study and therefore caution must be taken with the generalisation of these findings.

7.5 Domain: Quality of Life

Both participants showed improvement in the QOL measure, the ALA. Both participants showed an improvement by 19%. This is in accordance with other LIFT and ICAP studies, also demonstrating that participation in an ICAP can improve the QOL as perceived by the participant (Hoover et al., 2017; Dignam et al., 2015; Rodriguez et al, 2013).

However, there seems to be a potential discrepancy between self-perception of QOL and improved language ability. For instance, whilst WH demonstrated *high* levels of language recovery, she self-scored very *low* in the 'aphasia domain' of the ALA, which is designed to question how a PWA perceives their own language recovery. In contrast, KL did not demonstrate high levels of language recovery, yet he rated himself higher in the aphasia domain. In fact, for KL, this domain had the highest change in score within the ALA.

More insight into participants self-perception can be gathered from a study by Grohn, Worrall, Simmons-Mackie, and Hudson (2014) who studied a cohort of 15 PWAs during their first year post-stroke. Findings showed that participants' insight into how well they were managing their life with aphasia was often dependent on their *perceived improvement* as opposed to their *measured* improvement in language recovery. Participants who had demonstrated great levels of improvements in language recovery would still provide a low score on their perceived improvement, and vice versa. Therefore, it is possible that despite WH's substantial improvement in language ability, she *perceived* her own accomplishments to be small and therefore rated herself accordingly.

Due to the limitations of the current study, conclusion cannot be drawn regarding the long-term effects of aphasia on participants and how these affect QOL and/or self-perception of language recovery. However, in summary, both participants demonstrated meaningful overall improvements in the QOL measures from the pre to post LIFT treatment period.

7.6 Domain: Clinical Implications of the Application of LIFT

The clinical implications of implementing LIFT in an inpatient rehabilitation setting was explored via quantitative (three surveys) and qualitative (barriers and facilitators) means. The surveys included the Daily Satisfaction Survey, the Overall Participant Satisfaction Survey and the Survey to Other Health Professionals. The barriers and facilitators were covered in a list a key observations made by the CI.

7.6.1 Quantitative Findings

The three surveys were designed to explore the clinical implications of applying LIFT in the inpatient setting, not only for the participants but also for the health professionals and the organisational unit as a whole. The surveys revealed information from two perspectives: the participant's view and the views of the allied health professionals working on the stroke ward. The survey data revealed that both participants reported positive views towards the application of LIFT.

WH showed a higher satisfaction rate across the duration of the study on the daily overall satisfaction surveys (1.8 out of 2), which was also reflected by direct observation of her strong motivation and positive attitude during treatment. KL scored low to moderate levels of satisfaction (0.3 and 0.7), which were consistent with his presentation and self-reports of feeling lonely, frustrated and unsupported.

In summary, the surveys revealed that LIFT did not cause any overt adverse effects and that neither participant expressed dissatisfaction, nor did they exhibit or express a deterioration in their language function as a result of their participation in LIFT.

The majority of health professional respondents (71.4%) reported that LIFT treatment resulted in increased participant fatigue during their sessions. This finding was also reflected in participant reports of increased fatigue (in the FQ). Understandably, fatigue may have had a negative effect on their participation within a scheduled session, that is, may have resulted in reduced or missed sessions within other disciplines such as physiotherapy. However, despite the higher levels of reported fatigue, no health professionals (0%) reported difficulty in scheduling participants for therapy sessions. In summary, participant fatigue did not appear to negatively impact participation in LIFT or competing therapies, supporting the application of LIFT within this setting.

7.6.2 Qualitative Findings

The CI documented barriers and facilitators to feasibility of LIFT implementation by the use of a daily diary in which observations were recorded and considered. This is explained in greater detail in Section 6.2 and a summary of these barriers and facilitators include:

Facilitators:

a. Participants receiving minimal input from other disciplines due to their own high functioning made LIFT implementation more achievable.
b. Regular communication by the CI with other health professionals facilitated the successful implementation of LIFT.
c. The provision of LIFT therapy by multiple clinicians may be a facilitating factor, as KL reported that this made therapy more engaging. This is supported by other LIFT studies whereby intervention is provided by a team of clinicians (Rodriguez et al., 2013).
d. A supportive partner appeared to be a strong facilitator of participant mood and may contribute to positive clinical gains.

Barriers:

a. A one-month minimum admission time is required for participation in LIFT.
b. Resources may need to be re-organised to ensure the successful implementation of LIFT. This may require the use of Speech Pathologists, AHA's, students and volunteers to ensure that the program has adequate staffing to manage a number of participants.
c. The program might benefit from increased staffing support (within the hospital setting) to promote timely attendance to sessions, i.e., greater support from ward clerks to bring participants to their LIFT sessions on time.

7.6.3 Summary

In this study, the application of LIFT was found to be successful within a local inpatient rehabilitation hospital. Based on the results from Chapter 2, a PWA admitted into an inpatient rehabilitation hospital in Australia will have an average LOS of 32.8 days, which is conducive to participation in LIFT which requires a minimum participation of approximately one month. Therefore, based on these findings, it can be surmised that LIFT may be feasibly implemented within a similar inpatient rehabilitation setting in Australia. Other similar settings in different countries may also have the potential for successful LIFT implementation if the average LOS for a PWA is $\geq$ 32.8 days. However, facilities considering LIFT as a research project or a potential service delivery option, with permission from the LIFT developers via the University of Queensland (Rodriguez et al, 2013), may need to consider the barriers and facilitators identified in this study (see Chapter 6) and plan their services accordingly to maximise success.

However, it is acknowledged that this project was a single case study comprising of two participants and therefore future LIFT studies with larger sample sizes (i.e., Phase II Studies) may yield different results (Robey, 2004).

7.7 Clinical Application: LIFT as a service delivery option

Structured therapy programs can have implications for service delivery when applied in a clinical setting. The LIFT program has several implications for service delivery if it were clinically applied in an inpatient rehabilitation setting. Therefore, it is important to consider the factors that may predict outcomes as this will help determine who will gain the most benefit from LIFT. There are several aspects of the LIFT program that are also part of the recommendations in the NSF's Clinical Guidelines: offering PWAs the opportunity to partake in group therapy, Constraint Induced Language Therapy (CILT) and the use of computer-based therapy, supporting the concept of LIFT being offered as a service delivery option.

If LIFT were to be offered as a service delivery option, several modifications to the criteria and treatment protocol may be required to ensure the appropriate participants are included. Suggested changes include: refinement of the inclusion criteria considering patient therapy schedules, estimated discharge dates, and changes regarding selected outcome measures. The exclusion criteria would remain unchanged because the findings from this study reinforced the appropriateness of the existing exclusion criteria. These shall be elaborated upon in the section proceeding (see Section 7.6.2).

7.7.1 LIFT Candidates for Clinical Application

For LIFT to be clinically applied as a service delivery program, in an inpatient rehabilitation hospital, a refinement of the LIFT inclusion criteria is suggested. Two new criteria items are recommended for future consideration: suitable therapy schedules and estimated LOS.

Therapy Schedule

Given the high intensity of the program, participants need to have ample time available in their therapy schedules to attend LIFT and still attend therapy for other disciplines. A minimum of 3 hours per day is required during business hours, as clinicians will only be available during this time. However, this minimum is likely to cause increased participant fatigue based on our findings, as both participants resorted to daytime napping between therapy sessions. Therefore, LIFT candidates will ideally have at least 4 hours available per day. As a result, patients receiving high input from other conflicting disciplines (e.g., physiotherapy) may

be unsuitable candidates for this program. This view is supported by other studies of ICAPs that have also considered the *endurance capacity* of potential participants. A survey of ICAPs worldwide found that 9 of the total 12 ICAPs reviewed had endurance as an inclusion criterion. This endurance criterion ranged from the ability to tolerate 3 -7 hours of therapy per day (Rose, Cherney et al, 2013).

Within this study, the concept of endurance capacity was evident by the early withdrawal of one participant who was eligible for inclusion in the study. They decided to opt out before treatment commenced. They reported that they did not have the "energy" to complete LIFT within a demanding therapy schedule, as they required high intensity OT and PT input. Therefore, participants requiring predominantly speech pathology input may facilitate the successful implementation of LIFT.

Length of Stay

LIFT candidates need to have an estimated LOS of at least 4 weeks. This will allow sufficient time for pre- and post-testing, plus the 3-week program to be completed. This LOS recommendation was considered reasonable in this local rehabilitation hospital and in other similar inpatient settings based on the findings in chapter 2. Within this rehabilitation hospital, the average LOS for a PWA was 60 days and the average LOS in an Australian and/or New Zealand (NZ) rehabilitation hospital was 32.8 days (Rej et al., 2016). Thus, a PWA admitted to an inpatient rehabilitation hospital, within Australia or NZ, is likely to have a LOS that is sufficient to warrant participation in LIFT.

7.8 Future Directions and Study Limitations

The current study is considered a Phase I investigation, defined as constituting a proof of concept study investigating: treatment effectiveness, safety of the program, selection of outcome measures and the clinical implications of its application. Proof of concept studies often includes single subject designs, such as the current study, to determine whether the preferred treatment effects can be obtained (Hula, 2013; Robey, 2004). Findings from the current study demonstrated the feasibility and safety of the application of the LIFT program within an inpatient rehabilitation setting. Recommendations for the refinement of outcome measures were provided and clinically significant treatment effects were observed. It seems that this phase I study warrants further research into Phase II to further explore the effectiveness and implementation of the LIFT program. Ideally, a comparative study of treatment effect size between LIFT and standard service provision (of aphasia rehabilitation) should be conducted.

Rose et al. (2013) conducted an international online survey and identified 12 ICAPs. The findings demonstrated a vast degree of differences across ICAPs. While all the ICAPs comprised the same core elements of individual and group therapy, patient and family education, and technology inclusion, there were large differences in the treatment protocols, such as program length and dosage. Rose et al. (2013) reported that ICAPs comprised a mean of 101 treatment hours. This is significantly more than the number of treatment hours in this current LIFT study (45 hours), further highlighting the variations of treatment protocol amongst ICAP studies.

The findings by Rose et al. (2013) also highlighted the differing level of family involvement which was also observed in this study. Family members did not receive structured education during group therapy but rather attended family meetings on the ward and were provided with information/education by the treating rehabilitation team (medical and allied health staff). This is contrary to the findings in other LIFT studies (Dignam, 2016); Rodriguez et al., 2013), which included PWAs who were living in the community and therefore did not have access to the inpatient environment such as family meetings held with the treating rehabilitation team. In those studies, education for family members was alternatively provided during Group therapy.

It is clear that LIFT (and perhaps ICAPs in general) require further Phase II research to determine optimal treatment parameters (Hula et al., 2013). In light of this, recommendations can and have been made for the refinement of the treatment protocol (namely outcome measures) and personal observations have been noted for consideration in future studies (Robey, 2004).

7.8.1 Outcome Measures

Part of a Phase I study might be to refine the treatment protocols and this is best achieved by trialing them and then reflecting on their appropriateness. Most of the assessments that were recommended in the LIFT manual were considered appropriate for use in this current study, despite the change in setting; the original LIFT study (Rodriguez, 2013) was held in the community whereas the current study was conducted within an inpatient rehabilitation hospital. However, several outcome measures were observed to have some limitations in their use within an inpatient setting, in particular the CETI, ALA and the FIM. The CETI has the potential for subjective bias, the ALA is not an ideal assessment for the inpatient setting and the FIM is a limited measure, not designed to measure change in language function.

7.8.1.1 The Communicative Effectiveness Index

The CETI was used to investigate change in communicative ability as rated by a communication partner. Whilst the CETI is sensitive to change, the test has the potential for subjective bias by the rater. It is a self-rated questionnaire and based on the test protocol, the rater is required to mark the pre-treatment and post-treatment scores on the same response form, thus permitting them to see their score from the previous assessment. Consequently, the rater may be influenced to provide an improved score, due to the Hawthorne effect, which means that a person may alter their behavior or responses because they are aware of being studied (Roethlisberger, 1939). However, the test was designed with this intent as the authors wanted to create a VAS (visual analogue scale) of an individuals' change over time rather than a measure of absolute performance. Therefore, raters were permitted to see where they had previously scored and apply their new ratings to the same score sheet (Lomas et al., 1989). Although the authors acknowledged that the test may have a level of intra-rater bias, previous findings by Guyatt (1986) concluded that this level of bias is deemed to be insignificant, given the tests main objective.

Other ICAP studies have used different assessments to capture functional communication outcomes(Rose, Cherney, et al., 2013). Assessments such as the American Speech Language Hearing Association Functional Assessment of Communication Skills (ASHA FACS) and the Communication Confidence Rating Scale for Aphasia (CCRSA) have been successfully used (Babbitt & Cherney, 2010; Frattali, Thompson, Holland, Wohl, & Ferketic, 1995; Hoover, Caplan, Waters, & Carney, 2017; Rose, Cherney et al., 2013). Therefore, it is suggested that future studies exploring LIFT also consider other formal measures of functional communication. The original LIFT study used the CETI as an assessment to measure change in language function as perceived by the primary communication partner (Rodriguez et al., 2013). While this measurement, in principle may not be optimal, it was also used in this study as it was specified in the LIFT Manual. However, the tests subjectivity is acknowledged and suggestions for alternative assessments have been made.

7.8.1.2 The Assessment for Living with Aphasia

The ALA is a communication based QOL measure. However, its use in an inpatient setting has limitations. This is in partly due to the construct of the test, with domains focused on participation within the community. The LIFT participants in the current study were inpatients of a rehabilitation hospital and often did not access the community during the treatment period. Therefore, they found it challenging to answer a number of questions. For

instance, KL omitted several questions relating to his ability to participate in the community as he had not had the opportunity to leave the hospital.

As with the CETI, the ALA was also used in the original LIFT study and therefore this study also incorporated the ALA to measure communication based QOL of PWAs. Whilst this assessment is specially designed for aphasia, making it unique compared to other non-aphasia specific QOL measures, it can be limiting for some when used in an inpatient setting as some of the questions relate to community engagement which does not normally occur in an inpatient setting. It would be useful for future studies to consider a communication focused QOL measure that is more appropriate to the inpatient setting.

7.8.1.3 Functional Independence Measure

Both participants showed a higher discharge score on the FIM, showing a greater overall level of independence. WH scored a change in FIM score of 17 points and KL achieved a score of 10. However, neither participant achieved a clinically significant change in FIM score, as defined by AROC (2014) as ≥ 24.5 points. This was unachievable given the high admission FIM scores for both participants. In other words, a ceiling effect occurred and no clinically significant threshold could be achieved.

This finding is different to the findings in the Clinical Audit Study (Chapter 2) which revealed PWAs showed an average improvement in FIM scores greater than the AROC benchmark of 24.5 points (Australian Health Services Research Australian Health Services Research Institute, 2013; Rej et al., 2016). However, any comparison is tentative given the differences in the sample size of the Study 1 and 2 as well as participant characteristics.

The FIM also has limited domains (only 2) that address language function. Furthermore, it predominantly captures physical rather than cognitive domains. Despite its limitations, the FIM was included in this study as a measure of independence as Study 1 (see Chapter 2) informed its suitability as an outcome measure that is considered to be sensitive to change.

7.8.3 Personal Observations

Evaluating participant characteristics was not within the scope of this study. However, several noteworthy observations were made that could provide insight into WH's positive outcomes and how this might impact on the feasibility of LIFT. As previously mentioned, she had a highly supportive partner who, despite living rurally, was present for the majority of the LIFT treatment. The CI observed that WH's mood was noticeably poorer on the one occasion her partner was unavailable. This was reflected on day 5 when she scored her lowest satisfaction level in her Daily Satisfaction survey (see Figure 10). Her partner returned the following day

and stayed for the remainder of the study, and in line with this, WH's daily satisfaction scores rose to 2 (out of 2) and remained so, until the end of the treatment. This illustrated that WH's mood was likely highly dependent on the support of her partner. This finding is reinforced by several studies that have shown that support by a person deemed significant to the PWA is a crucial factor determining success and participation in aphasia treatment (Hilari & Northcott, 2006; McGurk et al., 2011; Worrall et al., 2011).

WH also displayed personal traits of strong motivation and good coping strategies as observed by the CI. She maintained a positive attitude, despite her language difficulties, and was able to show good coping strategies such as: developing rapport with nursing staff and turning to them for support when needed, seeking the CI between sessions if she was experiencing a communication breakdown, and after a perceived failure she would take a short break to clear her head and then continue with therapy rather than abandon it. These personal traits and the high level of partner support she received appeared to contribute to her positive treatment outcomes.

Furthermore, initial aphasia severity did not appear to be a barrier toward benefitting from LIFT treatment. This was shown as WH presented with low initial scores in all outcome measures, yet responded better to treatment. This finding was also reported in a retrospective study of two ICAPs by Persad (2013), in which participants with greater initial aphasia severity demonstrated greater clinically significant improvements compared with those with milder forms of aphasia. However, several participants had such mild forms of aphasia that they reached a ceiling effect on the WAB Aphasia Quotient, so that an overall treatment effect could not be demonstrated. Furthermore, these findings are in conflict with numerous other studies where initial aphasia severity was an indicator/predictor of treatment outcomes: those with milder aphasia severity tended to make the greatest gains (Code et al., 2010; Dignam et al., 2016; Hoover et al., 2017). In summary, WH may have performed better than expected (based on previous research findings) due to the substantial partner support she received and her own personal traits, which enabled her to achieve such clinically meaningful levels of language recovery, despite her initial diagnosis.

Several factors may have contributed to KL's outcomes. It was observed that he received minimal partner support during his LIFT treatment, as his partner was mostly unavailable due to travel commitments. He would often report that he missed his partner or was craving the company of his friends. His mood would noticeably improve when he had a visitor (which was infrequent). Furthermore, whilst there were no medical diagnoses to account for his low mood, it was later discovered (during a home visit by the community SP) that KL had an alcohol consumption dependency, both prior to and after his stroke. It is possible that a withdrawal from alcohol during his inpatient stay may have negatively affected his mood.

Therefore, it appeared that limited support (and potential alcohol dependency) could be linked to his low mood and this may have negatively affected his participation in LIFT. This finding was consistent with other studies that have shown lack of support and/or poor mood leading to reduced gains in rehabilitation and decreased participation in communication opportunities (Hilari & Byng, 2009; Hilari & Northcott, 2006).

7.9 Conclusion

This study was the first to explore the therapeutic effect and clinical implications of LIFT implemented in an inpatient setting during the subacute stage. Both participants demonstrated clinically meaningful improvements from participation in LIFT treatment and made gains in at least two domains (functional communication and QOL), which is in line with other studies investigating intensive aphasia treatment. No adverse effects were observed and participants were able to engage in and complete the intensive LIFT program.

This study was a Phase I exploratory study to determine if LIFT had a therapeutic effect on language recovery and to refine the treatment protocols for an inpatient setting. The next phase of research would be to compare this program against standard service provision in the same setting to determine if the treatment effects from LIFT are comparable or superior. Given that this exploratory study had a small sample size of two single case studies, caution must be taken with the interpretation and generalisation of the findings. Yet despite the small sample size, the findings of the current study demonstrate the effectiveness of LIFT and its potential for successful as well as practical implementation in an inpatient rehabilitation setting. It also has the potential to be applied within any similar inpatient rehabilitation hospital.

References

AROC Outcome Target Report (Inpatient - Pathway 3). (2013). *Australasian Rehabilitation Outcomes Centre*.

Australasian Rehabilitation Outcomes Centre. (2013). LOS and FIM change benchmarks in Australia. Retrieved 30/1/2014, from https://ahsri.uow.edu.au/content/groups/public/@web/@chsd/@aroc/documents/doc/uow159838.pdf

The Australasian Rehabilitation Outcomes Centre (AROC). (2014). Retrieved 5.2.2014, from http://ahsri.uow.edu.au/aroc/whatisaroc/index.html

Australian Aphasia Association. (2010). Aphasia facts and figures. *Aphasia facts and figures.* Retrieved 2015, from https://aphasia.org.au

Australian Bureau of Statistics. (2011). Causes of death, Australia, cat 3303.0. Retrieved 11.9.13, from http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/3303.0Chapter42011

Australian Health Services Research Institute. (2013). Length of stay and functional improvement of completed episodes of rehabilitation in Australia. . Retrieved Jan 21, 2014, from https://ahsri.uow.edu.au/content/groups/public/@web/@chsd/@aroc/documents/doc/uow159838.pdf.

Babbitt, E. M., & Cherney, L. R. (2010). Communication confidence in persons with aphasia. *Topics in Stroke Rehabilitation, 17*(3), p214.

Babbitt, E. M., Worrall, L. E., & Cherney, L. R. . (2013). Clinician perspectives of an intensive comprehensive aphasia program. *Topics in Stroke Rehabilitatio, 20*(5), p398.

Bakas, T., Kroenke, K., Plue, L., Perkins, S., & Williams, L. (2006). Outcomes among family caregivers of aphasic versus nonaphasic stroke survivors. *Rehabilitation Nursing, 31*, 33-42.

Bakheit, A. M., Shaw, S., Barrett, L., Wood, J., Carrington, S., Griffiths, S., . . . Koutsi, F. (2007). A prospective, randomized, parallel group, controlled study of the effect of intensity of speech and language therapy on early recovery from poststroke aphasia. *Clin Rehabil, 21* (10), 885-894. doi: 10.1177/0269215507078486

Barthel, G., Meinzer, M., Djundja, D., & Rockstroh, B. (2008). Intensive language therapy in chronic aphasia: Which aspects contribute most? *Aphasiology, 22*(4), 408-421. doi: 10.1080/02687030701415880

Basso, A. (2005). How intensive/prolonged should an intensive/prolonged treatment be? *Aphasiology, 19*(10-11), 975-984. doi: 10.1080/02687030544000182

Bhogal, S. K., Teasell, R., & Speechley, M. (2003). Intensity of aphasia therapy, impact on recovery. *Stroke, 34*(4), 987-993. doi: 10.1161/01.STR.0000062343.64383.D0

Biernaskie, J., Chernenko, G., & Corbett, D. (2004). Efficacy of rehabilitative experience declines with time after focal ischemic brain injury. *Journal of Neuroscience, 24*(5), 1245-1254. doi: 10.1523/JNEUROSCI.3834-03.2004

Bowen, A., Hesketh, A., Patchick, E., Young, A., Davies, L., Vail, A., . . . Tyrrell, P. (2012). Effectiveness of enhanced communication therapy in the first four months after stroke for aphasia and dysarthria: a randomised controlled trial. *BMJ, 345*, e4407. doi: 10.1136/bmj.e4407

Boyle, M. (2010). Semantic feature analysis treatment for aphasic word retrieval impairments: what's in a name? *Topics in Stroke Rehabilitation, 17*(6), 411-422.

Brodeur, M. B., Guérard, K., & Bouras, M. (2014). Bank of Standardized Stimuli (BOSS) Phase II- 930 New Normative Photos. *PLoS ONE, 9*(9). doi: 10.1371

Cadilhac, D. A., Pearce, D. C., Levi, C. R., & Donnan, G. A. (2008). Improvements in the quality of care and health outcomes with new stroke care units following implementation of a clinician-led, health system redesign programme in New

South Wales, Australia. *Qual Saf Health Care, 17*(5), 329-333. doi: 10.1136/qshc.2007.024604
Chalder, T., Berelowitz, G., Pawlikowska, T., Watts, L. , Wessely, S., & Wallace, E. P. (1993). Development of a fatigue scale. *Journal of Psychosomatic Research, 37*(2), 147–153.
Chapey, R. (2008). *Language intervention strategies in aphasia and related neurogenic communication disorders*. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins
Cherney, L. R., Patterson, J. P., & Raymer, A. M. (2011). Intensity of aphasia therapy: evidence and efficacy. *Curr Neurol Neurosci Rep, 11*(6), 560-569. doi: 10.1007/s11910-011-0227-6
Cherney, L. R., Patterson, J., Raymer, A., Frymark, T., & Schooling, T. (2010). Updated Evidence-Based Systematic Review: Effects of Intensity of Treatment and Constraint-Induced Language Therapy for Individuals with Stroke-Induced Aphasia. *Journal of Speech, Language, and Hearing Research*.
Christensen, J., & Anderson, J. (1989). Spouse Adjustment to Stroke: Aphasic versus Nonaphasic Partners. *J Commun Disord, 22*, 225-231.
Code, C., Mackie, N. S., Armstrong, E., Stiegler, L., Armstrong, J., Bushby, E., . . . Webber, A. (2001). The public awareness of aphasia: an international survey. *International Journal of Language & Communication Disorders, 36*, 1-6.
Code, C., & Petheram, B. (2011). Delivering for aphasia. *Int J Speech Lang Pathol, 13*(1), 3-10. doi: 10.3109/17549507.2010.520090
Code, C., Torney, A., Gildea-Howardine, E., & Willmes, K. (2010). Outcome of a one-month therapy intensive for chronic aphasia: variable individual responses. *Semin Speech Lang, 31*(1), 21-33. doi: 10.1055/s-0029-1244950
Dalemans, R. J., de Witte, L., Wade, D., & van den Heuvel, W. (2010). Social participation through the eyes of people with aphasia. *Int J Lang Commun Disord, 45*(5), 537-550. doi: 10.3109/13682820903223633
David, R., Enderby, P. , & Bainton, D. (1982). Treatment of acquired aphasia: speech therapists and volunteers compared. *J Neurol Neurosurg Psychiatry, 45*, 957-961.
Davidson, B., Howe, T., Worrall, L., Hickson, L., & Togher, L. (2008). Social participation for older people with aphasia: the impact of communication disability on friendships. *Top Stroke Rehabil, 15*(4), 325-340. doi: 10.1310/tsr1504-325
DeLoitte Access Economics. (2014). Living with Parkinsons An updated economic analysis Parkinsons Australia Inc.
Deloitte Access Economics. (2015). Economic analysis of motor neurone disease in Australia: Motor Neurone Disease Australia.
Denes, G., Perazzolo, C., Piani, A., & Piccione, F. (1996). Intensive versus regular speech therapy in global aphasia: A controlled study. *Aphasiology, 10*(4), 385-394.
Dickey, L., Kagan, A., Lindsay, M. P., Fang, J., Rowland, A., & Black, S. (2010). Incidence and profile of inpatient stroke-induced aphasia in Ontario, Canada. *Arch Phys Med Rehabil, 91*(2), 196-202. doi: 10.1016/j.apmr.2009.09.020
Difrancesco, S., Pulvermüller, F., & Mohr, B. (2012). Intensive language-action therapy (ILAT): The methods. *Aphasiology, 26*(11), 1317-1351. doi: 10.1080/02687038.2012.705815
Dignam, J., Copland, D., McKinnon, E., Burfein, P., O'Brien, K., Farrell, A., & Rodriguez, A. D. (2015). Intensive Versus Distributed Aphasia Therapy: A Nonrandomized, Parallel-Group, Dosage-Controlled Study. *Stroke, 46*(8), 2206-2211. doi: 10.1161/STROKEAHA.115.009522
Dignam, J., Copland, D., Rawlings, A., O'Brien, K., Burfein, P., & Rodriguez, A. D. (2016). The relationship between novel word learning and anomia treatment success in adults with chronic aphasia. *Neuropsychologia, 81*, 186-197. doi: 10.1016/j.neuropsychologia.2015.12.026

Ellis, C., Simpson, A. N., Bonilha, H., Mauldin, P. D., & Simpson, K. N. (2012). The one-year attributable cost of poststroke aphasia. *Stroke, 43*(5), 1429-1431. doi: 10.1161/STROKEAHA.111.647339

Elman, R. J., Ogar, J., & Elman, S. H. (2000). Aphasia: Awareness, advocacy, and activism. *Aphasiology, 14*(5-6), 455-459. doi: 10.1080/026870300401234

Enderby, P. (2012). How much therapy is enough? The impossible question! *Int J Speech Lang Pathol, 14*(5), 432-437. doi: 10.3109/17549507.2012.686118

Engelter, S. T., Gostynski, M., Papa, S., Frei, M., Born, C., Ajdacic-Gross, V., . . . Lyrer, P. A. (2006). Epidemiology of aphasia attributable to first ischemic stroke: incidence, severity, fluency, etiology, and thrombolysis. *Stroke, 37*(6), 1379-1384. doi: 10.1161/01.STR.0000221815.64093.8c

Flynn, L., Cumberland, A., & Marshall, J. (2009). Public knowledge about aphasia: A survey with comparative data. *Aphasiology, 23*(3), 393-401. doi: 10.1080/02687030701828942

Foley, N., Pereira, S., Salter, K., Meyer, M., McClure, J. A., & Teasell, R. (2012). Are recommendations regarding inpatient therapy intensity following acute stroke really evidence-based? *Topics in Stroke Rehabilitation, 19*(2).

Frattali, C. (1998). *Measuring outcomes in speech-language pathology*. New York: Theime.

Frattali, C., Thompson, C. M., Holland, A. L., Wohl, C. B. , & Ferketic, M. M. . (1995). *ASHA Functional Assessment of Communication Skills (FACS),* . American Speech - Language - Hearing Association: Rockville, MD.

Godecke, E. (2008). *Efficacy of aphasia therapy in the acute setting.* (PhD), Curtin University of Technology.

Godecke, E., Hird, K., Lalor, E. E., Rai, T. , & Phillips, M. R. (2012). Very early poststroke aphasia therapy: a pilot randomized controlled efficacy trial. *Int J Stroke, 7*(8), 635-644. doi: 10.1111/j.1747-4949.2011.00631.x

Grohn, B., Worrall, L., Simmons-Mackie, N., & Hudson, K. (2014). Living successfully with aphasia during the first year post-stroke: A longitudinal qualitative study. *Aphasiology, 28*(12), 1405-1425. doi: 10.1080/02687038.2014.935118

Hartman, J. (1981). Measurement of early spontaneous recovery for aphasia with stroke. *Annals of Neurology,, 9*, 89-91.

Hermann, D. M., & Chopp, M. (2012). Promoting brain remodelling and plasticity for stroke recovery: therapeutic promise and potential pitfalls of clinical translation. *The Lancet Neurology, 11*(4), 369-380. doi: 10.1016/s1474-4422(12)70039-x

Hilari, K. (2011). The impact of stroke: are people with aphasia different to those without? *Disabil Rehabil, 33*(3), 211-218. doi: 10.3109/09638288.2010.508829

Hilari, K., & Byng, S. (2009). Health-related quality of life in people with severe aphasia. *Int J Lang Commun Disord, 44*(2), 193-205. doi: 10.1080/13682820802008820

Hilari, K., Byng, S., Lamping, D. L., & Smith, S. C. (2003). Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39): evaluation of acceptability, reliability, and validity. *Stroke, 34*(8), 1944-1950. doi: 10.1161/01.STR.0000081987.46660.ED

Hilari, K., & Northcott, S. (2006). Social support in people with chronic aphasia. *Aphasiology, 20*(1), 17-36. doi: 10.1080/02687030500279982

Hilari, K., Owen, S. , & Farrelly, S. J. (2007). Proxy and self-report agreement on the Stroke and Aphasia Quality of Life Scale-39. *J Neurol Neurosurg Psychiatry, 78*(10), 1072-1075. doi: 10.1136/jnnp.2006.111476

Hoover, E. L., Caplan, D. N., Waters, G. S. , & Carney, A. (2013). *An Intensive, Interdisciplinary Treatment Program for Persons with Aphasia*. Paper presented at the Clinical Aphasiology Conference, Tucson, AZ.

Hoover, E. L., Caplan, D. N., Waters, G. S., & Carney, A. (2017). Communication and quality of life outcomes from an interprofessional intensive, comprehensive, aphasia program (ICAP). *Topics in Stroke Rehabilitation, 24*(2), 82(89)

Howe, T., Davidson, B., Worrall, L. , Hersh, D., Ferguson, A., Sherratt, S., & Gilbert, J. 'You needed to rehab … families as well': family members' own goals for aphasia rehabilitation. *International Journal of Language & Communication Disorders, 47*, 511-521. doi: doi:10.1111/j.1460-6984.2012.00159.x

Hubbard, I. J., Harris, D., Kilkenny, M. F., Faux, S. G., Pollack, M. R., & Cadilhac, D. A. (2012). Adherence to clinical guidelines improves patient outcomes in Australian audit of stroke rehabilitation practice. *Arch Phys Med Rehabil, 93*(6), 965-971. doi: 10.1016/j.apmr.2012.01.011

Hula, W. D., Cherney, L. R., & Worrall, L. E. (2013). Setting a research agenda to inform intensive comprehensive aphasia programs. *opics in Stroke Rehabilitation, 20*(5), 409-420. doi: 10.1310/tsr2005-409

Irwin, P., Hoffman, A., Lowe, D., Pearson, M., & Rudd, A. G. (2005). Improving clinical practice in stroke through audit: results of three rounds of National Stroke Audit. *J Eval Clin Pract, 11*(4), 306-314. doi: 10.1111/j.1365-2753.2005.00529.x

Ivers, N., Jamtvedt, G., Flottorp, S., Young, J. M., Odgaard-Jensen, J., French, S. D., . . . Oxman, A. D. (2012). Audit and feedback: effects on professional practice and health care outcomes (Review). *Cochrane Database of Systematic Reviews*(6). doi: 10.1002/14651858.CD000259.pub3.

Jette, D. U., Warren, R. L., & Wirtalla, C. (2005). The relation between therapy intensity and outcomes of rehabilitation in skilled nursing facilities. *Arch Phys Med Rehabil, 86*(3), 373-379. doi: 10.1016/j.apmr.2004.10.018

Kagan, A., Simmons-Mackie, N., Victor, J. C., Carling-Rowland, A., Hoch, J., Huijbregts, M., & Mok, A. (2010). *Assessment for living with aphasia (ALA)*. Toronto, ON, Canada: Aphasia Institute.

Kagan, A., Simmons‐Mackie, N., Rowland, A., Huijbregts, M., Shumway, E., McEwen, S., . . . Sharp, S. (2008). Counting what counts: A framework for capturing real‐life outcomes of aphasia intervention. *Aphasiology, 22*(3), 258-280. doi: 10.1080/02687030701282595

Kaplan, E., Goodglass, H. , & Weintraub, S. (1983). *The Boston Diagnostic Aphasia Examination*. Philadelphia: Lea & Febiger.

Katz, R. C., & Wertz, R. T. (1997). The efficacy of computer-provided reading treatment for chronic aphasic adults. *Journal of Speech, Language, and Hearing Research, 40*(3), pg. 493.

Kelly, H., Brady, M. C., & Enderby, P. (2012). Speech and language therapy for aphasia following stroke. *The Cochrane database of systematic reviews, 5*, CD000425.

Kertesz, A. (1982). *The Western Aphasia Battery*. San Antonio, Texas: The Psychological Corporation Harcourt Brace Jovanovich, Inc.

Kertesz, A. (2007). *WAB-R : Western Aphasia Battery-Revised*. New York: Grune & Stratton.

Kiresuk, T., & Sherman, R. (1968). Goal attainment scaling: a general method of evaluating comprehensive mental health programmes. *Community Mental Health Journal, 4*(443-453).

Kirmess, M., & Maher, L. M. (2010). Constraint induced language therapy in early aphasia rehabilitation. *Aphasiology, 24*(6-8), 725-736. doi: 10.1080/02687030903437682

Kleim, J. A., & Jones, T. A. (2008). Principles of Experience-Dependent Neural Plasticity: Implications for Rehabilitation after Brain Damage. *Journal of Speech, Language, and Hearing Research, 51*, S225(215).

Lazar, R. M., Minzer, B., Antoniello, D., Festa, J. R., Krakauer, J. W., & Marshall, R. S. (2010). Improvement in aphasia scores after stroke is well predicted by initial severity. *Stroke, 41*(7), 1485-1488. doi: 10.1161/STROKEAHA.109.577338

Lendrem, W., & Lincoln, N. B. (1985). Spontaneous recovery of language in patients with aphasia between 4 and 34 weeks after stroke. *Journal of Neurology, Neurosurgery & Psychiatry, 48*(8), 743.

Length of stay and functional improvement of completed episodes of rehabilitation in Australia. (2013). Retrieved 20/1/2014, from https://ahsri.uow.edu.au/content/groups/public/@web/@chsd/@aroc/documents/doc/uow159838.pdf

Leonard, C., Rochon, E., & Laird, L. (2008). Treating naming impairments in aphasia: Findings from a phonological components analysis treatment. *Aphasiology, 22*(9), 923-947. doi: 10.1080/02687030701831474

Lincoln, N.B., McGuirk, E., Mulley, G. P., Lendrem, W., Jones, A. C., & Mitchell, J. R. (1984). Effectiveness of speech therapy for aphasic stroke patients: a randomised controlled trial. *Lancet, 1*, 1197–1200.

Linebaugh, C., Baron, C. , & Corcoran, K. (1998). Assessing treatment efficacy in acute aphasia: Paradoxes, presumptions, problems and prinicples. *Aphasiology, 12*(7), 519-536.

Lomas, J., Pickard, L., Bester, S., Elbard, H., Finlayson, A., & Zoghaib, C. (1989). The communicative effectiveness index: development and psychometric evaluation of a functional communication measure for adult aphasia. *Journal of Speech and Hearing Disorders, 54*(1), 113-124.

Mackenzie, C. (1991). An aphasia group intensive efficacy study. *British Journal of Disorders of*

Communication, 26(3), 275-291.

Maher, L. M., Kendall, D., Swearengin, J. A. , Rodriguez, A., Leon, S. A. , Pingel, K., . . . Rothi, L. J. G. (2006). A pilot study of use-dependent learning in the context of Constraint Induced Language Therapy. *Journal of the International Neuropsychological Society, 12*, 843–852.

Marsh, E. B., & Hillis, A. E. (2006). Recovery from aphasia following brain injury: the role of reorganization. *Progress in Brain Research, 157*, 143-156.

Martins, I. P., Leal, G., Fonseca, I., Farrajota, L., Aguiar, M., Fonseca, J., . . . Ferro, J. M. (2013). A randomized, rater-blinded, parallel trial of intensive speech therapy in sub-acute post-stroke aphasia: the SP-I-R-IT study. *Int J Lang Commun Disord, 48*(4), 421-431. doi: 10.1111/1460-6984.12018

Mavis, I. (2007). Perspectives on public awareness of stroke and aphasia among Turkish patients in a neurology unit. *Clin Linguist Phon, 21*(1), 55-67; quiz 67-70. doi: 10.1080/02699200600903254

McGurk, R., & Kneebone, I. I. (2013). The problems faced by informal carers to people with aphasia after stroke: A literature review. *Aphasiology, 27*(7), 765-783. doi: 10.1080/02687038.2013.772292

McGurk, R., Kneebone, I. I., & Pit ten Cate, I. M. (2011). "Sometimes we get it wrong but we keep on trying": A cross-sectional study of coping with communication problems by informal carers of stroke survivors with aphasia. *Aphasiology, 25*(12), 1507-1522. doi: 10.1080/02687038.2011.599528

Meinzer, M., Rodriguez, A. D., & Gonzalez Rothi, L. J. (2012). First decade of research on constrained-induced treatment approaches for aphasia rehabilitation. *Arch Phys Med Rehabil, 93*(1 Suppl), S35-45. doi: 10.1016/j.apmr.2011.06.040

Moss Rehabilitation Research Institute. (2012). Detailed guide to Philadelphia Naming Test (PNT) Scoring. from Detailed guide to Philadelphia Naming Test (PNT) Scoring

National Stroke Foundation. (2010). Clinical Guidelines for Stroke Management 2010. Melbourne Australia.
Nickels, L. (2002). Therapy for naming disorders: Revisiting, revising, and reviewing. *Aphasiology, 16*(10-11), 935-979. doi: 10.1080/02687030244000563
Ottenbacher, K. J., Hsu, Y., Granger, C. V., & Fiedler, R. C. (1996). The reliability of the functional independence measure: a quantitative review. *Arch Phys Med Rehabil, 77*(12), 1226-1232.
Persad, C., Wozniak, L. & Kostopoulos, E. (2013). Retrospective analysis of outcomes from two intensive comprehensive Aphasia programs. *Topics in Stroke Rehabilitation, 20*(5).
Pickard, A. S., Johnson, J. A., Feeny, D. H., Shuaib, A., Carriere, K. C., & Nasser, A. M. (2004). Agreement between patient and proxy assessments of health-related quality of life after stroke using the EQ-5D and Health Utilities Index. *Stroke, 35*(2), 607-612. doi: 10.1161/01.STR.0000110984.91157.BD
Pulvermüller, F., Hauk, O., Zohsel, K., Neininger, B., & Mohr, B. (2005). Therapy-related reorganization of language in both hemispheres of patients with chronic aphasia. *Neuroimage, 28*(2), 481-489. doi: 10.1016/j.neuroimage.2005.06.038
Pulvermüller, F., Neininger, B., Elbert, T., Mohr, B., Rockstroh, B., Koebbel, P., & Taub, E. (2001). Constraint-Induced Therapy of Chronic Aphasia After Stroke. *Stroke, 32*(7), 1621-1626. doi: 10.1161/01.str.32.7.1621
Rej, L., Doeltgen, S., Rodriguez, A. , & van Steenbrugge, W. (2016). Aphasia Rehabilitation Service Delivery in a Stroke Rehabilitation Unit in Australia: A Clinical Audit of Speech Pathology Practices. *The Internet Journal of Allied Health Sciences and Practice., 14*(2).
Robey, R. R. (1994). The Efficacy of Treatment for Aphasic Persons: A Meta-analysis. *Brain and Language, 47*, 582-608.
Robey, R. R. (1998). A meta-analysis of clinical outcomes in the treatment of aphasia. *Journal of Speech, Language, and Hearing Research, 41*(1), 172-187.
Robey, R. R. (2004). A five-phase model for clinical-outcome research. *J Commun Disord, 37*(5), 401-411. doi: 10.1016/j.jcomdis.2004.04.003
Rodriguez, A. D., Worrall, L., Brown, K., Grohn, B., McKinnon, E., Pearson, C., . . . Copland, D. A. (2013). Aphasia LIFT: Exploratory investigation of an intensive comprehensive aphasia programme. *Aphasiology, 27*(11), 1339-1361. doi: 10.1080/02687038.2013.825759
Roethlisberger, F. (1939). *Management and the worker : an account of a research program conducted by the Western Eelectric Company, Hawthorne works, Chicago*. Cambridge, Mass: Harvard University Press
Rose, M. L., Cherney, L. R., & Worrall, L. (2013). Intensive comprehensive aphasia programs- an international survey of practice. *Topics in Stroke Rehabilitation, 20*(5).
Rose, M. L., Ferguson, A., Power, E., Togher, L., & Worrall, L. (2013). Aphasia rehabilitation in Australia: Current practices, challenges and future directions. *Int J Speech Lang Pathol*. doi: 10.3109/17549507.2013.794474
Sage, K., Snell, C., & Lambon Ralph, M. A. (2011). How intensive does anomia therapy for people with aphasia need to be? *Neuropsychol Rehabil, 21*(1), 26-41. doi: 10.1080/09602011.2010.528966
Schwamm, L. H., Fonarow, G. C., Reeves, M. J., Pan, W., Frankel, M. R., Smith, E. E., . . . Labresh, K. A. (2009). Get With the Guidelines-Stroke is associated with sustained improvement in care for patients hospitalized with acute stroke or transient ischemic attack. *Circulation, 119*(1), 107-115. doi: 10.1161/CIRCULATIONAHA.108.783688

Shewan, C. M., & Donner, A. P. (1988). A COMPARISON OF THREE METHODS TO EVALUATE CHANGE IN THE SPONTANEOUS LANGUAGE OF APHASIC INDIVIDUALS. *J Commun Disord, 21*(2), 171-176.

Sickert, A., Anders, L. C., Munte, T. F. , & Sailer, M. (2014). Constraint-induced aphasia therapy following sub-acute stroke: a single-blind, randomised clinical trial of a modified therapy schedule. *J Neurol Neurosurg Psychiatry, 85*(1), 51-55. doi: 10.1136/jnnp-2012-304297

Sickert, A., Anders, L. C., Munte, T. F., & Sailer, M. (2013). Constraint-induced aphasia therapy following sub-acute stroke: a single-blind, randomised clinical trial of a modified therapy schedule. *J Neurol Neurosurg Psychiatry*. doi: 10.1136/jnnp-2012-304297

Simmons-Mackie, N., Code, C., Armstrong, E., Stiegler, L., & Elman, R. J. (2002). What is aphasia? Results of an international survey. *Aphasiology, 16*(8), 837-848. doi: 10.1080/02687030244000185

Vogel, A. P., Maruff, P., & Morgan, A. T. (2010). Evaluation of communication assessment practices during the acute stages post stroke. *J Eval Clin Pract, 16*(6), 1183-1188. doi: 10.1111/j.1365-2753.2009.01291.x

Wardlaw, J. M., Murray, V., Berge, E., & del Zoppo, G. J. (2009). Thrombolysis for acute ischaemic stroke. *Cochrane Database of Systematic Reviews*(4), CD000213.

Winans-Mitrik, R. L., Hula, W. D., Dickey, M. W., Schumacher, J. G., Swoyer, B., & Doyle, P. J. (2014). Description of an intensive residential aphasia treatment program: rationale, clinical processes, and outcomes. *Am J Speech Lang Pathol, 23*(2), S330-342. doi: 10.1044/2014_AJSLP-13-0102

Wisenburn, B., & Mahoney, K. (2009). A meta-analysis of word-finding treatments for aphasia. *Aphasiology, 23*(11), 1338-1352. doi: 10.1080/02687030902732745

Worrall, L. (1999). *FCTP : Functional communication therapy planner* Bicester Winslow

Worrall, L., Sherratt, S., Rogers, P., Howe, T., Hersh, D., Ferguson, A., & Davidson, B. (2011). What people with aphasia want: Their goals according to the ICF. *Aphasiology, 25*(3), 309-322. doi: 10.1080/02687038.2010.508530

Appendices

Appendix 1 Daily participant satisfaction survey

From Rodriguez et al. (2013).

DAILY PARTICIPANT SATISFACTION SURVEY

Date: / / 2018

1. How do you feel about **today's Aphasia LIFT** program? Circle your answer below.

Appendix 2 Survey to other health professionals

Aphasia LIFT: impact on other health professionals in the Stroke Rehabilitation Unit

* 1. The Chief Investigator of the Aphasia LIFT project liaised with me regarding shared patients who were participants of the project.

	not enough	almost adequate	adequate	very high
Input received from the Chief investigator was:	○	○	○	○

Any comments?

* 2. Aphasia LIFT impacted my ability to schedule appointments for patients who were participants.

	No impact at all	Mild impact	Moderate impact	Severe impact
difficulty scheduling appointments	○	○	○	○

Any comments?

* 3. Aphasia LIFT made it difficult for me to provide the optimum amount (duration and/or frequency) of therapy sessions.

No	Yes
○	○

Any comments?

* 4. Participants appeared fatigued in my therapy sessions as a result of their participation in Aphasia LIFT.

No	Yes
○	○

Any comments?

5. If Aphasia LIFT became a service delivery option for patients requiring Speech Pathology input, how much impact would this have on your practice?

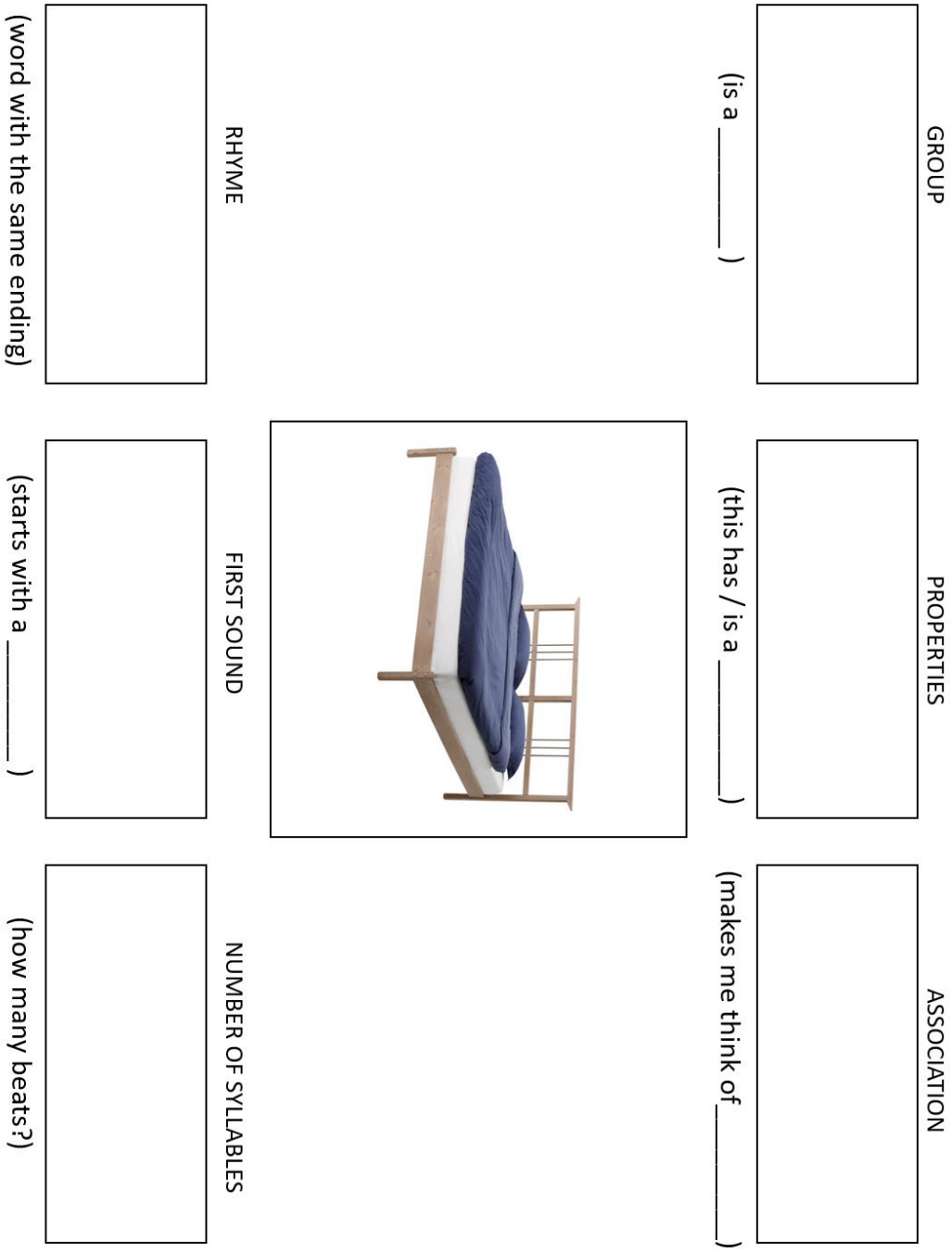
	none	mild negative impact	moderate negative impact	severe negative impact	positive impact
the impact on my practice would be	○	○	○	○	○

Any comments?

Done

Appendix 3 SFA/PCA Stimulus sheet

From Rodriguez et al. (2013).



Appendix 5 Participant information sheet

Government of South Australia
SA Health

Flinders UNIVERSITY

Participant Information Sheet

Invitation to participate
Hampstead Rehabilitation Centre in collaboration with Flinders University invites you to participate in this research project.

Title Aphasia LIFT in a Sub-acute Inpatient Rehabilitation Setting

OR Aphasia LIFT: An Intensive Therapy Program

What is aphasia?
Aphasia is a language disorder, commonly acquired after stroke that affects a person's ability to communicate. It can affect talking, understanding, reading and writing.

Aim of this research
To investigate the feasibility of implementing an intensive comprehensive aphasia program, named **Aphasia LIFT**, in a clinical setting, such as Hampstead Rehabilitation Centre (HRC).

Background
Aphasia LIFT was originally developed and trialed in the University of Queensland and showed positive therapeutic results for persons with chronic aphasia. We wish to build upon this research and extend its application to persons with early aphasia (less than 4 months following stroke).

Aphasia LIFT
Aphasia LIFT stands for **L**anguage **I**mpairment and **F**unctioning **T**herapy. It is an intensive aphasia rehabilitation program that includes individual, group and computer therapy and family education.

Suitable participants
You have been asked to participate in this study because you have had a stroke within the last 4 months and also have aphasia.

The importance of this research
This research will help us understand how we can better develop and provide aphasia rehabilitation to individuals after they experience a stroke.

Commitments
If you agree to participate, you – or your next of kin - will need to sign the consent form.

Before the research
You will be assessed by a speech pathologist to diagnose your aphasia and assess how aphasia impacts your communication, quality of life and levels of fatigue. Two to three sessions will be required for these assessments. Your nominated family member or friend will also be required to complete a questionnaire to evaluate their perception of how aphasia affects your functional communication. This self-rated questionnaire will take approximately 5-10 minutes to complete.
During the research
You will receive daily speech therapy sessions with the Researcher who is also an experienced Senior Speech Pathologist at HRC.

What will happen to me at the end of the study?
You will receive the standard speech therapy offered to all inpatients on the stroke ward. At HRC, therapy is not provided on the weekends.

Summary of procedures
Aphasia LIFT consists of **3 hours of therapy per day for 3 weeks**. Therapy includes daily individual Impairment, Functional and Computer therapy and Group therapy twice a week. An example of a *weekly* schedule may look like this:

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Impairment Therapy	1 hour	45 min	1 hour	45 min	1 hour
Functional Therapy	1 hour	45 min	1 hour	45 min	1 hour
Computer	1 hour	45 min	1 hour	45 min	1 hour
Group		45 min		45 min	

Participants will still continue to receive input from other disciplines, such as Physiotherapy and Occupational Therapy.
Participants will join the Speech Group therapy that currently runs at HRC. Group sizes can vary from 2 – 8 participants, whom are also inpatients of the stroke ward.

Risks
Due to the high intensity of therapy, you may feel fatigued. Your fatigue will be closely monitored by the use of a weekly Fatigue Questionnaire. You may experience anxiety or sadness when undertaking the assessments. The speech pathologist will work at your individual pace and provide you with support. Medical and nursing support will be available 24 hours a day on the ward and the Medical Officer may review you to determine if you should continue with the research, if concerns arise.

Compensation
Participation in this study does not impact on your basic legal right to seek compensation; however, if you do suffer harm, you may receive compensation without litigation.

Benefits
You may or may not regain language function at a faster rate due to the intensive therapy. Your family member and/or friends may benefit from attending group therapy and receiving education about aphasia. This may assist them in learning strategies to successfully communicate with you.

Location
You will remain an inpatient of the stroke ward and receive therapy by the researcher at HRC.

Cost
There is NO cost. You will not need to pay, nor will you be paid for participating.

Confidentiality
Your personal information will remain confidential. Your participation in the research project may be disclosed to other clinical and medical staff involved in your direct care.

Withdrawal
You can withdraw from the study at any time, as participation is completely voluntary. This will not affect your current or future access to standard speech therapy.

Publication
The results of the research may be published, but in a way that you cannot be identified. The results from this research project will also inform the researchers Masters Thesis.

Principal Researcher
Laleh Rej is the principal researcher and is also employed as a Senior Speech Pathologist at HRC. She will deliver the three-week Aphasia LIFT program.

Contact
If you have any queries about the research project, please contact:

Laleh Rej
Researcher/Senior Speech Pathologist
P: 041 33 99 752
E: laleh.rej@sa.gov.au

This study has been reviewed by the Southern Adelaide Clinical Human Research Ethics Committee. If you wish to discuss the study with someone not directly involved, in particular in relation to policies, your rights as a participant, or should you wish to make a confidential complaint, you may contact the Executive Officer, SAC HREC at the Flinders Medical Centre (8204 6453) or email research.ethics@health.sa.gov.au.

Thank you for your interest in this research project.

Appendix 6 Aphasia-friendly participant information sheet

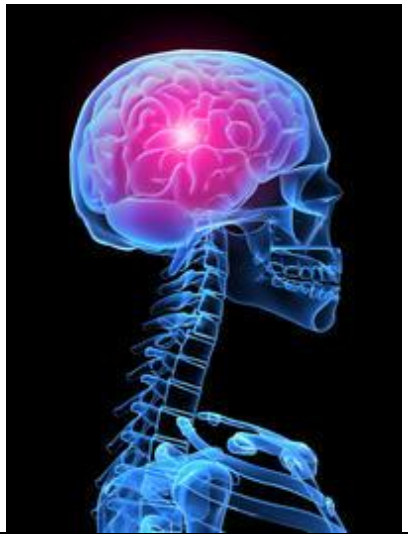
PARTICIPANT INFORMATION SHEET

<u>Research</u> **Aphasia LIFT:** An Intensive Therapy Program	**Why is this research important?** This research will help us understand better ways to provide **aphasia** therapy after **stroke**.
Assessment 	Beginning of research 4 assessments for YOU 1 assessment for a family member

EVERYONE GETS SPEECH THERAPY

standard aphasia therapy	1 hour per day 
Aphasia LIFT therapy	3 hours per day 

How Long For? 3 weeks 	After 3 weeks: End of LIFT therapy. Repeat assessments. Repeat assessments again after four weeks.
After Research You will receive standard aphasia therapy. 1 hour per day.	NO MONEY NEEDED  You WON'T be paid

ANY RISKS? You may feel tired due to the high intensity of therapy. 	ANY BENEFITS? You may have faster language recovery and improved quality of life. 
You can say NO 	Don't have to participate. Still get aphasia therapy. You can withdraw anytime. Your decision won't affect your care.

CONFIDENTIAL 	Your personal information will be kept private.
QUESTIONS 	For more information Please Contact: **Ms Laleh Rej** Researcher/ Senior Speech Pathologist Ph: 041 33 99 752 laleh.rej@sa.gov.au

Appendix 7 Participant consent form

Government of South Australia
SA Health

Flinders UNIVERSITY

CONSENT TO PARTICIPATION IN RESEARCH

Hampstead Rehabilitation Centre & Flinders University

Project Title: Aphasia LIFT in the Sub-acute Inpatient Rehabilitation Setting

OR Aphasia LIFT: an Intensive Rehab Program

I, ...
(first or given names) *(last name)*

give consent to my involvement in the research project

.....Aphasia LIFT: an Intensive Rehab Program.....
(short title)

I acknowledge the nature, purpose and contemplated effects of the research project, especially as far as they affect me, have been fully explained to my satisfaction by

.....
(first or given name) *(last name)*

and my consent is given voluntarily.

I acknowledge that the detail(s) of the following has/have been explained to me, including indications of risks; any discomfort involved; anticipation of length of time; and the frequency with which they will be performed:

1. The Western Aphasia Battery – 60 mins
2. Boston Naming Test – 30 mins
3. Assessment for Living with Aphasia – 20 mins
4. Fatigue Questionnaire – 5 mins
5. Daily participant Satisfaction Questionnaire – 1 min
6. Overall Participant Satisfaction Questionnaire – 10 mins
7. Aphasia LIFT – 45 hours in total over 3 weeks

I have understood and am satisfied with the explanations that I have been given.

I have been provided with a written information sheet.

I understand that my involvement in this research project may not be of any direct benefit to me and that I may withdraw my consent at any stage without affecting my rights or the responsibilities of the researchers in any respect.

I declare that I am over the age of 18 years.

I acknowledge that I have been informed that should I receive an injury as a result of taking part in this study, I may need to start legal action to determine whether I should be paid.

Signature of Research Participant : ..... Date: .....

I, ... have described to .....
the research project and nature and effects of procedure(s) involved. In my opinion he/she understands the explanation and has freely given his/her consent.

Signature: ..... Date: .....

Status in Project:

Appendix 8 Consent form – Third party

Government of South Australia
SA Health

Flinders UNIVERSITY

CONSENT BY A THIRD PARTY TO PARTICIPATION IN RESEARCH

Hampstead Rehabilitation Centre & Flinders University

Project Title: Aphasia LIFT in the Sub-acute Inpatient Rehabilitation Setting

OR Aphasia LIFT: an Intensive Rehab Program

I, ... give consent to
(first or given names) *(last name)*

.....'s involvement in the
(first or given names)(last name)

research project

.....Aphasia LIFT: an Intensive Rehab Program.....

.....
(short title)

I acknowledge the nature, purpose and contemplated effects of the research project, especially as far as they affect

.....
(first or given names) *(last name)*

have been fully explained to my satisfaction by .....
(first or given names) *(last name)*

and my consent is given voluntarily.

I acknowledge that the detail(s) of the following has/have been explained to me, including indications of risks; any discomfort involved; anticipation of length of time; and the frequency with which they will be performed:

1. The Western Aphasia Battery – 60 mins
2. Boston Naming Test – 30 mins
3. Assessment for Living with Aphasia – 20 mins
4. Fatigue Questionnaire – 5 mins
5. Daily participant Satisfaction Questionnaire – 1 min
6. Overall Participant Satisfaction Questionnaire – 10 mins
7. Aphasia LIFT – 45 hours in total over 3 weeks

I have understood and am satisfied with the explanations that I have been given.

I have been provided with a written information sheet.

I understand that ..... 's involvement in this research
(first or given names) *(last name)*
project may not be of any direct benefit to him/her and that I may withdraw my consent at any stage without affecting his/her rights or the responsibilities of the researchers in any respect.

I declare that I am over the age of 18 years.

I acknowledge that I have been informed that should he/she receive an injury as a result of taking part in this study, legal action may need to be taken to determine whether he/she should be paid.

Signature of parent, legal guardian or authorised person: ..... Date: .....

Relationship to subject: .....

I assent to taking part in this study

Signature of participant: ..... Date: .....

I, ... have described to ..... the research project and nature and effects of procedure(s) involved. In my opinion he/she understands the explanation and has freely given his/her consent.

Signature: ..... Date: .....

Status in Project: .....

Appendix 9 Consent form – Communication partner

Government of South Australia
SA Health

Flinders
UNIVERSITY

CONSENT TO PARTICIPATION IN RESEARCH – Communication Partner
Hampstead Rehabilitation Centre & Flinders University

Project Title: Aphasia LIFT in the Sub-acute Inpatient Rehabilitation Setting

OR Aphasia LIFT: an Intensive Rehab Program

I, ...
(first or given names) *(last name)*

give consent to my involvement in the research project

.....Aphasia LIFT: an Intensive Rehab Program.....
(short title)

I acknowledge the nature, purpose and contemplated effects of the research project, especially as far as they affect me, have been fully explained to my satisfaction by

.....
(first or given name) *(last name)*

and my consent is given voluntarily.

I acknowledge that the detail(s) of the following has/have been explained to me, including indications of risks; any discomfort involved; anticipation of length of time; and the frequency with which they will be performed:

1. The Communicative Effectiveness Index (CETI) – 10 mins

I have understood and am satisfied with the explanations that I have been given.

I have been provided with a written information sheet.

I understand that my involvement in this research project may not be of any direct benefit to me and that I may withdraw my consent at any stage without affecting my rights or the responsibilities of the researchers in any respect.

I declare that I am over the age of 18 years.

I acknowledge that I have been informed that should I receive an injury as a result of taking part in this study, I may need to start legal action to determine whether I should be paid.

Signature of Research Participant : ..... Date: .....

I, ... have described to .....
the research project and nature and effects of procedure(s) involved. In my opinion he/she understands the explanation and has freely given his/her consent.

Signature: ..... Date: .....
Status in Project: .....

Appendix 10 Overall participant satisfaction survey

Adapted from Rodriguez et al. (2013).

OVERALL PARTICIPANT SATISFACTION SURVEY

1. Has your **communication** improved since being in Aphasia LIFT?

Comments:_____

2. Was **three (3) weeks** a good amount of time for Aphasia LIFT?

Comments:_____

3. Was **three (3) hours a day** a good amount of time?

Comments:_____

4. Would you **recommend** Aphasia LIFT to others?

Comments:_____

5. Did Aphasia LIFT **fit in** well with your other therapy sessions?

Comments:_____

6. **Overall**, were you satisfied with the Aphasia LIFT program?

Comments:_____

Appendix 11 McNemar table for treated BoSS items for WH

Probe 1		**Probe 4** incorrect minus(-)		correct plus (+)	
			values		**values**
correct	plus (+)	**A**	**1**	**B**	**14**
incorrect	minus (-)	**C**	**7**	**D**	**8**

McNemar score = 5.44

Appendix 12 McNemar table for untreated BoSS items for WH

Probe 1			**Probe 4** incorrect minus(-)		correct plus (+)
			values		**values**
correct	plus (+)	**A**	**0**	**B**	**4**
incorrect	minus (-)	**C**	**15**	**D**	**11**

McNemar score = 11

Appendix 13 McNemar table for naming subtest of the WAB for WH

			After (therapy) incorrect minus(-)		correct plus (+)
Before (therapy)			**values**		**values**
correct	plus (+)	**A**	**0**	**B**	**2**
incorrect	minus (-)	**C**	**2**	**D**	**18**

McNemar score = 18

Appendix 14 McNemar table for untreated BoSS items for KL

Probe 1			**Probe 4** incorrect minus(-)		correct plus (+)
			values		**values**
correct	plus (+)	**A**	**5**	**B**	**8**
incorrect	minus (-)	**C**	**8**	**D**	**8**

McNemar score = 0.69

Appendix 15 McNemar table for untreated BoSS items for KL

Probe 1			**Probe 4** incorrect minus(-)		correct plus (+)
			values		**values**
correct	plus (+)	**A**	**4**	**B**	**7**
incorrect	minus (-)	**C**	**15**	**D**	**4**

McNemar score = 0

Appendix 16 McNemar table for WAB naming subtest for KL

			After (therapy) incorrect minus(-)		correct plus (+)
Before (therapy)			**values**		**values**
correct	plus (+)	**A**	**1**	**B**	**9**
incorrect	minus (-)	**C**	**4**	**D**	**6**

McNemar score = 3.57