Primary Language Comprehension Difficulties in a School Aged Child: A Pilot Study to test the Efficacy of Metalinguistic Intervention

Formatted for Child, Language, Teaching and Therapy

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Primary Language Comprehension Difficulties in a School Aged Child:  
A Pilot study to test the efficacy of Metalinguistic Intervention

Abstract

Background:  
Current research investigating effective interventions for receptive language comprehension deficits in children with a Specific Language Impairment (SLI) is limited to date. Many of these studies focus on preschool or older school-aged children. Furthermore, research has shown that working memory deficits and processing limitations can have a detrimental effect on language learning.

Objective:  
The current pilot study aimed to investigate the efficacy of a metalinguistic and metacognitive therapeutic approach when treating receptive language comprehension deficits.

Method:  
A controlled single case study design was utilised in a child aged 7 years 2 months with a diagnosis of SLI. The current pilot study aimed to investigate the efficacy of a combined intervention approach through the implementation of (a) Shape Coding, to explicitly teach syntactic rules, and (b) metacognitive strategies; rehearsal strategies and comprehension monitoring techniques, to improve working memory deficits. Baseline standardised assessment results and criterion-referenced test scores were used to select therapy targets. Pre and post-test measures of treated and untreated grammatical targets, and an expressive control were used as measures of effect.

Results:  
Although post therapy scores reveal no statistically significant gains, in-session data indicates improved comprehension of syntactic structures during therapy. Qualitative investigation of in-session data revealed improvements in the child’s awareness during communication breakdown, but poor application of rehearsal strategies.

Conclusion:  
While findings were not statistically significant, in-session data revealed that Shape Coding and explicit instruction can be effective for younger school-aged children with SLI. Qualitative data revealed that, although the child failed to utilise the rehearsal strategies, comprehension monitoring techniques can be an effective tool in enhancing metacognitive awareness, as indicated by performance related assessment. These findings should encourage further studies involving children with similar profiles and provide useful qualitative information on the nature of oral language comprehension difficulties.

Key Words

Primary language impairment, shape coding, comprehension difficulties, metacognitive strategies
Introduction

There is a significant gap in the literature investigating the efficacy of intervention for receptive language comprehension deficits in children with a Specific Language Impairment (SLI), (Skarakis-Doyle et al, 2008; Law et al, 2010). The research that is available largely focuses on pre-school or older school-aged children (Cirrin & Gillam, 2008). Primary language impairment is defined by a discrepancy in expressive and/or receptive language performance, which is not attributed to any other condition, despite equitably normal non-verbal intelligence (Bishop, 1997). There is an increased preference to use the term primary language impairment, as it encompasses the non-linguistic processing weaknesses that may exist with a language deficit in children with SLI. This distinction reflects the child's primary or only area of difficulty in language, alongside motor functioning, hearing and performance IQ scores within the normal range (Kohnert et al, 2009).

The aim of this study is to investigate and examine the efficacy of a receptive language intervention programme tailored specifically for oral language comprehension difficulties for a child aged 7 years 2 months. Law et al (2010) have demonstrated the limited research available on interventions for receptive language deficits, suggesting that deficits in language comprehension serve to predict more persistent receptive language learning problems in later life. Therefore, it is important to evaluate the effectiveness of intervention programmes and strategies in treating receptive language problems.

Language comprehension is a complex system, the acquisition and use of which are highly dependent on various aspects of perception, cognition and learning (Paul, 2007). It is therefore not surprising that language development can be impaired in a variety of ways. Children with language impairments often demonstrate poor receptive language scores in both standardised and non-standardised assessments. This may be attributed to poor comprehension of syntactic structures, and/or difficulty acquiring new semantic representations in lexical acquisition, comprehension of morphemes such as verb tense markers, phonological short-term memory deficits, and comprehension of more complex argument structures and syntax (Hsu & Bishop, 2011; Montgomery et al, 2008; Marshall & Van der Lely, 2006). Hsu and Bishop (2011) suggest that limitations of
short-term memory could potentially be involved in weak statistical learning. They believe that the poor extraction of statistical structure from language could be due to the fact that the incoming information is not adequately perceived. Norbury et al (2001) found that syntactic problems of children with SLI were more prevalent, when compared to children with mild-to-moderate hearing loss. In addition to this, Bishop et al (2006) found that children with SLI had poor comprehension of grammatical distinctions in optimal listening conditions, when presented with simple, pictured vocabulary and short sentences. Furthermore, in addition to these deficits, many children with receptive language comprehension difficulties show persistent word-finding and vocabulary difficulties. These different components of language however, are not impacted to the same degree in all children, resulting in relatively heterogeneous linguistic profiles in SLI.

**Characteristics of language comprehension difficulties in children with SLI**

Early lexical usage in children with SLI is much like that of a typically developing child at similar language levels, simply at a slower pace (Rescorla & Alley, 2001). Studies have shown that children with SLI communicate considerably less than their peers (Rescorla & Lee, 2001). The acquisition and appropriate use of new words is a complex process. To acquire new words, children must identify both the spoken form and correct meaning from the linguistic experience. Once learning is completed, the user must store and organise the word’s phonological, syntactic, and semantic information within the lexicon and be able to access this information for expressive use (Brackenbury & Pye, 2005). Research into the ability of children with SLI who acquire new words in “fast mapping” studies show impairments in both the production and comprehension of vocabulary (Alt et al, 2004; Weismer & Evans, 2002).

Children with SLI have weakness in all areas of language ability. Development is usually delayed and protracted; however it is not equally distributed in every area. There has been extensive research into their problems with the structural aspects of language, such as morphology and syntax (Leonard, 1998). Children with SLI have great difficulty producing and comprehending morphologically complex words, such as the past tense and plural inflections in English (Joanisse & Seidenberg, 1999). It is unusual for school-aged children with receptive language impairments to show complete lack of
understanding of specific syntactic structures; rather, they continue to make occasional errors in interpreting constructions that other children of the same age have mastered (Bishop et al, 2006). Follow-up studies indicate that these children continue to lag behind in syntactic development (Paul, 2007). Tallal et al (1996) have argued that children with SLI are specifically impaired in their ability to process rapidly presented information. However, some studies have called Tallal’s declaration into question, while promoting the work of Bishop, who suggests that auditory processing is immature rather than disordered (Bishop 2005; Mengler et al 2005).

According to Montgomery (2003), children with SLI have difficulty encoding oral word meanings, which coincides with problems within their working memory. This can have an impact on the depth of their vocabulary learning and sentence comprehension. Children with SLI experience pervasive problems with story comprehension; they are poor at answering questions that tap into information that has been explicitly presented in stories and also when information can be inferred from the text (Bishop and Adams 1992; Norbury and Bishop 2002; Botting and Adams, 2005). Although these studies show that the length and complexity of tasks used have a large effect on the child’s performance, it appears that children with SLI process information more slowly than their peers. Comprehension and production of complex grammar have been widely investigated by Van der Lely and her colleagues (Van der Lely & Stollwerk, 1997; Van der Lely, 2005; Marshall & Van der Lely, 2006). Van der Lely (2005) has argued that the syntactic deficit is characterised by impairment in structures that involve “movement” (e.g., reversible passives) and/or “binding” (pronominal sentences). These structural difficulties manifest themselves as impaired tense marking, impaired assignment of thematic roles in passive sentences, Wh-questions, and relative clauses. Friedmann & Novogrodsky (2011) found that school-aged children with syntactic SLI experience great difficulty in the comprehension of “which object” questions, and that other subtypes of SLI can be identified as those whose main deficit relates to lexical retrieval, with unimpaired comprehension of Wh-questions.
Effectiveness of interventions for oral language comprehension difficulties

There is a dearth of studies investigating clinical interventions designed to enhance oral language comprehension. The latest systematic review of language interventions (Law et al, 2010) concluded that, although there is evidence regarding the effectiveness of intervention provided to children with expressive phonological/vocabulary impairments, this cannot be said for children with receptive language difficulties. This is a worrying statement as Boyle et al (2010) reported that children with mixed receptive-expressive language impairments have a greater risk factor of unfavourable long term outcomes, thus highlighting that early intervention for children with receptive language difficulties is imperative. Impaired learners need a significant amount of input in order to show success in treatment. In order to maximise variability, children with language impairments need substantially more trials and exposure spread out over several days (Alt et al, 2012). It is important to incorporate explicit instruction on the target the child is required to learn, (Finestack & Fey, 2009; Owen, 2009), given that there is evidence that implicit learning may be weaker in children with impairments (Evans et al, 2009).

Ebbels (2007) conducted a series of interventions using “Shape Coding” on school-aged children aged between 7 and 14 years old. Shape Coding was used to teach grammatical rules in the areas of argument structure, syntax and morphology. Therapy took place over a period of a 10-week block and results indicate that it is useful when teaching older children with SLI about verb argument structure, the dative form, Wh-questions, passives and the past tense. Similarly, Ebbels et al (2012) conducted a randomised control trial, on fourteen older school-aged children, aged 11-16 years old. Students were randomly assigned to two groups, a therapy and control group, where the therapy group received eight half hour sessions 1:1 with a Speech and Language Therapist (SLT). Shape coding was used to address the understanding of coordinating conjunctions which included “and”, “but not”, “neither nor”, and “not only…but also”. Results indicate that four hours of Shape Coding therapy significantly improved comprehension of “neither nor” and “not only…but also”. Although they were conducted on older school-aged children, Ebbels studies (2007; 2012) show that this type of intervention can contribute effectively to the oral language comprehension needs of children with SLI. Dixon et al (2001) investigated a comprehension intervention with
older children aged 9-15 years old, through an approach called “Visualising and Verbalising”, where children were taught to visualise words and sentences to help them understand language. Results show that children’s language comprehension did not benefit more from “Visualising and Verbalising” over traditional therapy. It concluded that this intervention may place too high a demand on the working memory of a child with language impairment. These findings are reiterated by the work of Montgomery & Evans (2009), who found that the processing path of children with SLI appears to require greater mental resources. Indeed poor verbal memory has been proposed as one of the underlying reasons for the poor comprehension skills of children with SLI (Norbury & Bishop 2002). Gill et al (2003) investigated a working memory strategy designed to accommodate children with language impairments who have processing deficits. Children aged 6;05-11;05 years old received two, 30 minute sessions of language therapy per week for five weeks. Results show that students who were taught to use a rehearsal strategy and those taught to use a rehearsal/visualisation strategy made significant gains over a traditional language therapy group on a standardised test of following directions. However, only the rehearsal/visualisation group retained its gains over the traditional group eight months after intervention. These findings support the long-term efficacy of systematic training via rehearsal/visualisation to increase the ability of children with SLI to follow verbal directions.

Successful oral language comprehension also involves the processing of rapid sequential information encoded in the fast-fading auditory signal, which has been highlighted as an area of difficulty for children with SLI (Tallal et al, 1996). Failures in this task may indicate problems in language learning. Gillam et al (2008) conducted a randomised controlled trial study which compared the language and auditory processing outcomes of two hundred and sixteen children, aged 6-9 years old assigned to receive the Fast ForWord Language intervention (FFW-L). Fast ForWord (FFW) is a suite of computer activities designed to increase the cognitive skills needed to improve language and reading abilities. All children received 1 hour 40 minutes of treatment, five days per week, for six weeks. The aim of this study was to investigate whether children with language impairments who received FFW-L intervention made greater improvements on measures of language and auditory processing than children who received other types of interventions. The latter included academic enrichment,
computer-assisted language intervention, or individualised language intervention given by an SLT. Results show that the FFW programme was insignificant at improving general language skills and temporal processing skills. Although this study was based on randomised control trials, we don't have strong empirical support for FFW as a choice of language intervention for oral language comprehension difficulties. This is reiterated by Bishop's work (2005) who postulated that the performance deficits seen in children with SLI might reflect generalised attention problems rather than selective impairments in auditory processing.

Center et al (1999) conducted listening comprehension lessons using mental imagery training on children with poor listening comprehension aged 7 years. Training was conducted three times a week for a period of four weeks. In order to develop their metacognitive awareness, children were instructed to close their eyes and try to visualise the main features of an object. It was found that children with poor auditory comprehension, using visual imagery, outperformed the control group on standardised tests of reading comprehension and story event structure and on a curriculum based test of listening comprehension. The suggestions is that mental imagery training may have provided a non-verbal conceptual hook for those with poor comprehension, in which associated information is hooked for storage and retrieval, which can compensate to some extent for weaker phonological integration skills. Training in visual imagery may help children with SLI to develop their visual coding system and assist them in representing story information using this alternative coding system, which would ease the verbal memory load associated with constructive processing.

From the literature, it is apparent that when teaching children with oral language deficits compensatory strategies can assist in their learning abilities. Bianco et al (2010) conducted a study on children with SLI aged 4-5 years for three years which centred on teaching them to think aloud and check and resolve inconsistencies with comprehension. Results demonstrated that long term positive training is certainly effective, as the group that were provided intervention in both pre-kindergarten and kindergarten showed the greatest improvement in oral comprehension scores and these results were sustained for nine months post therapy. The review of the literature has demonstrated that although some studies focus on certain aspects related to
children’s receptive language difficulties, at present there appears to be no published accounts on the effectiveness of intervention for younger school-aged children with oral language comprehension difficulties. Shape Coding, although researched to date only on older school-aged children, (Ebbels, 2007; Ebbels et al, 2007; Ebbels et al, 2012), is a particular intervention method that has had successful outcomes which targeted the grammatical rules in the areas of argument structure, syntax and morphology. Memory strategies have also been shown to be of high importance when targeting oral language comprehension difficulties in children with SLI. Current intervention approaches utilise strategies such as meta-linguistic awareness, visualisation and rehearsal strategies, direct instruction, and comprehension monitoring.

From examining the current literature available, one way to expand our knowledge regarding effective interventions for younger school-aged children would be to investigate and examine the efficacy of a receptive language intervention programme, by replicating successful interventions and tailoring these to meet the child’s needs.

**Methodology**

A controlled single case study design, which was part of a case series involving a group of children aged 6-9 years, was used to investigate the efficacy of a metalinguistic intervention, and the teaching of metacognitive strategies. This therapy design provided an in-depth analysis on the effects of the intervention at the level of the child. According to Franklin (1997), a single case study approach is specific to the underlying deficit being treated, and equally explicit about the treatment given. As the following study is a pilot study, it was believed that a single case study design would provide valuable information about specific treatment effects (Wertz, 1992). Such specificity would make it possible to predict if children presenting with similar characteristics as the participant in this study would benefit from such treatment. Controlled single case study designs are important in establishing the viability of treatments in real-life settings before they are implemented at a larger scale involving randomised control trials (Byiers et al, 2012).

**Inclusion/Exclusion criteria**

Ethical approval was obtained from the Health Service Executive (HSE) Mid-Western Regional Hospital Research Ethics Committee. Recruitment was carried out with the
assistance of a SLT Manager from a local HSE community clinic. The SLT Manager was approached by the principal investigator to identify potential participants and obtain written consent from the parents (Appendix A). Parents were provided with an information letter outlining the purpose and requirements of the study (Appendix B). An information leaflet was designed specifically for the child, which outlined his role in the study (Appendix C). Criteria for inclusion in this study included:

1. Children whose primary language is English
2. Aged between 6-9 years at time of recruitment
3. Children with a diagnosis of primary language difficulties that includes clinically significant language comprehension impairment.
4. Participants must have receptive language impairment but may also display expressive language impairment. These children will 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 Version 2 (TROG-2)
   - The receptive portions of either the Reynell Developmental Language Scales (RDLS) or the Preschool Language Survey 4 (PLS-4)

Exclusion criteria included:
1. Children with a primary diagnosis of intellectual and/or sensory impairments and/or emotional/behavioural difficulties,
2. Children with identified visuo-spatial processing difficulties
3. Children whose first language is something other than English.

**Participant**

JH was 7 years 2 months at the beginning of the study and had received a primary diagnosis of SLI from an SLT following individual assessment. A medical diagnosis of Cystic Fibrosis was obtained aged 3 years 6 months, resulting in a late referral to SLT services. There is no family history of any speech and language difficulties. The participant is diagnosed with dyslexia, and is currently receiving resource teaching at his local primary school on the basis of his SLI diagnosis. Initial assessment results are presented on Table 1. Results from the CELF-4 (Semel et al, 2006) assessment indicate
a moderate receptive language disorder (SS:75) and a severe expressive language disorder (SS:59). Findings from the CELF-4 assessment indicated relative strengths on the word classes receptive and sentence structure subtests, but his ability to follow directions and basic concepts were weak. A poor Expressive Language Index (ELI) score is derived from low scores for ability to recall sentences, formulate sentences and use correct word structure. JH’s comprehension standard score falls between -1.5 and -2 standard deviations below the mean. Psychological assessment results, using the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV) (Weschler, 2003) and the Wechsler Individual Achievement Test – Second Edition (WIAT-II) (Wechsler, 2005), revealed the child was within the normal range for non-verbal cognitive ability.

Table 1: Standardised assessment results prior to intervention

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Subtest</th>
<th>Standard Score</th>
<th>Qualitative Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELF-4</td>
<td>Receptive Language Index</td>
<td>75</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Concepts &amp; Following Directions</td>
<td>1</td>
<td>Severe</td>
</tr>
<tr>
<td></td>
<td>Word Classes Receptive</td>
<td>9</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>Sentence Structure</td>
<td>8</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>Expressive Language Index</td>
<td>59</td>
<td>Severe</td>
</tr>
<tr>
<td></td>
<td>Word Structure</td>
<td>5</td>
<td>Low Average</td>
</tr>
<tr>
<td></td>
<td>Recalling Sentences</td>
<td>4</td>
<td>Low Average</td>
</tr>
<tr>
<td></td>
<td>Formulating Sentences</td>
<td>1</td>
<td>Severe</td>
</tr>
<tr>
<td>WISC-IV</td>
<td>General Ability Index</td>
<td>84-95</td>
<td>Low Average - Average</td>
</tr>
<tr>
<td></td>
<td>Verbal Comprehension</td>
<td>81</td>
<td>Low Average</td>
</tr>
<tr>
<td></td>
<td>Perceptual Reasoning</td>
<td>98</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>Working Memory</td>
<td>74</td>
<td>Boderline Range</td>
</tr>
<tr>
<td></td>
<td>Processing Speed</td>
<td>91</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>Word Reading</td>
<td>71</td>
<td>Boderline</td>
</tr>
<tr>
<td></td>
<td>Pseudoword Decoding</td>
<td>84</td>
<td>Low Average</td>
</tr>
<tr>
<td></td>
<td>Reading Comprehension</td>
<td>Not Completed</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>Numerical Operations</td>
<td>83</td>
<td>Low Average</td>
</tr>
<tr>
<td></td>
<td>Spelling</td>
<td>80</td>
<td>Low Average</td>
</tr>
<tr>
<td></td>
<td>Listening Comprehension</td>
<td>64</td>
<td>Extremely Low</td>
</tr>
</tbody>
</table>
**Procedure**

A battery of formal assessments was conducted to build a detailed language profile as well as providing a baseline of the child’s specific receptive language difficulties. These assessments included the Test for Reception of Grammar, Version 2 (TROG-2), Expression, Reception and Recall of Narrative Instrument (ERRNI), British Picture Vocabulary Scale: 3rd Edition (BPVS III), and the Working Memory Test Battery for Children (WMTB-C). Results from these assessments are illustrated on Table 2.

In order to effectively tap into the child’s syntactic abilities, the TROG-2 (Bishop, 2003) was administered. Results revealed a difficulty in understanding complex syntactic structures (Blocks passed: 9; Standard Score: 79). The BPVS-III, (Dunn & Dunn, 2009), provided an insight into the extent of his receptive vocabulary inventory. Results highlighted that his vocabulary development is within the normal range (Raw score: 93; Standard Score: 94). A low MLUw of 3.3, obtained from the ERRNI (Bishop, 2004), was consistent with his expressive language consisting predominantly of single clauses, with relatively unelaborated phrase structure, e.g. “toys”, “He leavin”. To assess working memory function, three subtests which focused on each component of the WM Model was administered: Digit Recall (Phonological Loop), Backward Digit Recall (Central Executive) and Block Recall (Visuo-spatial Sketchpad). Although the participant scored above average in both the Backward Digit Recall subtest (Standard Score: 109) and Block Recall subtest (Standard Score: 117), poor registration and manipulation of auditory information was noted from the Digit Recall subtest (Standard Score: 84).

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TROG-2</strong></td>
<td>Standard Score = 79</td>
</tr>
<tr>
<td></td>
<td>Blocks passed = 9</td>
</tr>
<tr>
<td></td>
<td>Age Equivalent = 5:06</td>
</tr>
<tr>
<td><strong>Failed Blocks</strong></td>
<td></td>
</tr>
<tr>
<td><strong>D: Three Elements</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>G: Relative Clauses</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>I: Reversible above and below</strong></td>
<td>Fail</td>
</tr>
<tr>
<td>Assessment</td>
<td>Results</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>K: Reversible passives</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>L: Zero Anaphor</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>N: Pronoun Building</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>O: Neither/Nor</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>P: X but not Y</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>R: Singular/ plural inflection</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>S: Relative clause in object</strong></td>
<td>Fail</td>
</tr>
<tr>
<td><strong>T: Centre - embedded sentence</strong></td>
<td>Fail</td>
</tr>
</tbody>
</table>

**BPVS - III**

- Raw Score = 93
- Standard Score = 94
- Percentile Rank = 33
- Age Equivalent = 6:02

**ERRNI**

- MLUw = 3.3
- Ideas: Initial Story Telling: Raw Score = 1
- Ideas: Recall: Standard Score = 65
- Comprehension: Standard Score = 72

**WMTB-C**

- **Digit Recall**
  - Standard Score = 84
  - Percentile Rank = 15
  - % of Population Scoring at the Same Level = 66

- **Block Recall**
  - Standard Score = 117
  - Percentile Rank = 88
  - % of Population Scoring at the Same Level = 64

- **Backward Digit Recall**
  - Standard Score = 109
  - Percentile Rank = 73
  - % of Population Scoring at the Same Level = 63
Results obtained from baseline assessments indicate poor oral language comprehension difficulties due to both a grammatical deficit and processing disorder. Examination of failed blocks taken from the TROG-2 highlighted a pattern of random errors, which suggests that he had little knowledge of the meaning of the grammatical constructions being tested, and a difficulty understanding complex syntactic structures. However, a systematic error pattern was made in block 0 and sporadic errors were made in block D and block I. This result corresponds with the poor scoring obtained from the Digit Recall subtest of the WMBT-C, indicating difficulties with both the registration and manipulation of auditory information. His non-verbal reasoning skills, attained from the Block Recall subtest, are above the average range, suggesting that his visual-spatial reasoning is developed.

**Therapy targets**

Following administration and analysis of individual results on the formal assessments, criterion-referenced tests were developed. A criterion-referenced test, encompassing the structures that were failed on the TROG-2 assessment, was used to choose specific grammatical therapy targets, while also serving as an outcome measure pre- and post-therapy. A total of 11 structures were assessed, consisting of 10 target items per structure. Each test stimulus was presented in a four picture multiple-choice format. The results for each probe section are included in Table 3. Targets for therapy were chosen based on the criteria of low-scoring and typical age of language acquisition. The to-be-treated structures chosen were “neither/nor” and “X but not Y”.

A control untreated task of “singular/ plural inflection”, was chosen to ensure a treatment-specific effect. Experimental control can also be exerted in single case research by including one or more dependent variables not expected to improve as a result of intervention (Pring, 2005). Thus, in order to monitor the possible effects of maturation, the Mean Length Utterance of words (MLUw) taken from the ERRNI, and one untreated probe were administered pre- and post-intervention (Broom and Doctor, 1995). One generalisation probe from the criterion-referenced test was also administered, “reversible passives”, to determine if the syntactic intervention might generalise to another related syntactic structure, as had been noted by Ebbels et al (2012).
### Table 3: Criterion-referenced test

<table>
<thead>
<tr>
<th>Blocks Failed</th>
<th>Number of Items Presented</th>
<th>Number of Items Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>D: Three Elements</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>G: Relative Clauses</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>I: Reversible above and below</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>K: Reversible passives</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>L: Zero Anaphor</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>N: Pronoun Building</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>O: Neither/Nor</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>P: X but not Y</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>R: Singular/plural inflection</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>S: Relative clause in object</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>T: Centre - embedded sentence</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

**Rehearsal strategies**

Rehearsal strategies are an explicit way of making the child aware of memory strategies in a structural context, and these strategies were introduced in the context of intervention for concepts. The Bracken Basic Concept Scale - Third Edition: Receptive (BBCS-3:R) was administered to obtain a baseline of JH’s concept knowledge. Results indicated low scores in some functionally relevant educational concepts, (See Table 4). Concepts to be taught within the rehearsal strategy therapy were chosen from both the results of the BBCS-3: R, and with the aid of the child’s school mathematical textbook. Targets included the prepositions of “every, beside, through, and over”. Mathematical concepts of “first/next/last”, “more than/less than”, and “on” were also targeted. The rehearsal protocol followed the therapy sequence of Gill et al (2003) (*Appendix D*).
Table 4: Results of BBCS-3: R

<table>
<thead>
<tr>
<th>Concept Area</th>
<th>Raw Score</th>
<th>Scaled Score</th>
<th>Percentile</th>
<th>Age Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directions/Position</td>
<td>49</td>
<td>6</td>
<td>9</td>
<td>5:07</td>
</tr>
<tr>
<td>Quantity</td>
<td>27 *</td>
<td>6</td>
<td>9</td>
<td>5:07</td>
</tr>
</tbody>
</table>

*Pictures demonstrating American currency, e.g. nickels, dimes, were omitted and therefore this score may not accurately reflect his level of ability.

**Comprehension monitoring**

As many learning activities impose a considerable burden on the child’s working memory, it is important to provide him with techniques to improve his attention and memory. Baseline assessment results from the Digit Recall subtest of the WMTB-C specified a deficit in the phonological loop causing auditory difficulties with both the registration and manipulation of information. Monitoring techniques were formulated to correspond with rehearsal strategies, and were adapted from the work of Bianco et al (2010), which centred on teaching him to think aloud, check and resolve inconsistencies with comprehension.

**Therapy intervention**

Intervention was conducted twice weekly for five weeks, a total of 10 sessions, at the University of Limerick SLT clinic. Each session lasted approximately 45 minutes. A parent was present at each therapy session along with a student SLT. The student SLT was present to observe and record the child’s progress in therapy for treatment fidelity purposes.

As the Shape Coding system aims to visually represent the major linguistic features of English, different aspects of the system was used to teach the participant a range of grammatical rules. A teaching order (Shape Coding Materials, Ebbels ©) was introduced during the initial stages of therapy (Appendix E). The child began at Step 1, but the timing of the steps was at the discretion of the researcher, which depended on the child’s progress in therapy. The first aim of therapy was to establish the link between the shapes and the question word, e.g. Oval shape indicates the “Who” of the sentence. The child was introduced to the shapes for subject Noun Phrase (NP), Auxiliary Verb Phrase (VP) and Adjective Phrase (AP). Once the child became familiar
with these shapes and their functions, the researcher moved onto the next steps outlined from ‘Shape Coding Materials’ (Ebbels ©), (Appendix F).

Therapy targets were introduced and practised, using specific shape templates, within the four different constructions:

1. Subject NP
2. Verb Phrase
3. Adjective Phrase
4. Subject NP and Adjective Phrase

**Example:** During the introduction of “And V’s But Not” in Subject NP, two sentence templates were used (Figure 1). First, the child was taught that ‘and’ corresponds to both NP’s and are carrying out the action in the sentence. The researcher and child took turns in creating sentences using ‘and’ while the other person acted out the sentence. Next the template of “But Not” was introduced and used to demonstrate that “But Not” means only the first NP is carrying out the action, not the second NP (shown by the cross). Again, the researcher and the child took turns in creating sentences while the other person acted it out. Once the responses were accurate, the templates were removed to promote spontaneous production, and reintroduced to check the responses.

*Figure 1: Templates for And V’s But Not Subject NP.*

Targets used were full, grammatical sentences, e.g. *She is jumping*, in order to foster syntactic complexity. A selection of toy animals was placed on the shape templates, with the written word on each shape. When the child heard a sentence, he would have to place the correct animal in the correct shape to match the sentence he heard, e.g. “The
“Sheep but not the pig is sleeping”. Other activities carried out included matching pictures to the correct parts of sentences, creating target sentences and asking the child or parent to act out the sentences, colouring activities, and role reversal games, e.g. Simon Says (See Appendix G for a sample session plan).

Rehearsal strategies followed the therapy sequence outlined by Gill et al (2003). Before the introduction of an activity, the child was asked to adhere to the following sequence; listen to the researcher’s instructions, repeat the instructions aloud, and carry out the instruction. Activities included demonstration of prepositions in which the child pointed to pictures or followed verbal directions, e.g. “Put the car through the tunnel” (See Appendix H for sample instruction scripts). Activities were varied using different objects and instructions to maintain interest and learning. Instructions were paraphrased, which allowed the child sufficient time to understand the instruction, and adapted through the use of visual cues. Directions were controlled for length and syntactic complexity, while accurate imitation was not required; rehearsals that contained omitted concepts were acceptable. The child was encouraged to rehearse the instructions repeatedly until he completed the task. When the child spontaneously rehearsed the instructions, the prompts to rehearse declined.

Facilitation and monitoring of comprehension was explicitly taught through the introduction of comprehension monitoring techniques. The researcher formulated a number of steps to explicitly teach comprehension monitoring techniques to the child (Appendix I). Barrier games were used to assess self-appraisal of comprehension. Each session began with a reminder to utilise comprehension strategies. He was presented with a series of directions, some of which were adequate and some of which were difficult to understand. The researcher purposely gave directions in a low tone, used complex language and/or spoke with competing noise.

**Statistical analysis & variability**

In order to determine the reliability of the intervention strategies used in this study, both the researcher and her colleague used the same scoring protocol. In-session data results were compared by the number of stimuli presented, to the number of correct responses with the second researcher recording the same information as the first.
researcher. Specific criteria used to establish unambiguous evaluation of the level of prompting required to elicit correct responses in the child was determined. A sample of 50% of in-session data was examined, with 21% disagreement recorded. A disagreement was observed during Session 5, when the researcher recorded a total of 88.23% responses correct during the teaching of “And V’s But Not” Subject NP, compared to the second researchers recording of 89.47% on the same task. However, the data was reviewed in order to achieve 100% agreement. The Statistical Product and Service Solutions (SPSS) software package (IBM, 2012) was used for statistical analysis. The McNemar, a non-parametric test, was used on pre-and post-therapy data with a significance level of p=0.05. As previously stated, variability is key for language learning. In order to maximise variability a number of presentation techniques were used: auditory bombardment, participation in a non-verbal activity (e.g. colouring), an action-figure activity and role play. The primary mission of these techniques was to increase the salience of the target stimuli, while allowing the researcher to incorporate components of complexity (linguistic complexity, multiple cues). Having a selection of these types of activities not only encouraged variability, but allowed for materials to be spaced at wider intervals, thus maximising the chances for integration.
Results

The amount of exposures per target structure within each session is illustrated in Figure 2.

Figure 2: Amount of exposure to target structures

![Amount of Exposure to Target Structures](image)

Repeated Measures: treated targets

Analysis of in-session data indicates an improvement in knowledge of therapy structures throughout intervention. Results obtained during the teaching of “And V's But Not” were consistent (Figure 3a). He progressed throughout intervention efficiently and consistently, establishing a good understanding of the target structure. During Session 6, the child progressed quickly through the structures of Subject NP, VP and AP, achieving 80% and above on the target structures. Towards the final sessions of therapy, the child’s perception of the target structure increased, as he would spontaneously explain the meaning of the structure to the researcher. Results obtained during the teaching of the treated target “Neither/Nor” were consistent (Figure 3b). However, it was observed within Adjective Phrase (AP), Subject Noun Phrase and Adjective Phrase (NP +AP), that the child became confused when the target structure was an alternative emotion, e.g. “The girl is neither dirty nor sad”. When asked to
elaborate on what the subject of the sentence is doing, he would become confused and inform the researcher that they are doing “nothing”. Intervention was adapted to explicitly teach the target using visual and verbal prompting. As the intervention progressed he began to understand targets and became successful throughout therapy sessions. He was motivated to take part in the activities and his increased confidence enabled him to become successful during therapy. Towards the end of therapy the child was exposed to a combination of structures; “Neither/Nor” V’s “And V’s But Not”, and “Neither/Nor” V’s NP “And”. Initially, he required prompting for both structures but achieved 100% spontaneously by the end of the sessions.

These results suggest that Shape Coding had a positive effect on the child’s comprehension of target structures throughout intervention. However, the critical question remains: did therapy have an overall therapeutic effect on the child’s oral language comprehension? The treated items from the criterion-referenced test were re-administered with results from both pre (T1) and post (T2) therapy illustrated in Table 5. In order to investigate whether there was any significant change, pre and post therapy scores were compared using the McNemar tests. Although the child made significant progress throughout therapy, the difference between pre and post test results for his comprehension of the target structure “X but not Y” (p=.625, 2 tailed) and “Neither/Nor” (p=1.000, 2 tailed), were not significant. As the post-therapy score for both targets is not normally distributed, it was not possible to carry out a Chi-square, to examine any significant differences made between targets pre-and post-therapy. JH did make progress within the target “X but not Y”; producing 90% correct responses post-therapy in comparison to producing 70% pre-therapy. However, pre-and post-therapy results indicate that he did not make any improvement in the target “Neither/Nor” (See Table 5). The lack of progress made on the treated structures indicates that, while Shape Coding can be beneficial in the short term, this did not appear to lead to a permanent change in performance.
Figure 3a: Exposure and stimuli correct of And V's But Not

Target: And V's But Not

- Stimuli Presented
- Stimuli Correct

Therapy Sessions

Number of Stimuli Presented

Data points for different therapy sessions.
Figure 3b: Exposure and stimuli correct of Neither/Nor
Table 5: Treated targets pre and post therapy

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
</tr>
<tr>
<td>X but not Y</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Neither/Nor</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

Repeated Measures: untreated targets

The untreated target of “singular/plural inflection” and generalisation target of “reversible passives”, was re-administered after the five week intervention period. Results obtained from pre and post-intervention are presented in Table 6. Statistical analysis of the untreated target indicates that there was no significant clinical change (p=1.000, 2 tailed). This is consistent with the generalisation target, which also had no significant change (p=1.000, 2 tailed). Despite this there was an improvement in the number of correct productions in T2 compared to T1.

Table 6: Production of Singular/Plural Inflection & Reversible Passives T1 & T2

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
</tr>
<tr>
<td>Singular/Plural Inflection</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Reversible Passives</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

Pre- and post-measures

Responses obtained from the ERRNI were analysed and an increase in MLUw was identified. The normal procedure for the computation of the MLUw from the ERRNI involves combining the results from the initial storytelling and the story recall phase, to get a more reliable estimate. These results are illustrated in Table 7. The ERRNI was used as a control measure, and from analysing the child’s responses it is evident that the child went from producing very little, e.g. “He leavin”, to producing linguistically lengthy utterances, e.g. “and then her Mum called her friends over”. The content and length of his responses increased, along with a significant change T1 (p=0.0303) to T2 (p=0.0607, 2 tailed). A decrease in the number of blocks passed within the TROG-2 was recorded.
There was no significant clinical change from the results obtained in T1 (p=1.000, 2 tailed) in comparison to T2 (p=1.000, 2 tailed) which are shown in Table 7. T2 results indicate an improvement in the block of Three Elements, which was initially failed in T1, which may be due to enhanced listening and comprehension.

**Table 7: Assessment data: T1 & T2**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
</tr>
<tr>
<td>ERRNI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MLUw</td>
<td>3.3</td>
<td>6.2</td>
</tr>
<tr>
<td>TROG-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blocks Passed</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Age Equivalent</td>
<td>5;06</td>
<td>5;03</td>
</tr>
<tr>
<td>Percentile Rank</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

**Rehearsal strategies**

Observation of responses in terms of uses of rehearsal strategies show an increased awareness of using these strategies; however these strategies required consistent prompting. Figure 4 highlights the improvements made throughout intervention. In order to explicitly teach the child rehearsal strategies, a visual and verbal prompt of “Listen, Say It, Do It” was required. The child struggled to carry out rehearsal strategies when given instructions of increasing length. During the reassessment phase, the child was exposed to 10 situations where rehearsal was needed. It was found that the child did not use the rehearsal strategy spontaneously and required prompting for each target in which he achieved 100%.
**Figure 4: Rehearsal strategies: exposures and trials correct**

![Graph showing rehearsal strategies and trials correct over therapy sessions.](image)

**Comprehension monitoring**

The child’s ability to seek clarification and assistance was noted to improve throughout intervention (Figure 5). His overall spontaneous use of comprehension strategies began at 40% during Session 1, increasing to 80% during Session 4 and finally to 100% during Session 6. During Session 1, JH showed recognition of situations where comprehension was negatively impacted by unclear messages, but required a considerable amount of prompting. These prompts included posing questions to the child as to why he could not carry out instructions. At the end of this session, the researcher and the child problem solved solutions in order to increase the child’s awareness and listening skills. During Session 4 the child spontaneously identified scenarios that could be used to improve his comprehension abilities “If I can’t hear the teacher I can put up my hand”.

By the end of the intervention, without prompting, he identified situations where he could ask for repetitions and seek clarification. These scenarios included situations at home and at school. During the reassessment phase, he was asked to identify strategies that may assist him when given complex directions to which he responded “Put up my hand, Say ‘I can’t hear you’, and ask for help”. During a barrier game the child spontaneously achieved 80% accuracy.
Treatment fidelity was closely monitored and observed by a student colleague, to ensure reliability and validity of results. Prior to the commencement of the study, the optional components of the study were pre-planned and outlined (Appendix J). In order to maintain treatment fidelity, the child’s progress was monitored by both the researcher and her colleague, thus ensuring the intended delivery of intervention. Detailed recording sheets were used to monitor the child’s progress throughout each session (Appendix K).

**Parental & teacher feedback**

In order to aid generalisation, homework was provided after each session (See Appendix L for sample homework). Shape Coding activities were used to recap on shapes, follow directions using objects on target structures, and play games e.g. Simon Says. JH’s parents were encouraged to use a visual aid before executing instructions to encourage spontaneous rehearsal. JH’s mother reported that he carried out the Shape Coding activities successfully and felt that he displayed good understanding of the target structures. She reported that he required consistent prompting to use rehearsal...
strategies and failed to use the comprehension strategies at home. JH’s teacher reported an improvement in his confidence, resulting in an increase in his ability to seek clarification and assistance. She reported that he failed to spontaneously use rehearsal strategies, but overall felt that the increase in his confidence reduced his levels of frustration.

**Clinical observations**

During the central stage of intervention, the child suffered from recurrent chest infections resulting in high levels of fatigue. Therefore, some sessions focused specifically on Shape Coding, excluding comprehension monitoring and rehearsal strategies. Therapy was suspended for one week, due to a public holiday, and during this time the child was admitted to hospital. On return to therapy, JH’s attention levels declined, particularly during afternoon sessions, which posed some difficulty during the implementation of rehearsal activities. The child attended 4 morning sessions and 6 afternoon sessions.

**Discussion**

This investigational and therapeutic programme was based on the hypothesis of examining the efficacy of a metalinguistic intervention approach to teach grammatical comprehension, in conjunction with metacognitive compensatory strategies to support memory for language in a child aged 7 years 2 months with SLI. Therapy tasks had to overcome the child’s receptive language problems, processing difficulties and memory complexities. As stated by Ebbels (2007), it was important to use only those parts of the Shape Coding system which were essential at any one time, thus avoiding unnecessary complexity.

The first hypothesis investigated whether Shape Coding is effective for treating language comprehension in a younger school aged child. It is apparent that the child’s understanding of the target structures improved throughout intervention. By using Shape Coding, the researcher was able to explicitly teach grammatical rules using visual supports to correct any errors made, while encouraging self-correction. In-session data revealed an increase in the understanding of target structures, which was reiterated during parental feedback. Explicit instruction targeted the child’s visual strengths, while accommodating his difficulties with both the registration and manipulation of
auditory information, as highlighted from his poor scoring in the Digit Recall subtest of the WMBT-C. Despite this, reassessment of the criterion-referenced test and TROG -2 demonstrated no significant clinical change. Results for the target “Neither/Nor” remained the same, but there was a slight increase in the number of correct responses for “X but not Y”. Overall, there is sufficient evidence to suggest that Shape Coding had a minimal effect on the child’s oral language comprehension needs. It is possible that a longer intervention period may have led to improved outcomes among this area. As outlined by Alt et al (2012), children with language impairments need substantially more trials and exposures spread out over several days. This may have assisted in the child’s understanding of the target “Neither/Nor”, which posed some difficulty for him. As the target was initially introduced in Session 6, and taught alongside the target “And Vs But Not”, sufficient exposure may have accommodated his understanding of this structure. By keeping sessions shorter, it would allow for more distributed practise rather than massed practise, which the literature suggests is beneficial (Alt et al, 2012; Childers & Tomasello, 2002). This hypothesis is more likely, given the success of Shape Coding therapy at teaching grammatical rules in older school-aged children (Ebbels, 2007), who received 10 hours of intervention on each structure.

It is accepted that the role of memory in intervention is compensatory in nature (Gill et al, 2003). Baseline assessment results revealed poor auditory memory, due to his inability to remember three items reliably in sequence. Thus, rather than trying to increase the child’s memory capacity, rehearsal strategies were introduced to improve his performance by enhancing the efficiency of memory resources. Analysis of findings revealed that the child did not make any significant gains in using rehearsal strategies despite visual and verbal prompting being provided constantly during tasks. The rehearsal strategies used in this study may have placed too high a demand on the child’s working memory, as it did in the studies by Dixon et al (2001) and Montgomery & Evans (2009). In order to facilitate the child’s learning, visualisation strategies may have assisted with his perception of rehearsal strategies. Gill et al (2003) found that when visualisation was taught alongside rehearsal strategies, children with SLI increased their ability to follow instructions. A combined approach might have been more effective, but due to the intervention timeframe it was not possible. Results obtained during the reassessment phase, highlighted that the child’s ability to follow lengthy
directions remained relatively static. Research suggests that rehearsal strategies can be an effective tool for children with SLI (Gill et al., 2003) however, due to the child's difficulties outlined in the current study it would be beneficial to assist him in applying and maintaining its use over time. There is strong evidence to suggest that a total of three hours of intervention can increase the direction-following ability of children with SLI (Gill et al., 2003). However, in the current study some intervention sessions were abandoned due to fatigue.

A series of activities adapted from Bianco et al. (2010) were used to monitor and assess JH's comprehension. This type of metalinguistic strategy allowed the researcher to model appropriate behaviour to the child. Well-defined, comprehension focused barrier games were successfully used in increasing his metacognitive awareness. Discussion surrounding communication breakdown allowed the researcher to highlight the importance of seeking assistance and clarification. Although these strategies were implemented over three sessions, an increase in the child's ability to spontaneously seek clarification was seen throughout the intervention. His ability to plan, think aloud, check, and resolve inconsistencies with comprehension is one of the most important developments of the formal operational periods (Westby, 2005 as cited in Paul, 2007). During reassessment, the child spontaneously used the strategies to 80% accuracy outlining that the training had a positive effect, which concurs with the findings from Bianco et al. (2010). There were some observable differences in performance obtained from these three sessions, which is in contrast to the results found by Paul (2007), where children were exposed to a larger period of intervention on these strategies. An increase in classroom comprehension was reported, due to an increase in his ability to seek clarification and assistance, which is a beneficial supplement to other classroom activities (Paul, 2007). These positive effects suggest that comprehension monitoring can be an effective tool in increasing metacognitive awareness of communication breakdown.

**Limitations**

This intervention was a pilot study and invariably there are some limitations. The intervention followed strict protocol and had control measures in place but due to the nature of the study design, the number of sessions was limited. The lack of
generalisation of both target structures during Shape Coding intervention begs the question of whether school aged children with oral language comprehension deficits require more exposures across a longer timeframe. As previously outlined by the literature (Alt et al, 2012), children with language impairments need substantially more trials and exposures spaced over several days. Due to the child’s medical condition some of the metacognitive strategies were abandoned. A modification of therapy input spaced over several days and for a longer timeframe may have assisted in the generalisation of targets beyond the clinical setting. In order to monitor the child’s progress outside of the clinical setting, the researcher should have observed the child in his natural settings, at home and school, to observe any generalisation effects.

An increase in MLUw obtained from the ERRNI may have occurred due to familiarity, as he attended sessions twice a week for five weeks and became comfortable with his surroundings. It may also be the result of a priming effect, as therapy consisted of hearing and producing numerous sentences. In general, the task of describing pictures became easier, resulting in more consistent responses. On this basis, the ERRNI was not an effective control. A further follow up session may have provided a deeper insight into the generalisation of these strategies.
Conclusion

This controlled single case study has highlighted the potential value for both a metalinguistic intervention approach, in teaching grammatical comprehension, and metacognitive compensatory strategies to improve working memory in a school-aged child. The Shape Coding system is flexible enough to be used to teach a range of grammatical rules, and although there were no statistical significant gains, in-session data has highlighted that it can be beneficial for younger school aged children with SLI. Qualitative data has revealed that, although the child failed to utilise the rehearsal strategies, comprehension monitoring techniques can be an effective tool in enhancing metacognitive awareness. Teacher feedback has shown that these techniques have assisted in improving the child’s awareness of communication breakdown within the classroom. While single case studies do not allow us to generalise for other children, they do let us investigate the idiosyncrasies of individual cases. Important aspects of the child’s performance have been highlighted, including the effects of his medical condition, cystic fibrosis, and its resultant significant effects on his energy levels which impeded on his ability to attend and actively participate in sessions. Therefore, a longer intervention period, entailing concise weekly sessions may have made a significant impact on his comprehension abilities, while improving his concentration levels. These findings should encourage further studies involving children with similar profiles and provide useful qualitative information on the nature of oral language comprehension difficulties.
**Acknowledgements**

I would like to express my sincere appreciation to my supervisor, Dr Carol-Anne Murphy for her continued support, motivation and immense knowledge throughout the supervision of this project. Your expertise, understanding, and patience have added considerably to my graduate experience.

I would like to thank JH and his parents for their consistent attendance, enthusiasm and willingness to participate in this study.

To my fellow colleagues, Oonagh Mc Mahon, Sile O'Shea, Michelle Boles, Melissa Murthaigh & Bridget Scanlon, for the stimulating discussions, support, laughter and all the fun we have had in the last two years.

To my family and friends, particularly my parents, for being a constant source of support – emotional, moral and of course financial – during my postgraduate years. Your continued love and support have allowed me to follow my dreams.

Finally to Kevin, for being there during times when I thought that it is impossible to continue, you helped me to keep things in perspective. Thank you for your patience, unwavering love and for sharing my dreams.
References


Appendix A

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. MIASLT, 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: ____________________________
Appendix B

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 and 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. 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 a HSE Research Ethics Committee.

**Further information and contact details**
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 the address provided. You will then be contacted by phone to arrange an appointment.
Appendix C

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.
Appendix D

Rehearsal Protocol (Gill et al, 2003)

*Sample instructional scripts for the rehearsal strategy training (taken from Gill et al 2003).*

**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 first 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 first.”

**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 first, 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.”
Appendix E

Shape Coding Teaching Order

1. **Who** ◆ **what doing**

2. Teach that can have >1 word per shape and it 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**
   - He ◆ **is** ◆ **running**
   - John ◆ **is** ◆ **cleaning the car**
   - John ◆ **is** ◆ **putting the car in the garage**
   - John ◆ **is** ◆ **washing the blue plate**
   - John ◆ **is** ◆ **washing his sister**
   - John ◆ **is** ◆ **washing the plate**
   - The boy ◆ **is** ◆ **running**
   - The little boy ◆ **is** ◆ **running**
   - John ◆ **is** ◆ **sleeping**
   - John ◆ **is** ◆ **tired**
   - John ◆ **is** ◆ **small**
   - The house ◆ **is** ◆ **small**

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

4. **answers questions of Who or What**

5. **answers questions of Who or What but belongs inside other shapes**
Appendix F

Steps to Shape Coding Therapy

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

a) Introduce the templates showing coordination of NPs in subject position, e.g.,

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’

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

2. ‘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.,

The cow <is jumping (over the fence) and 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’

![Diagram of cow jumping (over the fence) but not 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.

3. ‘And’ vs ‘but not’ (Subject NP + Adjective)

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

![Diagram of ball and hat are red]

b) Relate the coordinated subject to the question word “Who” – discuss how ‘and” means both NPs have the feature of the adjective.

c) Take turns to produce sentences using ‘and’ while the other one draws / colours in the sentence.

d) Introduce template with ‘but not’

![Diagram of ball but not hat is red]
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) has the feature of the adjective.

f) Take turns to produce sentences using ‘but not’ while the other one draws / colours in the sentence

g) take turns to create a sentence matching one of the two templates (‘and’ or ‘but not’) and the other draws / colours in, using template as a guide

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

4. ‘And’ vs ‘but not’ (Adjective Phrase)

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

\[ \text{The cow} \hspace{1em} \text{is} \hspace{1em} \text{big} \hspace{1em} \text{and} \hspace{1em} \text{black} \]

b) Relate the coordinated AP to the question word “What like” – discuss how ‘and’ means the subject has the feature of both adjectives.

c) Take turns to produce sentences using ‘and’ while the other one draws / colours in the sentence

d) Introduce template with ‘but not’

\[ \text{The cow} \hspace{1em} \text{is} \hspace{1em} \text{big} \hspace{1em} \text{but not} \hspace{1em} \text{black} \]

e) Relate coordinated AP to the question word “What like” – discuss how ‘but not’ means subject only has features of the first, not the second adjective (shown by the cross).

f) Take turns to produce sentences using ‘but not’ while the other one 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 draws / colours in

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

i) take turns to create sentences matching one of four templates from sections 4 and 5, other draws / colours in

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

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

\[ \begin{array}{l}
\text{a. the hat and the ball are big but not blue} \\
\text{b. the hat but not the ball is yellow and stripy} \\
\text{c. the hat and the ball are small and black} \\
\text{d. the hat but not the ball is red but not spotty} \\
\end{array} \]

l) take turns to create sentences matching these combine templates, other one draws / colours in
m) when accurate, remove templates, bring back to check responses

5. Neither nor (Subject NP)

a) Revise the templates showing coordination of NPs in subject position with VP. Use ‘neither nor’ as coordinator and discuss how ‘neither nor’ means that not the first and not the second NP are doing the action (shown by crosses)

Neither [the cow] nor [the cat] is jumping (around)

b) Take turns to produce sentences using ‘neither nor’ while the other one acts out the sentence
c) take turns to create a sentence matching one of the three templates (‘neither nor’, ‘and’ or ‘but not’) and the other acts out, using template as a guide
d) when accurate, remove templates, bring back to check responses

6. Neither nor (VP)

a) Introduce template with ‘neither nor’

The cow is neither jumping nor running

b) Relate coordinated VP to the question word “What doing” – discuss how ‘neither nor’ means subject does not do the first, and not the second verb (shown by the crosses).
c) Take turns to produce sentences using ‘neither nor’ while the other one acts out the sentence
d) take turns to create a sentence matching one of the three templates (‘neither nor’, ‘and’ or ‘but not’) and the other one acts out the sentence
e) when accurate, remove templates, bring back to check responses
f) take turns to create sentences matching one of six templates from sections 2,3,6 and 7 other acts out sentence
g) when accurate, remove templates, bring back to check responses
h) Make combinations of the templates using coordinated subjects and/or verbs e.g.,

- Neither the cow nor the cat is jumping and running
- the cow and the cat are neither standing nor jumping
- the cow but not the cat is neither lying down nor sliding
i) take turns to create sentences matching these combined templates, other one acts out sentence
j) when accurate, remove templates, bring back to check responses
7. Neither nor (Subject NP + Adjective)

a) Introduce template with ‘neither nor’

Neither the cow nor the cat is black

b) Take turns to produce sentences using ‘neither nor’ while the other one colours in / draws
c) take turns to create a sentence matching one of the three templates (‘neither nor’, ‘and’ or ‘but not’) and the other one colours in / draws
d) when accurate, remove templates, bring back to check responses

8. Neither nor (Adjective Phrase)

a) Introduce template with ‘neither nor’

The cow is neither big nor black

b) Take turns to produce sentences using ‘neither nor’ while the other one acts out the sentence
c) take turns to create a sentence matching one of the three templates (‘neither nor’, ‘and’ or ‘but not’) and the other one draws / colours in
d) when accurate, remove templates, bring back to check responses
e) take turns to create sentences matching one of six templates from sections 4, 5, and 8, other draws / colours in
f) when accurate, remove templates, bring back to check responses
g) Make combinations of the templates using coordinated subjects and/or adjectives e.g.,
   a. Neither the hat nor the ball is big and blue
   b. the hat but not the ball is neither yellow nor stripy
   c. the hat and the ball are neither small nor black
h) take turns to create sentences matching these combine templates, other one draws / colours in
i) when accurate, remove templates, bring back to check responses

9. Everything together

a) take turns to create sentences using any of the coordinators in any of the positions introduced in any combination, other one act out
b) use templates to check any disagreements
Appendix G

Example Therapy Session

Session 5:
1. Recap – rules of listening – refer to the poster and cue cards (approx 2 mins).

2. Shape Coding – (approx 30 minutes):
   a. Review homework from last week –
      i. use of ‘but not’ in sentences – NP Subject and VP – through ‘Simon Says’ game. Sorting activity worksheet for the shapes ‘cloud’ and ‘hexagon’.
      ii. Concepts – above, through, beside at picture level.
   b. Recap on NP Subject and VP for ‘and’ and ‘but not’ and combine sentences together.
      i. Give JH instructions using subject NP and VP structures to act out (without the shape template), and then bring templates back to check his response were correct.
      ii. Use role reversal – JH give me instructions – he will have shape template to help him – He will have to identify if I did it correctly or incorrectly.
   c. Introduce ‘And’ vs ‘But not’ in the Subject NP and Adjective:
      i. Using blank colouring sheets, JH will have to colour ‘the hat and the book blue’, ‘the hat but not the book blue’.
   d. Introduce ‘And’ vs ‘But Not’ in Adjective Phrase:
      i. Similar to today’s session and following Ebbel’s protocol – I will use some colouring sheets to teach this also – ‘The cow is big and black’ vs ‘The cow is big but not black’ – colour in a big cow brown!
   e. Make combinations of all constructs and ask JH to act them out:
      i. some will be accompanied by the shape template, while others won’t and we will bring the template back to check the response.
   f. Introduce Neither/Nor:
      i. Introduce Neither/Nor (Subject NP) and explain what neither/nor means. Contrast this with ‘And’ and ‘But Not’. I will use the same types of sentences/objects/pictures as today
and mix them together. JH will act out sentences that I make and vice versa.

3. Rehearsal Strategies – (approx 10 minutes):
   a. Introduce ‘each’ and ‘every’ into an activity – introduce and teach using rehearsal. Use game where ‘put a sword on every girl’, ‘put a dot on ‘every’ tree’.
   b. Introduce ‘less than’ – e.g. ‘give the dog less food than the cat’

4. Continue with Comprehension Monitoring – (10 minutes)
   • SSLT will introduce some visual reminders to aid comprehension monitoring.
   • SSLT play a barrier type game with JH, and we will have distractions set up that will interfere with his listening – complex information in the instruction, background noise, turning my back to JH while talking, omitting words in the instructions.
   • I will ask JH to identify what was preventing him from listening/carrying out the directions and problem solve solutions.
Appendix H

Example Rehearsal Instructions

*Activity at object level*

Put the dinosaur beside the tower

Put the dinosaur in front of the castle

Put the car through the tunnel

Fly the plane over the house

*Activity at picture level*

First draw a spider, next draw a tree, last draw a girl

Draw a duck beside the pond

Draw a boy on the swing

Colour the bucket with less apples
Appendix I

Protocol for Teaching Comprehension Monitoring Strategies

Comprehension Monitoring
These steps will be introduced/taught in sessions 1-2, and will be incorporated into the introductory session rules at the beginning of each subsequent session.
The aims of the first session are to:

1 Introduce and discuss why we are here
Ask child why they think you both are here, and if they have had speech and language therapy before. Explain using this ‘script’:

‘You are going to be coming to therapy two times a week. We are going to think about listening and helping our memories and play lots of games to help to become even better at doing these things.’

2 Establish rapport.

3. Discuss becoming a good listener
Discuss what to do to be a good listener. Brainstorm, getting the child’s ideas followed by discussion. Try to elicit the following points from the child, ideally using the child’s suggestions.

- We need to do good sitting.
- We need to do good looking.
- We need to stop talking.
- We need to be sitting still.
- We need to do good listening.

As each idea is backed up by showing the appropriate Boardmaker/visual prompt card and use adult modeling of ‘good’ and ‘bad’ listening using examples of all the rules.

We could introduce playing a guessing game where the child and adult take turns to choose a card with either a ‘good’ or ‘bad’ listening behaviour on it, to model for the other person who has to guess what it is. Once all the points on the list above have been discussed, put ‘good’ Boardmaker/visuals on the wall as a chart to remind the child of the ‘rules’.

4 Introduce the idea of communication breakdown
Introduce the idea of communication breakdown, saying: ‘You might be doing all the things we have talked about to help you to listen but sometimes the person who is talking to you – it might be your friend or the teacher or another grown up – might do something that makes it hard to understand what they have said. So it might not be your fault when you don’t understand. Let’s think about some of the things that can go wrong that make it hard to understand.’
Explain about rate, volume and noise. List some speaker factors that might affect comprehension:

- **Rate** - say: ‘I might talk really really fast so you don’t know what I’m saying.’ Model speaking too quickly.

- **Volume** - say: ‘I might talk so quietly that you can’t hear me, or there might be lots of noise in the room so you can’t hear me.’ Model speaking too quietly.

**Summarise**

At the end of the session explain to the child that they have done a lot of work on things that help us to be good at listening. They should try to remember to do some of these things when they are listening in the session/classroom or to their mum or dad or their friends.
Appendix J

Intervention Protocol

Background
Current research in the area of oral language comprehension is limited. The research that is available largely focuses on pre-school or older school age children (Cirrin & Gillam 2008). Children with Language Impairments often demonstrate poorer receptive language scores in both standardized and non-standardized assessments. This could be attributed to a child’s comprehension skills in language areas such as syntactic structures, the development of new semantic representations in lexical acquisition, verb tense markers, phonological short-term memory deficits and comprehension of more complex argument structures. Law et al has demonstrated the limited research available on interventions for these language deficits, with some authors suggesting that deficits in language comprehension serve to predict more persistent receptive language learning problems in later life (Law et al 2010). Therefore, it is important to evaluate the efficacy of intervention programmes and strategies in treating receptive language problems. Current intervention approaches utilize strategies such as metalinguistic awareness, visualization and rehearsal strategies, direct instruction, and comprehension monitoring.

Research Question
The current research is a pilot study that aims to investigate the efficacy of individually tailored intervention and strategies to improve the oral comprehension skills of children with primary language impairment aged six to nine years old.

Methodology
Recruitment of Participants
It is anticipated that a child aged between 6-9 years old will be selected from the Limerick area with the assistance of the local HSE Speech and Language Therapy community clinic. Selection of participants will be based on specific inclusionary and exclusionary criteria as outlined below:
**Inclusionary Criteria:**

- Children whose primary diagnosis is of a language impairment.
- Participants should have a non-verbal I.Q score of 80 or above in a psychological assessment and have receptive language impairment, but this does not exclude an expressive language impairment.
- The participants will typically have scored ≥ 2 SD below the mean in the Receptive Language Index of the Clinical Evaluation of Language Fundamentals 4 (CELF-4), the CELF Pre-School, the Reynell Developmental Language Scales (RDLS) and Preschool Language Scale (PLS). These assessments would ideally be administered within the past 6 months.
- Finally the participants in this study will be aged between six and nine years old.

**Exclusionary Criteria:**

- Children with an identified co-morbid diagnosis will not be considered appropriate for this research study, e.g. Autism Spectrum Disorder.
- Children whose first language is not English.
- Children should not be attending a language class at the time of intervention.
- Children should not be diagnosed as having a hearing impairment.

**Assessments**

Prior to intervention the following formal assessments will be administered to establish baseline measures:

- Test of Receptive Grammar 2nd Ed (TROG - 2)
- Expression, Reception and Recall of Narrative Instrument (ERRNI)
- British Picture Vocabulary Scale 3rd Ed (BPVS III)
- Bracken Basic Concepts Scale: Receptive (BBCS:R)
- Working Memory Test Battery for Children (WMTB-C)
These tests will provide further information on particular deficits to allow the researchers to adapt the intervention if necessary to the needs of the child. Following administration and analysis of individual results on the formal assessments, criterion referenced tests will be developed. These criterion-referenced tests will be used to tailor the intervention to the child’s specific language deficits, while also serving as an outcome measure pre and post therapy.

**Research Design**

A single subject research study utilizing a pre and post baseline design will be used. Repeated baseline measures post therapy will validate the reliability of initial assessment findings and demonstrate if a treatment effect was observed in post intervention assessments. Due to the heterogeneity of the population under investigation, single case studies have been demonstrated to be more appropriate than randomized control trials for studying the effects of a particular treatment (Franklin 1997).

A control task of untreated targets will be used to ensure treatment-specific effect. The untreated targets will be chosen based on the participant’s specific deficit as identified through pre-test assessments, for example, an expressive language task.

**Treatment Fidelity**

Students will alternate between carrying out treatment and observing the other student, to maintain treatment fidelity and ensure reliability and validity of results.

**Therapy**

**Brief Plan**

Therapy goals will be decided based on performance in outlined assessments. Each intervention will be client specific and mapped to deficits in specific areas of language comprehension. The chosen intervention aims to teach both individual targets and strategies to support generalisation following intervention. Intervention sessions will take place at the University of Limerick.
Clinic. It is anticipated that intervention will commence in February 2013. Intervention will involve:

- **Assessment Phase:** Attendance in the clinic over two days for 1 hour sessions to complete assessments
- **Intervention Phase:** Attendance in the clinic twice a week over a five week period for the intervention sessions.
- **Follow-Up Phase:** After the intervention phase is complete, attendance in the clinic for one session to complete a follow up assessments.

**Results**

An inferential non-parametric analysis will be employed to compare the child’s performance on pre and post assessment measures. This analysis will demonstrate if a statistically significant difference is demonstrated with intervention. Results will be presented visually through the use the graphs.
## Appendix Ka

**Shape Coding Therapy Data Sheet**

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<th>Target Structure</th>
<th>Task Type</th>
<th># Trials</th>
<th>Frequency</th>
<th>% Correct</th>
<th>Comments</th>
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<td>e.g. Shape Matching, Role Reversal</td>
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Appendix Kb

Recording Progress for Memory Strategies

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<th>Date</th>
<th>Session No</th>
<th>Strategy Used</th>
<th>Level of Instruction</th>
<th>Repetitions/Cues Needed</th>
<th>% Cues Needed</th>
<th>Self-Corrections</th>
<th>Other Comments</th>
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General Observation:
Appendix I

Sample Homework Activity: ‘And’ vs ‘But Not’ & ‘Neither/Nor’

To reinforce Jack’s understanding and use of ‘but not’ and ‘neither/nor’, it is important that you provide him with lots of examples. Here are a few sentences you can say when you are in the car with him/play around the home. Try to use them when commenting on something you are doing at that moment: You could say out loud:

1. Mammy is driving but not talking on the phone.
2. Mammy is watching TV and talking.
3. Mark is neither playing the DS nor watching TV.
4. Jack is building the Lego and laughing.
5. Jack’s bike is neither yellow nor pink.
6. Jack is neither eating nor talking.
7. Mammy but not daddy is cooking.
8. The bike is big and red.
9. Neither Mark nor Jack is sleeping.
10. Jack but not Mark is doing homework.
11. Neither Dad nor Jack is watching TV.
12. Mark but not Jack is playing the DS.
13. Mammy is neither sitting nor standing.
14. Neither the coat nor the trousers are dirty.
15. The clothes are neither dirty nor wet.

Instructions using ‘and/but not’ around the house:

1. Get me your socks and shoes
2. Get me your socks but not your shoes
3. Pass me the knife and fork
4. Pass me the knife but not the spoon
5. Give me your Math’s book and your English book (name of book)
6. Give me your English book but not your copy
7. Give me your pencil but not your ruler
8. Put on your blue t-shirt but not your jumper
9. Take off your shoes but not your socks.