Investigating the Efficacy of a Receptive Language Intervention with a 6-year-old boy with Primary Language Impairment: A Pilot Study

A Research Project submitted to the Department of Clinical Therapies in partial fulfillment of the requirements for the Master of Science in Speech & Language Therapy

May 2013

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Word Count: 8,219

Formatted for Child Language Teaching & Therapy
Acknowledgements

I would like to thank my research partner, Melissa Murtagh.

Thanks to Aoife McGuire for assisting in the recruitment process.

Thank you also to Aoife Murphy for providing some guidance on shape coding activities.

Finally, I would like to thank my supervisor, Dr Carol-Anne Murphy, for all the help and support provided throughout the project.
# TABLE OF CONTENTS

Abstract.................................................................................................................. 3  
Introduction............................................................................................................ 4  
The Nature of Language Comprehension Difficulties ........................................... 4  
Interventions............................................................................................................. 6  
  Acoustically Modified Sound Programmes......................................................... 6  
  Metcognitive Approaches..................................................................................... 7  
  Metalinguistic Approaches................................................................................... 8  
Method..................................................................................................................... 10  
  Research Design.................................................................................................... 10  
  Participant Selection Process................................................................................ 11  
  Assessment............................................................................................................ 12  
  Participant............................................................................................................ 15  
  Intervention.......................................................................................................... 19  
Clinical Observations ............................................................................................. 22  
Results..................................................................................................................... 24  
  Oral Language Comprehension Outcomes......................................................... 24  
  In session Data...................................................................................................... 28  
  Metalinguistic Approach...................................................................................... 28  
  Concepts.............................................................................................................. 28  
  Metacognitive Strategies..................................................................................... 29  
Discussion............................................................................................................... 30  
  Oral Language Comprehension.......................................................................... 30  
  Dynamic assessment............................................................................................ 31  
  The Metalinguistic Approach.............................................................................. 31  
  Attention Deficit in Language Impairment.......................................................... 32  
  Limitations............................................................................................................ 33  
  The Value of Single Case Research...................................................................... 34
Abstract

Background: There is currently a significant gap in the literature on speech and language therapy interventions in terms of their effectiveness in treating school-age children with receptive language difficulties.

Objectives: This was a pilot study that set out to investigate (a) Whether an individually tailored intervention can alleviate oral language comprehension difficulties for a 6-year old boy, JC, with primary language impairment and (b) The effect of an evidence based metalinguistic intervention on his oral language comprehension.

Method: Components of oral language comprehension were measured using standardised assessment and criterion referenced assessment. A controlled single subject design with repeated measures was employed with a selection of criterion referenced probes of treated and untreated grammatical structures. Therapy encompassed the following elements: 1) teaching of concepts embedded within metacognitive strategies including rehearsal and comprehension monitoring, 2) use of a metalinguistic approach to explicitly teach syntactic rules.

Results: There was no significant improvement in oral language comprehension on any measure.

Conclusions: Data should be interpreted in the light of the fact that the number of treatment sessions delivered was limited. In-session data suggests that JC had grasped the basics of the metalinguistic approach and was ready to move on to learning specific structures using the coding system. The study also provides some valuable qualitative information about the nature of oral language comprehension difficulties associated with a profile such as JC’s.
Introduction

A recent review by Law et al (2010), concludes that limited evidence is available concerning interventions for children with receptive language difficulties. As highlighted by Boyle et al (2010), language impairment with a receptive language component is more resistant to intervention than specific expressive or phonological delays, and carries a greater risk of co-morbid behavioural difficulties as well as adverse outcomes for language development and academic progress. Investigating the effectiveness of interventions for this population group would therefore make a valuable contribution to the literature relating to speech and language therapy practice. Cirrin & Gillam (2008) in a systematic review of language intervention practices for children with language disorders found that relatively few studies exist concerning the effectiveness of these interventions. They highlight that the majority of studies carried out, have been with preschool children under the age of 5 years. They emphasize a significant gap in terms of efficacy studies for language intervention with students with language disorders from age 6 up to adolescence.

The Nature of Language Comprehension Difficulties

As highlighted by findings such as those by Conti-Ramsden and Botting (1999), children with primary language impairment are a heterogeneous group. This creates great difficulty for researchers in the pursuit of effective interventions for this group. What works for one child may not work for the next. With receptive language specifically, there are many different levels of processing and so many possibilities for where a breakdown may occur. When we consider spoken language, these levels include auditory processing of the acoustic waveform, phonetic feature extraction, phonological analysis, word recognition and retrieval, syntactic parsing, semantic interpretation, use of inference from linguistic context, and interpretation of social context (Schwartz, 2009). Considering this process, the heterogeneity of children presenting with comprehension difficulties is not surprising. Traditionally, a distinction between two main accounts of SLI is apparent. The first is a perspective that regards children with SLI as having defective grammatical representations, and
the second sees the child with a primary language deficit as having wider processing difficulties (Bishop, 1997).

Processing difficulties present in the areas of auditory processing, attention and memory. The significant role of working memory in language processing has been well documented (e.g. Baddeley et al, 1998; Baddeley, 2003; Gathercole & Alloway, 2006). The likelihood of the presence of a working memory deficit in children with SLI, has received considerable support, particularly through the work of Montgomery and colleagues (e.g.; Montgomery, 2003; Montgomery et al, 2008; Montgomery & Evans, 2009). Montgomery & Evans (2009), included an investigation of the role of attention in language processing, viewing attention and working memory as part of the same system, containing limited resources. This attentional resource capacity is considered part of the central executive by other authors, for instance Baddeley (1996), with the central executive acting as a more global cognitive processing “controller”.

Researchers who adopt a more modular account of SLI, see grammatical knowledge as innate and aspects of this knowledge as defective or absent in children with SLI. Studies grounded in such theory have provided much insight on the specific areas of language with which children with SLI have difficulty. Several authors have observed that verb morphology is an area of difficulty for children with SLI (e.g. Rice and Wexler, 1996; van der Lely and Ullman, 2001). The formation of Wh-questions (van der Lely and Battell, 2003) and the comprehension of passive sentences (van der Lely, 1996) can also present a challenge to children with SLI.

A recent study by Riches (2012), investigated the underlying deficit which leads to poor sentence repetition in children with SLI. Findings supported a multifaceted view of sentence repetition with a role for syntactic knowledge, working memory and short term memory. The authors summarise that a process whereby long-term memory representations are used to maintain information in short-term memory, is likely to be a key process.
Considering all the evidence, it is likely that both the processing ability of the child and the quality of their stored grammatical representations have a part to play in oral language comprehension. We now must consider the question of what types of language intervention might facilitate or improve oral language comprehension in children with SLI.

**Interventions**

The selection of oral language comprehension interventions is sparse. As highlighted by Schwartz (2009), language comprehension has been studied less extensively in children than language production. This is partly due to the fact that comprehension is a more challenging component of language to measure, as it can only be measured indirectly. Interventions chosen to review have been separated into three broad categories:

**Acoustically Modified Sound Programmes**

A well recognized computer based intervention approach is FastForWord-Language (FFW-L) (FFW; Scientific Learning Corporation, 1997; 2001). The programme provides exposure to acoustically modified speech and non-speech sounds in an attempt to “train” the auditory processing system to ultimately improve language comprehension. It has undergone numerous experimental and non-experimental evaluations over time.

A number of RCT’s (randomised controlled trials have proven that this approach is ineffective in treating children with oral language comprehension deficits. For example, Bishop et al (2006) evaluated computerized language instruction aimed at improving sentence and story comprehension. Thirty-six students, (aged 8 - 13), with language impairments were assigned to one of three conditions; 1) computer intervention with slowed speech, 2) computer intervention with modified speech (FFW-L) and 3) an untrained condition. There were no group differences in the posttest scores in any of the language comprehension measures.
Findings suggest that many of the children participating had adequate auditory discrimination to decode the words in a sentence, and had understanding of the grammatical constructions used, but had difficulties in the processes of syntactic computation. The limited processing capacity account of SLI would fit with these findings and acoustically modified speech programmes do not appear to treat this underlying deficit.

Metcognitive Approaches

A number of studies have investigated the value of using meta-cognitive strategies to improve comprehension (e.g. Gill et al, 2003; Bianco et al, 2010). When using the term cognitive strategies, I refer to the process of making the child aware of, and forcing them to think about, their comprehension. Also encompassed, is the use of teaching techniques, such as visualizing or rehearsal, to facilitate their understanding.

Gill et al (2003), included rehearsal and visualization strategies in their study. Both the rehearsal strategy group and the rehearsal + visualization strategy group made significantly greater gains on tests of following verbal directions, than the controls (who received traditional treatment). There was no significant difference between the rehearsal group and rehearsal + visualization group. Follow-up measures suggested the rehearsal+visualization strategy provided a superior method for maintaining increased ability to follow directions after strategy training was withdrawn. The findings of this study of younger school-age children (aged from 6;06 to 8;06) with SLI are relevant to the current research. The children were measured on their ability to follow verbal directions which typically causes difficulty for children with this profile. The fact that the gains were maintained after 8 months, hints at the potential efficacy and power of strategy training.

Despite some positive findings, there seems to be a lack of understanding around how these strategies actually work. Also they may not be appropriate for all children
with SLI, which relates back to the heterogeneity of this population group and the complexity of comprehension deficits.

In addition to some of these strategies, grammar facilitation approaches, which have a good evidence base in terms of expressive language (e.g. Fey et al, 1993; 1997), can also provide input in terms of a receptive language intervention. The nature of these approaches would include frequent modelling and sentence recasts of target forms in response to child productions. Camarata et al (2009), studied the effects of such an approach with a group of 21 pre-school children with SLI. They found that the intervention group made significant receptive language gains in comparison to the control group (n=6). This study highlights the potential of an approach which involves broad exposure to grammatical structures to treat oral language comprehension.

Metalinguistic Approaches

When using the term metalinguistic approach, I refer to a type of intervention that explicitly teaches understanding of specific grammatical structures. These types of approaches are based on the assumption that children with language impairment have not acquired language implicitly in the normal way and may have specific grammatical deficits. Although the approach targets these grammatical deficits, that is not to say that it would not effectively treat a child with limited processing capacity. Perhaps in making the grammatical rules more concrete, the processing demand of oral language comprehension will be lessened for the child.

A single case study by Levy & Friedman (2009), involved the explicit teaching of syntactic movement to a 12 year old child with specific grammatical deficits. The treatment targeted both comprehension and production of sentences. Treated targets, relative clauses and topicalization structures, showed significant improvements. Treatment also generalised to an untreated target (comprehension of Wh questions). Performance was compared to an age-matched control group.
This provides evidence to support the use of a metalinguistic approach with a child presenting with a specific deficit in syntactic structure representations.

Some other metalinguistic approaches have included a coding system to simplify syntactic rules. One example is the Colourful Semantics method (Bryan 1997), which is widely used in clinics throughout the UK and focuses on the predicate argument structure (PAS) of simple sentences, but has only (so far) been proven effective in treating expressive language (Bolderson et al, 2011).

A similar but more extensive approach, Shape Coding, has been used by Ebbels (2007), with older school age children and adolescents. The Shape Coding system teaches children a range of grammatical rules of the English language. In an earlier pilot study, Ebbels and van der Lely (2001), used a time series design with multiple baselines to measure the efficacy of Shape Coding in treating expressive and receptive language in 4 children aged between 11 – 13. Improvements were shown in the comprehension of passives and Wh questions. Findings were not significant on all measures but did reach significance for some.

A more recent RCT by Ebbels and colleagues (2012), which has yet to be published, has investigated the use of the Shape Coding approach with a group of 7 adolescents, aged between 11 - 16, with severe language comprehension deficits. This research project has shown significant improvements in the comprehension of target conjunctions. There was also evidence that the gains were maintained following the intervention period.

The results of these studies are promising. This metalinguistic approach seems to work well for children presenting with difficulties learning and applying the rules of the English language, as it targets the underlying grammatical deficits while making more processing capacity available. The Shape Coding approach is supported by evidence of a moderate strength, for school-age children with comprehension difficulties. However, controlled studies are now needed to see whether similar methods of therapy can be effective with younger children with SLI. Considering this along with the knowledge that the most significant gap in the child language
intervention research starts around age 6, the current investigation was concerned with children between the ages 6 and 9.

Using the knowledge from successful studies employing metacognitive strategies and building on the findings of Ebbels and colleagues, an individually tailored intervention plan was generated to suit the needs of a 6-year old boy with primary language impairment. The current case study aimed to investigate:

a) Whether an individually tailored intervention can alleviate oral language comprehension difficulties for a 6-year old boy with primary language impairment

b) The effect of an evidence based metalinguistic intervention on his oral language comprehension.

Given the heterogeneity of children presenting with comprehension difficulties, analysing a child’s response to different intervention approaches can contribute to knowledge about the underlying deficits of language impairment. In the study by Ebbels & Van Der Lely (2001), individual variation was apparent in the response of each participant to the same intervention. The single case nature of the current research project allows for individualisation of the intervention according to the specific deficits of the child. It also allows in depth analysis of the participant’s response to the different aspects of treatment.

**Method**

**I. Research Design**

This study employed a controlled single-subject AB design with repeated measures. As highlighted by Polger & Thomas (2008), several threats to validity can be identified in AB single case study designs. For instance, any change that may occur could be as a result of maturation of the child. Changes could also be attributed to other environmental variables (e.g. change in activities at school or at home). In order to control for these variables a measurement of expressive language, which
was unrelated to the aims of the intervention, was measured. This measure was JC’s MLUw (mean length of utterance in words) as measured on the Expression, Reception and Recall of Narrative Instrument (ERRNI). In order to further strengthen the study design, both treated targets and untreated control targets of receptive language were measured. Including this in the study design would allow for a measurement of generalisation. Improvement in treated targets but not untreated, indicates change attributable purely to the intervention with no generalisation. However, improvement in both treated and untreated targets, with no improvement in the unrelated control measure (expressive language measure) may be due to generalisation to other structures within receptive language.

II. Participant Selection Process

The participant was selected from the local Health Service Executive Speech and Language Therapy community clinic. A letter was sent to the Speech and Language Therapy Manager, requesting that the most suitable subject be chosen from their case load. The subject was required to meet the following criteria:

- English as first language
- Be aged 6-9 years at time of recruitment
- Have a diagnosis of primary language difficulties that includes clinically significant language comprehension impairment (have receptive language impairment but may also display expressive language impairment). These children would typically have scored -2SD below the mean in either:
  - The receptive language index (RLI) of the Clinical Evaluation of Language Fundamentals 4 (CELF-4)
  - Test of Receptive Grammar (TROG)
  - The receptive portions of either the Reynell Developmental Language Scales (RDLS) or the Preschool Language Survey 4(PLS-4)

The following exclusion criteria were applied:
- Children with a primary diagnosis of intellectual and/or sensory impairments and/or emotional/behavioural difficulties.
- Children with identified visuo-spatial processing difficulties.
- Children whose first language is other than English.

A parent and child information sheet was provided and a consent form was signed and the referring SLT was asked to discuss the contents of the information sheet and consent form with the child’s parent (see appendices G, H & I for information sheets & consent form).

III. Assessment

Initial assessment happened over three 50-minute sessions. There were two phases to this assessment: (a) Baseline measurement of oral language comprehension and related abilities (b) Further probing to identify treatment targets.

(a) Phase 1:

A range of standardised assessments were used to obtain a measure of various domains of oral language comprehension in addition to a baseline measure of expressive language which would act as an untreated control.
**Table 1: Standardised assessments**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>What it Measured</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>British Picture Vocabulary Scale: Third Edition</strong></td>
<td>Receptive Vocabulary</td>
<td>Build receptive language profile (pre-intervention)</td>
</tr>
<tr>
<td>(BPVS3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Working Memory Test Battery for Children</strong></td>
<td>Online processing/working</td>
<td>Build receptive language profile (pre-intervention)</td>
</tr>
<tr>
<td>(WMTB-C)</td>
<td>memory</td>
<td></td>
</tr>
<tr>
<td><strong>Expression, Reception and Recall of Narrative</strong></td>
<td>Expressive Language (MLU)</td>
<td>Control measure taken pre &amp; post intervention</td>
</tr>
<tr>
<td>Instrument (ERRNI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Test for Reception of Grammar (TROG-2)</strong></td>
<td>Receptive grammar</td>
<td>Pre &amp; post measure of the dependant variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The Bracken Basic Concept Scale Third Edition:</strong></td>
<td>Understanding of concepts</td>
<td>Build receptive language profile (pre-intervention)</td>
</tr>
<tr>
<td><strong>Receptive (BBCS: 3R)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**(b) Phase 2:**

Based on the results during phase 1, criterion referenced probes were then developed. These probes were an extension of the TROG. Each construction from the TROG contains 4 items. The probes contained 10 items for each construction. So for example, if the construction was reversible above/below, the probe would require JC to identify 10 examples of above or below from 4-picture sequences each time. Picture sequences contained both lexical and grammatical foils as in the TROG. For instance, with reversible passives, if the target was “The woman was carried by the man”, the distracters would include one with noun phrases reversed, so a woman carrying a man, and a lexical foil might be a different verb, so a man walking beside a woman.
Table 2: Probe measures

<table>
<thead>
<tr>
<th>Probe</th>
<th>Chosen treated or untreated control targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversible in/on</td>
<td>Treated</td>
</tr>
<tr>
<td>Not only X but also Y</td>
<td>(Related) Untreated</td>
</tr>
<tr>
<td>X but not Y</td>
<td>*Treated</td>
</tr>
<tr>
<td>Reversible passives</td>
<td>(Unrelated) Untreated</td>
</tr>
<tr>
<td>Reversible above/below</td>
<td>Untreated target</td>
</tr>
<tr>
<td>Neither/Nor</td>
<td>*Treated</td>
</tr>
</tbody>
</table>

*Targets were planned to be treated using the metalinguistic approach. However, due to the limited number of treatment sessions delivered, these targets remained untreated.

The proposed statistical analysis to measure treatment effects included McNemar’s test to measure the significance of any change in raw scores, from baseline to re-assessment, on the TROG, the ERRNI or the criterion referenced probes. To further analyse the size of any possible treatment effect, a chi-square test would then be used to compare differences between targets at both baseline and post-intervention.

In order to ensure inter-rater reliability, two student SLT’s were involved in the assessment process. One student (Student A) administered the assessments while the other (Student B) observed and recorded any clinically relevant observations. JC’s baseline and post-intervention MLUw scores were also agreed upon between the Student SLT’s. Treatment session data was also gathered qualitatively in order to track in-session progress. Student B recorded 1) the number of exposures of a structure provided by student A, 2) the number of times that JC demonstrated an understanding of the structure and 3) An attention rating on a likert scale for every 10 minute segment of a session.
IV. Participant

(a) Background

At the beginning of the study, JC was 6;7 years of age. He received a diagnosis of SLI at the age of 5;7. JC was assessed on the Wechsler Pre-school and Primary Scale of Intelligence (WPPSI-IIIUK; Wechsler, 2003). His verbal IQ standard score was 77 which falls in the 6th percentile (moderate impairment), and his non-verbal IQ standard score was 90 which falls in the 25th percentile (average range).

His expressive and receptive language was also assessed using the Clinical Evaluation of Language Fundamentals Preschool (CELF-P2). His expressive language score fell in the 0.4th percentile (severe impairment) and his receptive language fell just below the 2nd percentile (severe impairment). Table 3 summarises subtest scores from the CELF-P2.

Table 3: Subtest scores on CELF-P2 at referral

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Scaled score</th>
<th>Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts &amp; Following directions</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Word Structure</td>
<td>2</td>
<td>0.4</td>
</tr>
<tr>
<td>Sentence Repetition</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Word Classes Receptive</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Expressive Vocabulary</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Sentence Structure</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Basic Concepts</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

A speech and language therapist at JC’s school had also been working with him on some areas of expressive language (including some grammar and pragmatic language goals) and receptive language targets included (teaching of concepts used in maths and following commands). Speech and language therapy input from JC’s school ceased for the duration of the study.
(b) Profile

Table 4: Scores for baseline standardised assessments

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Standard score</th>
<th>Percentile rank</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>TROG-2</td>
<td>55</td>
<td>&lt;1</td>
<td>Severe</td>
</tr>
<tr>
<td>ERRNI MLU</td>
<td>75</td>
<td>5</td>
<td>Moderate</td>
</tr>
<tr>
<td>BPVS III</td>
<td>74</td>
<td>4</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

**WMTB-C**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Standard score</th>
<th>Percentile rank</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonological Loop (Digit re-call)</td>
<td>93</td>
<td></td>
<td>Average</td>
</tr>
<tr>
<td>Visuo-spatial sketchpad (Block re-call)</td>
<td>111</td>
<td></td>
<td>Average</td>
</tr>
<tr>
<td>Central Executive (Backward digit re-call)</td>
<td>78</td>
<td></td>
<td>Mild-moderate</td>
</tr>
</tbody>
</table>

**BBCS-3R**

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Scaled score</th>
<th>Percentile rank</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction/position</td>
<td>4</td>
<td>2</td>
<td>Severe</td>
</tr>
<tr>
<td>Quantity</td>
<td>3</td>
<td>1</td>
<td>Severe</td>
</tr>
</tbody>
</table>

Table 5: Scores for baseline probes

<table>
<thead>
<tr>
<th>Probe</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversible in/on</td>
<td>5/10</td>
</tr>
<tr>
<td>Not only X but also Y</td>
<td>2/10</td>
</tr>
<tr>
<td>X but not Y</td>
<td>5/10</td>
</tr>
<tr>
<td>Reversible passives</td>
<td>5/10</td>
</tr>
<tr>
<td>Reversible above/below</td>
<td>3/10</td>
</tr>
<tr>
<td>Neither/Nor</td>
<td>3/10</td>
</tr>
</tbody>
</table>
At initial assessment it was apparent that JC was having processing difficulties. This was evidenced on the WMTB-C, central executive subtest. The results of the TROG-2 indicate that JC was having significant difficulties with sentences of increasing length. Scores were consistently low across structures “neither/nor”, “X but not Y” and “not only but also”. It’s possible that we are seeing a deficit in his stored grammatical representations. The poor performance could also be attributed to JC’s processing difficulties. Considering the impairment displayed in JC’s central executive functioning, on the WMTB-C, it is likely that his global processing ability is affecting his capacity to accurately apply any semantic or syntactic knowledge that he has stored. Additionally, it was observed that JC displayed frequent drops in sustained attention. His deficit shown in central executive functioning strengthens the likelihood of an attention deficit. This particular part of JC’s profile will be discussed in further detail during “clinical observations”.

With regard to semantics, JC may have a relative strength in the area of receptive vocabulary. For instance, his score on the BPVS fell in the moderate range. This score should be considered in light of the fact that this assessment was administered during the final 15 minutes of the session. During this time, JC was observed to become very inattentive and frequently moved from the chair. The confidence interval for the standard score should be noted at this point (83 to 65). If tested during a period when JC’s attention was at best, it is possible that his receptive vocabulary may fall within the average range. It’s also worth noting that referral information stated that JC had scored within the average range on the receptive vocabulary subtest of the WPPSI. Table 3 shows that JC’s score on the receptive word classes subtest also fell within the average range.

However, it was clear, as evidenced on the BBCS-3R and the TROG, that JC had significant difficulty with some concepts. He had poor understanding of directional/positional (e.g. inside/outside), quantity (e.g. full/empty) and spatial (e.g. above/below) concepts.
JC demonstrated visual processing strengths during initial assessment. This was evidenced on the WMTB-C visuo-spatial sketchpad subtest. Also, although JC scored in the severe range for the expressive element of this assessment, when probed receptively, he seemed to glean most of the pertinent information from the story picture sequence suggesting that when information is presented visually, JC processes it more easily.

In summary, at baseline, JC was presenting with severe receptive language impairment, showing particular weakness in the comprehension of concepts. Limitations in his central executive functioning were having an obvious impact on his ability to process verbal information and his ability to sustain attention. Deficits in grammatical representations were also apparent.

Based on the findings of the assessment phase of the project, an intervention plan was generated encompassing the following elements:

1. Comprehension monitoring strategies
   → **Rationale:** As JC displayed great difficulty in following lengthy verbal information, this part of the intervention would provide him with strategies for managing his comprehension break downs.

2. Rehearsal Strategies
   → **Rationale:** Gill et al (2003), demonstrated the efficacy of teaching rehearsal strategies to children with SLI to improve their ability to follow commands. Teaching JC to rehearse would help to compensate for his processing difficulties.

3. Teaching of concepts
   → **Rationale:** JC displayed poor understanding of a range of concepts which were to be targeted during treatment to support his individual needs.

4. Use of the shape coding approach to teach grammatical rules
   → **Rationale:** Explicitly teaching the grammatical rules that JC had difficulty with would build his knowledge of these structures and
potentially “free up” some processing space, in turn decreasing the language comprehension demands that he was experiencing

V. Intervention

To ensure treatment fidelity, student SLT’s worked in pairs with one student (student A) delivering the therapy and the other (student B) observing and recording progress. A qualified SLT also supervised the treatment sessions from an observation room, providing feedback on each session and intervening when necessary.

Treatment sessions were planned to be a total of ten 45-minute sessions, twice weekly for 5 consecutive weeks. However, due to family illness, the actual dosage was a total 4 treatment sessions with a four week gap between sessions 3 and 4. Sessions were conducted in a University clinic room.

As discussed above based on the hypothesis formed around JC’s diagnosis, an intervention plan was formed. The specific elements of the intervention were as follows:

1) Teaching of specific comprehension monitoring strategies (adapted from those used in Bianco et al, 2010):

→ **Aims:** To encourage JC to actively think about his understanding of language. He was provided with options of what he could do to help him to understand. Suggestions included things that he could do, for example, “Good looking” and “Good listening” and things that he could ask the speaker to do, for example, “Can you say that again?” or “Can you say that slower?”

→ **Plan:** These strategies were planned to be introduced and practiced through a designed activity in treatment session 1. The activity would then be repeated mid-way (around session 5) and then again during the final session.

→ **Delivery:** Due to the limited number of sessions delivered, activities to practice the use of these strategies only occurred during session 1.
However JC was briefly reminded of some of these strategies at the beginning of each treatment session.

→ See appendix A for further detail on the comprehension monitoring procedure followed during sessions.

2) Use of rehearsal strategies (taken from Gill et al, 2003):
→ **Aims**: Teach JC to hold verbal information in his working memory for long enough to glean the meaning from a command. JC was instructed to “say it first, then do it”.

→ **Plan**: Initially rehearsal was planned to be incorporated into activities for teaching concepts during each session. However, due to JC’s limited attentional capacity and processing difficulties, the rehearsal aspect of the intervention was “parked” after session 2. It had been intended to reintroduce the strategy further along the timeline when he had become accustomed to some of the other intervention strategies.

→ **Delivery**: Rehearsal was practiced during the first and second treatment session

→ See appendix B for further detail on the rehearsal procedure followed in each session

3) Teaching of concepts receptively:
→ **Aims**: To explicitly teach the meaning of specific concepts that JC demonstrated difficulty with during assessment

→ **Plan**: Some of the concepts that JC had not understood during the initial assessment were to be targeted during treatment. The first target was in/on. Activities varied greatly from one session to the next in an attempt to uncover the nature of JC’s difficulty with this concept.

→ **Delivery**: Due to the limited number of treatment sessions, In/on was the only concept covered.

→ See appendix C for further detail on “the teaching of in/on” procedure followed in each session

4) Meta-linguistic approach (Shape Coding):
→ **Aims**: To explicitly teach syntactic rules using a visual coding system
Plan: Appendix D provides a more detailed plan of the sequence of teaching the structures. In summary, after the shape coding basics had been introduced, there were 3 structures to be targeted; “X but not Y” and “neither/nor”

Delivery: There were 3 treatment sessions required in order to introduce the shape coding approach. After session 3, JC had demonstrated a sufficient level of understanding of the basics and was ready to move on to the first target structure. However, there was a 4 week gap leading up to the 4th session so the basics were revised during session 4 and “And” was introduced as an introduction to conjunctions.

See appendix D for the first 4 steps of the shape coding introduction taken from the Shape Coding CD ROM (© Susan Ebbels, 2002)

See appendix E for the first 4 steps of the suggested teaching order of conjunctions also taken from the Shape Coding CD ROM (© Susan Ebbels, 2002)

Activities used to complete these steps included a lot of input at first. So having JC listen to the student SLT talk about the who/what and what doing shapes, using pictures representing various nouns for who and what and action pictures for what doing. Activities then moved on to matching games where JC would be required to match the relevant picture to the shape. Activities including more concrete examples of who and what doing were also included in sessions involving the second student SLT and JC’s mother and sister in the activities where verbs or adjectives (emotions) would be “acted out”

See appendix F for further detail on the shape coding activities used throughout the sessions.
Clinical Observations

It quickly became apparent during baseline assessment, that JC had significant limitations in sustained attention. He presented as highly distractible during every session. This was demonstrated by his interjecting with questions and conversation topics unrelated to the task. He would also frequently move from the chair. His attention would have to be re-directed very frequently throughout a session. An estimation of the number of times JC’s attention waned per session allowed a calculation of his average sustained attention time, that is, the average number of minutes that JC would stay on task without any signs of distraction. This was two minutes.

Considering the impact that JC’s limited attention seemed to be having on his performance, a likert scale was introduced to track levels of attention during each session in an attempt to identify any correlation between attention levels and performance. During each session the observing Student SLT would rate JC’s attention subjectively on a scale of one to five with 1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = very good for each 10 minute segment of the session.

The main findings from an analysis of these ratings were that (a) JC’s attention consistently fluctuated downwards over the session duration as illustrated in figure 1 and (b) JC’s attention was highly variable, as illustrated in Figure 2. This variation was often associated with circumstances external to the clinic. For example, session 7, which was the session during which JC had lowest attention levels, was the second week of his Easter holidays from school. When this is compared to the level of attention displayed in session 8, when he was back in school, it may be that the lack of structure to his daily routine while off school was affecting his attention levels. Parental report confirms this, with comments about the changes in JC’s behaviour associated with a change in daily routine. The third interesting finding was a notable difference in attention during baseline assessment sessions compared with the post-treatment assessment session. This is illustrated in figure 3 and will be further discussed in the results section.
Figure 1: A downward fluctuation in attention can be seen over an average session.

Figure 2: Attention levels were highly variable over the course of the intervention.
**Figure 3:** A marked difference in attention was observed between baseline assessment and post-intervention assessment.

**Results**

I. Oral Language Comprehension Outcomes

The time lapse between the completion of initial assessment and the re-assessment session was 5 weeks and 3 days. There was a period of 1 week and 2 days between the final treatment session and the re-assessment session. Receptive grammar was re-assessed on the TROG-2. JC increased the number of blocks passed from two to four out of eleven. The McNemar test showed that this increase was not significant \( p = 0.625 \). There was also no significant change on any of the probe measures. The control measure of MLUw on the ERRNI went from a raw score of 5.13 to 5.31 indicating no change.
Examination of the change in raw scores, that is number of blocks passed on the TROG, indicates some change but this was not significant. Further given his attention levels, it is difficult to ascertain the reliability of assessment results and whether they are a true representation of his underlying language abilities. When comparing the attention ratings for the pre and post intervention assessments, there is a clear difference. During initial assessment, JC’s attention fluctuated from “very good” to “poor” in the 15 minutes during which the TROG was administered. In comparison, the final assessment session data shows that his attention declined only from “very good” to “good” in the corresponding window of time for the TROG re-assessment. When considering the limited amount of treatment delivered in conjunction with attention ratings, the change in scores may not be attributable to the effects of the intervention programme.
In relation to the post-treatment results of the probes, the only treated structure was reversible in/on which showed no improvement from baseline. However, a qualitative analysis of JC’s responses from the re-assessment data, revealed an interesting pattern. During the administration of the TROG, JC was observed to have excellent attention levels, pacing himself and rehearsing the commands during the “in/on” block. His attention on the likert scale was rated as a 5 (very good). Although he chose only 1 correct response out of the 4 in the block, an analysis of his responses showed that all three incorrect distracters chosen had the noun phrases reversed but correct preposition for example, Target: The cup is in the box, Response: The box is in the cup. In contrast, the administration of the in/on probe was during the final 10 minutes of the re-assessment session. JC’s attention had fallen to between a 2 and 3 (fair to poor). An analysis of these responses showed that, although some errors were syntactic, there were also some lexical foils chosen for example, Target: The cloud is in the box Response: The sun is in the cloud. There were also some errors where JC chose the incorrect preposition; for example, where the target was “the ball is on the table” he chose the picture with the ball beside the table. It seems as though when JC is focused his errors are purely grammatical. So his poor grammatical representations are consistently causing a comprehension breakdown whether he is focussed or not. At times when his attention is waning, his errors are more unpredictable. So perhaps JC has laid down a certain level of semantic representation for in & on but due to his poor attention and processing skills he is unable to apply this knowledge sufficiently. Declining attention seems to cause a complete inability to apply what semantic information he does have.

The initial administration of the probes was spread over three different sessions whereas, when re-assessed, they were administered in one session only. This may explain some of the variation in his scores illustrated in figure 4. An error analysis of JC’s responses for the reversible passives probe supports this hypothesis. Initial assessment administration of this probe was during the first 10 minute segment of the session which correlates with JC’s “best” attention ratings. Distracters chosen were always the reverse of the target during initial assessment (e.g. Target = The man is carried by the woman, Response = The woman is carried by the man).
Perhaps JC had gleaned the semantic information from the sentence, but the syntactic structure of passives was causing the comprehension breakdown. In contrast, the post-treatment administration of the same probe was during the last 10-minute segment of the re-assessment session, correlating with JC’s “worst” attention ratings. There was no clear pattern to his errors on this probe during re-assessment, (e.g. Target = *The present was given to the woman*, Response = *A dog inside a gift box*). This further highlights the impact of JC’s attention deficit on his task performance.
II. In session Data

Metalinguistic Approach:

Figure 5: Number of exposures and correct responses to noun phrase (who/what?), verb phrase (what doing?) and adjective phrase (what like/how feel?) introduction.

JC was giving a large number of correct responses by session 2 (with regard to the who/what (NP) and what doing (VP) shape). By session 3 he also demonstrated some understanding of the what like/how feel (AP) shape. His performance declined slightly during treatment session 4, correlating with an overall low rating of attention (see figure 2, session 7). These findings highlight the potential to progress to teaching JC specific structures using the shape coding approach. It was also noted that the shape coding element of the intervention was always presented to JC in the later end of the session. As this was during his least attentive phase, it may have limited his rate of progress.

Concepts

When first introduced, there was great variability in his success with following in/on commands. This may have been due to the varying nature of the activities and/or
due to fluctuating attention levels. During treatment session 3, JC had more contextual information to use about where to place an object, for example, *put the ball in the bin*, and received 100% accuracy. In session 4 the commands were more obscure, for instance, “put the duck on the fridge”. This led to only 50% accuracy for the “on” command but “in” had 100% accuracy. His overall attention rating for session 4 was 2 (poor) compared with 4 (good) in session 2. Further dynamic assessment is warranted in order to identify the specific breakdown in JC’s understanding of concepts.

**Meta-cognitive Strategies**

Rehearsal strategies were incorporated into “in/on” commands during session 1 and 2. Although JC was following the commands, he would require frequent prompting and reminding to use the strategy. Considering his central executive limitations and the fact that he was covering comprehension monitoring, concepts, rehearsal and shape coding all within a session, the rehearsal element of the intervention was parked temporarily with the intention of being re-introduced in time. Due to the limited number of sessions completed it is difficult to draw conclusions on the efficacy of rehearsal strategies for a child with JC’s profile.

Regarding the comprehension strategies, JC was observed to request a repeat of commands spontaneously six times during the re-assessment session having never been observed using them during baseline assessment. Further intervention with JC would include revision of these strategies and a discussion around how they can be applied in different environments. Teacher and parental report would help to track generalisation.
Discussion

This paper described an individualised oral language comprehension intervention for a six-year-old boy, JC, with severe expressive and receptive language impairment. The intervention encompassed a metalinguistic approach to explicitly teach grammatical rules, metacognitive strategies to compensate for processing difficulties and the teaching of concepts that he appeared to have poor understanding of.

Oral Language Comprehension

The first question we attempted to answer was whether we could improve JC’s oral language comprehension through the use of a specifically tailored intervention. Due to illness and family circumstances, only 4 of the 10 treatment sessions offered were completed. This was a major limitation of the study. Predictably, this low number of sessions did not yield any significant change in oral language comprehension measures. Despite this, some analysis of JC’s behaviours and responses during both assessment and treatment provide valuable information regarding the nature of receptive language impairment. One thing that was apparent throughout the course of the study was the variability of JC’s performance. Evans (2001), describes an “emergent” account of SLI considering the child and the environment as a multi-dimensional system of interacting components. This account considers the child’s varying performance as reflection of the moment to moment interaction of the child’s processing deficits with the properties of the English language. Their ability to use certain grammatical structures at a given moment, for example, may depend on task demand. So, they may appear to have acquired a structure on one day, but then it has “disappeared” the next day. Evans (2001), states that the variability in the child’s language behaviour is a reflection of the strength of the distributed representations. Language skills that appear highly variable and sensitive to changes in external contextual demands, from this perspective, would be a reflection of representations that are less well specified and have less rich connections. This explanation would match the hypothesis previously proposed in relation to JC’s
understanding of the *in/on* concept and would help to explain some of the other variability in JC’s assessment results.

**Dynamic assessment**

The type of static testing we use with standardised assessments has many limitations in terms of specifying a useful intervention or providing a prognosis for children with language impairment (LI). Hasson & Joffe (2005), emphasise the usefulness of dynamic assessment with this population group to overcome these limitations. The term ‘dynamic assessment’ includes a range of methods and materials to assess the child’s potential for learning, rather than a static level of achievement. For instance the child may be presented with a series of prompts (following a hierarchy) with the tester gauging the level of prompt needed for the child to achieve the target. This provides useful information about the responsiveness and motivation of the child to intervention in an attempt to predict improvement. Due to the nature of JC’s processing difficulties, dynamic assessment may provide the opportunity to analyse his level of ability in more depth as opposed to testing his static level of achievement. So, for instance, when assessing JC’s understanding of particular concepts, providing a hierarchy of prompts may help to unravel the true nature of his comprehension breakdown. This would also provide guidance on the teaching approach he would respond to best.

**The Metalinguistic Approach**

In-session data suggests that JC grasped the basics of the shape coding approach, that is, it is likely that he understood the function of the shapes representing the noun, verb and adjective phrase in the sentence. He was then ready to move on to learning conjunctions. The number of sessions completed was insufficient to draw any conclusions about the efficacy of using the approach in this context. Further investigation is needed to determine the potential of using shape coding with a child
of a similar profile to JC, to teach these structures and ultimately, improve comprehension.

**Attention Deficit in Language Impairment**

This study makes an important contribution to the literature in highlighting the impact of attention deficit in children with LI on (a) performance during assessment and (b) progress during language therapy. A meta-analysis by Ebert & Kohnert (2011), analysed the sustained attention differences between children with primary language impairment and their typically developing peers. They found sufficient evidence to support the existence of sustained attention deficits in children with LI in both auditory and visual modalities. The authors suggested further research to consider the role that sustained attention weaknesses play in LI. The characteristics of the child in the current case study are consistent with their findings. Inclusion of a baseline measure of central executive functioning as contained with the WMTB-C indicates potential attention difficulties. Additionally, the potential impact on response to assessment and intervention, which emerged from the detailed within-session profiling of attention levels and responses to stimuli, support their recommendation for further research on the role of sustained attention in LI. Further case studies which document the progress of children with LI and co-occurring attention deficits will help to build on this and to inform clinicians of the best assessment and treatment approaches for these individuals. The current study also emphasises the need for research on the optimal frequency, duration and timing of language intervention delivery for children presenting with poor executive functioning resulting in attention deficit.

As highlighted by Alt et al (2012), in terms of teaching, there is little known about optimal frequency and spacing of input even for typically developing learners. Considering the heterogeneity of children with SLI, combined with the paucity of intervention studies, it is not surprising that there are no definitive recommendations for optimal amount, duration or frequency of language therapy. Alt and colleagues emphasise the importance of timing and number of exemplars
that the child must be presented with when learning. The authors highlight the need for “more exposures over more sessions”, suggesting that children with LI seem to require lots of exemplars but spread over several sessions rather than in one single session. This point may be even more crucial for a child presenting with exceptionally limited sustained attention. Considering the length of the therapy sessions in this study (45 minutes) with the estimated average number of minutes that JC would stay focussed on a task (2 minutes), it is likely that he would make more progress with shorter but more frequent sessions. Separate manipulation of: the therapy environment, timing of activities, session duration and frequency would help to build a more individualised intervention to suit his needs.

**Limitations**

Regarding the findings associated with attention levels in this study, a potential limitation was the subjective nature of the rating scale used, which could be open to bias. In an attempt to introduce inter-rater reliability, both student SLT’s came to an agreement after each session in terms of how JC was rated. Video recordings of each session would have allowed a more comprehensive documentation of JC’s behaviour throughout the intervention.

Another limitation identified was the timing of post-intervention assessment. There was a period of just over a week between the final treatment session and the post-intervention assessment. A follow-up assessment after a longer period of time, to allow for consolidation of any learning might have yielded more measured improvements but considering the limited number of sessions delivered, this is unlikely.

Another useful addition to this study would have been teacher and/or parental report of situations where JC was observed using the comprehension monitoring strategies outside the clinic. Since there was evidence that JC was using the comprehension strategies at final assessment, it is possible that it may have generalised.
The Value of Single Case Research

Dodd (2008), emphasises the need for research that augments our understanding of the types of impairment associated with subgroups within broad diagnostic categories such as SLI. RCT’s are considered the gold standard for evaluating clinical interventions across health service provision (Reilly et al, 2004). However, this type of group research design is not appropriate when investigating the suitability of a specific language intervention for a specific type of profile, as no two individuals will have identical needs. Single subject research provides precise information about the client, the disorder, the intervention and the outcomes in terms of the acquisition, generalisation and maintenance, and provides a perspective on individual differences in response to therapy (Dodd, 2008). The current study has provided a detailed description of the nature of JC’s oral language comprehension impairment. As a result of this study, we now have a more comprehensive impression of his receptive language profile in comparison to the information available before the study. We also have a clearer picture of how JC responds to intervention. This information provides a valuable starting point in guiding further dynamic assessment, particularly in the area of spatial concepts. It also provides a picture of the extent of the general impact of the co-occurring attention deficit, seen in some children with language impairment, on performance during both assessment and treatment.

The American Speech-Language-Hearing Association (ASHA), place individual clinician’s measurement of the outcome of their intervention at the centre of evidence based practice. They state that the professional role of Speech and Language Pathologists is to participate in outcomes measurement activities and use data to guide clinical decision making and determine effectiveness of services provided in accordance with the principles of evidence-based practice (ASHA, 2001). Case by case research is imperative in this field. Further research using single subject designs will continue to provide detailed individual descriptions of a diverse population group. This will help to separate the broader diagnosis of SLI into more specific subgroups and to determine responsiveness to intervention within these subgroups.
Conclusion

The current study investigated the efficacy of an individualised receptive language intervention for a 6-year old boy with primary language impairment. There was an additional research question of whether an evidence-based metalinguistic approach would prove effective with a child of this age. The number of sessions completed was insufficient to draw conclusions on either of these research questions. However, the single-case nature of the study allowed for in-session data analysis and assessment response analysis which exposed some vital information about the nature of JC’s oral language comprehension.
References:


Appendix A

Comprehension Monitoring Protocol

Session 1:

- The student SLT explained that there are some things that “help us to understand what is being said”
- Some examples of situations were provided, to JC and his mother, of when there may be a comprehension breakdown in order to set the scene for the activity, for example, At school when the teacher requests the class to take out their maths book, turn to page 5 and do question 3.
- The student SLT presented JC with pictorial representations of “things that we can do to help us understand” particularly in the clinic and at school. These were as follows:
  - Good sitting
  - Feet still
  - Good listening
  - Good looking

* It should be noted that these picture representations were used as reminders throughout the sessions of general rules that should be followed in the clinic environment as JC’s behaviour was impacting so severely on his ability to complete tasks.

- The student SLT then explained that “even when we do everything right, sometimes other people do things that makes it hard for us to understand”
- Examples were given such as, when someone talks too fast, or too quietly or if there is a lot of noise in the room
- The student SLT then “acted out” some of these scenarios, requesting JC to identify a) what made it hard for him to understand and b) what he could ask the talker to do to make it easier, for example, ask for a repetition, ask the speaker to slow down or speak louder

Session 2, 3 & 4:

- At the start of the session, JC was asked to re-call the things that we can do to help us understand
- The pictorial representations were presented and placed on the wall for him to see
Appendix B

Rehearsal Strategies Protocol

A sample instructional script for the rehearsal strategy training was taken from Gill et al (2003), and is outlined below. In the original plan, these scripts were to be followed as closely as possible. However, due to JC’s processing difficulties, it was decided that the cognitive load was too great and rehearsal strategies were abandoned after treatment session 2.

SLT: “I will give you a direction. Before you do it, tell me what I said to do. Listen. Then say what I said. Then do it. Remember – say it first, then do it. Let’s try one. Pick up the pencil.”

Child: “Pick up a pencil.” (Then picks up the pencil) SLT: “Great! I said it, then you said it before you did it. Let’s do that again. Remember, say it before you do it. You can keep saying it to help you remember. Ready? Put the blue pencil on the brown desk.”

Child: “Put that pencil on the desk”. (Then does it.) SLT: “Great! Tell me – what you are going to do every time I give you a direction?” Child: “I’m gonna say it irst like you did and then I do it.” SLT: “OK. We’ll try a harder one. Ready? Put the little cup on the desk and then bring me an eraser.”

Child: (starts to get the cup) SLT: “Whoa – tell me Child: “Oh yea, get that cup and put it on the desk and give you an eraser. You don’t have to remind me. I know. . . Say it irst, then do it. OK, make the next one really hard.”

SLT: “OK. Now I won’t remind you very often. When I give you a direction, you tell yourself to say it. Keep on saying it to help you remember. See if you can do that every time.”

This script was used as a guide. During sessions 1 & 2, rehearsal was incorporated into the activity used to teach “in/on”. JC was given commands such as “put the teddy on the bucket” and in a similar way as outlined above, was encouraged to repeat the command, and then do it.
Appendix C

Teaching of the concept in/on

Session 1

- JC was presented with the following:
  - A bucket, a pram & a hat
  - A duck & a bear
- JC was given 1-part in/on commands to follow, for example, put the duck in the bucket
- The command was supplemented with a picture representation at first when introducing the task
- JC was then given the instructions without the picture to guide him
- Rehearsal was practiced during this task as discussed in appendix B.

Session 2

- JC was presented with a series of pictures
- Each picture contained an object “in” another object and the same object “on” the object
- JC was asked to circle or colour in the item relating to the command
- Rehearsal strategies were practiced during this activity

Session 3

- Objects included:
  - A ball and a doll
  - A bin, a chair and a table
- JC was given 1 and 2 part in/on commands to follow using the above objects
- Student B and JC’s mother were involved in the task in an attempt to a) facilitate JC’s attention difficulties and b) have him identify when a command was followed incorrectly

Session 4

- Objects included
  - Male and female dolls, a duck, a bear & a spider
  - A bucket & a hat
  - A miniature bathroom including; toilet, bath sink and shower
  - A miniature kitchen including; sink, fridge and oven
- JC was given 1 and 2 part in/on commands using the above items
Appendix D

The following protocol as outlined by Ebbels and colleagues (YEAR), was followed when introducing the approach:

1. **Who** ◆ **what doing**

2. Teach that can have >1 word per shape and it's the correspondence to the question word that is key to coding *(ALWAYS stress that the shape goes around the words that answer the question)*:

   - John ◆ is ◆ running
   - John ◆ is ◆ putting the car in
   - He ◆ is ◆ running
   - John ◆ is ◆ cleaning the car
   - The boy ◆ is ◆ running
   - The little boy ◆ is ◆ running
   - He ◆ is ◆ putting the car in

3. To reinforce the meaning of the shapes, give exercises where the shape changes according to the meaning.

   - John ◆ is ◆ sleeping vs. John ◆ is ◆ tired

4. **Who** or **What**

   - John ◆ is ◆ small
   - The house ◆ is ◆ small

43
Appendix E

Suggested teaching order for conjunctions as taken from the official shape coding CD ROM by Ebbels (YR):

1. Intro to Shape Coding

   Need to introduce the following (but only for those pupils who do not already know them)
   
a) ‘Who’ subject
b) aux ‘is’ and ‘are’ (but gloss over the plural/ singular distinction)
c) Verb phrase (only use single verbs here)
d) Adjective phrase

See Susan E if need instructions on how to do this

The last shape (Adj P) could be introduced just before step 4 or here (before step 2), at the discretion of the SLT.

2. ‘And’ vs ‘but not’ (Subject NP + Verb)

   a) Introduce the templates showing coordination of NPs in subject position, e.g.,
      \[ \text{The cow and the dog are jumping} \]

   b) Relate the coordinated subject to the question word “Who” — discuss how ‘and’ means both NPs are carrying out the action.
   c) Take turns to produce sentences using ‘and’ while the other one acts out the sentence
   d) Introduce template with ‘but not’
      \[ \text{The cow but not the dog is jumping} \]

   e) Relate the coordinated subject to the question word “Who” — discuss how ‘but not’ means only the first, not the second NP (shown by the cross) is carrying out the action.
   f) Take turns to produce sentences using ‘but not’ while the other one acts out the sentence
   g) take turns to create a sentence matching one of the two templates (‘and’ or ‘but not’) and the other acts out, using template as a guide
   h) when accurate, remove templates, bring back to check responses
3. ‘And’ vs ‘but not’ (Verb Phrase)

a) Revise the templates showing coordination of NPs in subject position with verb. Show similarity with template showing coordination of VPs, e.g.,

\[ \text{The cow is } \text{jumping (over the fence)} \text{ and } \text{running (round the field)} \]

b) Relate the coordinated VP to the question word “What doing” – discuss how ‘and’ means the subject is doing both verbs (or Verb Phrases).

c) Take turns to produce sentences using ‘and’ while the other one acts out the sentence

d) Introduce template with ‘but not’

\[ \text{The cow is } \text{jumping (over the fence) but not } \text{running (round the field)} \]

e) Relate coordinated VP to the question word “What doing” – discuss how ‘but not’ means subject does only the first, not the second verb phrases (shown by the cross).

f) Take turns to produce sentences using ‘but not’ while the other one acts out the sentence

g) take turns to create a sentence matching one of the two templates (‘and’ or ‘but not’) and the other one acts out the sentence

h) when accurate, remove templates, bring back to check responses

i) take turns to create sentences matching one of four templates from sections 2 and 3, other acts out sentence

j) when accurate, remove templates, bring back to check responses

k) Make combinations of the templates using coordinated subjects and/or verbs e.g.,

- the cow and the cat are jumping but not running
- the cow but not the cat is lying down and sliding
- the cow and the cat are standing and jumping
- the cow but not the cat is lying down but not sliding

l) take turns to create sentences matching these combined templates, other one acts out sentence

m) when accurate, remove templates, bring back to check responses
Appendix F

Shape Coding Activities

Session 1

- The student therapist explained what a sentence was and how we can use shapes as clues to help us understand sentences.
- The "Who/What?" card was introduced first on its own, linking it with both inanimate and animate objects in pictures.
- A mixture of about 15 pictures (mixture of animate and inanimate objects) were presented to demonstrate what the shape represented.
- For each picture the student therapist said "Who is this?" "When we talk about who/what where do we put the picture?" "In the ----o----val"
- The process was then repeated with the "What doing" shape using boardmaker action pictures.
- The two shapes were then brought together and JC was given 2 blank laminated pages. He was asked “who?” and “what doing?” questions for a range of verb card pictures e.g. the man is writing.
- JC was also asked to identify the appropriate shape to go with the “who & what doing”
- For the last shape coding activity, the large shapes were removed and small shapes (multiple who & what doing shapes) were placed on the table and mixed around.
- JC was required to select a picture from a range of pictures representing either “who?” or “what doing?” and identify which shape matched the picture.

Homework: JC’s mother was provided with a homework activity: The two big shapes were provided along with 5 “who/what” pictures and 5 “what doing” pictures. She was asked to reinforce that the “who/what” pictures go with the oval shape and the "what doing" pictures go with the hexagon.

Session 2

- Re-cap on the “who/what” and “what doing” shape with a matching activity where JC was required to identify which shape the picture went with.
- The shapes were then put together using some verb cards and the diamond “is” shape was used to make the full sentence.
- JC was required to draw the shapes around the correct words.
- The student SLT highlighted how more than one word can be in each shape.
• The “What like/how feel” shape (cloud) was then introduced with the student SLT presenting JC with examples of colours, emotions and other adjectives e.g. big, small, dirty.
• This activity continued similarly to the previous one but this time with emotion cards to introduce the “What like/how feel” shape

**Session 3**

• Movement was incorporated into the activities during this session
• The first activity involved student B and JC’s mother
• Student B held the hexagon and his mother held the oval.
• “Who/What” and What doing pictures were mixed up and when CJ turned a picture over he was asked to bring it to either student B or his mother.
• The next activity involved the use of a flipchart. The student SLT drew the oval, diamond and hexagon and gave CJ two pictures, one Who/What and one What doing. JC was asked to stick the pictures in the correct shape.
• JC helped the student SLT make a sentence and the words were written inside the corresponding shape.
• The student SLT explained again that more than one word can go in each shape and asked JC to count how many words were in each shape.
• The student SLT then did a table top activity reintroducing the cloud shape.
• The student SLT had pictures of adjectives, colours and feelings (10 in all) which she turned over and explained why they all go into the cloud – while also asking JC why they go into the cloud.
• The oval shape and the cloud shape were then put together. JC was given 2 laminated sheets – one under each shape. He was given one “Who/What” picture and one “What feel” picture and had to put each one on its corresponding sheet.
• JC then helped the student SLT make a sentence with those pictures which the student wrote and he drew the correct shapes for.

*Homework: JC’s Mother was given the cloud picture in addition to the oval and the hexagon and was asked to reinforce the purpose of each shape.*
Appendix G

Parent Information Sheet

Study title: A pilot study on the use of Shape Coding and memory strategies to improve understanding of language in school-age children (aged 6-9 years) with language impairment.

We would like to invite your child to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for your child, please take time to read the following information carefully. Talk to others about the study if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?
Children with language impairment can have comprehension (understanding) difficulties. This can occur where a child doesn’t understand certain concepts/grammar and/or where memory and/or attention skills are poor. Some recent therapies using coding as clues, have been shown to work with older school aged children and adolescents (11-16 years). The aim of this study is find out whether these approaches work with younger school-age children.

Why has my child been invited to take part?
Six children will take part in this study. Your child has been chosen because:
- He/she has difficulty understanding sentences
- He/she is in the age range of the study: 6 to 9 years.

Do I have to let my child take part?
It is up to you to decide. We will describe the study in this information sheet. We will then ask you to sign a consent form to show you have agreed to take part. You are free to withdraw at any time, without giving a reason. This would not affect any services you or your child receives.

What will happen to my child if we take part?
Your child will be given some tests by the researchers, who are final year student SLTs under the supervision of a qualified Speech & Language Therapist. These tests will include activities such as asking your child to listen to words and sentences, point to pictures from a choice of pictures that match the words and sentences, and repeat a short story. Your child will also participate in a short memory test, where he/she will be asked to repeat lists of words and numbers. This will take about one a half hours. We will split the testing over two sessions.

Treatment sessions will then take place twice a week for five weeks. The therapy will involve teaching your child codes or clues (using Shape Coding) to help them understand types of words and sentences, for example colour codes for verbs (doing words) and nouns (names of things) and shapes. We will also introduce your child to strategies to help their memory. Two weeks after the therapy ends we will repeat the tests to see if your child’s understanding of language is better.

Are there any disadvantages or risks in taking part?
There are no risks to your child. A disadvantage is that your child may miss other activities while participating in the language activities. The activities used in the programme are meant to be fun for the child.

**Are there any benefits in taking part?**
Your child will receive a very thorough language assessment and participate in a program that should help improve his/her language. This is a small-scale pilot study and from the results we can develop a larger group study. The information we get from this study should help improve the treatment of children with language difficulties in the future.

**What happens when the research study finishes?**
After all the results have been collected, the researchers will write the study up. The results will be analysed and shared with other Speech & Language Therapists to help them decide the best way to treat children with language difficulties. We will give you a summary report of the findings regarding your own child. You may request a copy of the report of all the findings at the end of the study. Your child will not be identified in any research report or publication.

**Will my child’s taking part in the study be kept confidential?**
Yes. All information which is collected about your child during the course of the research will be kept strictly confidential, and any information about him/her which leaves the clinic will have the name and address removed so that he/she cannot be recognised. You have the right to check any data held about your child for accuracy and correct any errors.

**What will happen if I don’t want my child to carry on with the study?**
You can take your child out of the study at any time, without giving a reason. This will not affect any services you or your child would normally receive.

**What if there is a problem?**
If you have a concern about any aspect of this study, you should ask to speak to the principal investigator who will do her best to answer your questions (Carol-Anne Murphy, 061 213076). If you remain unhappy and wish to complain formally, you can do this through:

**Who is organising and funding the research?**
The research is being carried out as part of final year Speech & Language Therapy students’ Master’s thesis under the supervision of a lecturer and qualified SLT at the University of Limerick, Castletroy, Limerick.

**Who has reviewed the study?**
All research in the University is looked at by independent group of people, called a Research Ethics Committee to protect the safety, rights, wellbeing and dignity of those taking part. This study has been reviewed and given favourable opinion by the HSE Mid-Western Regional Hospital Research Ethics Committee. If you have concerns regarding this study, please contact: Chairman, Mid-Western Regional Hospital Research Ethics Committee Risk Management Dept, 3rd Floor Nurses Home, Mid Western Regional Hospital, Dooradoyle, Limerick Tel (061) 234101 Email : joanne.oconnor@hse.ie

Further information and contact details:

For further information please contact the researcher, Carol-Anne Murphy (061 213076, or carol-anne.murphy@ul.ie).
Thank you very much for taking the time to read this information sheet. We will be grateful if you decide to let your child take part in the study. Your local speech and language therapist will go through the study information with you and your child. We have attached an information sheet for your child also, that he/she may read or that you can be used to explain the study to him/her.

If you decide to let your child take part in the study, please sign the attached consent form and return it to Catherine O’Farrell, Speech & Language Therapy Manager, Roxtown Health Centre, Old Clare Street, Limerick. You will then be contacted by phone to arrange an appointment.
Appendix H

Children’s information sheet

Title of Project: Helping Children to understand Words and Sentences

What is this about?
We are doing a project on helping children to understand different words and sentences. We would like help from children your age.

How will you be helping us?
We will see you in the clinic. We will do tests and activities to find out about your words and sentences. We will also teach you some new clues to help you with understanding words and sentences you find difficult. The tests and activities are like those you do with your speech and language therapist. We will write down what is said and we will record you telling a story on a digital recorder.

Do I have to help you?
This is up to you. You can talk to a grown up about it if you are worried or not sure.

This research has received ethical approval from the HSE Mid-Western Regional Hospital Research Ethics Committee. If you have concerns regarding this study, please contact: Chairman, Mid-Western Regional Hospital Research Ethics Committee Risk Management Dept, 3rd Floor Nurses Home, Mid Western Regional Hospital, Dooradoyle, Limerick Tel (061) 234101 Email: joanne.oconnor@hse.ie
Appendix I:

Parent Consent Form

Study title: A pilot study on the use of Shape Coding and memory strategies to improve understanding of language in school-age children (aged 6-9 years) with language impairment

Name of Principal Researcher: Carol-Anne Murphy, Lecturer/Speech and Language Therapist, B.Sc, M.Sc. MIALST, Clinical Therapies Department, University of Limerick

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

- I understand that my child’s participation is voluntary and that I am free to withdraw him/her at any time without giving any reason and without his/her healthcare or legal rights being affected.

- I understand that my child’s identity will be kept confidential and it will not be possible to identify him or her in any reported findings.

- I agree to let my child take part in the above study.

Name of Child: ______________________________DOB:__________

Name of Parent: ______________________________Date:__________ Signature: _____________________

Address: ____________________________________________________________________________

Telephone: ______________________________Email address: ________________________________

This study has been reviewed and given favourable opinion by the HSE Mid-Western Regional Hospital Research Ethics Committee. If you have concerns regarding this study, please contact: Chairman, Mid-Western Regional Hospital Research Ethics Committee Risk Management Dept, 3rd Floor Nurses Home, Mid Western Regional Hospital, Dooradoyle, Limerick Tel (061) 234101 Email: joanne.oconnor@hse.ie