Evidence for the Treatment of Co-occurring Stuttering and Speech Sound Disorder

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Speech Language Pathology

Rachael Unicomb, BPath(Hons)

School of Humanities and Social Sciences
Newcastle, NSW

February, 2015
STATEMENT OF ORIGINALITY

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University’s Digital Repository **, subject to the provisions of the Copyright Act 1968.

**Unless an embargo has been approved for a determined period.

____________________________________________________
Rachael Unicomb, PhD Candidate
ACKNOWLEDGMENTS

I would like to thank my supervisors, family and friends for their ongoing support.

My primary supervisor, Sally Hewat, has been a tireless source of knowledge and motivation. Working closely with her has given me many opportunities that I would not have otherwise been granted. Sally’s ability to see the big picture has spurred me on, and I owe her a great deal of gratitude. I am also grateful to the two co-supervisors, Elizabeth Spencer and Elisabeth Harrison, for their mentorship and time dedicated towards this thesis. I feel privileged to be supported by these renowned researchers and clinicians.

My gratitude goes to my colleagues, Julie MacFarlane, Jo Walters and Sarita Koushik. Julie willingly and selflessly stepped in to help me during a very difficult period of my life. The continuity of parts of this research would not have been possible without her doing so. Thank you also to Sarita and Jo for doing reliability checks on some of the data used in this project. I appreciate the time and effort taken to help me amongst your own busy workloads. To all of these women, I am extremely grateful.

To my family and friends, who need to know that I am deeply touched by their continued support. This thesis has not been an easy road for me. There were times throughout this journey that were the hardest I have ever had to endure. Without the support of these people, I may not have made it through to the other side. To my husband Neil - you stepped up to become the primary carer for our daughter, allowing me the time to dedicate to this thesis that put me well ahead during the first two years of my candidature. As difficult as it was for me to be the one who missed out on helping at our daughter’s swimming carnivals, or working in the school canteen, or going on her school excursions, I am now so thankful that it was you who did all of this. It allowed you to spend some beautiful time with her before you left this world, and us, unexpectedly and far too soon. To my grandmother, for cooking me a meal or two every single week because I was too tired; to my mother and stepfather for their financial support and pride in me; to my aunt Bernadette for embracing my daughter; to my good friend Reegan, who was always there for us and who helped me so much that I could not have undertaken paid employment without her; and to all of our other friends who provided play-date opportunities for Sophia in order for me to get some work done. There are of course, many others. They know who they are, and that I am truly grateful for their support.

Thank you to Kim Colyvas for his statistical support, and for his assistance in guiding this thesis into directions that would not have been possible without him. Also to Joan Rosenthal and Tanya Hanstock who both assisted in editing and proofreading this thesis.

Last, but far from least, my love and deepest gratitude goes to my beautiful young daughter, Sophia, who is now 10 years old. Though she doesn’t quite understand it yet, just having her in my life was the strongest motivation that I could ever have hoped for. Sophia is the reason this entire journey started and was completed. Everything I do and have ever done is for her…for both of us…for our future. Sophia, I love you more than words can ever express.
This thesis is dedicated to my husband Neil Unicomb (1964-2013). He would have been proud that I managed to achieve this milestone, as he always knew I would. He never gave up on me. I could not have completed this journey without him. Looking at the photo of us on my desk has pushed me to keep working through the hard times.

We miss you always.
# TABLE OF CONTENTS

Publications, Presentations, and Posters .............................................................................. x
List of Tables ...................................................................................................................... xi
List of Figures ................................................................................................................... xiv
List of Acronyms .............................................................................................................. xix
Abstract ............................................................................................................................. xxi

CHAPTER 1: Co-occurrence of Stuttering and Speech Sound Disorder: An Introduction ................................................. 1
- Stuttering ............................................................................................................................. 2
  - Epidemiology of Stuttering ................................................................................................. 3
    - Cause ........................................................................................................................ 3
    - Incidence and prevalence ......................................................................................... 6
    - Natural recovery ...................................................................................................... 7
    - Gender ratio ............................................................................................................ 8
- The Impact of Stuttering on the Individual ......................................................................... 8
- Timing of Treatment for Early Childhood Stuttering ........................................................ 10
- Speech Sound Disorder ..................................................................................................... 11
  - Epidemiology of Speech Sound Disorder ......................................................................... 13
    - Cause ...................................................................................................................... 13
    - Prevalence .............................................................................................................. 14
    - Normalisation ........................................................................................................ 15
- The Impact of Speech Sound Disorder in the Individual .................................................... 15
- Timing of Treatment for Speech Sound Disorder ............................................................... 17
- The Co-occurrence of Stuttering and Speech Sound Disorder .......................................... 18
- The Nature of Speech Sound Disorders in Children Who Stutter ...................................... 22
- Treatment of Co-occurring Stuttering and Speech Sound Disorder .................................. 29
- Summary ............................................................................................................................ 34

CHAPTER 2: Evidence for Treatment of Stuttering and Speech Sound Disorders. 37
- Introduction ....................................................................................................................... 38
- Evidence-based Practice .................................................................................................... 38
  - The external evidence ............................................................................................. 39
  - Challenges to the evaluation of evidence .............................................................. 44
  - The internal evidence: Best internal evidence from clinical practice .................. 47
  - The client’s preferences ......................................................................................... 47
- Evidence for Treatment of Stuttering in Young Children .................................................. 48
- Indirect Treatments for Early Childhood Stuttering ............................................................ 51
  - Parent-child interaction therapy .......................................................................... 51
  - Demands and capacities model ........................................................................... 52
- Direct Treatments for Early Childhood Stuttering .............................................................. 53
  - Syllable-timed Speech ......................................................................................... 54
  - The Lidcombe Program ....................................................................................... 55
- Mixed Treatments for Early Childhood Stuttering ............................................................. 57
  - Fluency facilitation .............................................................................................. 58
- Summary of Treatments for Early Childhood Stuttering .................................................. 58
- Evidence for Treatment of Speech Sound Disorders ......................................................... 59
### CHAPTER 4: Concurrent Treatment for Co-occurring Stuttering and Speech Sound Disorder: Phase I Clinical Trial Methods

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAPTER 4: Concurrent Treatment for Co-occurring Stuttering and Speech</td>
<td>121</td>
</tr>
<tr>
<td>Sound Disorder: Phase I Clinical Trial Methods</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>122</td>
</tr>
<tr>
<td>Study Design</td>
<td>123</td>
</tr>
<tr>
<td>Ethics</td>
<td>124</td>
</tr>
<tr>
<td>Recruitment</td>
<td>124</td>
</tr>
<tr>
<td>Participants</td>
<td>125</td>
</tr>
</tbody>
</table>
CHAPTER 5: Concurrent Treatment for Stuttering and Speech Sound Disorder: Case Reports and Results of a Phase I Clinical Trial

Data Collection.......................................................................................................................... 127
Direct Treatments ..................................................................................................................... 128
  Stuttering treatment ............................................................................................................ 129
  Speech sound disorder treatment ..................................................................................... 132
    Traditional articulation therapy ...................................................................................... 133
    Minimal pairs therapy ..................................................................................................... 133
    Target selection ................................................................................................................. 135
  Concurrent service delivery ............................................................................................... 136
Research Protocol .................................................................................................................... 138
Outcome Measures .................................................................................................................. 139
  Treatment data .................................................................................................................... 139
  Stuttering ............................................................................................................................ 139
  Speech sound disorder ........................................................................................................ 140
Primary outcome measures .................................................................................................... 140
  Stuttering ............................................................................................................................ 140
  Speech sound disorder ........................................................................................................ 141
  Inter-judge and intra-judge agreement ............................................................................... 141
  Familiar listener perceptions .............................................................................................. 145
Summary .................................................................................................................................. 156

Data Analysis........................................................................................................................... 145
  Statistical analysis of single case studies using the reliable change index ....................... 146
  Reliable change using 95% credible intervals .................................................................... 149
  Overdispersion ....................................................................................................................... 155

Case Study 1: Brad .................................................................................................................... 160
  Background information ...................................................................................................... 160
  Pre-treatment profile of stuttering ..................................................................................... 161
  Pre-treatment speech sound profile .................................................................................. 161
  Overview of treatment ......................................................................................................... 163
  Results: stuttering ................................................................................................................. 164
    Treatment data ................................................................................................................... 164
    Primary outcome data ....................................................................................................... 165
  Results: speech sound disorder .......................................................................................... 169
    Treatment data ................................................................................................................... 169
    Primary outcome data ....................................................................................................... 170
  Survey data .......................................................................................................................... 173
  Summary of case 1: Brad ..................................................................................................... 173
Case Study 2: Daniel ................................................................................................................ 174
  Background information ...................................................................................................... 174
  Pre-treatment profile of stuttering ..................................................................................... 176
  Pre-treatment speech sound profile .................................................................................. 176
  Overview of treatment ......................................................................................................... 177
  Results: stuttering ................................................................................................................. 179
    Treatment data ................................................................................................................... 179
    Primary outcome data ....................................................................................................... 180
  Results: speech sound disorder .......................................................................................... 184
    Treatment data ................................................................................................................... 184
PUBLICATIONS/CONFERENCE PRESENTATIONS/POSTERS RESULTING FROM THIS THESIS

INTERNATIONAL CONFERENCE PRESENTATIONS


NATIONAL CONFERENCE PRESENTATIONS


JOURNAL ARTICLES


POSTERS


LIST OF TABLES

Table 2.1 Summary of ASHA (2004) and NHMRC (2009) frameworks for evaluating external evidence
Table 2.2 Robey (2004) 5-phase model of clinical trial development
Table 2.3 Onslow et al. (2008) 3-phase model of clinical trial development
Table 2.4 Direct, indirect and mixed treatments of early childhood stuttering and evaluation of the evidence
Table 3.1 Demographic information of interview participants
Table 3.2 Transcription conventions
Table 3.3 Open coding example on portion of transcript
Table 3.4 Coding development scheme
Table 3.5 Example of coding structure from participant data
Table 3.6 Assessment measures by participants used for stuttering and speech sound disorders – interview study
Table 3.7 Participant rationales for serial service delivery
Table 3.8 Participant rationales for concurrent service delivery
Table 4.1 Examples of parental verbal contingencies used in Lidcombe Program delivery
Table 5.1 Brad’s pre-treatment %SS within the clinic and the average of beyond-clinic data
Table 5.2 Brad’s PCC pre-treatment, at single word and connected speech levels
Table 5.3 Phonological processes and/or speech errors used by Brad in single-word and connected speech at pre-treatment
Table 5.4 Brad’s %SS within the clinic and the average of the beyond-clinic data (all assessment occasions)
Table 5.5 Phonological processes and/or speech errors used by Brad in single-word and connected speech at 12-months post commencement of treatment
Table 5.6 Brad’s PCC at all assessment occasions, single-word and connected speech levels
Table 5.7 Daniel’s pre-treatment %SS within the clinic and the average of beyond-clinic data

Table 5.8 Daniel’s PCC pre-treatment, at single word and connected speech levels

Table 5.9 Phonological processes and/or speech errors used by Daniel in single-word and connected speech at pre-treatment

Table 5.10 Daniel’s %SS within the clinic and the average of the beyond-clinic data (all assessment occasions)

Table 5.11 Phonological processes and/or speech errors used by Daniel in single-word and connected speech at 12-months post commencement of treatment

Table 5.12 Daniel’s PCC at all assessment occasions, single-word and connected speech levels

Table 5.13 Frank’s pre-treatment %SS within the clinic and the average of beyond-clinic data

Table 5.14 Frank’s PCC pre-treatment, at single word and connected speech levels

Table 5.15 Phonological processes and/or speech errors used by Frank in single-word and connected speech at pre-treatment

Table 5.16 Frank’s %SS within the clinic and the average of the beyond-clinic data (all assessment occasions)

Table 5.17 Phonological processes and/or speech errors used by Frank in single-word and connected speech at 12-months post commencement of treatment

Table 5.18 Frank’s PCC at all assessment occasions, single-word and connected speech levels

Table 5.19 Elijah’s pre-treatment %SS within the clinic and the average of beyond-clinic data

Table 5.20 Elijah’s PCC pre-treatment, at single word and connected speech levels

Table 5.21 Phonological processes and/or speech errors used by Elijah in single-word and connected speech at pre-treatment

Table 5.22 Elijah’s %SS within the clinic and the average of the beyond-clinic data (all assessment occasions)

Table 5.23 Phonological processes and/or speech errors used by Elijah in single-word and connected speech at 12-months post commencement of treatment

Table 5.24 Elijah’s PCC at all assessment occasions, single-word and connected speech levels
Table 5.25 Aiden’s pre-treatment %SS within the clinic and the average of beyond-clinic data

Table 5.26 Aiden’s PCC pre-treatment, at single word and connected speech levels

Table 5.27 Phonological processes and/or speech errors used by Aiden in single-word and connected speech at pre-treatment

Table 5.28 Aiden’s %SS within the clinic and the average of the beyond-clinic data (all assessment occasions)

Table 5.29 Phonological processes and/or speech errors used by Aiden in single-word and connected speech at 12-months post commencement of treatment

Table 5.30 Aiden’s PCC at all assessment occasions, single-word and connected speech levels

Table 5.31 Summary of demographic and descriptive information for all five single cases

Table 5.32 Analysis of overdispersion on all participants clinical data – multiple measures of %SS by the researcher
LIST OF FIGURES

Figure 2.1 NHMRC (2009) hierarchical levels of evidence

Figure 2.2 Baker & McLeod’s (2011) SSD intervention approaches described in more than 1 publication

Figure 3.1 Coding methodology

Figure 3.2 Development of a parent theme

Figure 3.3 Stuttering programs used by participants

Figure 3.4 Speech sound disorder programs used by participants

Figure 4.1 Typical Stage 1 session goals

Figure 4.2 Visual aid used to motivate children through session goals

Figure 4.3 Treatment progression flow chart

Figure 4.4 Pearson’s correlation coefficient for inter-judge agreement - %SS

Figure 4.5 Pearson’s correlation coefficient for inter-judge agreement – SR

Figure 4.6 Example of graph showing reliable change index (original) method

Figure 4.7 Example of step 1 of reliable change using 95% CIs

Figure 4.8 Example of output results visualised in R software

Figure 4.9 Example of modified reliable change index scatter plot using fictitious data with >1 participants

Figure 5.1 The average of Brad’s beyond-clinic daily severity ratings in Stage 1 Lidcombe Program

Figure 5.2 Bayesian method with beta distribution to determine credible intervals for Brad’s within-clinic %SS data for all assessment occasions (researcher)

Figure 5.3 Bayesian method with beta distribution to determine credible intervals for Brad’s average of beyond-clinic %SS data for all assessment occasions (researcher)

Figure 5.4 Bayesian method with beta distribution to determine credible intervals for Brad’s within-clinic %SS data for all assessment occasions (blind rater)

Figure 5.5 Bayesian method with beta distribution to determine credible intervals for Brad’s average of beyond-clinic %SS data for all assessment occasions (blind rater)

Figure 5.6 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS within-clinic for Brad (both rater’s)
Figure 5.7 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS beyond-clinic for Brad (both rater’s)

Figure 5.8 Bayesian method with beta distribution to determine credible intervals for Brad’s PCC at single-word level

Figure 5.9 Bayesian method with beta distribution to determine credible intervals for Brad’s PCC at connected speech level

Figure 5.10 Modified RC method to determine statistical significance (reliable change) in SSD outcome measure of PCC in both single-word and connected-speech contexts for Brad

Figure 5.11 The average of Daniel’s beyond-clinic daily severity ratings in Stage 1 Lidcombe Program

Figure 5.12 Bayesian method with beta distribution to determine credible intervals for Daniel’s within-clinic %SS data for all assessment occasions (researcher)

Figure 5.13 Bayesian method with beta distribution to determine credible intervals for Daniel’s average of beyond-clinic %SS data for all assessment occasions (researcher)

Figure 5.14 Bayesian method with beta distribution to determine credible intervals for Daniel’s within-clinic %SS data for all assessment occasions (blind-rater)

Figure 5.15 Bayesian method with beta distribution to determine credible intervals for Daniel’s average of beyond-clinic %SS data for all assessment occasions (blind-rater)

Figure 5.16 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS within-clinic for Daniel (both rater’s)

Figure 5.17 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS beyond-clinic for Daniel (both rater’s)

Figure 5.18 Bayesian method with beta distribution to determine credible intervals for Daniel’s PCC at single-word level

Figure 5.19 Bayesian method with beta distribution to determine credible intervals for Daniel’s PCC at connected speech level

Figure 5.20 Modified RC method to determine statistical significance (reliable change) in SSD outcome measure of PCC in both single-word and connected-speech contexts for Daniel

Figure 5.21 The average of Frank’s beyond-clinic daily severity ratings in Stage 1 Lidcombe Program

Figure 5.22 Bayesian method with beta distribution to determine credible intervals for Frank’s within-clinic %SS data for all assessment occasions (researcher)
Figure 5.23 Bayesian method with beta distribution to determine credible intervals for Frank’s average of beyond-clinic %SS data for all assessment occasions (researcher)

Figure 5.24 Bayesian method with beta distribution to determine credible intervals for Frank’s within-clinic %SS data for all assessment occasions (blind-rater)

Figure 5.25 Bayesian method with beta distribution to determine credible intervals for Frank’s average of beyond-clinic %SS data for all assessment occasions (blind-rater)

Figure 5.26 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS within-clinic for Frank (both rater’s)

Figure 5.27 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS beyond-clinic for Frank (both rater’s)

Figure 5.28 Bayesian method with beta distribution to determine credible intervals for Frank’s PCC at single-word level

Figure 5.29 Bayesian method with beta distribution to determine credible intervals for Frank’s PCC at connected speech level

Figure 5.30 Modified RC method to determine statistical significance (reliable change) in SSD outcome measure of PCC in both single-word and connected-speech contexts for Frank

Figure 5.31 The average of Elijah’s beyond-clinic daily severity ratings in Stage 1 Lidcombe Program

Figure 5.32 Bayesian method with beta distribution to determine credible intervals for Elijah’s within-clinic %SS data for all assessment occasions (researcher)

Figure 5.33 Bayesian method with beta distribution to determine credible intervals for Elijah’s average of beyond-clinic %SS data for all assessment occasions (researcher)

Figure 5.34 Bayesian method with beta distribution to determine credible intervals for Elijah’s within-clinic %SS data for all assessment occasions (blind-rater)

Figure 5.35 Bayesian method with beta distribution to determine credible intervals for Elijah’s average of beyond-clinic %SS data for all assessment occasions (blind-rater)

Figure 5.36 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS within-clinic for Elijah (both rater’s) 

Figure 5.37 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS beyond-clinic for Elijah (both rater’s)

Figure 5.38 Bayesian method with beta distribution to determine credible intervals for Elijah’s PCC at single-word level
Figure 5.39 Bayesian method with beta distribution to determine credible intervals for Elijah’s PCC at connected speech level

Figure 5.40 Modified RC method to determine statistical significance (reliable change) in SSD outcome measure of PCC in both single-word and connected-speech contexts for Elijah

Figure 5.41 The average of Aiden’s beyond-clinic daily severity ratings in Stage 1 Lidcombe Program

Figure 5.42 Bayesian method with beta distribution to determine credible intervals for Aiden’s within-clinic %SS data for all assessment occasions (researcher)

Figure 5.43 Bayesian method with beta distribution to determine credible intervals for Aiden’s average of beyond-clinic %SS data for all assessment occasions (researcher)

Figure 5.44 Bayesian method with beta distribution to determine credible intervals for Aiden’s within-clinic %SS data for all assessment occasions (blind-rater)

Figure 5.45 Bayesian method with beta distribution to determine credible intervals for Aiden’s average of beyond-clinic %SS data for all assessment occasions (blind-rater)

Figure 5.46 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS within-clinic for Aiden (both rater’s)

Figure 5.47 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS beyond-clinic for Aiden (both rater’s)

Figure 5.48 Bayesian method with beta distribution to determine credible intervals for Aiden’s PCC at single-word level

Figure 5.49 Bayesian method with beta distribution to determine credible intervals for Aiden’s PCC at connected speech level

Figure 5.50 Modified RC method to determine statistical significance (reliable change) in SSD outcome measure of PCC in both single-word and connected-speech contexts for Aiden

Figure 5.51 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS within-clinic for all cases (researcher)

Figure 5.52 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS within-clinic for all cases (blind rater)

Figure 5.53 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS beyond-clinic for all cases (researcher)

Figure 5.54 Modified RC method to determine statistical significance (reliable change) in stuttering outcome measure of %SS beyond-clinic for all cases (blind rater)
Figure 5.55 Modified RC method to determine statistical significance (reliable change) in SSD outcome measure of PCC at the single-word naming test level

Figure 5.56 Modified RC method to determine statistical significance (reliable change) in SSD outcome measure of PCC at the connected-speech level

Figure 6.1 Proposed framework for the clinical management of co-occurring stuttering and SSD
# LIST OF ACRONYMS USED IN THIS THESIS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APP-R</td>
<td>Assessment of Phonological Processes – revised</td>
</tr>
<tr>
<td>BC</td>
<td>Beyond-clinic</td>
</tr>
<tr>
<td>CAQDAS</td>
<td>Computer assisted qualitative data analysis software</td>
</tr>
<tr>
<td>CI</td>
<td>Credible interval(s)</td>
</tr>
<tr>
<td>CS</td>
<td>Connected speech (speech sample)</td>
</tr>
<tr>
<td>DEAP</td>
<td>Diagnostic Evaluation of Articulation and Phonology</td>
</tr>
<tr>
<td>EBP</td>
<td>Evidence-based practice</td>
</tr>
<tr>
<td>E3BP</td>
<td>Evidence-based practice (3-tiered Dollaghan model)</td>
</tr>
<tr>
<td>ENT</td>
<td>Ear, nose and throat specialist</td>
</tr>
<tr>
<td>DCM</td>
<td>Demands and capacities model</td>
</tr>
<tr>
<td>GT</td>
<td>Grounded theory</td>
</tr>
<tr>
<td>ICF</td>
<td>World Health Organization’s International Classification of Functioning, Disability and Health</td>
</tr>
<tr>
<td>LP</td>
<td>Lidcombe Program</td>
</tr>
<tr>
<td>LBDL</td>
<td>Lidcombe Behavioural Data Language</td>
</tr>
<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
</tr>
<tr>
<td>PACT</td>
<td>Parents and children together therapy</td>
</tr>
<tr>
<td>PCC</td>
<td>Percent consonants correct</td>
</tr>
<tr>
<td>PCI</td>
<td>Parent-child interaction therapy</td>
</tr>
<tr>
<td>PICO</td>
<td>Patient-intervention-comparison-outcome framework</td>
</tr>
<tr>
<td>PVC</td>
<td>Parental verbal contingencies</td>
</tr>
<tr>
<td>RC</td>
<td>Reliable change</td>
</tr>
<tr>
<td>RCT</td>
<td>Randomised controlled trial</td>
</tr>
<tr>
<td>SDCS</td>
<td>Speech Disorders Classification System</td>
</tr>
<tr>
<td>SE</td>
<td>Scale estimate</td>
</tr>
<tr>
<td>SLP</td>
<td>Speech Language Pathologist</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SR</td>
<td>Severity rating(s)</td>
</tr>
<tr>
<td>SSD</td>
<td>Speech sound disorder</td>
</tr>
<tr>
<td>STS</td>
<td>Syllable-timed speech</td>
</tr>
<tr>
<td>SW</td>
<td>Single-word (speech sample)</td>
</tr>
<tr>
<td>VRCS</td>
<td>Verbal response-contingent stimulation</td>
</tr>
<tr>
<td>WC</td>
<td>Within-clinic</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>ICF-CY</td>
<td>World Health Organization’s International Classification of Functioning, Disability and Health – Children and Youth Version</td>
</tr>
<tr>
<td>WNL</td>
<td>Within normal limits</td>
</tr>
<tr>
<td>%SS</td>
<td>Percentage of syllables stuttered</td>
</tr>
</tbody>
</table>
ABSTRACT

Stuttering and speech sound disorder are communication disorders that may co-occur in young children. Both disorders alone can negatively impact individuals across their lifespan. For this reason, when either disorder occurs in isolation, best practice supports the need for early intervention.

Although these two disorders do co-occur, little is known about how best to provide intervention for young children with this comorbidity. There is one previous study investigating a treatment approach for co-occurring stuttering and speech sound disorder that was published over 20 years ago by Conture, Louko and Edwards (1993). These researchers suggested that the two disorders be treated concurrently using predominantly indirect treatment approaches for the stuttering and the speech sound disorder, with treatment goals embedded within each other (or blended). There have also been several guidelines published in the surrounding literature which draw from the research of Conture and colleagues and/or are based on clinical experience and expert opinion.

Since Conture et al. (1993) initially published their findings, there have been greater advances in the research into the treatment of each disorder in isolation. Many of the treatment approaches are supported by high levels of research evidence for both stuttering and speech sound disorder, and are direct in nature. Speech-language pathologists have reported using these direct approaches. Some examples of these include the Lidcombe Program for early childhood stuttering, and minimal pairs therapy for speech sound disorder. Little is known, however, about how clinicians should manage the two disorders when they co-occur in light of these treatment advances. Further, there is no research indicating whether or not treating stuttering and speech sound disorder concurrently using direct approaches to intervention would be efficacious.

The overall purpose of this thesis was to consider the current evidence for the management of young children presenting with co-occurring stuttering and speech sound disorder, and to establish further scientific evidence to help guide treatment practices with this caseload in the future. In order to achieve this, several aims were established. The first aim was to investigate and describe how clinicians are currently
managing this caseload of young children. The second aim was to investigate whether stuttering and co-occurring speech sound disorder could be treated concurrently using direct treatment approaches that are supported by high levels of evidence, and whether this could be done in a safe, efficient, and efficacious manner. That is, to determine the presence (or not) of emerging evidence of treatment effect.

The first study in this thesis was qualitative in nature and used semi-structured in-depth interviews to explore the management practices of 13 Australian speech-language pathologists. Five major themes were derived from analysis of the data. The core theme was identified as ‘clinical reasoning’ and highlighted that many of the participants noted a need for more up-to-date treatment guidelines when working with children who have co-occurring stuttering and speech sound disorder. They also reported confusion when deciding on a service delivery method for this caseload, due to the paucity of available evidence. Although the majority of these speech-language pathologists stated that they would treat this caseload serially, some noted that doing so might compromise use of the window period for early intervention. They also noted that treating serially may cause financial burden on some families, and cause lack of motivation and/or risk ‘therapy burn-out’ for the parent and/or the child if treatment progressed for a long period.

The results of the abovementioned findings informed the next study in this thesis, a Phase I clinical trial (single case studies) that involved five preschool aged participants. A Phase I clinical trial was considered an appropriate methodology because a further aim of this thesis was to thoroughly document and develop a treatment protocol for the treatment of co-occurring stuttering and speech sound disorder. All participants underwent concurrent intervention for both stuttering and speech sound disorder using direct treatment approaches. For the stuttering, all were treated with the Lidcombe Program as manualised. Direct treatment for the speech sound disorder was individualised based on analysis of each child’s sound system. Four of the five children completed Stage 1 of the Lidcombe Program. This thesis detailed a new method of analysis that measures statistical and reliable change in individuals. Using this method, all children in the Phase I clinical trial showed statistically significant improvements in outcome measures for both disorders from pre-treatment to 12 months post commencement of treatment. The one child who did not complete the Lidcombe
Program exhibited statistically significant improvements in the primary outcome measure for speech sound disorder from pre-treatment to 12 months post commencement of treatment. Caution was exercised when designing the research protocol for these children, due to the anecdotal reports of negatively impacting either disorder when using direct treatment approaches. Therefore, the research design was non-experimental in nature (descriptive case studies), and subsequently no causal inference can be concluded from the results. However, the positive findings of the study highlight the need for further research to be conducted on more children in order to start building on the limited evidence base in this area. These preliminary findings indicate that young children with co-occurring stuttering and speech sound disorder may be treated using direct treatment approaches in a concurrent manner in some instances. Treating in this way may be more cost and time-efficient for both speech-language pathologists and families alike. Treating the disorders in this way may also address the crucial need for early intervention in both disorders.