The Efficacy of the Mixed Up Marty Home Programme in resolving Phonological Delay and Disorder

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Abstract

Background: Children with Speech Sound Disorders (SSDs) comprise the majority of paediatric Speech and Language Therapists caseloads. Current resource limitations lead to delayed intervention, increasing the risk for negative consequences for these children. A parent-implemented home programme could provide an evidence-based therapy tool to be implemented immediately upon diagnosis of a SSD, specifically a phonological delay or disorder.

Objective: To evaluate the efficacy of a parent-implemented home programme in improving the speech of children with phonological delay or disorder.

Methods: Twelve children (aged 3:02 to 4:05) diagnosed with phonological delay or disorder alongside their parents participated in the study. Recruitment was on a voluntary basis. Following initial assessment, parents received two hours training in the administration of the Mixed Up Marty Home Programme. Efficacy was measured using a Pre-Post design comparing a widely used metric of speech accuracy, Percentage Consonants Correct (PCC) on the Diagnostic Evaluation of Articulation and Phonology (DEAP) and in a constrained connected speech sample elicited using pictures from the Renfrew Action Picture Test (RAPT). Six children received Treatment Now (Tnow) and six children acted as a control and received Treatment Later (TLater). The programme, consisting of input-based phonological awareness activities, was carried out over seven weeks.

Results: Statistical analyses revealed the difference in PCC between groups was not clinically significant.

Conclusions: Possible reasons for the lack of success were identified. These include programme content, severity of diagnosis, high levels of variability within the sample used and short administration time. The programme warrants modification and further investigation before being considered as a clinical tool in the treatment of SSDs.

Keywords: Speech Sound Disorders (SSDs), Phonological delay, Phonological disorder, Home Programme, Percentage Consonants Correct (PCC).
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Introduction

Children with Speech Sound Disorders (SSDs) in Ireland spend longer than recommended on waiting lists for therapy placing them at risk for a variety of negative consequences (RCSLT 2010). It is proposed that a parent-implemented home programme grounded in evidence-based therapy principles provided by a Speech and Language Therapist (SLT) could provide an effective service delivery option in providing a solution to therapy access for children with SSDs.

Speech Sound Disorders

Prevalence

A systematic review by Law et al (2000) proposed 6% as an indicative figure of children with SSDs within the general population. Studies comparing figures in the Irish context are limited and figures for this population are less clear. A survey from “Growing up in Ireland: The National Longitudinal Study of Children,” indicated 7.8% of parents in Ireland had concerns directly related to their child’s speech production (Rooke et al 2012); a figure slightly higher than the Law et al (2000) estimated 6%. Data from the UK also suggest approximately 40% of paediatric SLT case loads are made up of children with the subtypes of SSDs known as phonological disorder and delay (Joffe and Pring 2008, Broomfield and Dodd 2004). As such, there are a large number of children presenting for therapy each year whose primary difficulty is speech sound production.

Therapy Access and the Impact of Delayed Intervention

SSDs impact intelligibility and have been shown to increase the risk of negative educational, vocational and social consequences in both the short and long term (Felsenfeld et al 1994, RCSLT 2010). A systematic review by McCormack et al (2009) revealed an elevated risk of literacy problems as well as reduced levels of participation across the life-span as a result of unresolved SSDs. These consequences of a phonological impairment as experienced by children must be considered in treatment and management. Intervention before children with SSDs begin school is recommended in the treatment of SSDs (Williams et al 2010). However, current resource limitations in Ireland are interfering with this. A recent report by Inclusion Ireland revealed 15,700 children in Ireland were on the waiting list for speech and language therapy in February 2014 (Conroy and Noone, 2014). The Wait Times Benchmark for SSDs in Canada proposes a maximum of three and eight months for high and low risk candidates respectively (Rvachew and Rafaat 2014). In the UK children wait a maximum of ten months for therapy (RCSLT 2010). Overall wait times in HSE services for speech and language therapy in 2012 were fifteen to eighteen months (Hayes et al 2012). International standards therefore suggest a service delivery model in Ireland which cannot cope with demand. Where service delivery is impacting on the efficacy of intervention Rvachew and Rafaat (2014) suggest the provision of services via paraprofessionals as a potential solution. Such a collaborative model of
service delivery e.g. a parent-implemented home programme may provide a pragmatic solution for therapy access.

**Service Delivery**

The efficacy of the traditional clinician-directed one-to-one model of service delivery for speech and language therapy has a wealth of support and predominates in current practice as revealed by a systematic review in the UK (Law et al. 2000). Over the past few years the roles of the SLT and parents have changed considerably from the traditional model to an increasingly collaborative model of service delivery which involves parents in many aspects of therapy including provision (Williams et al. 2014). This is based on two things. International policy now mandates family participation in paediatric allied health intervention (Franck and Callery 2004). Secondly empirical findings indicate parental involvement in intervention can improve intervention outcomes. An example of this within the SSD literature was the finding that therapy delivered in the home by parents who had been trained by an SLT resulted in children performing as well and in some aspects, significantly better, than a clinic-based group on measures of speech and language functioning (Eiserman 1990).

Further afield in the USA the Response To Intervention (RTI) model of service delivery also reflects the collaborative work of the SLT with significant others in the child life such as the teacher and parents. The RTI approach is as a proactive multi-tiered intervention approach grounded within empirical research literature which has been cited as having the potential to reduce false positive or false negative diagnoses and promote early intervention (Justice 2006). One example is the Speedy Speech programme in a school in Highland Park Illinois where collaborative work is utilised as a screening tool, identifying those children in need of more intensive intervention, thereby facilitating optimal caseload management and allocation of therapy resources (Butler and Nelson 2005). This is of particular relevance in Ireland where a similar approach could be used to combat resource constraints. The efficacy of a specific collaborative model of service delivery, i.e. parent-implemented intervention for SSDs is now considered in detail.

**Parent-Implemented Intervention**

Literature surrounding parent-implemented phonological intervention boasts mixed results and is less abundant or well-documented than traditional clinician-directed one-to-one therapy (Elomari 2012). This may in part be due to predominately efficacy-based evidence i.e. research under clinical conditions, with a dearth of effectiveness-based research or studies in real-life conditions (Baker and McLeod 2011). A number of studies which were similar in nature utilised parent-implemented intervention to achieve improvements in both speech accuracy as well as long term academic and
social consequences (Brady 2011, Eiserman 1990, Ianco et al 1998). Studies utilising parents as agents of therapy have also been shown to indicate high levels of acceptability e.g. parent would recommend this approach to therapy (Gardner 2006). As noted however, the evidence that parent-implemented therapy is superior to traditional clinician directed intervention is limited with unpublished results where parent-implemented home programmes have failed to result in statistically significant improvements in speech accuracy (Meaney 2013). There are a number of factors which may influence the success of parent-implemented intervention and research is needed to examine the degree and nature of parental involvement necessary in order to achieve efficacious intervention (Eiserman et al 1995).

**Parent Training**

Gardner (2006) stated that parent-implemented home programmes offer the potential for effective therapy when provided with training in appropriate implementation. Brady (2011) trained parents for two hours in the provision of a home programme which focused on speech perception and Minimal Pair production therapy. The study found a 17% increase in speech accuracy as measured by percentage consonants corrects (PCC) after the 6-week parent-implemented home programme. Results should however be interpreted with caution due to small sample size and the lack of comparison with a clinic-based therapy. Meaney (2013) implemented a similar input-focused home programme in the absence of parent training and found no significant improvement in articulation accuracy for a group of children with SSDs. The importance of parent training is further highlighted in a study by Shelton et al (1978). Results indicated a lack of significant change, attributed to the fact parents had not been shown how to correctly implement the activities and the use of a “one-size-fits all,” approach. Although the component parts of these interventions differed in nature, parent training appears to be associated with greater improvements in speech accuracy and is therefore recommended.

As with all methods, parent-implemented therapy is not without limitations. Issues are evident in the literature regarding parent stress, competency of therapy delivery, compliance and the costs, monetary and non-monetary for the family (Eiserman et al 1995, Lancaster et al 2010, Gardner 2006). Careful consideration and appropriate training can successfully offset such potential issues. The studies outlined in this section provide preliminary evidence for parent-implemented therapy with a need for more large-scale well controlled studies highlighted by Eiserman (1995).
**Treatment Approaches**

**Input-focused intervention**

Research suggests the most suitable intervention in one which targets underlying deficits (Dodd and Bradford 2000). There is a growing evidence base for a causal relationship between speech perception and language production (Jamieson and Rvachew 1992, Shiller and Rochon 2014). Early research in this area failed to identify such a relationship (Rvachew et al 2004). This was attributed to the use of methodologically inappropriate tasks which failed to provide information of the child’s underlying phonological representation (Locke 1980). The use of more appropriate methodologies, specifically word identification tasks have led to a different conclusion. A review of the literature concluded that children with SSDs commonly experience difficulties in speech perception reflected by poor underlying knowledge of the sound system (Jamieson and Rvachew 1992). The highest level of evidence in support of input-focused intervention comes from a randomized controlled trail by Rvachew and Brosseau-Lapré (2012a). Outcomes revealed similar gains in articulation accuracy for children whether assigned to either input or production-focused intervention. Further support has come from a recent article by Schiller and Rochon (2014) which saw speech motor adaptation directly influenced by a child’s ability to perceive acoustic properties of speech.

Ensuring good perceptual phonological knowledge is an important part of any programme as children acquire speech through the input surrounding them (Gierut and Morrisette 2014). Focused Stimulation, i.e. providing exposure to high quality input in a learning context, can alter a child’s underlying perceptual knowledge, specifically the acoustic-phonetic representation of words, by increasing the frequency and salience of the targets. A randomised control trial using such an approach revealed an improvement in speech production for children with SSDs similar to that of an intervention which targeted speech production (Rvachew and Brossueva-Lapré 2012b). The intervention in this study was carried out over twelve weeks with eighteen children who received speech perception intervention in the clinic and parent-administered dialogic reading in the home. Results indicate input-focused intervention effected a change at both the productive and perceptual levels and suggests the utility of such an approach in the treatment of SSDs (Rvachew and Brossuea-Lapré 2012b). A note of caution from the authors stressed that results were contingent upon all intervention components being administered with sufficient intensity with lesser improvements in speech accuracy in the absence of this.

Priming is another input-focused mechanism which has been shown to be effective in the maintenance and generalization of phonological learning in the treatment of children with phonological delay (Gierut and Morrisette 2014). Specifically, nine preschool children with SSDs took part in the single-subjects design. The children each received one hour of treatment three times a
week which consisted of priming followed by treatment on sound production. Results from the study indicated priming improved phonological generalisation when delivered in the auditory modality. Words from dense lexical neighbourhoods that overlap in rhyme structure with words which are to be treated e.g. tie and guy were used to improve the abilities of children with SSDs to imitate these forms. These results provide preliminary evidence for auditory priming as a learning mechanism facilitating the child in forming internal representations and learning new words (Gierut and Morrisette 2014).

**Common Intervention Approaches in the Remediation of SSDs**

**Phonological Contrast Therapy**
One of the oldest and most widely used approaches to phonological intervention with an empirical base spanning more than twenty-five years is Minimal Pairs (MP) contrast therapy (Williams et al 2010, Broomfield and Dodd 2004). Minimal Pairs is often used as a production component of a therapy and is most appropriate for children between 3;0 and 6;0 with a mild to moderate phonological impairment in the absence of concomitant hearing, oromotor or language difficulties (Williams et al 2010). The goal is to reorganise the child’s linguistic system by confronting the child with the semantic confusion caused by the homonymy in their system. Learning is achieved via a communication breakdown with the child motivated to produce the correct sound to avoid or remediate the confusion. An example of Minimal Pairs in action might be where the child acts as teacher, telling the SLT to pick up one of two pictures depicting minimal pairs e.g. ring and wing. Where the child is substituting /w/ for /r/ and asks the SLT to pick up the wing when they actually meant to say ring the desire to be understood facilitates the change in the child’s speech. This in turn facilitates the suppression of atypical and delayed typical speech processes. This is the most distinctive aspect of the approach s children learn that the sound contrast results in successful communication. As the approach is quite technical therapy is generally administered by the clinician. The efficacy of an input-focused Minimal Pair-type activity would eliminate this difficulty and could potentially be administered via parents. However, such an approach warrants investigation.

**Phonological Awareness (PA) Therapy**
The aim of this type of therapy is to improve phonological awareness, which is an essential skill for reading and has been shown to be lacking in children with SSDs (Gillon 2004). Skills which make up Phonological Awareness include segmentation or identification of the first or last sound in a word e.g. having a child tell you what the first sound in the word “mop,” is. Integrating PA in therapy with production based tasks has proved to be equally effective in improving speech accuracy as using production based tasks alone, with the added value of improving PA too (Ehri et al 2001). The approach is considered suitable for children around the age of four with SSDs who have the
cognitive capacity to benefit from meta-linguistic tasks as well as the physical potential to improve their speech. Gillon (2000) has demonstrated that integrating PA into speech therapy demonstrates speech outcomes comparable to those of production-based intervention alone. A study by Rvachew et al (2004) carried out sixteen sessions of therapy using phonological awareness on a group of thirty-four children and discovered greater gains were made in speech accuracy than a control who received no therapy. In the past the PA approach has incorporated production e.g. used alongside Minimal Pairs to emphasise the necessity to change speech alongside increasing awareness of how to do so.

Study Aims
There is a substantial evidence base in support of Minimal Pairs, Phonological Awareness and input-focused intervention in isolation via the traditional clinician-led model of service delivery. The provision of speech and language therapy in the form of an input-focused parent-implemented home programme grounded in evidence-based therapy principles is a potential service delivery option and would add to the existing evidence base outlined above in support of such an approach. One such programme created specifically to investigate the concept of parent-implemented intervention is the Mixed Up Marty Home Programme. The Programme consisted of a manualised intervention made up of activities grounded in evidence based therapy principles to promote phonological development. Previous production-based versions of this programme have added to preliminary evidence for parent-implemented home programmes in the remediation SSDs (Brady 2011) but no research has been carried out on the current input-based version of the programme. The aim of the current study is to evaluate the efficacy of the input-based version of the Mixed Up Marty Home Programme in improving the speech accuracy of children with SSDs. The following is hypothesised:

1. Children who receive the Mixed Up Marty Home Programme will show greater improvement in terms of PCC than a no treatment control group.
2. The Mixed Up Marty Home Programme will generalise to real life as measured by parent ratings of communication participation skills.
3. Parents will find the utilisation of such a programme highly acceptable.
Methodology

Summary of Intervention

The Mixed up Marty Home Programme is grounded in the evidence based therapy principles outlined in the introduction and was designed to be administered in the home by parents for fifteen minutes per day, six days a week for seven weeks. The fifteen minutes was made up of three five minute activities of which one was to always be a Mixed-Up Sound Story. The Home Programme contained five different types of activities to promote phonological development (Appendix A for examples of activities and instructions). Star charts were also included in order to provide motivation for the children. It is a common challenge for a clinician to ensure compliance in any treatment programme that requires parents (Millard, Nicholas and Cook 2008). The Home Programme Diary (Appendix B) completed by parents detailing activities completed each day alongside a phone call midway through the programme encouraged compliance and fidelity with the Home Programme as well as providing treatment verification data. All participants received identical materials with clear instructions on how each activity was to be carried out. The activities are outlined as follows:

Mixed Up Sound Stories and Activities

These stories were written specifically for the programme and target a variety of speech processes e.g. fronting. The stories emphasise the semantic confusion caused by Marty and his friends mixing up their words due to speech errors e.g. asking for two teas instead of two keys. The ultimate goal of the stories is formed on the basis of the MP approach i.e. to confront the phonological system of the child to recognise similarities and differences between sounds and how they can mark differences in meaning. A previous study by Brady (2011) revealed that it was difficult to train parents in administering a minimal pair type intervention that focused on producing the correct sound. The Mixed Up Sound Stories provide a solution to this as it is input-focused and so only requires the child to listen to a story character making the speech error. Each story had a follow on activity to reinforce the sound contrast highlighted in the story. Exposure to errors aims to motivate the child to make a change to their own speech to avoid confusion, thereby facilitating speech development.

Sounds Different Stories

Stories containing words from dense lexical neighbourhoods were created and read aloud by parents in the same way as a nursery rhyme. This activity was based on Gierut and Morisette’s (2014) finding that auditory priming in dense lexical neighbourhoods, which incorporate the phonological similarity of words with the finding that it makes the treatment generalise better for children with SSDs. The words within the stories were designed to act as near minimal pairs and were read aloud to the children like a nursery rhyme.
Phonological Awareness Activities
These activities were primarily aimed at improving the child’s phonological awareness and letter-sound knowledge. They consisted of Nursery Rhymes and Rhyming Characters. Parents were instructed to read and talk about these with their child with the aim of targeting skills such as syllable awareness, onset-rime awareness, facilitate early phonological and phoneme awareness as well as acting as near minimal pairs (Gillon 2004).

Scrapbook
Each page in the scrapbook is given to a different sound and words beginning with that sound are then stuck onto the page. Where the child is making a particular substitution e.g. /t/ to /k/ then these sounds were presented on opposite pages to make the difference salient. The purpose of this activity was to teach identification of the first sound of a word to increase phonological awareness.

Making Long Words
This activity also utilises principles of phonological awareness in order to get the child to focus on word structure and eliminate the phonological process of Weak Syllable Deletion where present. The activity involves using a number of pictures which illustrate words and having the child combine these in order to make a new long word e.g. lady and bird makes ladybird. The aim is to illustrate to the child that all elements must be included to make the new words and have the correct meaning.
Making New Words
This sound pattern activity targets the underlying deficits associated with phonological disorder such as poor phonological awareness (Holm and Dodd 2010). The “making words,” activity involved the child being given a picture of a word e.g. bow. The child then picked a phoneme and was shown how adding a phoneme to the beginning or end of a word changed the meaning e.g. adding /t/ to get /boat/. The activity therefore targets word structure as well as illustrating how substitution of a different sound effects a change in meaning.

Ethical Approval and Consent
Ethical approval was obtained from the Research Ethics Committee University Hospital Limerick. Informed written consent was acquired from the parents of the participants prior to the start of the study (See Appendix C for copy of consent form and parent information sheet).

Research Design
This study used a Pretest-Posttest design with a treatment later control group and random allocation to both groups to evaluate the efficacy of the Mixed Up Marty Home Programme.

- Dependant variable: Percentage Consonants Correct (PCC)*
- Independent variable: Group.
  - Treatment Now (TNow): Received the programme immediately.
  - Treatment Later (TLater): Control group for comparison.

*Phonological Awareness (Real-Word and Non-Word Discrimination) and Language skills (RAPT) were also assessed formally and informally. Results from these using the same participants are reported elsewhere as they do not pertain directly to the aims of the current study.

Participants
Recruitment
Recruitment was on a voluntary sample basis. Parents with eligible children who were on SLT service waiting lists for initial assessment as a result of a referral of speech sound difficulty. These parents were sent a letter by the SLT manager offering them an opportunity to participate in the project.

Inclusionary and Exclusionary Criteria
The inclusion criteria stipulated that participants were aged between 3;0 and 4;11 and were monolingual English speaking children (due to the fact bilingual children have different phonological systems (Paradis 2001)) and all testing materials are in English only. Participants were excluded based on the following: currently receiving speech and language therapy, speech deficits due to structural or organic causes or an additional diagnosis of cognitive or sensory difficulties.
Fourteen children attended for initial assessment with two excluded from the study, one due to non-compliance during initial assessment and the other was currently in receipt of speech and language therapy and was therefore omitted based upon the exclusionary criteria. A total of twelve children (seven boys and five girls) were ultimately included in the study, leaving the researcher with a sample comparable to those used in the majority of studies in the field of SSDs.

Materials

- **Case History Form (Appendix D):** Questions designed to establish any relevant background information including risk factors and ensure adherence to all inclusionary and exclusionary criteria.

- **FOCUS Questionnaire: (FOCUS on the Communicative Outcomes of Children under Six, Thomas-Stonell et al 2010):** Outcome tool used by clinicians in measuring change in the communication participation skills of preschool-aged children by parents rating their agreement with a series of questions on a scale of one to seven.

- **Diagnostic Evaluation of Articulation and Phonology (DEAP; Dodd et al 2002).** Provides a norm-referenced score for an appropriate age-range of children and is standardized on a UK, Australian and US population (Williams et al 2010) as well as the Irish population (Dodd et al 2002).
  - **Diagnostic Screen:** Picture naming involving the elicitation of ten words on two separate occasions in order to assess the need for further assessment with regard phonological inconsistency, stimulability and error patterns.
  - **Phonology Subtest:** Picture naming involving the elicitation of fifty words that contain all speech sounds in word initial and word final position in order to assess phonological ability and establish error patterns.

- **Parent Likert Questionnaire (Appendix E):** Outcome tool designed to measure parents overall perception of the Home Programme by asking them to rate their agreement with a series of ten questions on a scale of one to five.
**Assessment Procedure:**
Table 1 details the assessments and the order in which they were carried out at T1 and T2:

<table>
<thead>
<tr>
<th>Initial Assessment (T1)</th>
<th>Post Home Programme assessment (T2)</th>
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<tbody>
<tr>
<td>Case History</td>
<td>Parent Likert Scale</td>
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<tr>
<td>FOCUS Questionnaire</td>
<td>FOCUS Questionnaire</td>
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<tr>
<td>DEAP Diagnostic Screen</td>
<td>DEAP Phonology Subtest</td>
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<td>DEAP Phonology Subtest</td>
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Table 1: Assessment Materials T1 and T2

**Initial Assessment (T1)**
Assessment sessions lasted approximately forty-five minutes and took place in a quiet clinic environment with minimal distractions. In all cases a lead researcher, who carried out the assessment on the child, a second researcher who carried out secondary transcription and a minimum of one parent were present. Following T1 children were randomly assigned by selecting either a red or a yellow coin from a bag, to one of the two groups: TNow or TLater.

- **Case History:** Administered in order to determine any relevant background information, risk factors as well as adherence with inclusionary and exclusionary criteria.
- **FOCUS:** Administered and scored according to the instructions in the manual in order to establish a baseline for parent’s perception of the impact their children’s SSDs on their child’s everyday communication functioning and participation.
- **DEAP:** Administered and scored according to the instructions in the manual to establish a diagnosis, baseline PCC as well as the characteristics of each child’s speech errors in accordance with the criteria specified in the manual (Dodd et al. 2002).

**Parent Training and Delivery of Home Programme**
Following the initial assessment parents of the children in TNow received the Home Programme and attended a two hour compulsory training evening organised by four student SLT’s and the supervising SLT (see Appendix F for parent training presentation). The training consisted of a presentation detailing programme content, target delivery of the programme along with examples of ways in which to model and recast speech in order to promote and facilitate phonological development. Following the presentation the parents were given the opportunity to practice administration of the various activities on a one-to-one basis with the student SLTs in order to ensure they were confident in administration of the programme. All children receive the same activities which were delivered in fortnightly episodes in a comic-book format. Training involved researchers explaining thoroughly all activities contained within the programme including how to
carry them out. Parents were instructed to carry out the programme for fifteen minutes, six days a week over the following seven weeks. Parents of children in TLater were informed that they would receive the same programme and training in seven weeks and to carry on as normal in the interim.

**Reassessment (T2)**

Seven weeks later parents and their children were invited to attend a reassessment session where the following were administered:

- **FOCUS**: Administered and scored according to the instructions in the manual in order to establish post intervention figure (T2) for parent’s perception of the impact their children’s SSDs on their child’s everyday communication functioning and participation.
- **DEAP**: Administered and scored according to the instructions in the manual to establish any change in diagnosis, post-intervention (T2) PCC as well as the characteristics of each child’s speech errors in accordance with the criteria specified in the manual (Dodd *et al* 2002). In order to rule out any effects of familiarity due to the re-administration of the DEAP within a short time frame alternative pictures for stimulus items were used. The pictures were chosen by the lead researcher with 100% agreement ratings from the secondary researcher.
- Likert questionnaire in order to measure parental perception of the acceptability of the Home Programme.

**Outcome Measures**

**Hypothesis 1**: Children who receive the Mixed Up Marty Home Programme will show greater improvement in terms of PCC than a no treatment control group.

- **Speech Accuracy**
  - Single Word (DEAP)
    - PCC
    - Severity (Standard Scores)
  - Connected Speech
    - PCC

**Hypothesis 2**: The Mixed Up Marty Home Programme will generalise to real life as measured by parent ratings of communication participation skills.

- Generalisation of communication participation skills
  - FOCUS Total Scores
Hypothesis 3: Parents will find the utilisation of such a programme highly acceptable.

- Programme Acceptability
  - Parent rating (Likert Scale)

Reliability
Two researchers transcribed during each assessment session, one of whom carried out the assessment with the other observing. Sessions were audio recorded using an Olympus WS-832 Digital Voice Recorder. Transcriptions were verified for accuracy against the audio recording with discrepancy between transcriptions resolved by listening back to the audio recording. A 95% agreement was reached over phonemic transcriptions with the lead researcher having the final say. The same lead researcher assessed each participant at T1 and T2 in order to eliminate issues relating to inter-rater reliability by having the same individual carry out the assessment at both times.
Results
The results of the study are presented both descriptively and using quantitative data. Non-parametric tests were chosen based on the small sample size and the finding that not all of the data was normally distributed. PCC was chosen as it is the most widely used metric in measuring speech accuracy in speech disorders (Lawrence et al 1997). Correlational analysis between single word and connected speech PCC highlighted a strong relationship between changes in single word and connected speech accuracy ($r=.87$, $n=12$, $p=0.00$), indicating PCC scores at single word level to be closely associated with scores in connected speech, adding confidence to the use of PCC as a measure of change.

Characteristics and Baseline measures of Participants
Table 2 reports details and baseline data for all participants.

<table>
<thead>
<tr>
<th>Group</th>
<th>No</th>
<th>Gen</th>
<th>Age</th>
<th>Diagnosis</th>
<th>PCC T1</th>
<th>Severity (Standard Score)</th>
<th>Prev. Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNow</td>
<td>4:2 M:F</td>
<td>1</td>
<td>F</td>
<td>42 (3;06) Phonological Delay</td>
<td>75</td>
<td>Mild (6)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>F</td>
<td>47 (3;10) Consistent Phonological Disorder</td>
<td>62</td>
<td>Severe (3)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>M</td>
<td>38 (3;02) Consistent Phonological Disorder</td>
<td>29</td>
<td>Moderate (4)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>M</td>
<td>42 (3;06) Phonological Delay</td>
<td>63</td>
<td>Severe (3)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>F</td>
<td>50 (4;02) Consistent Phonological Disorder</td>
<td>63</td>
<td>Severe (3)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>F</td>
<td>44 (3;08) Phonological Delay</td>
<td>80</td>
<td>Borderline (7)</td>
<td>No</td>
</tr>
<tr>
<td>TLater</td>
<td>3:3 M:F</td>
<td>2</td>
<td>M</td>
<td>45 (3;11) Consistent Phonological Disorder</td>
<td>65</td>
<td>Severe (3)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>M</td>
<td>53 (4;05) Consistent Phonological Disorder</td>
<td>71</td>
<td>Moderate (4)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>M</td>
<td>40 (3;04) Consistent Phonological Disorder</td>
<td>55</td>
<td>Mild/Moderate (4)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>M</td>
<td>47 (3;11) Consistent Phonological Disorder</td>
<td>50</td>
<td>Severe (3)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>F</td>
<td>49 (4;01) Phonological Delay</td>
<td>64</td>
<td>Severe (3)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>M</td>
<td>53 (4;05) Consistent Phonological Disorder</td>
<td>59</td>
<td>Severe (3)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 2: Participant Information at baseline (T1)

Hypothesis 1: Effect of the Home Programme

Group Analyses
Table 3 depicts the change in mean and standard deviations on speech accuracy, generalisation to everyday life as well as the number of processes for each child for each of the groups at T1 and T2. Significant improvements were not noted on any of these measures for either group indicating that...
overall children in the treatment and the control groups did not experience significant improvement in their speech accuracy or everyday communication abilities at T2.

<table>
<thead>
<tr>
<th></th>
<th>DEAP PCC Mean (SD)</th>
<th>Connected Speech PCC Mean (SD)</th>
<th>FOCUS Mean (SD)</th>
<th>No. Of Processes Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TNow</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>62 (17.8)</td>
<td>72.5 (15.6)</td>
<td>235.83 (53.05)</td>
<td>3.83 (1.94)</td>
</tr>
<tr>
<td>T2</td>
<td>64 (18.45)</td>
<td>71.67 (16.07)</td>
<td>252.5 (16.07)</td>
<td>3.5 (1.64)</td>
</tr>
<tr>
<td><strong>TLater</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>60.67 (7.55)</td>
<td>72.33 (11.09)</td>
<td>262 (33.31)</td>
<td>4.17 (1.47)</td>
</tr>
<tr>
<td>T2</td>
<td>62.83 (12.67)</td>
<td>74.67 (12.78)</td>
<td>265.5 (26.39)</td>
<td>4.5 (1.87)</td>
</tr>
</tbody>
</table>

Table 3: Mean and Standard Deviation scores per group at T1 and T2

**Between Group Effect**

**Baseline (T1)**

A Mann Whitney U Test and a Crosstabs analysis were conducted to investigate any difference between groups pre-intervention and revealed treatment groups to be comparable. The crosstabs Chi-square test for independence (with Yates Continuity Correction) indicated no significant association between the categorical variables of Gender $\chi^2 (1, n=12) = 0.00, p=1.0$ or Dodd Classification $\chi^2 (2, n=12) = 0.38, p=0.54$ between the groups. A Mann Whitney U further revealed there was no significant difference at baseline between the groups, TNow and TLater in terms of:

- **Age** (TNow (Md=47, n=6) and TLater (Md= 49.5, n=6) $U=9.5, z=-1.37, p=0.17$
- **DEAP PCC T1** (TNow (Md=47, n=6) and TLater (Md= 49.5, n=6) $U: 15.0, z=-0.48, p=0.63$
- **Connected Speech PCC T1** (TNow (Md=47, n=6) and TLater (Md= 49.5, n=6) $U=15.5, z=-0.40, p=0.6$
- **DEAP Standard Scores T1** (TNow (Md=47, n=6) and TLater (Md= 49.5, n=6) $U=13.5, z=-0.81, p=0.42$

Results therefore indicated that both groups were equivalent before the intervention was conducted. The following graphs depict the changes in speech accuracy for each participant;
Figure 3: Changes in DEAP PCC pre and post intervention

Figure 4: Changes in Connected Speech PCC pre and post intervention

Figure 5: Changes in DEAP Standard Scores pre and post intervention
Post Intervention (T2)
Having established that both groups did not differ significantly before receiving the Home Programme (T1), a Mann Whitney U Test was conducted to investigate any difference between groups post intervention. Results indicated the programme had no effect on speech accuracy at the group level based on a lack of significant difference between the groups at T2 in terms of:

- **DEAP PCC T2** (TNow (Md=47, n=6) and TLater (Md= 49.5, n=6) U=15.5, z= -0.40, p=0.69)
- **Connected Speech PCC T2** (Tnow Md=57.5, n=6) and TLater (Md=69, n=6) U=15.0, z= -0.40, p=0.69)
- **DEAP Standard Scores T1** (TNow (Md=47, n=6) and TLater (Md= 49.5, n=6) U=13.5, z=-0.81, p=0.42)

Within Group Effect

**Analysis of Individual Results**
It is clear from figures 2 and 3 that some of children made small improvements in PCC from T1 to T2. Table 4 depicts the individual changes in PCC for each child as measured using the Fishers Exact Test. This revealed a statistically significant increase in DEAP PCC for one child in TLater.

<table>
<thead>
<tr>
<th>Group</th>
<th>No.</th>
<th>M/F</th>
<th>Age (months) T1</th>
<th>PCC T1</th>
<th>PCC T2</th>
<th>Fishers Exact p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNow</td>
<td>1</td>
<td>F</td>
<td>42 (3;06)</td>
<td>75</td>
<td>84</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>F</td>
<td>47 (3;10)</td>
<td>62</td>
<td>62</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>M</td>
<td>38 (3;02)</td>
<td>29</td>
<td>33</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>M</td>
<td>42 (3;06)</td>
<td>63</td>
<td>61</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>F</td>
<td>50 (4;02)</td>
<td>63</td>
<td>62</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>F</td>
<td>44 (3;08)</td>
<td>80</td>
<td>82</td>
<td>0.88</td>
</tr>
<tr>
<td>TLater</td>
<td>2</td>
<td>M</td>
<td>45 (3;11)</td>
<td>65</td>
<td>65</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>M</td>
<td><strong>53 (4:05)</strong></td>
<td><strong>71</strong></td>
<td><strong>82</strong></td>
<td><strong>0.04</strong></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>M</td>
<td>40 (3;04)</td>
<td>55</td>
<td>49</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>M</td>
<td>47 (3;11)</td>
<td>50</td>
<td>49</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>F</td>
<td>49 (4;01)</td>
<td>64</td>
<td>71</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>M</td>
<td>53 (4;05)</td>
<td>59</td>
<td>60</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Table 4: Individual changes in PCC

Based on these results the first hypothesis, that children who receive the Mixed Up Marty Home Programme will show greater improvement in terms of PCC than a no treatment control group, is not supported. The analyses indicate that the intervention group did not make more gains than the
non-intervention group and no individual in the intervention group experienced a significant improvement in speech accuracy as measured by PCC.

**Hypothesis 2: Generalisation of communication gains to real life**

**Between Group Effect**
A Mann Whitney U Test was used to investigate the overall change in FOCUS scores, which measure the impact of SSDs on children in their everyday lives. Results indicated the groups did not differ significantly on this measure either before or after the Home Programme was administered.

<table>
<thead>
<tr>
<th>FOCUS T1 (TNow (Md=47, n=6) and TLater (Md=49.5, n=6) U=11.0, z=-0.40, p=0.7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOCUS T2 (TNow (Md=47, n=6) and TLater (Md=49.5, n=6) U=11.5, z=-1.04, p=0.3)</td>
</tr>
</tbody>
</table>

**Figure 6: Changes in FOCUS scores pre and post intervention**

**Within Group Effect**

**Analysis of Individual Results**
Based upon the scoring guidelines for the FOCUS, four of the six children in the treatment group made improvements in everyday communication (Table 5). As there was no significant change found in PCC it was not expected a corresponding change would be noted in the children’s everyday communicative functioning. The lack of difference between groups at T2 may have been due to two of the children in TLater also reporting significant clinical change. However it was noted that four children (P3, P6, P9, P11) had a different parent complete the FOCUS questionnaire at T2 diminishing a degree of reliability and as such it cannot be stated conclusively that the programme brought about an improvement in the children’s everyday communication.
Based on this analysis the second hypothesis that The Mixed Up Marty Home Programme will generalise to real life as measured by parent ratings of communication participation skills is not supported.

**Actual versus Target Therapy**
As mentioned with regard to programme administration compliance can be an important factor in treatment efficacy for parent-implemented home programmes. Table 6 depicts actual versus target hours for therapy and reveals that none of the participants received the target twelve hours of therapy. This may have impacted upon results and is interpreted in greater detail in the discussion.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Therapy Received (hours)</th>
<th>Target Therapy (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7 hours 55 minutes</td>
<td>12 hours</td>
</tr>
<tr>
<td>4</td>
<td>Diary not returned</td>
<td>12 hours</td>
</tr>
<tr>
<td>5</td>
<td>11 hours 5 minutes</td>
<td>12 hours</td>
</tr>
<tr>
<td>8</td>
<td>10 hours 25 minutes</td>
<td>12 hours</td>
</tr>
<tr>
<td>9</td>
<td>4 hours 5 minutes</td>
<td>12 hours</td>
</tr>
<tr>
<td>11</td>
<td>7 hours 55 minutes</td>
<td>12 hours</td>
</tr>
</tbody>
</table>

**Table 5: FOCUS Questionnaire Interpretation**

**Table 6: Actual versus Target Service Delivery**
Hypothesis 3: Programme Acceptability

A Likert Scale was used to assess parents’ perception of the acceptability of the Mixed Up Marty Home Programme with results indicating high average scores of acceptability with most parents mostly or strongly agreeing with statements on a variety of aspects of the programme. Error bars represent minimum and maximum scores for each question. The results indicate that the final hypothesis has been supported i.e. The Mixed Up Marty Home Programme is a highly acceptable form of parent-administered intervention for phonological delay and disorder.

Figure 7: Parent Rated Acceptability of Home Programme
Discussion

Effectiveness of the Intervention Approach
The purpose of this study was to investigate the efficacy of the Mixed Up Marty Home Programme in improving the speech accuracy of children with phonological delay and disorder. The overarching hypothesis was that a programme designed upon evidence-based principles of phonological and input-based therapy would target the underlying deficits in the children’s SSDs, leading to improved accuracy in speech production and subsequent improvements in the children’s everyday life and functioning. The results indicate that:

1. The Mixed Up Marty Home Programme was not effective in improving the speech accuracy of children with SSDs. The results illustrate that the children, whether they received the programme or not, did not experience significant improvements in speech accuracy at the single word level or in connected speech.

2. A number of the children from both groups showed generalisation by improvements in everyday communication abilities as measured by parent rated communication participation skills. There was no significant difference between groups and it therefore cannot be stated conclusively that the Mixed Up Marty Home Programme generalised to the everyday communication abilities of the children.

3. Overall parents found the utilisation of such a programme highly acceptable.

Comparison with other Home Programmes
This multi-factorial nature of the Home Programme and the heterogeneity of the population of children with SSDs make it difficult to isolate the factors which may have been implicated in the lack of a significant result. Reasons as to why the programme may have proved ineffective are proposed.

Programme Structure
As outlined in the introduction previous parent-implemented intervention have demonstrated impressive gains in speech accuracy. However, the structure and content of these programmes varied. Brady’s (2011) version of the Mixed Up Marty Home Programme focused on production-based minimal pair activities whereas the current programme limited activities to those which were input-based, including novel Minimal Pair type stories which did not require the child to produce any output. The input-focused nature of activities may therefore have impacted upon improvements. This is in line with previous findings from a similar study by Meaney (2013) investigating the efficacy of a parent-implemented input-based home programme in the absence of a production component where no significant improvement was noted in speech accuracy. The input-focused approach
requires further investigation in order to support the evidence by Rvachew and Brosseau-Lapre (2012) for its effectiveness as an intervention for children with SSDs.

A final note on programme content highlights that the programme was designed in a broad-based manner and so not tailored to the specific phonological processes exhibited by each child as identified at the baseline assessments. Outcomes may have revealed greater gains where the activities were more specifically tailored for each child.

**Parents as Agents of Input-Focused Therapy**

Another factor which may have impacted upon results was the delivery of an input-based activity by parents. As outlined in the introduction clinician-directed therapy is well documented within the literature as a successful means of service delivery for phonological disorders (Williams *et al* 2010) with mixed results of parent-implemented therapy (Elomari 2012). It may be that parent implementation of an input-focused intervention approach is not a suitable means of service delivery. Parent-implementation of a production-based version of the home programme using phonological contrast therapy has illustrated gains in speech accuracy (Brady 2011). The production component was removed in the current study in order to eliminate the necessity for parents to provide feedback on production as this has been identified in the past as an area of weakness for parents (Ianco *et al* 1998). The subsequent lack of a clinically significant increase in speech accuracy however poses questions surrounding the ability and suitability of parents, even with training, to deliver input-focused intervention. Rvachew and Brosseau-Lapre (2012) have illustrated that such an approach is effective when delivered via a clinician. It may be that parents lack the theoretical understanding of phonological development necessary to deliver such a therapy correctly. For example, although parents received two hours of training this may not have been sufficient opportunity and experience to equip parents to carry out tasks. As such, parents, although vital sources of support in the implementation of home programmes may lack the clinical skills to make salient the necessary elements of the approach in order to facilitate phonological development.

Although the results of the study do not support the use of the programme in remediating SSDS the third hypothesis was in keeping with previous research on Home Programmes in revealing that parents reported high levels of programme acceptability. For example the majority of parents strongly agreed with the statement that “the instructions provided were adequate to carry out the programme.” This illustrates the programme’s ease of utility and potential as a therapy tool. It would appear therefore that this study contributes to previous research in finding parent-implemented home programmes to be a feasible and enjoyable service delivery method.
Length of Administration

Length of administration is linked to programme content. A study by Hesketh et al (2000) revealed production-based therapy had a significantly greater immediate effects on target sounds whereas nonsignificant trends from the PA intervention suggested it may have broader and longer-lasting effects on speech output. As such, it is not to say the programme was not beneficial. Rather, the lack of clinical significance may indicate the importance and necessity of production targets in gaining results within a short time frame e.g. a seven week parent-implemented home programme. As indicated by Hesketh et al (2000) gains have often been noted after eighteen sessions of thirty to forty-five minutes two to three times a week but have failed to be noted in intervention approaches utilising phonological awareness when the therapy is delivered for less than twelve weeks. It was also noted from the Home Programme diaries that only one child’s parents complied with the target of a minimum twelve hours of recommended therapy via the programme. This is a factor which may have contributed to the lack of change with one child receiving only four hours five minutes of the recommended time. This has implications for parents as agents of therapy and the suitability for such a programme for those with busy schedules despite the stories being designed to fit in easily to daily routines e.g. bedtime.

Severity

Severity may have been another important factor in the children’s response to the programme. Interestingly, the child in TNow who made the greatest improvement (Participant 1, p=.06) had a diagnosis of a mild phonological delay. It may be that the Home Programme can provide an evidence-based therapy tool for parents to use as a form of therapy with their child immediately upon receiving a mild diagnosis. Brady (2011) emphasised that the provision of such indirect therapy would reduce client caseloads and subsequently reduce waiting times for children requiring more intensive therapy. It would therefore be of interest to re-administer the programme specifically with children with a mild diagnosis as children with more severe phonological difficulties may not be suitable for this intervention approach. Where this is successful it would indicate the potential of the programme to function as a triage tool, identifying the children who require more intensive e.g. one-to-one clinician directed therapy. In this way the Programme could operate in-line with emerging service delivery approaches such as Response To Intervention (RTI) models, as a proxy for therapy in the case of those children with mild phonological delay or disorder. It would allow therapists to effectively manage their waiting lists and allocate therapy in a more productive and efficient way (Justice 2006). This would in turn address the current resource limitations in Ireland outlined in the introduction.
Individual Variability
The heterogeneity of SSDs was outlined in the introduction. In fact, not only do these children present differently, the PCC scores obtained for each child in the current study were highly variable highlighting the individual variability within this population in their response to intervention. For example some children require different amounts of therapy due to intrinsic factors such as overall capability, motivation or behaviour (Baker and McLeod 2004). The observation that participant 3 in TLater made a statistically significant improvement is in line with general agreement that speech disability generally decreases as children get older (Broomfield and Dodd 2004 in Elomari 2012) and supplies evidence for spontaneous improvement within the population of children with SSDs. However, no predictive factors for spontaneous recovery have to date been identified and as a result caseloads cannot be managed in this way.

Limitations and Indications for Further Research
Methodological limitations have the potential to impact results within a study. As mentioned, the sample size for the current study was small. Replication using a larger sample of children is therefore recommended. Secondly, due to low response rates at the recruitment stage four children (P2, P3, P9, P12) were included in the study who had received previous speech and language therapy. This was reflective of the fact many of the children had SSDs which were moderately severe in nature. As the programme is designed to target children with relatively flexible phonological systems, the children included in the study may not have been suitable as their phonological systems had previously demonstrated resistance to change. Children were included who had already had therapy without success, indicating pervasive deficits, rather than the target audience of children who have just completed their initial Assessment. Finally, reliability for future studies could be improved by ensuring that, where the FOCUS questionnaire is utilised as an outcome measure in a pre-post design, the same parent is asked to complete this.

Conclusions and Clinical Implications
Possible reasons have been identified for the lack of success of the Home Programme on this occasion. These include programme structure and content, parents as agents of input-focused intervention, short time frame of administration, severity of diagnosis and high levels of variability within the sample used. Based upon these findings, the Mixed Up Marty Home Programme warrants modification and further investigation before it may be considered for use as a clinical tool in the remediation of SSDs.
References


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RCSLT. (2010). Call to Action: Communication Disability Services, London: RCSLT.

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Appendix A

Sample Story and Activities from the Programme
Marty and Sue go to Spain

Marty and Sue were very excited. It was their first holiday abroad and the first time they had been on a plane. They really enjoyed the flight.

When they got to Spain there were lots of new things to see and the sun was very hot! They all decided to go to the market to see what they could buy.

Marty had never been so hot. "I'm too hot", he said, "I think I am going to paint!"

"You can't paint here, Marty!" said Sue, "there is nowhere to sit and no paints."

Then she looked at him, he looked very white! "Oh no, I think you're going to faint, not paint! We'd better get you a fan to keep cool."

"That's a good idea", said Marty. They saw a stall selling lots of useful things.

"Look, there are some fans," said Sue.

Marty said to the man at the stall, "I would like to buy a pan please." The man reached down a pan from the back of the stall.
“Here you go, here’s a strong pan for you.” he said.

“A PAN?” said Marty, “No thank you, I would like a pan please!”

“But this is a pan.”, said the shopkeeper.

“But I really need a pan for this hot weather.” Marty said. The man was very confused.

Sue could see that Marty had mixed up again. “He means a fan, not a pan!” she said to the man.

“Ah! You are looking for a fan!” said the man. “Well I have lots of fans here as it is very hot outside. What colour fan would you like?”

“I would like a green one please.” said Marty, and Sue wanted an orange one.

The fans helped them to keep cool. “I feel better now.” said Marty. “Let’s get something to eat”.

“There’s a lovely fruit stall over there,” said Sue.

There were apples, oranges, bananas and grapes. But also some fruits that Marty and Sue had not seen before. Sue pointed at a small green fruit that she didn’t know. “What is this please?” Marty asked the fruit seller.

“These are figs”, replied the fruit seller.
Oh, they look tasty. I will buy one to try, thought Marty.

So he asked the fruit seller, “Could I have one pig please?”

The fruit seller looked very surprised. “A pig?” he said. “I think you have come to the wrong market stall, I only sell fruit.”

“Not a pig”, said Marty, “a pig, I would like to buy a pig.”

The fruit seller pointed over to another part of the market. “You will find the pigs over there.”

Sue knew what was happening and said to the fruit seller. “Marty has got mixed up. He would like a fig please, not a pig.”

“Oh, I see!” said the fruit seller, and he put one ripe juicy fig into a bag for Marty to eat later. It was delicious!

Marty had got mixed up again. He said paint instead of faint.

pan instead of fan, and pig when he meant fig.

Why not make a fan by pleating a sheet of paper and folding the bottom.

Practice fanning each other.

Look at the figs next time you go to the market or supermarket. Maybe you could try one!
Can you find other words that Marty might get mixed up?

<table>
<thead>
<tr>
<th>Image</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="fan.png" alt="Fan" /></td>
<td>fan</td>
</tr>
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<td><img src="pan.png" alt="Pan" /></td>
<td>pan</td>
</tr>
<tr>
<td><img src="fin.png" alt="Fin" /></td>
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<td><img src="pin.png" alt="Pin" /></td>
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<tr>
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<td>faint</td>
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<tr>
<td><img src="paint.png" alt="Paint" /></td>
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<td><img src="fig.png" alt="Fig" /></td>
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</tr>
<tr>
<td><img src="pig.png" alt="Pig" /></td>
<td>pig</td>
</tr>
<tr>
<td><img src="farm.png" alt="Farm" /></td>
<td>farm</td>
</tr>
<tr>
<td><img src="palm.png" alt="Palm" /></td>
<td>palm</td>
</tr>
<tr>
<td><img src="foal.png" alt="Foal" /></td>
<td>foal</td>
</tr>
<tr>
<td><img src="pole.png" alt="Pole" /></td>
<td>pole</td>
</tr>
<tr>
<td>cuff</td>
<td>cup</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>leaf</td>
<td>leap</td>
</tr>
<tr>
<td>chief</td>
<td>cheep</td>
</tr>
</tbody>
</table>
Here are some nursery rhymes. Your child will only learn to rhyme by hearing lots of rhymes. Being able to rhyme is important in reading and spelling.

Read these rhymes to your child, and add in actions where you can.

Point out the rhyming words to your child, say, in Humpty Dumpty for example:

“**Wall** and **fall** rhyme, they sound a bit the same, don’t they. They rhyme. **Men** and **again** rhyme too. They sound the same at the end.

**Things to do with nursery rhymes.**

- When your child gets to know the rhyme, say it together. You can stop before the rhyming words and let your child fill them in. If they don’t get it straight away, just say it for them. Try again another time.
- Clap out the rhythm together,
  - e.g. Hump-tee Dump-tee sat on a wall
    - clap-clap clap-clap clap clap clap
  - First clap out the syllables together
  - When your child get good, let her clap out rhythm alone
Rhyming characters

Focusing on rhymes makes your child see that just changing one sound makes a difference in the meaning of the word. This will encourage them to incorporate all the sounds they need into their speech. It also helps with learning to read.

Here are 4 sets of characters with rhyming names. There are two worksheets for each character.

- **Activity one**
  - Take the first worksheet. Talk about the characters on the worksheet, so your child gets familiar with what each one is called, e.g. say:
    - "He is Funny bunny. He is funny because he is rolling on the floor laughing. He is wearing a funny party hat and a badge. What a funny bunny.”
  - When you have talked about all the characters, get your child to point to each bunny, so you are sure they recognise them.
  - Colouring in:
    - Say: “now you have to colour in the bunny I say: Sunny Bunny”
    - Help your child to colour in if he is not very good yet.
  - Do this on two separate occasions for the two worksheets

- **Activity two**
  - When both worksheets are coloured in, cut one up into individual bunnies. Hide these around the room.
  - Your child must find all the bunnies and put them on the complete worksheet to “win”. Each time he finds a bunny, say the name a lot, e.g. :
    - “Oh you found Honey bunny, well done. Where does Honey bunny go? Honey bunny goes here. Honey bunny likes honey. I like honey too. Now can you find Money bunny?”
  - If you have other children, you can hide the bears and the bunnies, for example, and see who is the quickest to find their own set. Don’t forget to keep saying the names, so your child hears the contrasting sounds.
Getting to know the structure of long words

Some children miss out bits of longer words, for instance they might say "puter" for computer. This is normal for very young children, but starts to cause problems if children are still doing it when they are older, especially when they are learning to read.

In the pictures below, longer words are split up into a series of little words. The game is to put the little words together to make the long word. This will make your child realise they need to put all the parts of the word in when they say it.

You will have to show your child how this works a few times before he or she gets the idea.

Instructions

Get ready
- Choose one word/strip to work on at a time.
- Cut the sheet into strips and each strip into squares.
- Focusing on the first picture of the strip ask your child to name the picture or describe what he/she sees. Talk about the picture together. Once understood move onto the second picture of the strip. Repeat the process with the remaining pictures in the strip.
- Reveal the word segment pictures of the strip, keeping the answer picture covered. Point and say each word with your child. Ask your child to say the words themselves. Then point and say the three pictures together while revealing the fourth picture. Do this 3 times. For example: 'wheel, baa, row, makes wheelbarrow'.
- You will need to teach your child the letter names for D (dee), O (oh), B (bee), E (ee) and the sound for a (a as in ant), and the er! sound, (as in butter).
- If your child forgets the name of one of the words, go back and repeat the earlier process. Take one word from the strip and talk about it together saying its name several times. Give your child an example of where you would use/see this word. For example: 'queue, these people are standing in a line called a queue. We make a queue when we’re waiting to buy ice cream, or when we are waiting to buy match tickets. We have to wait our turn and make a queue behind the person in front of us'.

Play the game
- Once your child is familiar with the words in the strip, mix them up and then get your child to put the little words in the right order to make the big word. Keep saying the words as often as you can.
Make it harder

- Once your child has the hang of the game, mix up the parts of two words together. Add more words as he gets better at it.
Making Words Activity

The aim of this activity is to make your child understand that if you use a different sound in a word, it makes a different meaning. This will encourage them to introduce all the sounds they need into their speech system, and know where they must use different sounds to make different words.

This activity will also help your child with reading as it involves building-up a word from its sound components. Your child does not need to say anything, only to point to the correct picture!

Instructions

1. Cut out the letters on top of the page and the pictures on the bottom of the page. Talk about the pictures for a while, until you are sure your child knows what the word for that picture is meant to be. For example the picture of the girl is “Di”, not “girl”, the picture of someone giving money for a drink is “buy”, not “pay for”. Talk about the big picture too, so they know what that is meant to be, e.g. eye, bow etc.

2. Choose 1 sound picture and place it on the yellow square.

3. Add this sound to the big word, e.g. ‘eye’. Say for example for b:
   “buh…eye. buh..eye, buh.eye, buy”. Make the space between the letter and the word smaller each time, till you say the actual new word.
   Say: “what word does that make? can you find the picture?”

4. At first just give him a choice of 2 words e.g. picture of “tie” and “buy”.

5. Place the picture of the word he chooses on the green square.

6. If the picture is correct say “Yes, that’s right! buh. eye makes ‘buy”

7. If the picture he chooses is wrong, place it in the green square and say “Hmmm, t + eye makes buy?? Let’s try it, t…eye, t..eye, t.eye, tie! No, that makes “tie” doesn’t it. Let’s try the other one!”

8. Show him both pictures as you are explaining and let him choose again. Place the correct picture on the green square and point to each picture saying “buh….eye. buh…eye, buh.eye makes buy”.

9. Now repeat with a different two pictures and a new letter, eg “puh” and the pictures of “pie” and “Di”. Keep going till you have made all the words. Give him as many demonstrations as he needs. Give lots of praise when he gets it right, but just try again if he gets it wrong. Don’t correct him. It doesn’t matter if he never gets it right, just keep demonstrating. He will learn by listening to you do it.

Remember your child doesn’t need to say the word, only point to the picture of the word which the sounds make. You can start with a choice of 2 words and as your child becomes more familiar with the activity you can start to add more words for him to choose from.
bow

plus

makes

boat

bowl

bone
Scrapbook Activity

For this activity you will need a scrapbook, scissors and a glue stick.

On the next two pages there are some sound pictures. Cut them out and stick one at the top of each page in the scrapbook. If your child mixes two sounds up all the time, for example says “t” when it should be “k”, make sure you stick these on opposite sides of the pages, so you can see both at once.

Then get a pile of magazines or catalogues, like the Argos catalogue, and cut out pictures for the two sounds, for example, teapot, tiger, tie, table, kitten, kick, kettle, kitchen.

Spread the pictures out on the table and help your child decide if each one goes on the t page or the k page. Your child may not be able to do this at first, so you will actually decide, but let him see how you do it, e.g. say

“Kick, k, k, Kick.
Yes, Kick begins with k
It goes on the k page
k,k,k, kick.
It’s not t, t, t, kick, is it?
It is k,k,k, kick.
Do you think it goes on the k page?
Yes it does”

Do one or two sounds each day, till you have made pages for all the sounds.

http://www.letterland.com/parent-guide/alphabet-sounds

REMEMBER
You need to say the sound of the letter, not the letter name, e.g. Say, “buh” not “bee”.
If you want to check the letter sounds, you can do it on the internet at the link below

REMEMBER
Sh and ch are separate sounds, they don’t begin with the s and c sounds.
But c and k are the same sound, e.g. cat and kitchen. (don’t use words where c sounds like s at this stage)
Home Programme

Diary

Name________
Instructions

Carrying out the programme

- Try to spend 15 minutes each day using the programme with your child in a one-to-one situation. Please read at least one of the stories to him/her and carry out one of the activities each day. Let your child choose the story or activity as much as possible, but try and spend some time on the stories that demonstrate difficulties like those she/he has a few times a week.
- If your child would like to read lots of stories or do lots of activities that is fine! Just take into account that you need to keep his interest for eight weeks.

Filling in the diary

- Please fill in the diary each day with the name of the story or stories you read and activity you did. Please also add any comments about things like whether your child enjoyed the activity, or whether you felt it was suitable.
- If your child is sick or out of sorts, or if you have to miss a day for any reason, please just note this in the diary so we know how much time your child spent on the programme.
- Please fill in a comment also whenever you see signs of progress, for example if you hear your child use a new sound, or if a relative comments that they can understand him/her better, or if your child shows more confidence, e.g. speaking on the phone or to a stranger for the first time.

Using the star chart

- We have given you a star chart so you can put a star or sticker in each day that the child does something in the programme. If your child is hard to motivate, you might use a little reward, such as an outing to the park or something nice to eat, every time they get a certain number of stars.

Have any questions or need some advice?

- Please ring 086 4478771 or contact aileen.wright@ul.ie if you need any help or advice.
<table>
<thead>
<tr>
<th>Week 1</th>
<th>What you did today? (which stories or activities)</th>
<th>Comment: (e.g. enjoyment, progress, setback)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>Time spent:</td>
<td></td>
</tr>
<tr>
<td>Day 2</td>
<td>Time spent:</td>
<td></td>
</tr>
<tr>
<td>Day 3</td>
<td>Time spent:</td>
<td></td>
</tr>
<tr>
<td>Day 4</td>
<td>Time spent:</td>
<td></td>
</tr>
<tr>
<td>Day 5</td>
<td>Time spent:</td>
<td></td>
</tr>
<tr>
<td>Day 6</td>
<td>Time spent:</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Parent Consent Form and Information Sheet
Parent Consent Form

Study title: The efficacy of the “Mixed Up Marty” programme for remediation of speech sound difficulties in pre-school children

Name of Principal Researcher: Aileen Wright, BA(Hons), MSc. MIASLT, University of Limerick

- I confirm that I have read and understand the information sheet dated.................. (version............) for the above study. I have had the opportunity to consider the information, ask questions and have 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 give permission for my child’s speech to be recorded, and I understand that this recording will be destroyed within one month of being taken.
- I give permission for the researchers to send a report of my child’s test results to my local Speech and Language Therapy Service.
- I understand that my child’s identity will be kept confidential and it will not be possible to identify him or her in any published findings.
- I agree to let my child take part in the above study.

Name of Child: ______________________ DOB: ____________

Name of Parent: ______________________ Date: ______ Signature: ________________

Address: ______________________________________________________________

Telephone: ______________________ Email address: ______________________

This research has received ethical approval from the HSE Mid-Western Regional Hospital Research Ethics Committee. If you have concerns regarding this study, please contact: Chairman, Education and Health Sciences, Research Ethics Committee, EHS Faculty Office, University of Limerick, Tel (061) 234101 Email: ehsresearchethics@ul.ie
When your child reaches the age of six, we will contact you again to ask if we can carry out another assessment of your child’s speech, to make sure all speech difficulties have got better.

Sometimes children who have speech difficulties when they are young, may go on to find learning to read more difficult. The Mixed Up Marty Programme has been designed to promote the skills your child will need when learning to read, as well as to improve their speech. So when your child reaches the age of 7, we will contact you again to ask if we can carry out a short test of reading, to see if the Programme worked.

Are there any disadvantages or risks in taking part?
There are no risks to your child. A disadvantage is that your child might become more aware of his/her speech difficulty. However the activities are designed to be fun for the child and to present speech difficulties in a fun way.

Are there any benefits in taking part?
Your child will receive a very thorough speech assessment straight away, and we will discuss the findings with you. You will get a program that should help improve your child’s speech. The information we get from this study should help improve the treatment of children with speech sound 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 speech sound 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 to 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 (Aileen Wright, 061 234234). If you remain unhappy and wish to complain formally, you can do this through the EHS Research Ethics Committee (contact details below).

Who is organising 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 in Castletroy.

Who has reviewed the study?
All research is looked at by independent group of people, called a Research Ethics Committee to protect the safety, rights, wellbeing and dignity of those taking part. This study has been reviewed and given favourable opinion by the HSE Mid-Western Regional Hospital Research Ethics Committee. If you have concerns regarding this study, please contact: Chairman, Education and Health Sciences, Research Ethics Committee, EHS Faculty Office, University of Limerick, Tel (061) 234101 Email: ehsresearchethics@ul.ie

Further information and contact details.
For further information please contact the researcher, Aileen Wright (061 234234, or aileen.wright@ul.ie).

Thank you very much for taking the time to read this information sheet. We will be very grateful if you decide to let your child take part in the study.
Appendix D

Case History Form
# Case history form

<table>
<thead>
<tr>
<th>Case No:</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s Name:</td>
<td>DOB:</td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>Mother’s name</td>
<td>Phone:</td>
</tr>
<tr>
<td>Father’s name</td>
<td>Phone:</td>
</tr>
<tr>
<td>Carer’s name (if different from parent)</td>
<td>Phone:</td>
</tr>
</tbody>
</table>

I consent to this session being recorded on audio. The recording **may/may not** (delete where applicable) be used for teaching purposes by the University of Limerick. My child will not be identified.

Signed: ___________________________ Date: ______________________

<table>
<thead>
<tr>
<th>Diagnosis:</th>
<th>Normal</th>
<th>Articulation</th>
<th>Phon. Delay</th>
<th>Consistent Phon. Disorder</th>
<th>Inconsistent Phon. Disorder</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendations:</td>
<td>Discharge</td>
<td>Review</td>
<td>Waitlist for therapy</td>
<td>Assess language</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Signed:</td>
<td>Aileen Wright, SLT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

57
<table>
<thead>
<tr>
<th>Birth &amp; development</th>
<th></th>
<th>Number of weeks?</th>
<th>How long?</th>
</tr>
</thead>
<tbody>
<tr>
<td>My child was born prematurely</td>
<td>Y/N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My child needed special care when born</td>
<td>Y/N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My child had some feeding difficulties</td>
<td>Y/N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My child sat up at age:</td>
<td></td>
<td>Months</td>
<td></td>
</tr>
<tr>
<td>My child walked at age:</td>
<td></td>
<td>Months</td>
<td></td>
</tr>
<tr>
<td>My child has difficulties with motor skills, e.g. running, climbing, picking up things</td>
<td>Y/N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Communication development                                                        |   |                   |           |
| My child babbled as a baby                                                        | Y/N |                   |           |
| My child said his/her first words at age:                                         |   | Months           |           |
| My child joined words together at age:                                            |   | Months           |           |

| Medical                                                                            |   |                   |           |
| My child has a health problem: (please give details)                               | Y/N |                   |           |
| My child has been in hospital: (please give details)                               | Y/N |                   |           |

| Hearing                                                                            |   |                   |           |
| My child has had a hearing test:                                                  | Y/N |                   |           |
| Result of hearing test:                                                            | Normal |               | Not normal|
| My child has had ear infections:                                                  | 1-3 times | 4-6 times | more than 6 times |

<p>| Personality                                                                       |   |                   |           |
| My child plays well with others                                                   | Y/N |                   |           |
| My child is very shy                                                              | Y/N |                   |           |</p>
<table>
<thead>
<tr>
<th>Child care</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>My child is at home with a parent</td>
<td>Y/N</td>
</tr>
<tr>
<td>My child is looked after by a childminder</td>
<td>Y/N</td>
</tr>
<tr>
<td>My child goes to crèche/nursery</td>
<td>Y/N</td>
</tr>
<tr>
<td>My child goes to playschool</td>
<td>Y/N</td>
</tr>
<tr>
<td>My child goes to school</td>
<td>Y/N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exposure to Irish/other languages</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Previous contact with SLT services</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>My child has had a speech language assessment</td>
<td>Y/N</td>
</tr>
</tbody>
</table>

|                                                                  |       |
| He/she was assessed at ________________________________         |       |
| on ____________________________                                |       |
| My child has had speech therapy                          Y/N |

|                                                                  |       |
| Number of sessions __________________________               |       |
| Approximate date: ______________________________             |       |
| Service provider ___________________________________       |       |

| Please tell the therapist about the therapy your child had. |       |
Appendix E
Parent Likert Questionnaire
Home Programme Project – Parental Questionnaire

Please answer the questions on a scale of 1-5 where:

<table>
<thead>
<tr>
<th>1 = Strongly disagree</th>
<th>2 = Disagree</th>
<th>3 = Neither agree nor disagree</th>
<th>4 = Agree</th>
<th>5 = Strongly agree</th>
</tr>
</thead>
</table>

1. The home programme helped improve my child’s speech.
   1    2    3    4    5

2. My child enjoyed the programme.
   1    2    3    4    5

3. I enjoyed doing the programme with my child.
   1    2    3    4    5

4. The instructions provided were adequate to carry out the programme.
   1    2    3    4    5

5. The materials provided were adequate to carry out the programme.
   1    2    3    4    5

6. It was easy to find time to do the programme with my child.
   1    2    3    4    5

7. I spent more one-to-one time with my child because of the programme.
   1    2    3    4    5

8. I will continue doing these activities with my child.
9. The activities are useful to do with my other children (if applicable).

10. I felt confident using the programme with my child.

Any other comments or feedback?

Thank you for completing the programme.

We hope that it was a positive experience for you and your child.
Appendix F
Parent Training (PowerPoint Presentation)
INTRODUCTION

Overview of training session
- Introductions

SPEECH

Speech development
- Speech sounds typically mastered by 4 to 4:06
  - m, b, d, j, n, w, p, h
  - t,ng, k, g, f, v, ch, dʒ
  - sh, s, th, dh, r, z, ʒ

1-3 years
3-6:06 years
5-7:06 years

(Shriberg, 1990; Grunwell in Fletcher & Hall, 1992)

HOW CHILDREN SIMPLIFY SPEECH?
- All children make predictable pronunciation errors when they are learning to talk like adults
- These 'errors' are sometimes called phonological processes
- An example of this is a 2 year old saying 'tat' for 'cat'
- Research on large numbers of children gives us guidelines about when these processes should disappear
- Some children continue using these processes longer than average and need help to catch up with their peers

SPEECH THERAPY
- Long waiting lists for speech therapy
- Phonological therapy works for delay and disorder (Dodd, 2008). This develops your child’s sound system.
- Parental involvement is crucial
- Therapy given little and often is most effective

OUR STUDY WILL LOOK AT...
- Whether your child's speech is different before and after doing the home programme?
- Whether the home programme is a useful way of providing therapy for children on waiting lists

HOME PROGRAMME
- 8 weeks
- 6 days a week
- 15 minutes a day
- The programme contains 5 types of activities
  1. Minimal Pair Stories and activities
  2. Phonological Awareness (rhyme)
  3. Making Long Words
  4. Making New Words
  5. Scrapbook
- 3 activities each day- 5 minutes each! One should be a Mixed Up Marty story.
**Sound Different Stories**
- These stories are designed to show your child that lots of words sound the same except for the first sound.
- This will help them understand that they need to use all the sounds in their speech, and if they use a wrong sound, it makes a different word.
- Read like a nursery rhyme. with a slight emphasis in rhyming words.
- The more times they hear the stories, the better!
- When they are familiar with the stories, let them fill in the words themselves.

**Making Long Words (Word Shapes)**
- Some children have difficulty saying longer words, e.g., they might say “puter” for computer.
- This is normal for many children but may cause problems when older for reading.
- In this activity longer words are split up into many little words. The idea of this game is to put the little words together to make the long word.
- This will make your child realise they need to put all the parts of the word in when they say it.
- You will have to show your child how this works a few times before he or she gets the idea.

**Scrapbook**
- For this activity you will need a scrapbook, scissors and a glue stick.
- Identify the sounds your child mixes up. E.g., “t” and “k.” Cut out these sound pictures provided and stick one at the top of each page in the scrapbook. Make sure you stick these on opposite sides of the pages, so you can see both at once.
- Cut out picture from internet, magazines or Argos catalogue for the two sounds. E.g., teapot, tiger, kitchen, kitten, and stick into scrapbook.
- Spread the pictures out on the table and help your child decide if each one goes on the “t” page or the “k” page. Show your child how to do this.

**Making New Words (Word Shapes)**
- The aim of this activity is to make your child understand that if you use a different sound in a word, it can have a different meaning.
- This will introduce all the sounds they need into their speech system, and help them to understand where they must use different sounds to make different words.
- This activity will also help your child with reading as it involves building up a word from its sound components.
- Your child does not need to say anything, only to point to the picture!

**Programme Diary**
- Please fill out daily diary.
- Record activities completed and approximate duration of activities.
- If there are days with no programme completed, please record.
WHAT TO DO IF....

The activity is too easy?
- Even repeating something that is easy helps your child learn and gives them lots of confidence.
- If they are bored with it, try something else.

The activity is too difficult?
- Don't spend more than 5 minutes on each activity
- Model what the child should do
- Keep games fun to maintain interest
- Try a different activity
- Come back to the difficult activity a few days later
- Go at your child's own pace

FINALLY...
- Phone call approximately 4 weeks into the programme
- Issue 2, 3 and 4 will be mailed to your home address, containing new activity materials.

Questions & Comments
- General Queries please call: Aileen Wright on 061234234

WHERE TO NEXT?
- Parents to be contacted to arrange follow-up assessments after 8 weeks and 16 weeks of the programme.
- Report of your child's assessments will be sent to your Speech and Language Therapist.
- Leaflet will be sent to all parents regarding the results of the study.

QUESTIONS?

Thank You!