The Efficacy of the Mixed-Up Marty Home Programme in the remediation of Speech Sound Disorders

A Research Project submitted to the Department of Clinical Therapies, University of Limerick, as part of the requirement for the Master of Science in Speech & Language Therapy.

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Abstract

Background: Children with speech sound disorders (SSDs) constitute a large proportion of Speech and Language Therapists caseloads. Service delivery limitations in Ireland leave these children facing long wait-times for intervention, which can be detrimental to other areas of development. An effective parent-implemented programme of therapy would allow for immediate delivery of intervention and relieve pressure on waiting lists.

Objectives: To investigate the efficacy of the parent-implemented ‘Mixed-Up Marty’ home programme for pre-schoolers with SSDs.

Methods: Twelve children (aged 3;02 to 4;05) with SSDs participated in the study. Subjects were randomly assigned to a treatment now or treatment later (control) group. Parents of children in the treatment now group received training to deliver a phonology based home programme, which was delivered for fifteen minutes per day, 6 days a week, over 7 weeks.

Results: Measures of Percentage Consonants Correct (PCC) on the Diagnostic Evaluation of Articulation and Phonology (DEAP) and connected speech sample (Renfrew Action Picture Test (RAPT)), and parental scoring of the Focus on the Outcomes of Communication Under Six (FOCUS) questionnaire indicated that there was no statistical significance between treatment conditions pre- and post-intervention. A Likert questionnaire investigating parental perceptions of the programme indicated a high level of acceptability and utility.

Conclusions: Children with SSDs who received the Mixed-Up Marty programme did not make greater improvement in speech accuracy than the control group in terms of PCC on the DEAP and in connected speech or in terms of functional communication skills as perceived by their parents. Despite this, parents were in favour of the Mixed-Up Marty programme as an intervention. The implications of these findings are discussed.

Keywords: speech sound disorders, home programme, phonological intervention
Introduction

Children with speech sound disorders (SSDs) have speech that is difficult to understand, characterized by mispronunciations of words. They are a heterogeneous population, differing in terms of the underlying cause of the disorder, the characteristics of their speech errors, the severity of their difficulty, and their response to treatment (Dodd 2005). The presence of a SSD indicates a high frequency of speech errors relative to age matched peers, impacting on intelligibility. Functional SSDs are those that have no identifiable causal factor (i.e. structural, cognitive, or psychological origin).

Children with SSDs constitute approximately half of a Speech and Language therapists’ paediatric caseload (Joffe & Pring 2008; Brumbaugh & Smit 2013). Broomfield & Dodd (2004) estimated that 48,000 children are referred with primary speech difficulty in the UK each year, and that 6.4% of otherwise normal children had a SSD. Shriberg et al (1999) estimated that approximately 14% of 3 year olds meet the criteria for a SSD, 3.8% of which continue to present with difficulties at 6 years, confirming that for some children, SSD difficulties may persist past early childhood. More than half of speech-disordered children have delayed phonology, just under a quarter consistently make some atypical errors, and the remainder present with articulation and inconsistent phonological disorder (Broomfield & Dodd 2004).

The inability to achieve speech that is sufficiently intelligible to serve a child’s social and functional needs may have long-lasting consequences (Rvachew & Brosseau-Lapré 2012a), such as literacy, social, behavioural and academic difficulties in later life (Law et al 2010; O’Conner et al 2012; McCormack et al 2010), particulary if not resolved by school age (McCormack et al 2009). If unresolved, the consequences of SSDs may carry over to the adult years (Felsenfeld et al 1994), and economic costs are incurred due to these individuals inability to participate fully as a member of society (Bishop 2000 cited in Bishop & Leonard 2000). Timely intervention can give children with SSDs the opportunity to resolve their difficulties and to make the transition to “literacy,
learning and later academic, social and emotional success” (I CAN Talk Series Issue 2 2006). The Royal College of Speech and Language Therapists (2009) agree that early intervention gives rise to optimal outcomes for children with SSDs. Bishop and Adams (1990) state that children need to be intelligible by five and a half years to avoid encountering such a plethora of difficulties.

Current Services

The Pan Canadian Alliance of Speech-Language Pathology and Audiology Organizations established evidence-based wait-time benchmarks for SSDs, which indicate the maximum time that a child with a SSD should wait for therapy. The recommended wait-times for intervention for 0-3 year olds is three to six months, for 4-6 year olds is one to three months, and for school-age children is three to eight months (Rvachew & Rafaat 2014). In Ireland, these benchmarks are not being achieved due to the lack of clinician positions as a result of a programme of austerity, the volume of children on clinician’s caseloads and therefore, long waiting lists for therapeutic intervention. It is documented that over 4,500 are waiting or likely to be assessed as needing SLT intervention, and that approximately 3000 children who have already been assessed as needing support have been waiting at least a year without treatment (Conway 2014). For those who are fortunate to be receiving intervention, it is likely that service constraints mean that the level of intervention is insufficient to attain desired clinical outcomes (Law & Conti-Ramsden 2000). While statistics specific to SSDs are not available, it is fair to assume that they are included in these figures. These service constraints, resulting in long waiting times, and the previously discussed impact of delayed intervention, highlight the necessity to consider an alternative approach of service delivery for the SSD population.

Parent Implemented Interventions

Current models of best practice encourage early intervention professionals to view families as partners in the intervention process for their children (Watts Pappas 2010), and one way of doing so is through the training of parents to be agents of therapy.
Broen & Westman (1990) established that children’s phonological skills improved when taught by parents, with weekly supervision and training by a clinician, compared to a previous no treatment baseline and a no treatment control group. This study consisted of twenty children aged between 4 and 5 years (12 in the experimental group, 8 in the control group). Parent training consisted of 1.5 hour group sessions per week, over seventeen weeks. The intervention approach targeted phonological patterns and natural classes.

Eiserman et al (1990; 1995) also compared clinician and parent delivered interventions for speech disordered preschoolers (N=20), and found that they were equally effective. The researchers also evaluated the cost effectiveness of both, and found that if the cost of the parents’ time was excluded (four weekly sessions approximately 20-30 minutes in length), there was no difference in costs between methods of delivery. However, if the cost of parents’ time were to be included, the clinician programme would be more cost effective. Parent training involved 40-minute fortnightly individual sessions, which was tailored to each parent and child, and the intervention period lasted approximately seven months. However, it is important to note that there was no control (no treatment) group to compare intervention outcomes with.

Lancaster et al (2010) provide evidence that parent implemented approaches were not as efficacious as clinician implemented, but nevertheless did show significant gains and were more effective than no treatment for preschoolers with SSDs (N=15). Parent training involved a two-hour group training with reviews every six weeks, over a six month duration, and clinician based intervention involved 15 thirty-minute sessions over five months. The clinician-delivered intervention adopted an eclectic approach for therapy, whereas the parent-delivered intervention adopted auditory input and bombardment activities only, therefore not comparing like with like.

Dodd and Barker (1990) investigated the effects of a parent training programme on five children who presented with deviant phonological development and found significant improvements in percentage of consonants correct (PCC). The intervention consisted of minimal pairs activities which target
the underlying deficit of consistent phonological disorder (Crosbie et al 2005). However, similar to other studies, parent training was lengthy (twenty-four hours in total).

Service delivery for training and monitoring of parents in the delivery of a home programme such as those mentioned are not realistic for practising SLTs working with children with primary SSDs in the current situation in Ireland where the current intervention block is commonly limited to six sessions, due to limited funding and resources. Brady (2010) found preliminary evidence for the effectiveness of a more attainable, six week long, novel parent led home programme in improving speech accuracy and reducing error patterns for children with phonological delay and consistent phonological disorder, which only involved two hours of parent training. The programme consisted of nine hours of parent led therapy in total during the six weeks, to seven children aged 3;05 to 4;10. A midway visit was conducted to ensure correct implementation of the programme, which consisted of minimal pairs contrast therapy and phonological awareness activities, in conjunction with rule-learning and pattern activities to target the underlying deficits of these subgroups of SSDs. However, this study did not have a ‘no treatment’ condition to control for possible maturation gains.

In summary, the evidence suggests that the training of parents to deliver intervention can lead to significant improvements in speech intelligibility. When the other option is to remain on a waiting list for intervention in the distant future, parent training is certainly a viable option for service delivery. However, the studies mentioned delivered high levels of clinician input over long periods of intervention, an option which not currently viable in Ireland under current service delivery limitations. There is apparent need for successful parent-led interventions for children with SSDs, which do not require such high levels of clinician input.

**Input Based Approaches to Intervention**

Usage-based theories of language development are of the opinion that a child’s
knowledge of phonological patterns develop as a result of environmental exposure and use of language (Bybee 2001). This exposure allows a child to learn to contrast meaning, form meaningful words, and initiate the development of an implicit awareness of the underlying structure of the language’s sound system (Rvachew & Brosseau-Lapré 2012a). Many children with SSDs may have difficulties with phonological processing, characterized by poor speech perception and/or phonological awareness skills. Research has demonstrated that regularities in the input of language are used by typically developing children to acquire expressive phonology (Stoe-Gammon 2011), and that children with SSD’s require frequent access to high quality input to improve the same (Rvachew & Brosseau-Lapré 2012b). Rvachew & Brosseau-Lapré (2012b) provide evidence that a twelve week input oriented approach to intervention (comprising of speech perception activities, dialogic reading and phonological awareness activities) showed similar gains in speech output to output-based intervention of the same length, and was an effective treatment for promoting phonological awareness skills for children with developmental phonological disorders. The authors also propose that input based intervention may be particularly suitable for young children with word-based phonology, as they are most likely to benefit from good-quality exposure to language input of words and word shapes, and also children with many phonological inventory constraints.

Gierut & Morrisette (2012a) looked at how density & frequency of lexical items impact phonological learning in eight preschool children with phonological delay, and found that frequent words from dense neighbourhoods were optimal for generalisation. Stimuli comprised of target words with visual representations. Input cues are derived from lexical (word) and sub-lexical (phonological) structures, with lexical structure relating to neighbourhood density (phonetically similarly sounding words based on only one phoneme differentiating them) and word frequency (Gierut & Morrisette 2012a). When a child frequently hears words from dense neighbourhoods, segmental overlaps orientate and points of distinctiveness are emphasised. For example, in the repeated exposure to “tin, pin, chin”, the rhyme is familiarised and the emphasis is placed on the onset,
highlighting phonemic contrasts. In another study, the same researchers established that auditory priming was found to promote the greatest phonological generalization in nine children with phonological delay, highlighting its importance for phonological learning and its utility in clinical treatment for this population (Gierut & Morrisette 2012b). Auditory priming of high frequency words from dense neighbourhoods is an intervention approach that may be easily taught to parents to carry out at home.

Another approach that yields a high quality language input is Focused Auditory Stimulation. Focused Auditory Stimulation is a component of the ‘Cycles’ approach to the remediation of unintelligible speech (Hodson & Paden 1991), & can be used in coordination with other speech sound interventions. This approach promotes high frequency exposures and saliency of target forms, and includes principles of modelling and recasting. Used typically with preschoolers, this intervention approach focuses on listening to rather than producing particular speech sounds, within a variety of contexts and words. This technique has a moderate evidence level and was used in the parent training group of Lancaster et al’s aforementioned study (2010), which found the approach to be effective in improving speech compared to not receiving any intervention. Such positive outcomes for children with SSDs, therefore, suggest that this is a useful approach to implement with the SSD population.

Phonological awareness highlights the understanding of the sound structure of words (syllables and phonemes), and includes rhyme awareness (Hesketh 2009 cited in Bowen 2009), phoneme isolation and matching tasks. Facilitating phonological awareness development at an early stage can be achieved concurrently with improvements in speech sound gains and intelligibility (Hesketh 2009 cited in Bowen 2009) and therefore it may be beneficial to include phonological awareness therapy as part of an intervention plan for children with phonological disorders. The literature also suggests that children with SSDs are at risk for developing literacy difficulties (Gillon 2004; RCSLT 2009), and that intervention that involves developing phonological
awareness skills can help develop literacy skills of children with SSDs (Gillon 2005).

Meaningful minimal contrast therapy is effective in remediating the problems caused by homonymy by reorganising the child’s phonological system through the development of meaningful contrasts (Crosbie et al 2005). Meaningful phonemic contrasts are typically achieved using minimal pairs (Weiner 1981), two words that differ by one sound only, with an aim to confront homonymy in a child’s system. This approach is thought to aid generalisation to other affected sounds (Dodd 2005), with an ultimate aim to improve speech production in children with unclear speech due to SSDs. Meaningful minimal contrast therapy has been widely investigated and has high levels of evidence with a number of randomized control trials supporting its use as an intervention for children with SSDs (Ruscello et al 1993; Dodd et al 2008). A variation of minimal contrasts, is Williams’ (2000) multiple oppositions, which involves multiple contrastive pairings. This approach also predicts system-wide reorganisation of a phonological system and its effectiveness is supported by a number of quasi-experimental studies (Williams 2006) and a non-randomised control trial (Pagliarin 2009).

However, therapeutic approaches such as minimal pairs and multiple oppositions require skill in their delivery, and therefore it is difficult to train parents to carry these out properly. Gardner (2004) showed that parents carrying out therapy tasks for children with SSDs displayed a different style of interaction from speech and language therapists, which led to incidences at times that resulted in the child moving on a trajectory away from an acceptable production of a target sound or word. However, the principles of such approaches may be used to create therapeutic activities which may not require the same amount of skill to deliver i.e. that parents could be trained to deliver. An example of such an adaptation may be a short story illustrating the effect of homonymy in speech, and how to resolve it, that parents could read to their child, with no demand for the child to produce phonemic contrasts. Another
would be matching activities with the use of multiple opposition rhyming target words.

Together, this eclectic mix of approaches are anticipated to promote a foundation for phonological development, by increasing language input frequency and the quality of the input (Rvachew & Brosseau-Lapré 2012a), and by highlighting meaningful contrasts and encouraging phonological awareness. In addition, such approaches may be delivered in a manner that is input-only based, making them suitable to be delivery by parents. For that reason, an eclectic, input-based approach to intervention is a worthwhile consideration for pre-school aged children with phonological SSDs.

Aims of investigation & hypotheses

A review of the literature has highlighted the significant and urgent need for an alternative service delivery approach for children with SSDs awaiting initial therapy. This is needed to reduce the impact of the presence of SSD’s and to assist clinicians in managing caseloads and to reduce wait times. The evidence for the efficacy of home-programmes was presented, and a number of effective approaches for the remediation of SSDs were highlighted. The current research aims to investigate the efficacy of an input-based “Mixed-Up Marty” home programme for pre-school children with phonological SSDs. In particular, we aim to explore whether children given the Mixed up Marty programme improve more than a no treatment (awaiting therapy) control group. We hypothesise that:

1. Children who receive intervention in the form of the Mixed-Up Marty programme will improve more than those who do not receive treatment, in terms of Percentage of Consonants Correct (PCC) scores on the Diagnostic Evaluation of Articulation and Phonology (DEAP; Dodd et al., 2002) and in connected speech.

2. Children who receive intervention in the form of the Mixed-Up Marty programme will improve more than those who do not receive treatment,
in terms of generalisation to activities and participation as measured by the FOCUS (Thomas-Stonell et al 2012).

3. Parents will find the Mixed-Up Marty programme to be an acceptable intervention.

Method

Ethical Approval & Consent

Ethical approval for the current study was granted by the Research Ethics Committee University Hospital Limerick. An information leaflet was provided to parents about the aims and methods of the research, and informed written consent was obtained from parents prior to initial assessment and programme participation.

Experimental Design

The design of the study was a repeated measures between groups design. The independent variable was the treatment condition (now vs. later/control). The dependant variables were PCC in a single word sample from the DEAP and in a connected speech sample, and FOCUS questionnaire outcomes pre- and post-intervention. Also measured was parental acceptability and utility of the home programme, using a Likert scale questionnaire.

Subjects & Sampling

Fourteen children were recruited via local speech and language therapy services. The principal investigator contacted local SLT managers, who identified suitable children on their waiting lists and contacted their parents. Parents were informed about the study, and those who wished to participate then contacted the principal investigator. All children were currently awaiting initial assessment, or therapy. After initial assessment for the current study, one child was excluded as the parents no longer wished to participate. After post-intervention assessment a second child was excluded from the research as the data collected was unreliable due to non-compliance during assessment. Inclusionary criteria required that subjects be between 3;0 - 4;11 years of age with a primary
diagnosis of a phonological delay/disorder. The children’s diagnoses and severity of same were made according to criteria set out by Dodd and colleagues in the DEAP manual (Dodd et al 2002). Of the twelve children in the final study, four were diagnosed with phonological delay as they made speech errors that were inappropriate for their chronological age, but were the same as those used by younger, typically developing children, and eight with consistent phonological disorder, as they made predictable errors atypical of normal development. Two children had a secondary diagnosis of articulation disorder. Exclusionary criteria included children who were currently in receipt of speech therapy, were bilingual, had current hearing difficulties, had speech deficits due to structural or organic causes, or who had additional diagnoses of cognitive or sensory difficulties. Therefore, the final sample consisted of twelve pre-school children (7 male, 5 female) aged between 3;02 and 4;05 (M=3;08) with phonological based SSD’s. Originally it had been intended to recruit up to fifty children in total, who had not yet received therapy, but recruitment difficulties forced this to be amended. Five children in total had previously received intervention for their speech disorder.

Parents blindly choose a coloured token to determine their child’s treatment condition (red=treatment now; yellow=treatment later). Six subjects were assigned to receive treatment immediately (4 boys, 2 girls), while the remaining six (3 boys, 3 girls) were to receive treatment later.

Reliability

Phonemic Transcriptions

For each participant, two student speech and language therapists (sSLT’s) made on-line phonetic transcriptions of single word productions and connected speech samples. Speech samples were recorded using an OLYMPUS® WS-832 Digital Voice Recorder and original transcriptions were verified against audio recordings following each assessment by both sSLT’s, to ensure accuracy of transcription. In the event of a disagreement in transcriptions, the assessing sSLT’s transcription was used. At least one of the sSLTs from the initial assessment was present for post-treatment assessment.
Procedure & Materials

Design of the Mixed-Up Marty Programme

The Mixed-Up Marty programme was designed to be delivered by parents, using the resources provided. The programme comprised of a number of activities which were designed based on the principles of phonological therapy and phonological awareness, which are proven in the literature to be effective at remediating phonological delays and consistent phonological disorders.

**Mixed-Up Marty Stories and activities:** Mixed-Up Marty is a character who has a speech sound disorder and lots of friends. Mixed-Up Marty is the hero of the stories, which aimed to highlight to children the confusion that occurs when sounds are not contrasted to change meaning (appendix A). The confusion of this homonymy is ultimately resolved at the end of each story. Each story focused on one typical or atypical phonological process, e.g. velar fronting, initial consonant deletion. It was asked that at least one Mixed-Up Marty story be read each day with participants, and therefore they were a key component of the programme. Minimal pair activities (appendix B) were included at the end of stories to highlight the contrastive meaning of different sounds in words.

**Phonological awareness activities:** These activities aimed to highlight the sound structure of spoken words and to develop phonological awareness skills. Activities included rhyming activities such as saying nursery rhymes (appendix C) and clapping out each syllable, sounds different stories (appendix D) which contrasted words from highly dense neighbourhoods, and rhyming characters (e.g. funny bunny, money bunny, etc.) (appendix E). Rhyming activities are beneficial in that they assist to correct phonological deficits and enhance children’s phonological sensitivity, which helps with literacy skills (Gillon 2005). Also included were Letterland™ sound stories (appendix F), where lots of examples of words beginning with the same sounds are included. These stories provided children with increased input frequency of specific sounds.

**Making Long Words:** In this activity longer words are split into shorter words with accompanying images (appendix G). The activity requires parent and child
to sound out shorter words together to make one long word. It aims to highlight to a child the need to put in each syllable of a multisyllabic word.

**Making new words:** This activity is designed to highlight that adding or substituting a single sound in a word effects a change in meaning. For example, children were given a word e.g. ‘eye’, a number of consonants to place in front of this word, and matching images for the new consonant-and-word combinations. For example, add /b/ to get bye, /t/ to get ‘tie’, etc. (appendix H)

**Scrapbook activities:** These activities involved parents choosing two sounds that their child failed to contrast, and finding pictures of words that begin with those sounds. The sounds were to be put on two separate scrapbook pages opposite one another to highlight the contrast and the child was to decide which page to put each picture with the help of their parent (appendix I). As they were doing this, parents were advised to talk about the words to increase the frequency of exposure of the sounds for the child. The higher the input frequency of word initial consonants, the earlier it appears in spontaneous speech (Van Severen et al 2012).

**Modelling and Recasting** (Bowen 2015): the concepts of modelling and recasting were explained and demonstrated to parents. The regular use of these with their children was encouraged and examples were provided in the parent training materials.

**Pre-Treatment Assessment**

Each child was assessed by a final year SLT Masters student in a quiet clinic room, with a second student SLT observing. Initial assessments lasted approximately sixty minutes and the primary caregiver was present throughout the assessment.

**Case History:** Parents were asked to complete a case history form to obtain background information. This was then reviewed by the assessor to further probe for relevant information.

**FOCUS (Tomas-Stonell et al., 2009):** Grounded conceptually in the WHO (2011) International Classification of Functioning, Disability, and Health (ICF) framework,
this questionnaire is a preschool communication measure that evaluates the impact of speech and language intervention on the child’s ability to communicate and participate in the community (Thomas-Stonell et al 2009). Parents were asked to complete the questionnaire and the assessor reviewed completed forms to ensure all items were scored.

**DEAP (Dodd et al 2002):** The DEAP was administered as per assessment guidelines i.e. the DEAP screener was administered first to establish the characteristics and consistency of the child’s speech errors. The phonology subtest was used to determine the child’s error patterns and PCC, using the calculations and criteria specified in the DEAP manual.

**RAPT (Renfrew 2011):** This assessment was administered as a language screener so as to determine if participants had concomitant language difficulties. It was also used to obtain a connected speech sample which was transcribed by both assessors, who then calculated and agreed upon PCC.

Two other tests were administered as part of another study. These are not reported in the current study.

**Parent Training and implementation of the Mixed-Up Marty programme**

Parent training lasted two hours in total, and was carried out by four SLT Masters Students in 2 separate sessions, with the principal investigator present at both sessions to ensure consistency in the content and quality of training provided. Each child had at least one parent attend, with four having both parents attend. Detailed information slides on speech sound disorders and typical speech development were provided and explained (appendix J), along with clear instruction packs and resources for programme activities. Demonstrations and role plays of each component of the programme were carried out at the training session, and parents were given the opportunity to practice and ask questions.

The manualised programme was delivered in four separate issues at fortnightly intervals to encourage interest in, and continuation of, the programme. To encourage programme compliance, each parent was asked to
maintain a diary detailing the activities completed each day and the approximate duration, along with any other comments. Parents were encouraged to contact the principal investigator at any stage should they have any queries regarding the programme. The programme was seven weeks in duration and involved carrying out three activities per day (approx. 5 minutes each), six days a week.

**Mid-way Review**

Parents carrying out the programme were telephoned at the mid-way point of programme to monitor compliance, answer any questions, and to schedule post-treatment assessments.

**Post-Treatment Assessment**

At least one of the original assessors was present for each child’s post-intervention/control assessment to ensure consistency in phonetic transcription. Sessions lasted approximately twenty minutes. The following assessments were carried out:

**FOCUS:** This questionnaire was completed by the parents of children in both treatment conditions as an outcome measure of functional communication.

**Likert questionnaire:** This 7 item questionnaire (appendix K) was developed as a post-assessment measure of the parents perceptions of the Mixed-Up Marty programme. For each item parents rated their agreement on a scale of 1=strongly disagree and 5=strongly agree. Only the parents of the children who received the programme completed this questionnaire.

**DEAP Phonology subtest stimuli:** To try and avoid a practice effect from re-administering the standardised assessment, new picture stimuli were found for the target words of the phonology subtest of the DEAP. The picture stimuli were selected by the principal investigator, with 100% agreement upon spontaneous naming with secondary researchers. The order of the presentation of the target words was reordered at random (appendix L). PCC and error pattern analysis were conducted as per initial assessment.

**RAPT:** As per initial assessment.
Statistical analyses

Statistical analyses were conducted using IBM SPSS Statistics 22 software. Analyses were conducted using non-parametric tests as tests of normality found the data was not normally distributed ($p > .0005$), and due to the small sample size.

Results

Treatment Groups

Treatment now subjects were aged 3;02-4;02 (M=3;08) and the control subjects were aged 3;04-4;05 (M=4;0). Table 1 summarizes the characteristics of treatment groups at the time of initial assessment. Treatment conditions were comparable in terms of age ($U=9.5$, $Z=-1.368$, $p = .171$), severity ($p = .534$) and classification of SSDs ($p = .221$), i.e. there were no significant difference between groups in terms of age, SSD severity as indicated by DEAP scaled scores, and SSDs classification.

Summary of Assessment Data

Table 2 summarise mean scores for DEAP PCC, connected speech PCC, and FOCUS scores pre- (Time 1) and post- (Time 2) intervention for all subjects. For the treatment group, there was an increase in means from Time 1 to Time 2 in terms of DEAP PCC (though only small) and FOCUS scores, and a decrease in scores for connected speech PCC. This indicates that as a group DEAP PCC scores slightly improved, FOCUS scores did improve, and connected speech PCC did not improve after receiving the programme. For the control group all measures had a slight increase in means, indicating a slight improvement for the group as a whole.
Table 1: Characteristics of treatment groups at initial assessment

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Chronological Age</th>
<th>Classification of SSD</th>
<th>Severity</th>
<th>Concomitant language difficulties</th>
<th>Previously Received Therapy</th>
</tr>
</thead>
<tbody>
<tr>
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<td>F</td>
<td>3;06</td>
<td>PD</td>
<td>severe</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>4;02</td>
<td>CPD</td>
<td>severe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>3;08</td>
<td>PD</td>
<td>borderline</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Control Group

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Chronological Age</th>
<th>Classification of SSD</th>
<th>Severity</th>
<th>Concomitant language difficulties</th>
<th>Previously Received Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>M</td>
<td>3;11</td>
<td>CPD</td>
<td>severe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>4;05</td>
<td>CPD</td>
<td>moderate</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>3;04</td>
<td>CPD</td>
<td>mild/moderate</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>3;11</td>
<td>CPD</td>
<td>severe</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>M</td>
<td>4;01</td>
<td>PD</td>
<td>severe</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>4;05</td>
<td>CPD</td>
<td>severe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 2: Table of Means of assessment data for treatment groups

<table>
<thead>
<tr>
<th>Assessment:</th>
<th>Treatment Now Group Mean Score Pre Intervention (SD)</th>
<th>Treatment Now Group Mean Score Post Intervention (SD)</th>
<th>Control Group Mean Score Pre Intervention (SD)</th>
<th>Control Group Mean Score Post Intervention (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEAP PCC</td>
<td>62 (17.80)</td>
<td>64.00 (18.45)</td>
<td>60.67 (7.55)</td>
<td>62.83 (12.67)</td>
</tr>
<tr>
<td>Connected Speech PCC</td>
<td>72.5 (15.61)</td>
<td>71.67 (16.07)</td>
<td>72.33 (11.09)</td>
<td>74.67 (12.79)</td>
</tr>
<tr>
<td>FOCUS</td>
<td>235.83 (53.05)</td>
<td>252.50 (37.22)</td>
<td>262.00 (33.31)</td>
<td>265.50 (26.39)</td>
</tr>
</tbody>
</table>

---

1 M=Male; F=Female

2 PD=phonological delay; CPD=consistent phonological disorder
Correlation between single word (DEAP) and connected speech PCC measures

A Spearman’s rho correlation was conducted to investigate the relationship between Time 1 and Time 2 measures of PCC in single word and in connected speech measures. A statistically significant strong correlation was found between single word and connected speech PCC pre-intervention ($r=.874$, $N=12$, $p=.000$), and post-intervention ($r=.877$, $N=12$, $p=.000$). This highlights that the relationship between the DEAP and RAPT speech samples as measures of PCC is strong, indicating that PCC scores at single word level are closely associated with PCC scores in connected speech. There was no correlation between the amount of change in PCC on the DEAP and the amount of change shown in the connected speech sample PCC at Time 1 and Time 2 ($r=.353$, $N=12$, $p=.261$). This indicates that PCC at a single word level is not predictive of PCC at connected speech level.

Amount of Therapy Received

Should parents have carried out the intervention as requested (i.e. three 5-minute activities per day, six days a week, for seven weeks), each child would have received 10 hours 30 minutes of intervention. As the table below highlights, only one child received this optimum intervention (participant 5), with another closely approximating the optimum time (participant 8).

**Table 3: Total amount of therapy received by each participant**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Total Amount of Intervention Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7 hours 45 minutes</td>
</tr>
<tr>
<td>4</td>
<td>Diary not submitted</td>
</tr>
<tr>
<td>5</td>
<td>11 hours 5 minutes</td>
</tr>
<tr>
<td>8</td>
<td>10 hours 25 minutes</td>
</tr>
<tr>
<td>9</td>
<td>4 hours 5 minutes</td>
</tr>
<tr>
<td>11</td>
<td>7 hours 55 minutes</td>
</tr>
</tbody>
</table>
Hypothesis 1: Children who will receive the Mixed-Up Marty programme will improve in speech accuracy more than those who do not receive treatment, in PCC measures on the DEAP and connected speech.

A Mann Whitney u-test was used to investigate whether there was a significant difference between groups in PCC pre- and post- intervention. It was found that there was no statistical significance between treatment groups in terms of DEAP PCC at Time 1 ($U=15$, $N_1=6$, $N_2=6$, $p=.630$) or at Time 2 ($U=15.5$, $N_1=6$, $N_2=6$, $p=.688$). It was also found that there was no statistical significance between treatment groups in terms of connected speech PCC at Time 1($U=15.5$, $N_1=6$, $N_2=6$, $p=.688$) or at Time 2 ($U=15$, $N_1=6$, $N_2=6$, $p=.630$). This indicates that the groups were equivalent in severity at Time 1, and the intervention group had not improved more than the control group by Time 2, post intervention. Therefore the hypothesis that children who receive the Mixed-Up Marty programme will improve in speech accuracy more than those who do not, in PCC measures on the DEAP and connected speech, must be rejected.

Analysis of individual cases
Table 4 contains DEAP PCC and scaled score outcomes for individuals in both treatment conditions. In the treatment group, three participants improved in terms of PCC, with two of these participants’ improving in terms of DEAP scaled scores, indicating they were catching up with norms for their age. However, a Fisher’s exact analysis found that these improvements were not statistically significant, participant 1 ($p=0.0576$), participant 5 ($p=0.7939$), and participant 11 ($p=0.8838$).

Three children improved in terms of DEAP PCC scores in the control group, with two of these participants improving in scaled scores also. However, a Fisher’s exact analysis found that only one child’s outcomes were statistically significant (participant 3): participant 3 ($p=.0367$), participant 10 ($p=.254$), and participant 12 ($p=.8096$).
Table 4: DEAP PCC and scaled scores

<table>
<thead>
<tr>
<th>Participant</th>
<th>Treatment Now</th>
<th></th>
<th></th>
<th>Control/Treatment Later</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Intervention</td>
<td>Post-Intervention</td>
<td>Participant</td>
<td>Pre-Intervention</td>
<td>Post-Intervention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCC</td>
<td>Scaled Score</td>
<td>PCC</td>
<td>Scaled Score</td>
<td>PCC</td>
<td>Scaled Score</td>
</tr>
<tr>
<td>p1</td>
<td>75</td>
<td>6</td>
<td>84</td>
<td>8</td>
<td>p2</td>
<td>65</td>
</tr>
<tr>
<td>p4</td>
<td>62</td>
<td>3</td>
<td>62</td>
<td>3</td>
<td>p3</td>
<td>71</td>
</tr>
<tr>
<td>p5</td>
<td>29</td>
<td>4</td>
<td>33</td>
<td>4</td>
<td>p6</td>
<td>55</td>
</tr>
<tr>
<td>p8</td>
<td>63</td>
<td>3</td>
<td>61</td>
<td>3</td>
<td>p7</td>
<td>50</td>
</tr>
<tr>
<td>p9</td>
<td>63</td>
<td>3</td>
<td>62</td>
<td>3</td>
<td>p10</td>
<td>64</td>
</tr>
<tr>
<td>p11</td>
<td>80</td>
<td>7</td>
<td>82</td>
<td>8</td>
<td>p12</td>
<td>59</td>
</tr>
</tbody>
</table>

A Wilcoxon signed ranks test was conducted to investigate if there was a within group effect on outcome measures. It was found that there was no significant difference between participant scores at Time 1 and Time 2 in the treatment now group \((z=-1.804, N=6, p=0.279, two-tailed)\) or control group \((z=-0.813, N=6, p=0.416, two-tailed)\) in terms of DEAP PCC.

Connected Speech Analysis

Table 5: Connected Speech PCC Scores

<table>
<thead>
<tr>
<th>Treatment Now</th>
<th></th>
<th></th>
<th></th>
<th>Control/Treatment Later</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>Pre-Intervention</td>
<td>Post-Intervention</td>
<td>Participant</td>
<td>Pre-Intervention</td>
<td>Post-Intervention</td>
<td></td>
</tr>
<tr>
<td>p1</td>
<td>86</td>
<td>89</td>
<td>p2</td>
<td>81</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>p4</td>
<td>71</td>
<td>71</td>
<td>p3</td>
<td>88</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>p5</td>
<td>43</td>
<td>42</td>
<td>p6</td>
<td>67</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>p8</td>
<td>82</td>
<td>73</td>
<td>p7</td>
<td>65</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>p9</td>
<td>72</td>
<td>73</td>
<td>p10</td>
<td>75</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>p11</td>
<td>81</td>
<td>82</td>
<td>p12</td>
<td>58</td>
<td>58</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 contains connected speech PCC outcomes for individual participants in both treatment conditions. In the treatment group, three participants improved
in terms of PCC, albeit only by 2-3%. In the control group, three children also improved in terms of connected speech PCC, by 3-8%. As aforementioned, there was no statistically significant difference between groups at Time 1 and Time 2 in connected speech PCC.

A Wilcoxon signed ranks test was conducted to investigate if there was a within group effect on this measure. It was found that there was no significant difference between participant scores at Time 1 and Time 2 in terms of connected speech PCC in the treatment now group (z= .137, N=6, p=.891, two-tailed) or control group (z=.813, N=6, p=.416, two-tailed).

Hypothesis 2: Children who receive intervention in the form of the Mixed-Up Marty programme will improve more than those who do not receive treatment, in terms generalisation to activities and participation as measured by the FOCUS.

Looking at the mean FOCUS total scores of both groups (table 6), it is apparent that the treatment now group made greater gains (16.67 points in total) than the control group (3.5 points in total), as reported by parents. A Mann Whitney u-test was used to investigate whether there was a significant difference between groups in FOCUS scores pre- and post-intervention. It was found that there was no statistical significance between treatment groups pre-intervention (U=11, N1=6, N2=6, p=.262) and post-intervention (U=11.5, N1=6, N2=6, p=.297), indicating that the groups were equivalent in terms of functional communication skills at Time 1, and the intervention group had not improved more than the control group by Time 2, post intervention. Therefore the hypothesis that children who receive the Mixed-Up Marty programme will improve in functional communication skills more than those who do not, as measured by the FOCUS, must be rejected.

Within the treatment now group, a Wilcoxon signed ranks test showed that there was no statistically significant change between pre- and post-intervention outcomes (z=-1.753, N=6 p=.90, two-tailed). This was also true for the control group (z=-.314, N=6, p=.753, two-tailed).
Table 6: FOCUS Mean scores

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Treatment Now Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Score Pre-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervention (SD)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean Score Post-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervention (SD)</td>
<td></td>
</tr>
<tr>
<td>FOCUS</td>
<td>235.83 (53.05)</td>
<td>262.00 (33.31)</td>
</tr>
<tr>
<td></td>
<td>252.50 (37.22)</td>
<td>265.50 (26.39)</td>
</tr>
</tbody>
</table>

Table 7: Summary of individual FOCUS scores

<table>
<thead>
<tr>
<th>Participant</th>
<th>Treatment Now</th>
<th>Treatment Later</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Treatment FOCUS Scores</td>
<td>Post-Treatment FOCUS Scores</td>
</tr>
<tr>
<td>P1</td>
<td>191</td>
<td>211</td>
</tr>
<tr>
<td>P4</td>
<td>172</td>
<td>228</td>
</tr>
<tr>
<td>P5</td>
<td>223</td>
<td>234</td>
</tr>
<tr>
<td>P8</td>
<td>279</td>
<td>277</td>
</tr>
<tr>
<td>P9*</td>
<td>237</td>
<td>253</td>
</tr>
<tr>
<td>P11*</td>
<td>313</td>
<td>313</td>
</tr>
</tbody>
</table>

* For these participants the parent who filled out the post-treatment FOCUS form differed from pre-assessment completion of the form.

The figures in table 7 provide the FOCUS scores pre- and post- intervention for children who received treatment now versus the control group. For those children who did receive the programme, four made gains in their FOCUS total score. Two of these made significant clinical change as indicated by the FOCUS manual scoring guidelines, with a further two children falling into the FOCUS category of “possibly having made meaningful clinical change”. For two of the children in the treatment now group, the parent completing the FOCUS questionnaire was not the same pre- and post-intervention. One of these participants made clinically significant gains, the other did not make any change. Three children who did not receive the programme
also improved in FOCUS total scores, one of which was significant clinical change, and the other which was possible meaningful clinical change, as per the FOCUS manual. For three of the children in the treatment later group, the parent completing the FOCUS questionnaire pre- and post- intervention differed, with all total scores having decreased at Time 2 assessment.

For the one child (participant 3) who made significant improvement in single word accuracy as highlighted by DEAP PCC scores earlier, this change was not captured in terms of their FOCUS outcomes. In fact, parent report on the FOCUS indicates a small regression rather than an improvement. However, this is not a reliable measure, as the parent who completed the FOCUS pre- and post-intervention differed for this particular child.

**Hypothesis 3: Parents who carry out the Mixed-Up Marty programme with their children will find it an acceptable method of intervention.**

The average scoring for each item on the parental Likert scale are captured in figure 1. Each item had a mean score of 4 or more, as rated by parents on a scale of 1=Strongly Disagree to 5=Strongly Agree, illustrating that on average scores were high on all items. This indicates that parents mostly agreed or strongly agreed with the items on the questionnaire, suggesting a high level of acceptability and utility of the programme. Therefore, the hypothesis that parents who carry out the Mixed-Up Marty programme will find it an acceptable method of intervention is supported.

The top scoring items included item 4 “Instructions provided were adequate to carry out the programme” ($M=5$), item 10 “I felt confident using the programme with my child” ($M=4.83$), item 8 “I will continue to use the programme with my child” ($M=4.83$), and item 5 “Materials provided were adequate to carry out the programme” ($M=4.8$).
Figure 1: Likert Scale Mean Scores.

Error bars indicate minimum and maximum scores for each item.

<table>
<thead>
<tr>
<th>Likert Scale Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The home programme helped improve my child’s speech.</td>
</tr>
<tr>
<td>2. My child enjoyed the home programme.</td>
</tr>
<tr>
<td>3. I enjoyed doing the programme with my child.</td>
</tr>
<tr>
<td>4. Instructions provided were adequate to carry out the programme.</td>
</tr>
<tr>
<td>5. Materials provided were adequate to carry out the programme.</td>
</tr>
<tr>
<td>6. It was easy to find time to do the programme.</td>
</tr>
<tr>
<td>7. I spent more one to one time with my child because of the programme.</td>
</tr>
<tr>
<td>8. I will continue using activities with my child.</td>
</tr>
<tr>
<td>9. These activities are useful for my other children.</td>
</tr>
<tr>
<td>10. I felt confident using the programme with my child.</td>
</tr>
</tbody>
</table>

A Spearman’s rho test found no correlation between FOCUS total scores and parental report for item 1 on the Likert scale “the programme helped improve my child’s speech” ($r=.304$, $N=6$, $p=.558$, two-tailed).

Discussion

Effectiveness of intervention for speech accuracy

The aim of the study was to investigate the efficacy of the Mixed-Up Marty programme in the remediation of SSDs. It was hypothesised that children who received the programme would improve in PCC on the DEAP and in connected speech more than those children who received no treatment. This was not reflected in the results either by individual outcome scores or by statistical
significance between treatment groups, and so the hypothesis is not supported. Rather results indicate that the Mixed-Up Marty programme was not efficacious in improving children’s speech when measured in PCC. In fact, only one child made statistically significant improvements, and this child did not receive treatment. Therefore, we must accept that the Mixed-Up Marty programme is not a useful tool for clinical practice.

**Effectiveness of intervention for functional communication skills**

It was hypothesised that children who received the programme would improve more than children who did not in terms of functional communication skills as measured by parental report on the FOCUS. It is essential to consider the child holistically and ensure that an intervention facilitates functional communication, encouraging social interaction and participation in daily life (McLeod & Bleile 2004). This was not reflected in the results between treatment groups, although individual outcomes did indicate significant clinical change and possible meaningful clinical change for four of the six participants in the treatment group. However, significant change also occurred for those children who did not receive the home programme and so progress of those in the treatment group may not be attributed to be as a result of the Mixed-Up Marty programme. Therefore, we must reject our hypothesis that children who received the programme would improve more than children who did not in terms of functional communication skills, and accept the null hypothesis. Furthermore, when interpreting FOCUS outcomes, it is important to note that the parents filling out the form differed for a number of participants pre- and post- intervention, questioning the reliability of the data when comparing group outcomes.

**Parental Acceptability**

It was hypothesised that parents would find the Mixed-Up Marty programme an acceptable method of intervention as reported through agreement on a Likert scale devised specifically for the research. Results show that this was the case, with parents finding the programme materials and delivery adequate, and that it was enjoyable to carry out for parent and child alike. Parents were of the opinion
that the programme helped improve their child’s speech, however, there was no correlation between FOCUS score improvements between Time 1 and Time 2, and parental rating of this item. Furthermore, the PCC outcomes of single word and connected speech accuracy for individual participants do not support this reported improvement.

Although the programme was not effective in the remediation of SSDs, parents felt they were confident in delivering it, and so information about the delivery of materials and the aesthetic design of the programme may be useful in devising future home programmes. Parents reported that they would continue to carry out activities with their child, after the intervention had ceased. While the specific activities did not result in gains in speech accuracy, this agreement highlights parent’s motivation to be agents of therapy to their children.

Severity of Sample

The lack of success of the programme in general may be due to the characteristics of the population of the study, namely, the severity of the children with SSDs, as research indicates that children with severe SSDs have more persistent difficulties. The treatment group of the current research included three children with severe SSDs, one of which had previously received intervention for their speech sound difficulties, and three of which had evidence of a concomitant language disorder at the time of initial assessment, further highlighting the extent of their difficulties. For those three children, gains in PCC on the DEAP and in connected speech were minimal, and scaled scores did not change from Time 1 to Time 2. It is unlikely that a child with such difficulties (i.e. speech disorder and concomitant language difficulties) will remediate their speech difficulties with intervention in the form of a home programme – it is probable that specialist intervention is required and that their difficulties will not be easily resolved.

Intervention Dosage and Delivery

Another reason for the lack of effectiveness may be due to the lack of participants who actually received the optimum dosage of intervention. Only one
child received the optimum amount of intervention as set out at parent training for the treatment now group, with another receiving just under the recommended amount. However, these two children did not make gains in speech accuracy. This may be linked to their overall severity: one had a severe phonological delay, the other a moderate consistent phonological disorder with concomitant language difficulties. While the amount of intervention received was not recorded for one child, the remaining children received less than eight hours treatment, with one receiving less than half the desired amount.

As with all forms of parental involvement, there remains an uncertainty as to how competent parents are as agents of therapy, how consistent the delivery of the programme was, and as to how often intervention was accurately and effectively actually carried out.

Comparison with other home programmes

This programme differed to previous efficacious home programmes in improving speech, in that the parent training component and duration of the programme was a lot shorter compared to studies such as Dodd and Barkers (1990) 24 hours of parent training and Eiserman et al’s (1990; 1995) 40 minute fortnightly parent training sessions which continued for 7 months. Unlike Eiserman et al’s study, parent training was not tailored to each parent-child dyad, and targets were not selected specifically for each child.

The motivation behind the current research was to evaluate the efficacy of a programme that would be viable for clinicians to deliver under service delivery restrictions. Two hours of parent training, and six weeks of intervention was a sufficient length of time for Brady (2010) to produce measurable gains in PCC, but they targeted underlying deficits of PD and CPD along with other approaches to phonological intervention. Also as previously mentioned, the researchers did not have a control group to compare gains reported.

Limitations & Recommendations

The results of the current research must be interpreted with caution due to the small sample size as it is not considered to be a representative sample of the
preschool speech sound disordered population, and so is unlikely to be sufficient to yield reliable results. Also, results may not be generalizable to the larger population of children with SSDs due to the general severity of sample. Due to the heterogeneity of children with SSDs in terms of their varying abilities and responses to intervention, obtaining significant findings will always be a challenge for researchers. It is recommended that future studies investigating the effectiveness of a home programme are carried out on larger samples, so that the results may be considered some-what representative of the speech-disordered population. Also it may be worth investigating if perhaps a programme such as the Mixed-Up Marty programme may be better suited to children with milder diagnoses of SSDs.

Conclusion & clinical implications

The results of the current research do not support the use of the Mixed-Up Marty programme as an efficacious method of intervention for the remediation of SSDs or in improving functional communication skills. Therefore the current programme is not a useful clinical tool for use in current practice or service delivery models. However, parents were in favour of the general delivery and aesthetic design of the programme, and so this may be useful when devising future home programmes for use with a pre-school population.
References


Conway, P. (2014) The case of speech and language therapy, Inclusion Ireland [online], available:


Appendix A

An example of a Mixed-Up Marty Story

MS2 Mixed up Marty at the swimming pool

MS2. Mixed up Marty at the swimming pool:

This is Mixed up Marty, and his friends, Guy, Di, and Fix up Fi.

Today the gang are going swimming at the school pool. It’s a sunny day, but a bit cool.

There’s a shop at the pool, so afterwards they can have Coke and cookies.

They’ll need keys for the lockers to put their clothes in. “Who’s going to get the keys?” says Guy?

“I’ll do it!” says Mixed Up Marty, and he runs off to the shop. “Hi Mr Bob,” he says. “Four teas, please.”
“Okay” says Mr Bob, and fetches four cups of tea.

“Oh no” says Marty, “I didn’t want teas, I want teas”.

“Yes” says Mr Bob. “Here are four teas”.

“No, teas for the lotter”

“Yes” says Mr Bob. “Teas for the lot of them”.

“Oh No” says Marty, “help!”.

Luckily, Fix up Fi comes to see what’s keeping him. “Oh I see”, she says. “Marty has mixed up again. He doesn’t mean teas, he means keys for the locker!”

“Oh well, he said teas!” says Mr Bob, grumpily. But he goes off and gets the keys. “Here you are, 4 keys for the locker, not 4 teas he says.

Now they have the keys, the gang get changed. Oh dear says Guy, I forgot my swimming togs. I can’t go in the pool”.

“Don’t worry” says Marty, “we’ll borrow some” and he runs off to Mr Bob.

“Hi Mr Bob. Di has no swimsuit. Do you have one to borrow?”

“Sure” says Mr Bob, and gives Marty a big bag.
Marty runs back to Guy. "See, Mr Bob has spare swim suits. Here's one for you." And he gives Guy the bag.

Guy opens the bag and takes out a red and white bikini. I can't wear this he says! What can they do?

Along comes Fix up Fi. "I can guess what happened" she says. "Mixed up Marty's done it again. He said the suit was for Di, instead of Guy!"

She goes back and gets a boy's togs for Guy. Now at last they can all go swimming, thanks to Fix up Fi. Now they'll have a lot of fun.

Mixed Up Marty said tea when he meant key. And Di when he meant Guy. So everyone got mixed up!
Appendix B
An example of a Minimal Pair Activity

Find other words that Marty might get mixed up:

<table>
<thead>
<tr>
<th>tap</th>
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<tbody>
<tr>
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<td>tool</td>
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</tbody>
</table>

INSTRUCTIONS
Cut these pictures out and mix them up. Help your child match the word with its rhyming pair. Say the words as often as you can. This will make your child aware that he needs to use two different sounds to make two different words. Just start with a few pictures at first.
Appendix C

An example of a nursery rhyme

Humpty Dumpty

Humpty Dumpty sat on a wall.
Humpty Dumpty had a great fall
All the king's horses and all the king's men
Couldn't put Humpty together again.
Appendix D

An example of a ‘Sounds Different’ story

---

**Sounds different**

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 the wrong sound, it makes a different word.

Just read the stories out like nursery rhymes, with a little bit of emphasis on the rhyming words. Hopefully your child will like them and want you to read them again and again. The more times they hear the stories, the better. When they are used to the stories, let them fill in the words themselves.

---

**DIAGRAM**

- **DIN PETE**
  - My cat’s called Pete.
  - He likes the beat.

- **PETE**
  - He’s got big feet.
  - He eats meat.
  - He even eats up on the sheet.
  - This is Pete out on a seat.

---

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Appendix E

An example of ‘Rhyming Characters’

08. RHYMING CHARACTERS

There are 4 sets of characters with rhyming names in this section. There are two worksheets for each character.

* Activity one
  o 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."
  o When you have talked about all the characters, get your child to point to each bunny, so you are sure they recognise them.
  o 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.
  o Do this on two separate occasions for the two worksheets.

* Activity two
  o When both worksheets are coloured in, cut one up into individual bunnies.
  o Hide these around the room.
  o 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?"
  o 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.
Appendix F

An example of a ‘Letterland’ story

Dippy Duck lives by the Letterland duck pond. Can you see her specially shaped Duck Door?

Everyone loves the duck pond. Dogs, deer and donkeys come to drink and dip their feet in the water. They also come to the duck pond to watch Dippy Duck diving down deep.

When Dippy isn’t splashing and diving in her duck pond she loves to draw. Can you see anything in the distance you think she might like to draw? Do you think the dinosaur could be a real dinosaur?

Dippy Duck doesn’t quack like other ducks. She’s a Letterland duck so she makes a short little ‘d’ sound instead!
Appendix G

An example of a ‘Making Long Words’ activity

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.

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 (as in ant), and the e/r 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.
Appendix H

An example of a ‘Making New Words’ activity

**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, 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, e.g. “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.
tie
pumpkin pie
Dog
high
buy
Guy

e

眼

+ plus

= makes

p

j
Appendix I

An example of a Scrapbook activity

05. 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 you 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. You 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. Keep adding pictures to them throughout the programme, and go back and look at them often.

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 sounds like s at this stage)
Appendix J

Parent Training slides

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
  - s, ng, k, g, t, v, zh, dʒ
  - sh, s, th, dh, r, z, ʒ

(Shibberg, 1995; Downsall 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 “tut” 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 Martty story.
**Minimal Pair Stories & Activities**
- Minimal pairs are words that differ by one sound only e.g. car & tar.
- For example, a child says 'tar' for BOTH 'car' and 'tar'.
- The Mixed Up Marty stories are the main part of the programme.
  - The stories demonstrate the confusion that results if you don’t teach the child the right sounds in words.
  - Remember your child is able to say the sounds.
  - The problem is that they have not worked out where it is important to put the right sound.
- The stories show that, if you want to get your message across, it is important to use the right sounds in words.
- All the activities in the programme work on an unconscious level as well as at a conscious level.
- As you child hears words that differ by only one sound, close together, he/she unconsciously learns that they need to add those sounds to their production.

**Minimal Pairs Stories & Activities cont.**
- When reading the Mixed Up Marty stories, point out to your child how the confusion occurred.
- Say e.g.
  - Marty mixed up book and boot, so he said the bird had a fish in its boot, instead of its book. Nobody knew what he meant!
- OR
  - “Marty said you when he meant you, so the shop assistant thought he wanted to buy a you! Wasn’t that silly! He should have said you, shouldn’t he?”

**Phonological Awareness**
- Phonological Awareness (PA) is a child’s awareness of the sound structure of spoken words e.g. ’k’ is the first sound of cat, cat is made up of the sounds c-a-t.
- PA is important for reading and spelling skills.
- Some children with speech sound difficulties have poor awareness of the sound structure of spoken words.

**Phonological Awareness Activities Include:**
- Syllable clapping – child can clap the syllables (beats) of a simple word e.g. Jump-up, Jump-up (scrappbook)
  - Monday = 2 syllables
  - Saturday = 3 syllables
- Awareness of Initial sounds – child identifies that dog begins with a ‘d’ (scrappbook)
- Sound stories – reading stories with lots of examples of a specific sound (Sound stories)
- Increasing vocabulary – words beginning with the same sounds (scrappbook)

**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 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.
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.

SCRAPBOOK

- Once you have made pages for the sounds your child confuses, continue on with other sounds.
  - This will help your child to recognise the sounds words begin with when he starts to learn to read.

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.

EVERYDAY WAYS TO SUPPORT SPEECH DEVELOPMENT

Looking at other story books:
- Take time to look at storybooks and discuss the pictures
- Tell a story and talk about it.

Vocabulary Enhancement:
- Pick a topic e.g. "my house" and talk about all the words associated with it e.g. rooms and what you do in each room, objects in each room etc.

EVERYDAY WAYS TO SUPPORT SPEECH DEVELOPMENT CONT...

Good Modelling:
- Using slow, clear speech
- Short sentences
- Repetition

Common Modelling mistakes
Child: "That’s a big bird"
Adult: "Not a big bird. Don’t say a big bird, it’s a big bird";
Child: Says nothing
- What’s being modelled here?

EVERYDAY WAYS TO SUPPORT SPEECH DEVELOPMENT CONT...

Modelling:
- Children learn speech through hearing the example of people around them
- Parents are young children’s speech model
- Modelling has two meanings:
  - Providing an example all the time of how to communicate
  - Providing an example of a speech target (a word that you want to practise)

EVERYDAY WAYS TO SUPPORT SPEECH DEVELOPMENT CONT...

Effective Modelling and Recasting
Child: "I like his punny face"
Adult: "I like his funny face too. It’s a really funny face, a funny face! Do you know what that guy with the funny face is called?"
Child: "I want the yellow one"
Adult: "I want the yellow one"

Note: Always model whole words not sounds by themselves
REQUEST FOR CLARIFICATION
- Sometimes you need to ask your child to repeat themselves if you haven’t understood them.
- A genuine communication breakdown can motivate your child to repair their speech.
- Research shows that asking your child to clarify their incorrect production, is more successful in getting them to speak more clearly than simply giving them the right word.
- So if your child says “dodle” for “dogge”, don’t say “did you say “dogge”?”, but “did you say “doodle”?”.

EVERYDAY WAYS TO SUPPORT SPEECH DEVELOPMENT CONT...

Avoid:
- Criticism
- Interrupting the flow of conversation
- Getting in the way of listening

Remember:
- Speech development is a gradual process
- Expect your child’s progress to be gradual
- You are your child’s main speech model
- Talk lots about everyday things!
- Keep it fun

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!
Appendix K

Post-Treatment Likert Questionnaire

Home Programme Project – Parental Questionnaire

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

\[
\begin{array}{|c|c|c|c|c|}
\hline
1 = \text{Strongly disagree} & 2 = \text{Disagree} & 3 = \text{Neither agree nor disagree} & 4 = \text{Agree} & 5 = \text{Strongly agree} \\
\hline
\end{array}
\]

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.

1 2 3 4 5

9. The activities are useful to do with my other children (if applicable).

1 2 3 4 5

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

1 2 3 4 5

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 L

### Post-Assessment DEAP stimuli Assessment Form

| DEAP Code | C.A. | Date | Assessor 1 | Assessor 2 | Stimulus | Target | Production | GL | GA | CA | Fr | Hu | St | Vo | Vo | Ac | Kd | Kc | Md | IGD | FO | Other |
|-----------|------|------|------------|------------|-----------|--------|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|
|           |      |      |            |            | swing     | swing  |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | dog       | dog    |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | book      | book   |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | kitchen   | kitchen|            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | van       | van    |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | crab      | crab   |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | train     | train  |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | boat      | boat   |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | monkey    | monkey |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | lighthouse| lighthouse|            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | hanger    | hanger |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | square    | square |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | school    | school |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | wolf      | wolf   |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            | fire      | fire   |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |
|           |      |      |            |            |          |        |            |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |

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PCC: ____________________