Parent-child interaction therapy: Adding to the evidence

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Abstract

The aim of this study was to evaluate the impact of Palin Parent-Child Interaction (Palin PCI) therapy with young children who stutter. Ten children who stutter (age 3;07–4;11) were randomly allocated to a treatment (n = 6) or to a no treatment condition (n = 4). A single subject series design was used to evaluate progress over baseline (A1), therapy (B1 + B2) and follow up (A2) phases. Multiple measures of stuttering frequency were obtained from home-based video recordings. Children in the no treatment condition completed phases A1 and A2 only. Stuttering frequency was analysed using cusum. Language was assessed and a parent questionnaire completed at the start and end of the study. All six children who received therapy and one child in the no treatment condition significantly reduced stuttering frequency over the period of the study. This was associated with therapy in four cases. Children who received therapy and began with above average expressive language skills had lower scores relative to age at the end of the study. Families who participated in therapy reported reduced impact and increased knowledge and confidence in managing stuttering at the end of the study. Palin PCI can be effective in reducing stuttering frequency in individual young children who stutter.

Keywords: *Effectiveness study, experimental single subject design, stuttering.*

Introduction

Palin Parent-Child Interaction therapy (Palin PCI) (Kelman & Nicholas, 2008) is a therapy approach aimed at the management of stuttering in children aged 7 years and under. It is based on the understanding that stuttering is a heterogeneous multifactorial disorder (Wall & Myers, 1995), with a large number and variety of factors influencing the onset, manifestation and chronicity of stuttering in the individual child (Yairi & Ambrose, 2005).

While the exact cause of stuttering remains unknown, there is evidence that some children are born with a predisposition towards stuttering that may have a genetic (Ambrose, Cox, & Yairi, 1997) or neurophysiological basis (Sommer, Koch, Paulus, Weiller, & Buchel, 2002). However, evidence from twin studies would suggest that the genetic propensity to stutter is not in itself enough for stuttering to occur or persist (Farber, 1981), but another factor will "influence the extent to which the behavioural trait finds expression" (Starkweather, 2002). These factors may be linguistic, environmental or cognitive-affective influences (Wall & Myers, 1995; Cook & Botterill, 1999) and may also provide some explanation for the variability observed in early stuttering.

Manipulating these factors may reduce the frequency of stuttering or in some cases eliminate it. Clearly some factors that have been associated with increased risk of persistency such as family history of persistent stuttering (Ambrose et al., 1997) are not open to change. However, there are other factors that can be manipulated and have been associated with increased fluency when changes are made. Environmental factors for instance may be modified, including parent interaction variables. These include a reduction in parent speech rate (Guitar, Kopf-Schaefer, Donahue-Kilburg, & Bond, 1992; Zebrowski, Weiss, Savelkoul, & Hammer, 1996), increased pause time (Newman & Smit, 1989) and improved turn taking (Winslow & Guitar, 1994). However, the evidence supporting these changes is limited and inconsistent, possibly because of the idiosyncratic responses of individual children (Zebrowski et al., 1996). This reinforces the need to tailor a therapy program to meet the needs of the individual child, to try to introduce therapy aims based on an understanding the factors perceived to influence the child's fluency both positively and negatively and to modify the program as it progresses, based on the child's response.

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Linguistic factors have also been associated with moments of stuttering, with stuttering more likely to occur for instance at the start of utterances (Silverman, 1974) and on longer more complex utterances (Logan & LaSalle, 1999). While there is little consistent evidence to suggest that children who stutter (CWS) are either more or less linguistically able than children who do not (CWNS), there is some evidence that the pattern of linguistic development may be somewhat different, with CWS exhibiting more dissociations across linguistic domains (Anderson, Pelowski, & Conture, 2005) than CWNS. There is also emerging evidence that the expressive language skills of CWS may not advance as predicted and that this may be associated with increased fluency (Bonelli, Dixon, Bernstein Ratner, & Onslow, 2000; Watkins & Yairi, 1997), suggesting a trade off between expressive language development and fluency development.

Palin PCI aims to identify factors that may make it hard for an individual child to establish and maintain fluency, as well as those factors that appear to support fluency development. There are three main strands within the program, with the possibility of combining both indirect and direct management principles. The first strand requires parents to make modifications to their interaction styles. While many of the interaction targets identified are similar to those in other indirect programs (Conture & Melnick, 1999; Wall & Myers, 1995; Yaruss, Coleman, & Hammer, 2006), Palin PCI differs in that there are no standard strategies that all parents focus on. They identify their own targets through video observations and knowledge of what helps their own child.

The second strand of therapy focuses on family strategies, such as acknowledging the child's stutter, encouraging confidence, behaviour management, or coping with teasing. For children who continue to stutter after the implementation of interaction and family strategies, the third strand aims to teach the child more direct speech management strategies, such as rate reduction, pausing or using easy onsets.

The long-term research program investigating Palin PCI is based on the model proposed by Robey and Schultz (1988). This is a five-phase model of clinical outcome research, which advocates a progression from treatment efficacy research, where therapy is investigated under optimal conditions, to treatment effectiveness research, where therapy is investigated under clinical conditions. As the process develops, the factors that influence outcome are isolated and investigated. There are five phases of research described in a logical series, but which are not discrete. In phase 1 the aim is to determine whether there are potential therapeutic effects, observable through case studies and small group studies. Phase 1 evidence for Palin PCI is emerging.

Matthews, Williams and Pring (1997) monitored stuttering frequency in a 4-year-old boy using an ABC design. Stuttering frequency was measured once a week for 6 weeks before therapy, 6 weeks during clinic based therapy and 6 weeks while the parents continued the strategies at home. The evidence indicated that there was a significant reduction in stuttering frequency during the clinic therapy phase and the improvement was maintained during the home consolidation phase. This study was limited by the lack of any long-term follow-up data and by the fact that the parent-child video recordings used to provide samples of speech for analysis, were recorded in the clinic situation.

Millard, Nicholas and Cook (2008) reported data from six young children who stutter, improving on the methods employed by Matthews et al. (1997). Each child had been stuttering for a minimum of 12 months, had received no previous therapy and was under 5;0 at the start of the study. Using a single subject ABC design, Millard et al. collected stuttering frequency data from speech samples recorded at home while each child played with each parent. These were recorded once a week for 6 weeks prior to the start of therapy, once a week for 6 weeks during the period when the family attended clinic sessions on a weekly basis, once a week for 6 weeks while the family implemented the therapy at home and in the final phase, the recordings were made once a month for a period of 1 year. The authors applied cusum analyses (Montgomery, 1997) to the data as a method of analysing stuttering frequency data. This method of analysis allows trends in data to be determined, but is appropriate for data that naturally fluctuate as it identifies whether the trend is over and above the range of variability observed in the baseline. Four of the six participants reported by Millard et al. demonstrated a significant reduction in stuttering with both parents by the end of the home therapy phase. One child demonstrated a significant reduction with one parent but not the other and both received direct sessions of therapy in the final phase of the study.

The Millard et al. (2008) study improved on the Matthews et al. (1997) study considerably by reporting on the progress of six children, using more naturalistic speech samples collected in the home environment, including long term follow up data and applying a method of analysis to take account of the natural variability in childhood stuttering. However, the inability to generalize the findings outside these individual participants is an important limitation of the study.

One way of increasing the external validity of single subject studies is to replicate the methods and findings (Pring, 2005; Thompson, 2006). Kully and Langevin (2005) argue the value of replicated single subject studies as particularly relevant in relation to stuttering because of the heterogeneous nature of the disorder and consequently therapy. Further, Kully and Langevin suggest that since single subject studies answer different questions to group studies, replicated single subject studies should be considered

alongside RCT's in terms of the contribution they make to the strength of the evidence base.

In addition to a reducing stuttering where this is possible, Palin PCI seeks to "empower and equip parents and reduce their anxieties" (Kelman & Nicholas, 2008, p. 91). Millard (2003) conducted a Delphi study (Mead & Mosley, 2001) to identify what parents considered to be important outcomes from therapy. In addition to a reduction in stuttering frequency and severity, there was a high consensus amongst parents that they would wish to see a reduction in the impact that the stuttering had on the child; that they would be less worried and concerned about the stuttering; and that they would feel more knowledgeable and confident about what they could do to help their child. This study demonstrated that parents of CWS wish these broader aims of therapy to be met as part of the process. There is little empirical evidence so far about whether or not these aims are met.

The primary aim of this study was to further explore the efficacy of Palin PCI using single subject methodology, expanding the Phase 1 evidence (Robey & Schultz, 1988). Inclusion of children who do not receive therapy provided insight into how a group of children who are being studied may progress over time, without intervention. Given the early evidence that language development may change over time, an evaluation of language was included.

Method

The study was conducted at the Michael Palin Centre for Stammering Children (MPC) a specialist offering tertiary referral service alongside provision for local families.

Therapy

The Palin PCI assessment and therapy methods and materials are reported in detail by Kelman and Nicholas (2008). In short, the standard package of care begins with an initial assessment, followed by six sessions of clinic-based therapy, 6 weeks of home-based therapy and regular review sessions for up to 1-year post therapy. Throughout the process both parents attend, unless a single parent family.

The initial assessment. The initial assessment consists of two sessions: a child assessment and a parent consultation. The aim is to identify the physiological, linguistic, environmental and emotional factors that are relevant to the individual child's fluency (Cook & Botterill, 1999; Kelman & Nicholas, 2008). The child assessment includes receptive and expressive language assessments, a fluency assessment and an evaluation of the child's level of awareness and concern about the stuttering. During the parent consultation, the parents complete a detailed case history with the therapist. At the end of the parent consultation, the therapist discusses the child's stuttering within the context of the four-factor framework (Kelman & Nicholas, 2008) and current risk factors research, highlighting the factors that may be influential in relation to the child's fluency. If there are indications that the child is at risk of persistent stuttering and/or the family wish to receive support, therapy is recommended.

The clinic based therapy. The clinic based therapy aims to increase the impact of the factors that were identified as supporting the child's fluency and to manage or reduce the impact of factors that were considered to reduce the child's ability to be fluent. The program is initially delivered as a 6-week package of weekly 1-hour long clinic sessions and may incorporate interaction strategies, family strategies and direct fluency strategies.

In the first clinic session, Special Time is arranged. Special Time is a 5-minute playtime that each parent agrees to have with the child a minimum of three times and a maximum of five times each week. Sessions two to six follow have a similar format. In the second session, each parent is video recorded playing with the child. The parent uses the video to identify the interaction strategies they are using to support the child's fluency and identifies a interaction strategy to target during Special Time. The therapist's role is one of encouragement and reinforcement, helping parents to identify times when they are already demonstrating the interaction strategy and to encourage discussion about the reasons why such a change may be helpful for the individual child. Family strategies may also be included in these sessions. For the majority of children, the emphasis is on the development of interaction and family strategies, with direct fluency strategies introduced at a later stage.

Interaction strategies. Since change in one aspect of interaction may be helpful for one child's fluency and not another's (Zebrowski et al., 1996), there are no universal or prescribed targets within the program. Importantly, parents select targets themselves based on their understanding of their child's needs and their knowledge of times when their child is more fluent. Interaction strategies typically include: reducing parental rate of speech, increasing pause time, reducing the number of questions used, following the child's lead in play or using language that is within the child's linguistic competence.

Family strategies. Palin PCI is explicit about the need to help parents address issues such as managing anxiety about stuttering, helping children manage emotions, confidence building, and other behaviour management such as setting boundaries and routines with, for example, sleeping, eating and turn taking. The main principles of managing aspects of child

behaviour are broadly based on behavioural methods, being specific about attainable goals, with appropriate reinforcement.

Direct strategies. Direct strategies that are taught to the children and practised with the parents at home might include slowing rate of speech, increasing the frequency and duration of pauses, using easy onsets or turn taking.

Home based therapy. Once the six clinic sessions are completed, the parents continue with Special Time for a period of 6 weeks. The aim is for the parents to consolidate their skills and generalize these into the home environment. Parents continue to receive written feedback from the therapist based on the Special Time feedback forms that are returned on a weekly basis.

Review sessions. Each child's progress is reviewed at 3-weeks, 3-months, 6-months and 1-year post clinic therapy. During each of these sessions the child's fluency is reassessed and the level of child and parent concern discussed.

Design

This was a single subject design replicated across participants. There were four phases, each lasting 6 weeks. The length of the phases and the data collection points were arranged to coincide with the current delivery of the program. The duration of the study (i.e., from the first week of phase A1 to the last week of phase A2) was matched to the time that families were on the waiting list for an assessment appointment, so that taking part in the study did not
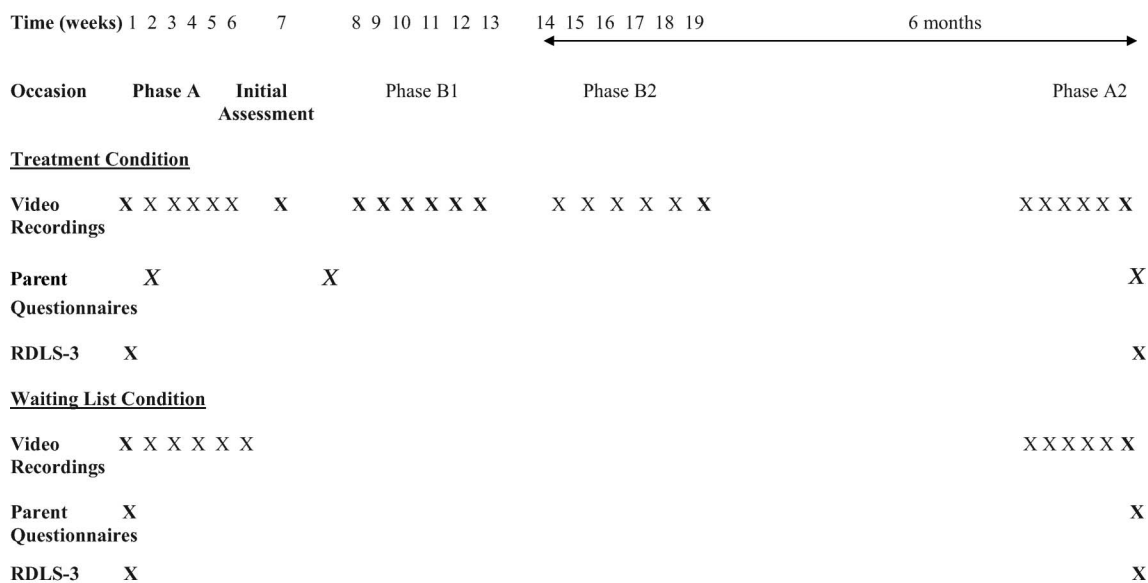
disadvantage those who did not receive therapy. This allowed us to establish a no treatment group. During each phase parents video recorded parent-child play sessions at home, once a week. Children who were allocated to the therapy condition completed all phases, while those who were allocated to the waiting list condition completed only the assessment phases (A1 and A2). The phases and data collection points for each condition are summarized in Figure 1.

Phase A1. The baseline phase. At the start of this phase, parents completed questionnaires and the child completed a language assessment. Families did not receive any specific advice or intervention.

Phase B1. The clinic-based therapy phase. This began with the consultation appointment. Following this, the child and parents attended the clinic once a week for a period of 6 weeks to participate in the PCI program. In all the cases reported in this study, therapy consisted of the development of interaction and family strategies only.

Phase B2. The home-based therapy phase. Parents continued to carry out strategies developed in the clinic phase at home and sent weekly feedback sheets to the therapist, who provided reinforcement, advice and support in response to these. A review appointment took place at the end of phase B2, when clinician and parents reviewed progress and determined whether further intervention was indicated.

Phase A2. The follow-up phase. This phase began 3 months after the end of phase B2 and ended with a review session that corresponded to 6-months post clinic therapy. In the review appointment the

Time (weeks)	1 2 3 4 5 6	7	8 9 10 11 12 13	14 15 16 17 18 19	6 months
Occasion	Phase A	Initial Assessment	Phase B1	Phase B2	Phase A2
Treatment Condition					
Video Recordings	**X** X X X X X	**X**	**X X** X X X X	X X X X X **X**	X X X X X **X**
Parent Questionnaires	*X*	*X*			*X*
RDLS-3	X				X
Waiting List Condition					
Video Recordings	**X** X X X X X				X X X X X **X**
Parent Questionnaires	X				X
RDLS-3	X				X

* bold **X** denotes attendance at clinic.

Figure 1. Data collection points summary.⋆

therapist and parents discussed progress, concerns and determined whether further intervention was required. In addition parents completed the questionnaire and the language assessment was re-administered. Those in the waiting list condition (no treatment condition) completed the recordings within a corresponding time frame.

Participants

All children referred to MPC who met the following criteria were invited to participate in the study: under 5;0 years of age; diagnosed as stuttering by minimum of two speech and language therapists; stuttering for a minimum of 12 months; no therapy in the previous 6 months; use English as the primary language at home; both parents (if a two parent family) able to attend MPC for therapy.

Fourteen families began phase A1 and six children completed the study in the therapy condition and four in the waiting list condition. Attrition was as follows: two children (one therapy, one waiting list condition) did not complete the data collection in the baseline phase; two children (one therapy, one waiting list condition) withdrew because of family illness and bereavement; four families receiving therapy withdrew during phase B1 as they were unable to combine the needs of the therapy and the demands of the data collection. All of these continued to receive Palin PCI, although they had withdrawn from the study.

Table I summarizes the information about those who completed the study.

Procedures

Allocation to conditions. Children were randomly allocated to one of two conditions, a therapy condition and a waiting list condition, using a process of minimization (Taves, 1974), to ensure a balance of males/females and family history/no family history across the two conditions. Due to changes in referral patterns and a reduction in the waiting list time at MPC, the waiting list condition had to cease part way through the study so that children who took part in the study did not have to wait longer for therapy.

Therapy. The therapy was conducted by specialist speech and language therapists (SLTs) working at MPC. Each of the therapists had been involved in the development of Palin PCI and was familiar and experienced in delivering the program. Treatment integrity was therefore high. None of the researchers was involved in the clinical management of these families.

Decisions about whether further input was required or whether discharge was appropriate, were made jointly by the SLT and the parents at the three review sessions (6 weeks, 3 months and 6 months after the end of phase B1). In all cases in this study, the therapy consisted of interaction and family strategies. All the participants who received therapy were discharged within 1-year post therapy.

Outcome measures

Stuttering frequency. During each phase parents made 20-minute video recordings of the child playing at home with a parent, once a week. Parents were advised that the activity should be one that could be carried out at a table or on the floor.

Each recording was coded and randomly presented for transcription by a trained research assistant under the supervision of the first author. Thirteen minutes of each recording was transcribed using the Child Language Data Exchange System (CHILDES) (MacWhinney, 2000). Episodes of stuttering that consisted of single syllable word repetitions, part syllable repetitions, prolongations and blocks were identified and coded using the Codes for the Human Analysis of Transcripts (CHAT) according to the methods described by Bernstein Ratner, Rooney, and MacWhinney

Table I. Summary information about the participants.

Participant	Gender[1]	Age[2]	TSO[3]	Family[4] history	Condition
P1	M	3;11	12	Yes	Therapy
P2	M	4;01	15	No	Therapy
P3	M	3;07	24	Yes	Therapy
P4	F	4;11	21	No	Therapy
P5	M	3;07	13	Yes	Therapy
P6	M	3;10	15	No	Therapy
C7	M	4;03	30	Yes	Control
C8	M	4;06	22	Yes	Control
C9	M	4;04	22	Yes	Control
C10	M	4;11	34	No	Control

[1]M = Male; F = Female.
[2]Chronological age at start of study in years and months.
[3]Time since reported onset of stuttering, in months.
[4]History of stuttering in the family.

(1996). Frequency of stuttered words was determined using the Computerized Language Analysis (CLAN) component of the CHILDES system. Access to the CHILDES system, including the CHAT and CLAN packages is available at http://childes.psy.cmu.edu.

Stuttering frequency data (percentage stuttered words) was analysed using cusum analysis (Montgomery, 1997). This is a method of analysis that seeks to monitor change in data that naturally fluctuate, to determine whether any shift can be attributed to an influencing variable. Using the mean and standard deviation of the data in the baseline, the cusum analysis determines whether a shift in subsequent phases is outside the range that could be attributed to chance.

Parents' perspectives of change. A questionnaire previously developed using a Delphi approach (Millard, 2003), consisting of a series of visual analogue rating scales was completed by parents at the start and end of the study (Appendix A). The individual scales were grouped according to whether they referred to the frequency of stuttering, the impact of the stuttering on the child, the impact of stuttering on the parent or the parent's knowledge and confidence in managing the stuttering. Each scale was 10 cm long. The parents' ratings were measured in millimetres providing a score from 0–100, with higher scores reflecting a more positive rating. Mean scores were determined for each group of scales.

Each parent completed the questionnaire independently. The mean of the two parents' scores for each group of scales was calculated, with the exceptions of C7 and C10 who did not live with their fathers and scores therefore refer to ratings made by mothers only.

Language. Receptive and expressive language skills were assessed at the start of phase A1 and at the end of phase A2 using the Reynell Developmental Language Scales III (Edwards et al., 1997).

Results

Stuttering frequency

Each of the participants completed all recordings, giving a total of number of 192 submitted recordings. Two of these were blank (P6 recording number 17 and C8 recording number 24), yielding a total of 190 recordings for analysis. The mean number of words was 439.9 (SD = 177.71, range 109–897, median 436). The percentage words stuttered each week during each phase is recorded in Table II for each individual.

Reliability of stuttering frequency measures. The first author who was blind to the original coded transcripts, reanalysed one third of the recordings

Table II. Percentage of stuttered words.

Participant	Baseline (A1)						Clinic-based therapy (B1)						Home-based therapy (B2)						Follow up (A2)					
P1	6.8	5.4	6.3	3.6	4.9	3.4	4.9	1.7	5.7	3.7	6.2	3.7	2.7	4.1	3.3	5.6	4.1	4.8	3.6	1.0	2.1	3.6	5.5	2.6
P2	3.2	3.3	5.1	4.4	4.2	4.0	5.2	4.0	3.5	2.6	4.9	3.8	4.7	9.0	5.4	5.6	7.1	4.1	7.4	3.0	3.8	1.3	3.6	3.4
P3	12.1	11.0	15.9	11.9	18.9	10.2	8.4	7.7	4.8	2.3	6.0	4.9	6.5	3.9	10.5	7.1	4.3	7.6	2.6	10.2	7.2	8.8	9.2	3.3
P4	7.8	3.9	6.8	4.5	9.1	4.4	4.0	3.0	4.6	4.1	5.5	3.0	3.9	0.9	3.3	4.1	3.5	2.7	3.8	2.8	3.8	4.1	3.5	2.5
P5	12.1	10.9	14.4	11.8	8.7	15.8	14.5	15.6	21.1	26.0	16.7	8.4	10.1	8.5	9.5	7.3	8.5	3.6	14.2	6.4	8.6	10.7	2.9	5.9
P6	10.1	7.1	6.7	10.3	4.6	7.9	11.8	12.7	10.3	8.9	7.0	12.8	6.2	4.1	3.4	0.9	*	5.7	3.7	2.0	0.7	2.6	1.8	2.4
C7	14.3	14.2	8.6	6.3	13.4	12.9													3.6	4.4	3.9	2.9	4.3	2.9
C8	14.6	6.7	7.0	13.3	10.6	8.8													23.6	7.4	11.1	6.2	9.8	*
C9	6.6	2.4	2.7	9.4	11.7	5.2													3.6	7.6	1.6	3.4	1.8	4.9
C10	1.7	2.1	1.9	1.4	3.0	3.0													2.3	3.0	0.9	1.2	1.6	2.1

*Data missing.

(n = 64), coding episodes of stuttering. Inter-rater reliability was based on agreements and disagreements between raters according to whether words were stuttered or fluent. Using the percentage agreement index (Suen & Ary, 1989) an agreement of 97.9% (SD 1.37, range: 94.5 – 100%) was obtained.

Analysis of stuttering frequency over time. A cusum analysis was conducted on the percentage stuttering frequency data obtained for each child to determine whether there was a significant trend in the data. In order to interpret the analysis, an understanding of the graphs will be required (see Figure 2). The target line 0 represents the mean of the baseline data and each point marked on the target line denotes a data collection point. A line above the target line denotes an increase in the percentage stuttering data above the mean, while a line below the target denotes a decrease in the data. If the graph line crosses the upper cusum limit, this represents an increase in the frequency of the stuttering data that can not be explained by chance. If the lower line crosses the lower cusum limit there is a decrease in stuttering frequency that can not be explained by chance. Any significant change reflects a systematic increase or decrease in the data that cannot be explained by the variability of the data in the baseline phase.

The cusum charts for the individual participants are presented in Figures 2–11.

Four of the children who received therapy (P3, P4, P5 and P6) demonstrated a systematic reduction in the frequency of stuttering that reached significance during the therapy phase (B1 + B2), indicating that the reduction was associated with therapy. Graphs for two of the children (P5 and P6) show that the stuttering significantly increased during phase B1, before starting to reduce at the end of the phase. The remaining two participants who received therapy (P1 and P2) demonstrated a significant reduction by the

end of Phase A2. However, since the reduction does not reach significance during the therapy phase, the improvement observed in A2 cannot be directly attributed to the therapy itself, but could be the result of other variables. Interestingly, while the cusum graph for P2 shows little change over the clinic
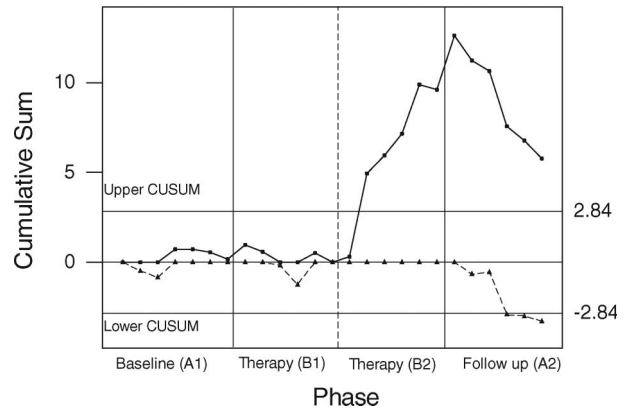
Figure 3. Participant P2's cusum chart demonstrating a systematic increase in stuttering frequency during the phase B2 and a systematic reduction relative to the baseline in phase A2.

Figure 4. Participant P3's cusum chart demonstrating a systematic reduction in stuttering frequency that cannot be explained by chance during phase B1.
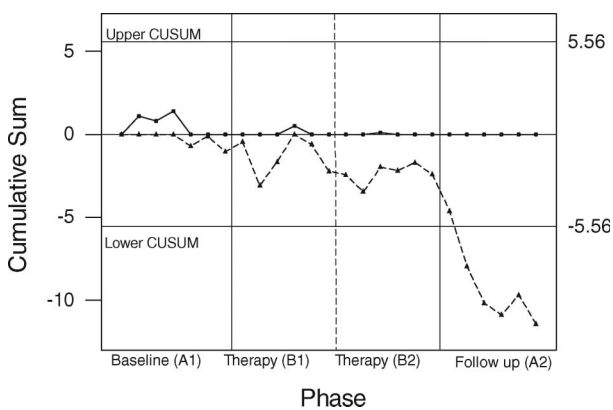
Figure 2. Participant P1's cusum chart demonstrating a systematic reduction in stuttering frequency that cannot be explained by chance during phase A2.

Figure 5. Participant P4's cusum chart demonstrating a systematic reduction in stuttering frequency that cannot be explained by chance in phase B2.
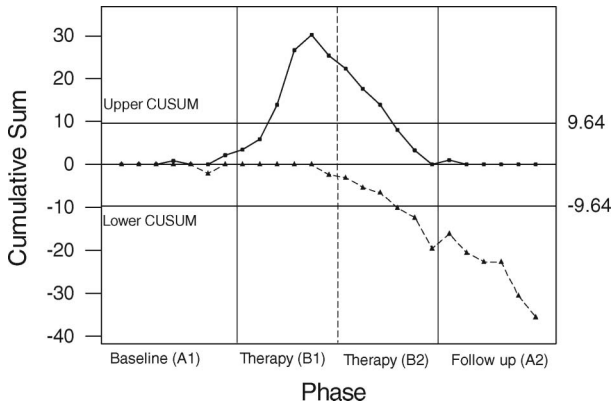
Figure 6. Participant P5's cusum chart demonstrating a systematic increase in stuttering in phase B1, followed by a decrease in stuttering that cannot be explained by chance in B2.
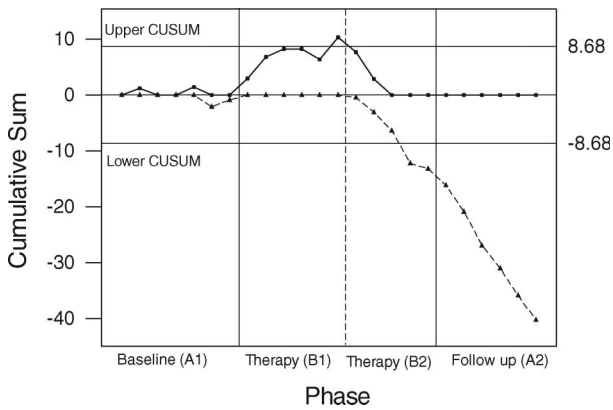
Figure 7. Participant P6's cusum chart demonstrating a systematic decrease in stuttering frequency that cannot be explained by chance in phase B2.
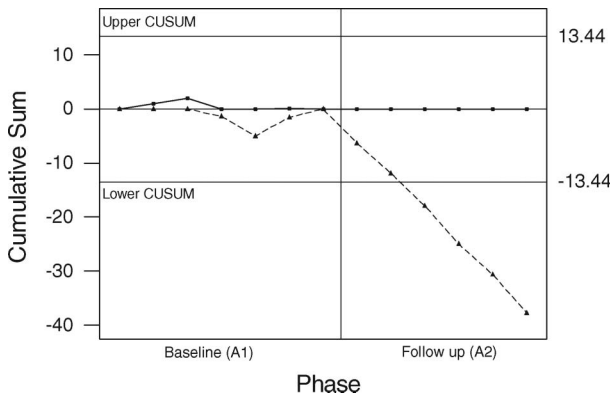
Figure 8. Participant C7's cusum chart demonstrating a systematic reduction in stuttering frequency that cannot be explained by chance in phase A2.

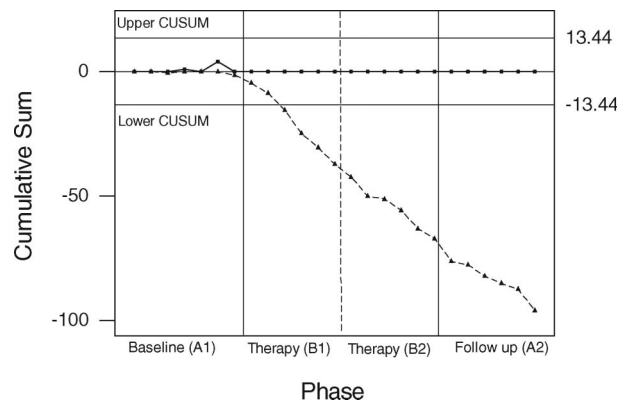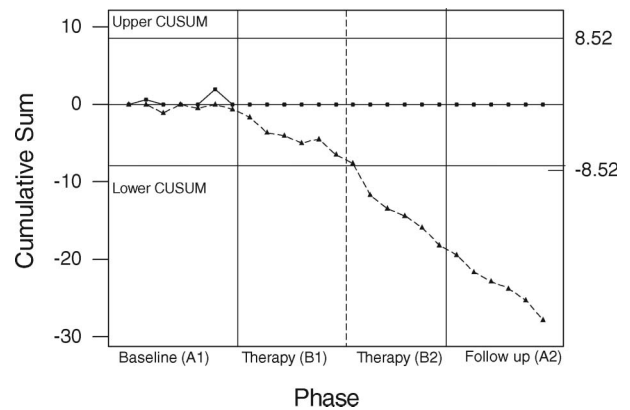Figure 9. Participant C8's cusum chart demonstrating no systematic change in stuttering frequency in phase A2 relative to A1.
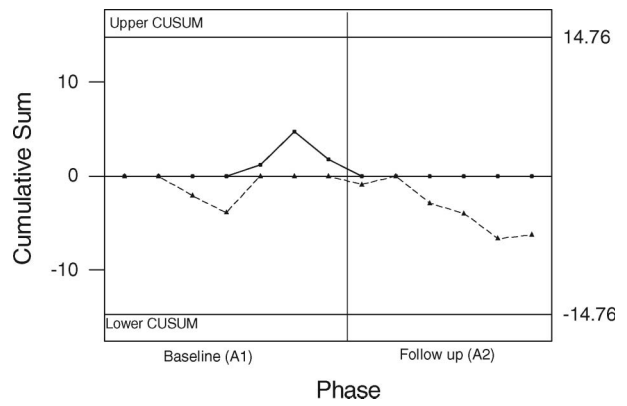
Figure 10. Participant C9's cusum chart demonstrating no systematic change in stuttering frequency in phase A2 relative to A1.
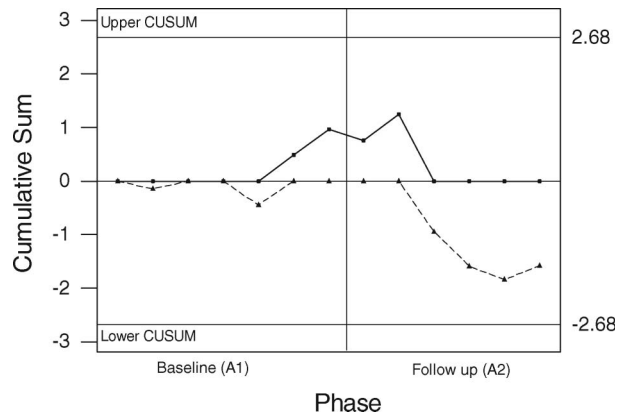
Figure 11. Participant C10's cusum chart demonstrating no systematic change in stuttering frequency in phase A2 relative to A1.

therapy (B1), there is a significant increase in stuttering frequency over the home based therapy phase. This might indicate a difficulty with home transfer and maintenance for P2. While there was a significant reduction during the follow up phase (A2), the absence of observed positive change

associated with the therapy phase once again means that the improvement cannot be directly attributed to the therapy. One child (C7) demonstrated a significant reduction in trend over the period of the study.

Parent ratings of fluency

The mean parents' ratings of fluency are presented in Figure 12. P2's parents did not complete the questionnaire at the end of the study, but completed it at a review appointment 3 months post clinic therapy, so scores will be reported separately. At the start phase A1, P2's parents' mean rating of fluency was 75.8 compared to 88.0 at 3 months post clinic therapy.

Parents' ratings of fluency indicated improvement over time, although there was a relatively small change reflected in the scores of C8 and C9 parents. With the exception of C10's parent, these ratings were in line with the stuttering frequency analyses.

Parents' ratings of the impact of stuttering on the child

The mean parents' ratings of scales relating to the impact of the stuttering on the child are presented in Figure 13. At the start, the mean parent rating for P2 was 97.2 and at the three-month review appointment was 98.2. All except C9's parents indicated that the stuttering was having less impact on the child at the end of the study than at the start.
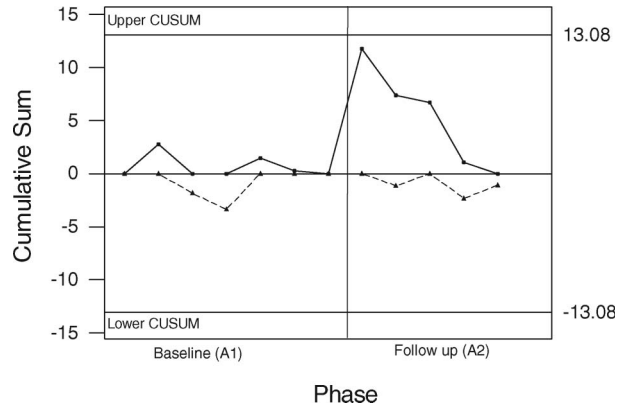
Parents' ratings of the impact of stuttering on themselves

The mean parent ratings of parental worry and concern about the stuttering are presented in Figure 14. C2's parents scored 47.8 at the start and 60 at the 3-month review.

Ratings from parents of children who improved over the period of the study, including all who received therapy, indicated that the stuttering had less impact on them at the end of the study than at the start. There was little change in the ratings made

by C10's mother and some indication by C8 and C9 that they were more worried and concerned at the end than at the start.

Parents' knowledge and confidence in managing the stuttering

These ratings are presented in Figure 15. The mean ratings for P2's parents increased from 77.8 at the start to 82.8, 3 months post clinic therapy. Ratings of parents' knowledge about stuttering and confidence in how to manage it increased for parents whose children improved over time, with little improvement evident for parents of C8 and C9.

Figure 13. Parents' ratings of the impact of stuttering on the child.

Figure 12. Parents' ratings of fluency at the start and end of the study.

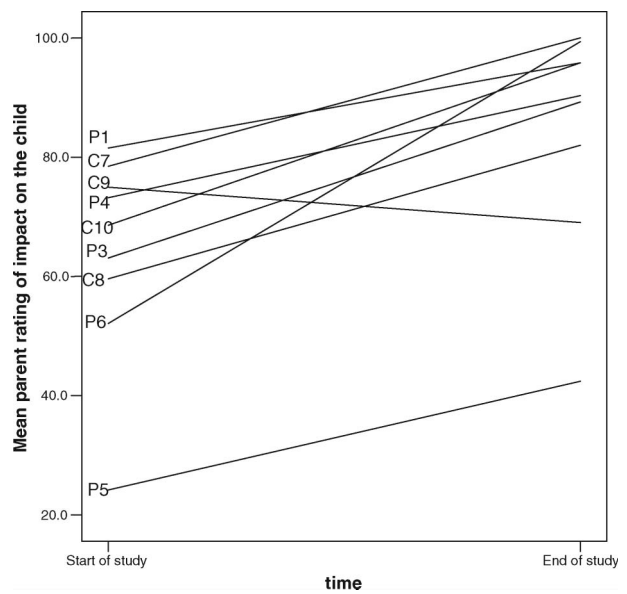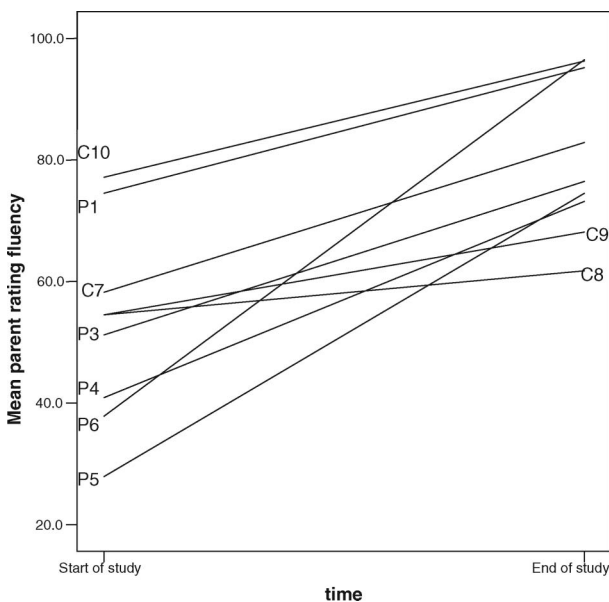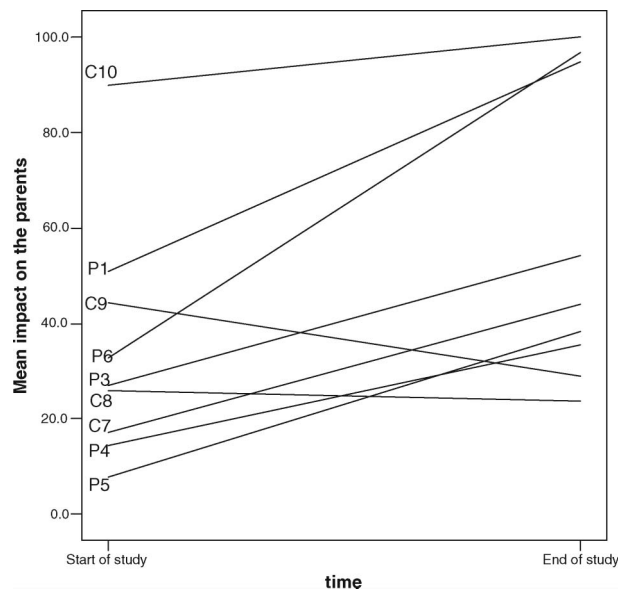Figure 14. Parents' ratings of the impact of stuttering on themselves.

Language

Five of the six children who received therapy obtained above average receptive language scores at the start of phase A1 (all except P4, who was within normal limits). At the end of the study all were high average or above. There was a wide range in receptive skills recorded in the children who did not receive therapy at the start of Phase A1 (standard score range 37–62). All of these children demonstrated an increase in receptive scores relative to age, with three (C8, C9 and C10) achieving above average scores at the end of phase A2.

At the start of phase A1 five of the children who received therapy demonstrated above average expressive language scores but a reduction in scores
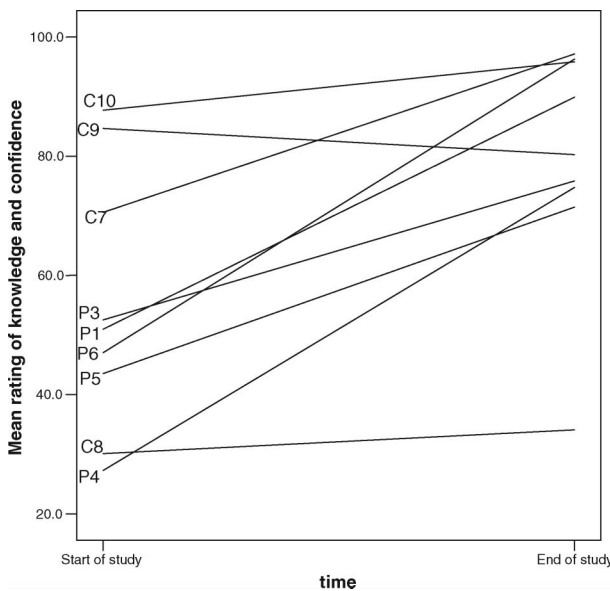
relative to age at the end of phase A2. Two children (C7 and C10) demonstrated an increase, C8 a reduction and C9 no change in expressive skills relative to age. Receptive and expressive languages scores obtained at the start of phase A1 and end of phase A2 are recorded in Tables III and IV respectively.

Discussion

The aim study was to investigate the efficacy of Palin PCI with individual young CWS. The selection criterion of 12 months post onset was included in an attempt to reduce the possibility that the findings could be attributed to natural recovery (Yairi, Ambrose, Paden, & Throneburg, 1996). The results indicate that there was a systematic reduction in the trend of stuttering for all children who received therapy over the period of the study (phases A1 through to the end of A2). Further, the use of the cusum analysis demonstrates that the improved fluency could not be explained by the variability of each child's stuttering, as observed in the baseline. Reduction in stuttering became significant during the therapy phases (B1 + B2) in four of the participants who received therapy an association that suggests the change may be attributed to the therapy. The findings of this study support the clinical reports of this study that suggest responses to therapy are individual, some children will demonstrate improvements at a faster rate than others (Kelman & Nicholas, 2008), and that this may still occur if an increase in stuttering is observed, as in the cases of P5 and P6.

The change seen in C7 supports the possibility that other factors may have contributed to the reduction in stuttering over this time period and supports reports that a child's stuttering may reduce in the absence of therapy for some time after onset

Figure 15. Parents' ratings of knowledge about stuttering and confidence managing it.

Table III. Reynell Developmental Language Scales-3 Receptive Language Scores.

Subject	Start of study				End of study			
	CA	SS	PR	AE	CA	SS	PR	AE
P1*	3;11	64	92	5;6–5;7	4;09	63	91	6;0–6;6
P2*	4;01	61	88	4;11–5;5	5;00	69	98	>6;6
P3**	3;07	66	95	4;11–5;5	4;05	66	95	6;0–6;6
P4**	4;11	50	56	4;11–5;5	5;09	60	85	>6;6
P5**	3;07	66	95	4;11–5;5	4;05	60	85	5;6–5;7
P6**	3;10	62	89	4;6–4;7	5;00	58	80	5;8–5;11
C7*	4;03	50	51	4;3	5;01	55	68	5;6–5;7
C8	4;06	47	38	4;4–4;5	5;02	61	86	6;0–6;11
C9	4;04	58	80	4;11–5;5	5;02	68	97	6;6
C10	4;11	37	11	4;3	6;02	64	93	>6;6

*significant reduction in stuttering over period of study.
** significant reduction in stuttering directly associated with therapy.
CA, chronological age.
SS, standard score.
PR, percentile rank.
AE, age equivalent.

Table IV. Reynell Developmental Language Scales-3 Expressive Language Scores.

Subject	Start of study				End of study			
	CA	SS	PR	AE	CA	SS	PR	AE
T1*	3;11	50	50	3;11	4;09	52	60	5;00
T2*	4;01	64	93	5;01–5;02	5;00	57	75	5;07
T3**	3;07	67	96	4;05	4;05	54	66	4;09–4;11
T4**	4;11	58	80	5;07	5;09	50	52	5;09
T5**	3;07	67	96	4;05	4;05	58	79	5;01–5;02
T6**	3;10	65	96	4;05	5;00	45	30	4;05
C7*	4;03	51	55	4;04	5;01	60	85	5;09
C8	4;06	48	44	4;05	5;02	42	23	4;05
C9	4;04	53	62	4;04	5;02	53	61	5;04–5;06
C10	4;11	42	23	4;02	6;02	52	57	6;03–6;04

*significant reduction in stuttering over period of study.
**significant reduction in stuttering directly associated with therapy.
CA, chronological age.
SS, standard score.
PR, percentile rank.
AE, age equivalent.

(Yairi & Ambrose, 1999), in this case somewhere between 22- and 30-months post onset.

The parent rating scales indicated that improved stuttering was also associated with a reduction in the perceived impact that the stuttering had on the child and the impact that it had on the parents, in terms of the anxiety and concern that the parents were experiencing about the child's stuttering. The indications that stuttering has an impact on parents' well-being would be expected by those who work with this client group, however there is little empirical evidence to support this. This study indicates that this is a variable worthy of investigation and one that can demonstrate change and can be evaluated.

Child language

There was evidence that those children who began the study with language scores above average and who received therapy reduced their expressive language relative to age over time. This is despite the evidence that indicates that children tend to sustain advanced language skills over time (Robinson, Dale, & Landesman, 1990). The possibility that the modification of a child's communication environment could impair linguistic development has been suggested in the past (Miles & Bernstein Ratner, 2001). However, there is little evidence to support this interpretation of the findings. Firstly, there is a large body of child language literature suggesting that language syntactic development (the area that receives greatest focus in the RDLS-3) is largely independent of input (Smith, 1999). Secondly, in the current study, there was no associated reduction in comprehension scores, suggesting that language competence continued to develop and the linguistic environment was adequate. Finally, the findings add further support

to those of Watkins and Johnson (2004) and Bonelli et al. (2000) that a relative reduction in expressive language may be associated with increased fluency and are indicative of a fluency-language trade-off (Anderson, Pellowski, & Conture, 2005). In the current study, this was only evident in children who began with advanced language skills and was not enough to explain change in all children. Nevertheless, this study does support an evaluation of language skills alongside fluency skills in outcome research. Further the possibility that this reduction could be the mechanism by which Palin PCI is effective in this particular subgroup of children, warrants further investigation.

Limitations

The strength of this study is the high internal validity obtained in a number of ways. These include, incorporating multiple measures over time as part of the research design, the high degree of treatment integrity obtained through the therapy context and evaluation of the data by considering variability in the baseline phase. However, there are also limitations that must be recognized. Importantly, these results cannot be generalized to the population of CWS. Further, while the implementation of the program by specialists in a well-resourced specialist centre enhances confidence in the integrity of the program delivered, this does not mean that similar outcomes in differing therapeutic contexts can be assumed.

The validity and reliability of the parent rating scales assessment has not been established. The ratings obtained broadly reflected the stuttering frequency data and the clinical decisions made by the parents and SLTs, indicating that further evaluation of this tool would be warranted.

There was a high attrition rate, with eight of the families who began the study, withdrawing in phases A1 or B1. One of the reasons why it is important to acknowledge this attrition, is that participants may withdraw if they perceive the therapy to be having either no impact or a negative impact. There is no evidence that this is the case in this study, since all of those who began phase B1 continued with the therapy even when they were no longer collecting data for the purposes of the study. Another reason the attrition information is important relates to the ability to generalize the results. If this were a group study it would be important that the participants were representative of the population of CWS in order to enhance the external validity of the study and the characteristics of those who withdrew could be important. For instance, those who were able to complete both the therapy and the study may be those who were particularly concerned, had fewer demands outside the therapy or were more able to organize or prioritize the study demands. While this has minimal implications for the interpretation of the data in this study, it is important to recognize the demands that the data collection methods placed on families in the development of future studies.

Conclusions

The findings indicate that Palin PCI may significantly reduce stuttering in some individual children, who would be considered to be at risk of persistent stuttering. Parents claimed to be more knowledgeable and confident about managing stuttering at the end of the study and indicated that they were less concerned and worried about it. The results indicate that a larger scale study into the effectiveness of this approach is warranted and that an evaluation of language development should be included as part of this.

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Appendix A
Parent Rating Scales

Name of parent: ————————————   **Name of child:** ————————————

Date: ————————————   **Assessment occasion:** ————————————

Please rate each of the following by marking a cross on the line. Do not spend much time on each, go on your gut reaction! If something varies then rate the level according to the last 2 weeks.

Your child:

1) How often does your child stammer?

————————————————————————————
0   10
(as much as he possibly could)   (not at all)

2) How severe is your child's stammering?

————————————————————————————
0   10
(as severe as it possibly could be)   (not severe at all)

3) How much is your child struggling when speaking?

————————————————————————————
0   10
(as much as he possibly could be)   (not at all)

4) Does your child speak less because of the stammering?

————————————————————————————
0   10
(always)   (never)

5) Does your child have fluent times?

————————————————————————————
0   10
(never)   (always)

6) How frustrated is your child with his speech?

————————————————————————————
0   10
(as much as he possibly could be)   (not at all)

7) How upset is your child by his stammering?

————————————————————————————
0   10
(as much as he possibly could be)   (not at all)

8) How anxious is your child about his speech?

————————————————————————————
0   10
(as much as he possibly could be)   (not at all)

9) How confident is your child in speaking situations?

————————————————————————————
0   10
(not at all)   (completely confident)

10) How confident is your child generally?

_____
0   10
(not at all)   (completely confident)

11) How happy is your child generally?

_____
0   10
(not at all)   (completely)

12) How well can your child take turns in conversation?

_____
0   10
(not at all)   (completely appropriately)

13) How well can your child wait for his turn (not just in conversation)?

_____
0   10
(not at all)   (completely appropriately)

14) How well can your child express how he feels?

_____
0   10
(not at all)   (completely appropriately)

You:

1) How worried are you about your child's stammering?

_____
0   10
(as much as I could be)   (not at all)

2) How anxious are you about your child's future because of the stammering?

_____
0   10
(as much as I could be)   (not at all)

3) Do you understand what influences your child's stammering?

_____
0   10
(not at all)   (completely)

4) How confident are you in the therapy you have received so far?

_____
0   10
(not at all)   (completely)

How confident are you in your knowledge of how to:

a) Respond when your child is stammering

_____
0   10
(not at all)   (completely)

b) Encourage fluency in your child

_____
0   10
(not at all)   (completely)

c) Deal with your child's concern / awareness of stammering

_____

0   10

(not at all)   (completely)

d) Encourage confidence in your child

_____

0   10

(not at all)   (completely)

Your family:

1) How much of an impact does the stammering have on your family?

_____

0   10

(as much as it possibly could)   (none at all)

2) How relaxed are things at home generally?

_____

0   10

(not at all)   (completely)

3) How well do you and your partner work together to achieve your goals?

_____

0   10

(not at all)   (perfectly)