

## PACT: Parents and children together in phonological therapy

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### Abstract

PACT (parents and children together) is a broad-based intervention approach for children with phonological impairment, which involves the participation of caregivers in therapy. Its components are: Parent Education; Metalinguistic Training; Phonetic Production Training; Multiple Exemplar Training (minimal pair therapy and auditory bombardment); and Homework. Accommodating to the gradual nature of phonological change in typical development, PACT therapy is delivered in planned therapy blocks and breaks from therapy attendance, during which parents continue aspects of the therapy. A review of literature relevant to the theoretical underpinning, development and evaluation of PACT is provided, and unique features of the approach are highlighted. The processes of speech assessment using parent-observed screening, independent and relational analyses, treatment planning and scheduling, and target selection and goal-setting are presented and discussed in the context of Jarrod, a 7 year old boy with a severe, inconsistent phonological impairment. Difficulties in applying the PACT approach with Jarrod are noted, principally that PACT is most suited to the three to six year age-group. Alternative intervention approaches are suggested.

**Keywords:** *Phonological therapy, family centred practice, therapy schedule.*

### Introduction

PACT (parents and children together) is a family centred intervention for children with phonological impairment. It provides speech-language pathologists (SLPs) with a theoretically coherent, empirically supported option for families willing, able and available to participate in it. It is a broad-based phonological therapy in the sense that Kamhi (1992) used the expression in talking about therapies; namely that while PACT's primary focus is *phonemic* (linguistic), it also takes *phonetic* (articulatory or sensorimotor) and *auditory perceptual* factors into account. The reason that it does so is that children with functional phonological disorders (Gierut, 1998) may be experiencing difficulties in one or any combination of these three areas (Flipsen, 2002). "Broad-based" has various connotations, so it should be noted that PACT is not broad-based in the sense of being theoretically eclectic, an alternative use of the term adopted by Kamhi (2005) in his discussion of therapists.

In terms of its theories of development, disorders and intervention (Fey, 1992), PACT stems from mid-1970s clinical phonology (Grunwell, 1975; Ingram, 1976) and mid-1980s speech-language pathology (SLP) (Dean & Howell, 1986; Fey,

1985; Grunwell, 1985; Stoel-Gammon & Dunn, 1985). In that period the articulation therapy era, with its bottom-up, surface, phonetic sound-by-sound, linear emphasis, was at its peak, and the phonological revolution was barely perceptible in clinics. The evidence-base that nurtured its early development came from a decade of accounts of the application of phonological principles by SLP clinicians and researchers from different, and often complementary, theoretical orientations, including: Blache, Parsons and Humphreys (1981), Elbert and Gierut (1986), Hodson and Paden (1983), Leahy and Dodd (1987), Monahan (1986), Weiner (1981), and Young (1983). Responsive to the literature, PACT saw further development in the following decade, as it continues to do, incorporating more recent research on auditory input therapy (Flynn & Lancaster, 1996), target selection (Gierut, Morrisette, Hughes, & Rowland, 1996), and stimulability (Miccio, Elbert, & Forrest 1999; Rvachew, Rafaat, & Martin, 1999).

While not *theoretically* eclectic, in *practice* some components of PACT emanate from existing therapy methodologies. Traditional phonemic placement techniques (cf. Van Riper, 1934; Bleile, 2004) familiar to almost all paediatric SLPs are employed, as is a variation of Hodson and Paden's (1983)

auditory bombardment, more recently called focused auditory input (see Hodson, 2006). Weiner's (1981) conventional minimal pair therapy (Barlow & Gierut, 2002) is included as an activity; and guided discussion is incorporated along similar lines to Dean and Howell's (1986) in the early stages of development of the *Metaphon* approach (Hill, Dean, & Howell, 1997).

PACT is unique as the only phonological therapy to date to be tested with treated and untreated groups of children, showing that the therapy was more effective than no therapy (Bowen, 1996). Other unique aspects of the PACT approach include: its active involvement of caregivers (Bowen & Cupples, 2004); its planned blocks and breaks treatment schedule, which takes the gradual nature of phonological acquisition into account (Grunwell, 1992); and its particular combination of five treatment components (Bowen & Cupples, 1999b).

The treatment components that constitute the PACT approach are: Parent Education; Metalinguistic Training; Phonetic Production Training; Multiple Exemplar Training comprising minimal pair therapy and auditory bombardment; and Homework. Each of these individual components is intuitively appealing and, more importantly, theoretically defensible. We must acknowledge, however, that none of the PACT components has been subjected to systematic manipulation to test their relative contribution, if any, to therapy outcomes. The blocks and breaks administration and the training and participation of caregivers, for instance, may or may not be essential elements. For a comprehensive review of the issues around parent involvement in phonological therapy, see Watts Pappas, McLeod, McAllister and Simpson (2005).

### Background to the development of PACT

Research conducted by people who are primarily clinicians is a rare phenomenon in SLP. But after years of discussing the desirability of it (Ingram, 1998; O'Toole, Logemann, & Baum, 1998; Logemann & Gardner, 2005), and urging and empowering clinicians to do it, the demand for, and feasibility of clinical research by "ordinary" SLP researchers is undeniable. The inspiration to draw PACT's components into a cohesive, theoretically coherent, and most importantly *testable* intervention package had two salient aspects, neither of which related to any perceived call to action from the SLP literature of the day. First, and potent at a professional level, was the first author's participation in a trans-disciplinary Family Therapy postgraduate diploma course in 1988–89, which provided the skills necessary to engage collaboratively and effectively in information sharing and problem solving with families, while remaining, sensitive and responsive to clients' cultural beliefs and practices (Watts Pappas & Bowen, in press). The application of

family systems theory (Carr, 2000; Reimers, 2001) to phonological intervention harmonized with a new appreciation within the SLP culture of family centred practice (Crago & Cole, 1991; Crais, 1991; van Kleeck, 1994) and the use of techniques such as culturally sensitive ethnographic interviewing (Westby, 1990), taking the principles of adult learning (Houle, 1992) into account. Second, was the privilege of presenting continuing professional development (CPD) workshops on phonological intervention to SLP colleagues in Australia. This experience served to highlight the need for answers to pressing clinical questions about treatment efficacy (Olswang, 1990), many of which persist. Among these questions were the accountability issues of treatment effectiveness (was this phonological therapy a valid intervention: did it work?), treatment efficiency (did it work as well as, or better than traditional articulation therapies?), and treatment effects (what changes did the therapy evoke?). Facing these questions was confronting for a would-be clinician-researcher, for as Finn, Bothe and Bramlett (2005, p. 182) caution, "professionals should be wary about trusting their own clinical experience as the sole basis for determining the validity of a treatment claim". If PACT were to be administered to clients, or presented to colleagues in CPD or any other context, as a viable treatment option it must first undergo close scientific scrutiny and evaluation. So it was that after years of *clinical* hypothesis testing, that PACT was formally evaluated (Bowen & Cupples, 1998; 1999a).

Fourteen children ranging in age from 2;11 (years;months) to 4;9 when their therapy began, served as participants in the treatment efficacy study (Bowen, 1996). A longitudinal matched groups design was used, comprising assessment, treatment and re-assessment or probe phases. When the probe assessments were conducted, the treated children showed accelerated improvement in their productive phonology, compared with the untreated eight, who did not. Statistical analysis of the initial and probe severity ratings (Bowen & Cupples, 1999b) of the two groups showed highly significant selective progress in the treated children only ( $F(1,20) = 19.36$ ,  $p < 0.01$ ). No such selective improvement was observed in either receptive vocabulary or Mean Length of Utterance in Morphemes (MLU-M): findings that attested to the specific effect of the therapy. The initial severity of the children's phonological impairments was the solitary predictor of the frequency and duration of consultations required for their speech patterns to fall within age-typical expectations.

### PACT: Principles and process

PACT is based on two interrelated principles. The first is that phonemic change is motivated by homophony. A child's capacity to perceive, talk

about, reflect upon and revise homophonous productions is enhanced when his or her awareness of word/phoneme contrasts (e.g. *car* and *tar* realized as [ka] and [ta] respectively) and word/phoneme collapses (e.g. *car* and *tar* both realized homonymously as /ta/) is made overt. By targeting metalinguistic awareness in naturalistic, supportive clinic or home situations, and drawing a child's attention to the communicative consequences of homophony, the probability of improving the accuracy of that child's knowledge of the system of phonemic contrasts grows, and the likelihood of spontaneous revisions and repairs (self-corrections) increases. The second principle is that heightened perceptual saliency of minimal contrasts, minimally, maximally or multiply opposed in input (listening) and output (production) tasks, makes new productive word-contrasts easier for a child to learn, and thus facilitates phonemic change for the better (Barlow & Gierut, 2002).

Embracing these principles, the foundations of all minimal pair therapies are observed in PACT: error patterns not individual error-sounds are targeted systematically; use of feature contrasts, as opposed to perfect phonetic execution, is rewarded; and, there is an emphasis, as far as possible, on naturalistic contexts with authentic communicative consequences. Throughout the therapy process it is made explicit to the family and child that they have a central role in intervention, and that the function of phonology (creating meaning distinctions) is communication. Caregivers, usually the client's parents, are carefully instructed in specific techniques relevant to their own child, to use in homework sessions and in everyday communication. The techniques include modelling, recasting, encouraging self-modelling and self-correction by the child and enhancing the child's awareness of this process, using labelled praise, providing focused auditory input, and doing a range of multiple exemplar activities. This level of parent education means that technical aspects of therapy and assessment must perforce be understood by participating carers, and it may seem to some families that they have taken a short course in their own child's clinical phonology. Interestingly, two mothers that we know of, having been involved in PACT with their respective children, enrolled subsequently in university SLP programmes. Parents with little secondary school education, to those with high levels of tertiary education, including, in all categories, sole parents and people with non-English-speaking backgrounds, have been involved in its effective administration.

#### *Parent education and the Quick Screener*

Parent education begins with a screening assessment. If, in joining (Minuchin, Lee, & Simon, 1996) or engaging with a client in the history taking, introductory phase of the therapeutic engagement, first impressions of child

and family suggest that a new client with a speech sound disorder is a potential candidate for PACT, phonological assessment begins with parent(s) observing the administration and scoring of the *Quick Screener* described by Holm and Crosbie (2006). The child's responses to the screener (Figure 1) are recorded using broad phonetic transcription and then analysed for phonological processes (as in Figure 2) in the presence of the parent(s), and discussed in the child's hearing.

Administering and discussing the screener is an important first step in both assessment and intervention. It allows the family to observe from the outset that intelligibility, sound patterns, percentage consonants correct (PCC), percentage vowels correct (PVC), vowel and consonant inventories and constraints, syllable-word shape inventory and constraints, stimulability, and, if relevant, a syllable stress inventory and consistency of production, are of interest. Baker (2004) provides a helpful format within which a clinician can summarize these data in a way that facilitates management planning. Discussion of the screener also demonstrates to the child that the responsibilities entailed in therapy are shared three ways between child, family and clinician. This collaborative approach is adopted partly to pre-empt a commonly reported difficulty that children will do therapy in a clinical setting with their therapist but not at home with their parents, and partly to facilitate the necessary three-way working relationship. The screener is re-administered at either the beginning or the end of each treatment block, depending on which is appropriate for a particular child, providing objective measures of change that are readily understood by most families.

#### *Parent education and homework*

Parents are provided with written information about the phonological intervention in the form of a short book (Bowen, 1998), electronic documents from the first author's web site [www.speech-language-therapy.com](http://www.speech-language-therapy.com), desktop informational slideshows (also freely available on the website) viewed and discussed in the clinic or emailed for home viewing, and notes in the child's own speech book, which contains therapy and homework activities. Notably, the speech book may include activities that are not strictly speech related, for example if the child has co-occurring intervention needs in the areas of voice, language, fluency or pragmatics/functional discourse.

During therapy blocks, the homework component of PACT sees parents practising activities from the previous therapy session with their child in 5 to 7 minute practice bursts, once to three times daily, as directed by the therapist and described both verbally and in the child's speech book. In breaks from therapy, no formal homework is done with the speech book, but parents continue to employ the strategies learned during therapy blocks in naturalistic contexts. Parent and child casually review the

QUICK SCREENER							
SINGLE-WORD SCREENING SAMPLE USING THE METAPHON STIMULUS VOCABULARY							
Dean, E., Howell, J., Hill, A., & Waters, D. (1990). Metaphon Resource Pack. Windsor, Berks: NFER Nelson							
Date of Birth Today's date				Observer(s) Examiner			
① completely intelligible ② mostly intelligible ③ somewhat intelligible ④ mostly unintelligible ⑤ completely unintelligible							
#	TARGET	TRANSCRIPTION	CC	#	TARGET	TRANSCRIPTION	CC
1	cup	ʌ k ʌ	1	23	jam	æ j i æm	1
2	gone	ɒ k ɒ n	1	24	house*	au * h æʊ	1
3	knife	aɪ n aɪ	1	25	path	a p <sup>h</sup> a	1
4	sharp	a j a :	0	26	door	ɔ d ɔ	1
5	fish*	ɪ * b e	0	27	smoke	ou m ou	1
6	kiss*	ɪ * d e	0	28	bridge*	ɪ * w e ʔ	0
7	sock	ɒ j: ɒ k	1	29	train	eɪ ɹ eɪ n	2
8	glass	a j a	0	30	chair	ɛə j ɛə	0
9	watch	ɒ m b w ɒ ʔ	1	31	red	e w e :	0
10	nose	ou n ou	1	32	spoon	u b u n	1
11	mouth	au m au	1	33	plane	eɪ v ɹ eɪ	0
12	yawn	ɔ j ɔ n	2	34	fly ✧	aɪ j aɪ	0
13	leaf*	ɪ * j ə i	0	35	sky	aɪ d aɪ	0
14	thumb	ʌ θ ʌ ŋ <sup>d</sup>	1	36	sun	ʌ j ʌ n	1
15	foot*	ʊ * b ɒ ʔ	0	37	wing	ɪ w e ɪ n	1
16	toe	ou t <sup>h</sup> ou	1	38	splash*	æ * w ʌ ʃ	1
17	snake	eɪ f n eɪ ʔ	1	39	tent	e d e n ʔ t	2
18	van*	æ * b eɪ n	1	40	salt	ɒ j ɒ t	1
19	fast	a b a	0	41	crab*	æ * b b w a	0
20	girl	ɜ g ɜ ʊ	1	42	sweet	i w i ʔ	1
21	stairs*	eə d e	0	43	sleeve ✧	i w i ʔ	0
22	big	ɪ b ɪ	1	44	zipper	ɪ j ɪ b ə	0
boy bɔ ɪ ear ʔe ə h			SUBTOTAL CC:	14	TOTAL CC:		29
				* vowel replacement ✧ invented			

TENTATIVE single word phonetic inventory and percentage of vowels and consonants correct:

Vowels	i	ɪ	e	æ	a	ʌ	ə	ɜ	ɒ	ɔ	ʊ	u	Vowels correct (/47) 76 % Consonants correct (/100) 29% MARKED p t k f v θ ð s z ʃ ʒ tʃ dʒ
Obstruents	p	b	t	d	k	g	f	v	STIMULABILITY				
	θ	ð	s	z	ʃ	ʒ	tʃ	dʒ					
Sonorants	m	n	ŋ	l	r	w	j	h					

Figure 1. Quick Screener, Jarrod 7;0.

homework book, doing the activities the child enjoys most, in the fortnight before the next block. A detailed account of the parent information and homework components of PACT is available in Bowen and Cupples (2004).

*Metalinguistic training*

Metalinguistic training finds child, parents and therapist, talking and thinking about speech sounds

and the way they are organized and contrasted to convey meaning. Games and activities, at home and in therapy, involve: phonetic level sound picture associations (/s/ ... is the snake noise); phoneme segmentation for onset matching (ball starts with /b/); awareness of rhymes and sound patterns between words (e.g. minimal contrasts: *pin-bin*, near minimal contrasts: *ten-tent*, *ache-cake*); rudimentary knowledge of the concept of word; understanding the idea of words making sense in context; awareness of the

<b>Velar Fronting 25% SI 25% SF</b>					
#	Target SI	0 / 1	#	Target SF	0 / 1
1	cup	0	7	sock	0
6	kiss	1	17	snake	0
2	gone	0	22	big	0
20	girl	0	37	wing	1
.	TOTAL 1/4		TOTAL 1/4		

  

<b>Palato-alveolar Fronting 0: note gliding</b>					
#	Target SI	0 / 1	#	Target SF	0 / 1
4	sharp	0 GL	5	fish	0
30	chair	0 GL	9	watch	0
23	jam	0 GL	28	bridge	0
.	TOTAL 0/3		TOTAL 0/3		

  

<b>Word-final devoicing 0: note FCD / GR</b>					
#	Target	0 / 1	#	Target	0 / 1
41	crab	FCD	43	sleeve	FCD
31	red	FCD	10	nose	FCD
22	big	FCD	28	bridge	FCD
.	sleeve, bridge ? WF		TOTAL 0/6		

  

<b>Backing 0</b>					
#	Target SI	0 / 1	#	Target SF	0 / 1
16	toe	0	15	foot	0
39	tent	0	42	sweet	0
26	door	0	31	red	0
.	TOTAL 3/3		TOTAL 0/3		

  

<b>Stopping Fricatives 37% SI: note gliding</b>					
#	Target SI	0 / 1	#	Target SF	0 / 1
5	fish	1	13	leaf	0
15	foot	1	11	mouth	0
14	thumb	0	6	kiss	0
7	sock	0 GL	38	splash	0
36	sun	0 GL	43	sleeve	0
4	sharp	0 GL	10	nose	0
18	van	1			
44	zip(per)	0 GL			
.	TOTAL 3/8		TOTAL 0/6		

  

<b>Stopping Affricates 0: note gliding</b>					
#	Target SI	0 / 1	#	Target SF	0 / 1
30	chair	0 GL	9	watch	0
23	jam	0 GL	28	bridge	0
.	TOTAL 0/2		TOTAL 0/2		

  

<b>Pre vocalic voicing 57%</b>					
#	Target	0 / 1	#	Target	0 / 1
25	path	0	5	fish	1
16	toe	0	14	thumb	0
6	kiss	1	36	sun	1 GL
			4	sharp	1 GL
.			TOTAL 4/7		

  

<b>Liquid / glide simplification 50%</b>					
#	Target	0 / 1	#	Target	0 / 1
9	watch	0	12	yawn	0
13	leaf	1 GL	31	red	1
.			TOTAL 2/4		

  

<b>Initial Consonant Deletion 0</b>					
#	Target	0 / 1	#	Target	0 / 1
3	knife	0	7	sock	0
22	big	0	30	chair	0
18	van	0	12	yawn	0
.			TOTAL 0/6		

  

<b>Final Consonant Deletion 66%</b>					
#	Target SI	0 / 1	#	Target SF	0 / 1
23	jam	0	10	nose	1
44	zip	0	5	fish	1
31	red	1	28	bridge	1/?
.			TOTAL 4/6		

  

<b>Initial Cluster Reduction 100%</b>					
#	Target SI	0 / 1	#	Target SI	0 / 1
33	plane	1	43	sleeve	1
8	glass	1	27	smoke	1
28	bridge	1	17	snake	1
29	train	1	32	spoon	1
41	crab	1	21	stairs	1
34	fly	1	35	sky	1
42	sweet	1	38	splash	1
.			TOTAL 14/14		

  

<b>Final Cluster Reduction 100%</b>					
#	Target	0 / 1	#	Target	0 / 1
19	fast	1	40	salt	1
39	tent	1			
.			TOTAL 3/3		

Figure 2. Quick Screener phonological processes summary, Jarrod 7;0.

use of revision and repair strategies; judgement of correctness tasks (*a puppy is a little dog vs. a puppy is a little dod*); and playing with lexical and grammatical innovations using morpho-phonological structures (*bee vs. bees, walk vs. walked*). In therapy

and at home, a 50:50 split between what is portrayed to parents as talking tasks vs. thinking and listening tasks is aimed for, with the balance tipped slightly in favour of the auditory (input) side.

### Phonetic production training

Phonetic production training uses stimulability techniques (Miccio, 2005), in which the therapist teaches the child how to produce accurately absent or distorted phones beyond the level of the sound in isolation, or failing that, to produce reasonable approximations in the same sound class. Thus, a child is usually taught to produce target sounds in two syllable positions, usually the onset (syllable initial word initial: SIWI) and coda (syllable final word final: SFWF) positions. It is rarely necessary to train intervocalic stimulability that is, syllable initial within word (SIWW) or syllable final within word (SFWW). Apart from stimulability tasks which may be at individual sound and nonsense syllable level, PACT therapy is at word level or above.

In the initial steps of working on syllable structure patterns (Velleman, 2002), such as initial consonant deletion, final consonant deletion, weak syllable deletion and cluster reduction, any attempt a child makes to produce the correct syllable shape is rewarded alongside modelling and shaping of the adult target. Similarly, at first with systemic processes, like fronting, stopping, and gliding, any attempt by a child to produce an approximation to the target is reinforced in conjunction with modelling and shaping. Once a child is stimutable for a target, or is producing a passable approximation, or a phone in the same sound class, in syllables or words, therapy moves onto the phonemic level and all activities are “communication based” or “meaning based” and are at word level and beyond. Listening and talking games are employed in the clinic and for homework to provide production practice of a very small number of words: usually no more than six at a time, containing the target sound in a chosen syllable position, typically SIWI, but with SFWF as the usual starting point for fricatives because of the natural tendency for fricatives to emerge first in the coda position in typical acquisition. In the course of production practice, minimal pairs, minimal triplets, or sets of four stimuli, may be minimally, maximally or multiply opposed. Phonetic production training is integrated with multiple exemplar training.

The approach to target selection in PACT is individualized, flexible and evidence-based, and may include selecting: (1) sounds that are not stimutable (Miccio, Elbert, & Forrest, 1999); (2) later developing sounds (Gierut, Morrisette, Hughes, & Rowland, 1996); (3) sounds that are consistently in error (Forrest, Elbert, & Dinnsen, 2002); (4) sound patterns that are most deviant from normal phonology (Grunwell, 1982); (5) sounds for which the child has least phonological knowledge (Williams, 1991); and, (6) marked sounds (voiceless sounds, affricates, fricatives and consonant clusters, shown at lower right in Figure 1) in order to facilitate the acquisition of unmarked aspects of the system (Barlow & Gierut, 2002). The interested reader is referred to a target

selection comparison table at: [http://www.speech-language-therapy.com/target\\_selection.htm](http://www.speech-language-therapy.com/target_selection.htm).

### Multiple exemplar training

In multiple exemplar training, parent and therapist read, without amplification, auditory input word-lists of up to 15 words representing a target to the child, and the child sorts words pictured on cards according to their sound properties. One or more activities for a clinic or home session may be chosen from the following selection. Families may innovate, making up comparable games for their children.

- *Point to the one I say:* Child points to pictures of the words, spoken in random order (e.g. *buy, pin, bin, pie*), or rhyming order (e.g. *bin, pin, buy, pie*) by the adult.
- *Put the rhyming words with these words:* Three to nine cards are presented (e.g. *sip, sour, sack, sore*) and the child puts rhymes beside them (*ship, shower, shack, shore*).
- *Say the word that rhymes with the one I say:* Adult says words with the target, and the child says a rhyming non-target word (e.g. adult says *ride* and child says *wide*).
- *Give me the word that rhymes with the one I say:* Adult says the non-target word, and the child selects the word with the target (e.g. adult says *din*: child selects *chin*).
- *Tell me the one to give you:* Child says the word, and the adult responds to the word actually said (Weiner, 1981). For example, if the child attempted to say, *phony*, but produced it as *boney*, the adult would give him or her a card with *boney* depicted on it, causing the child to experience a communication failure. The aim is for the child to realize the failure to communicate his/her message, and attempt to revise the production. This particular activity is not included in homework.
- *You be the teacher: tell me if I say these words the right way or the wrong way:* Adult says target words singly in rhyming or random order, or in phrases or sentences, and the child judges whether they have been said correctly.
- *Silly sentences:* Child judges whether a sentence is a “silly one” or not (e.g. *I wear a little cap* vs. *I wear a little tap*; *I cuddle my bear* vs. *I cuddle my pear*).
- *Silly dinners:* This is a variation of *Silly Sentences*. The adult says what s/he wants for dinner, and the child judges whether it is a silly dinner (*I will eat two shops* vs. *I will eat two chops*; *I want green peas* vs. *I want green bees*).
- *Shake-ups and Match-ups:* The child is presented first with four pictures representing meaningful contrasts such as: *top, stop, tool stool*. The word-pairs are repeated to the child several times. Then the cards are put in a

container and shaken up. The child is asked to take the cards and arrange them “the same as before” (i.e. in pairs). This can be done with sets of three (*ship, chip, sip; shoe, chew, Sue*), or four (*fin, sin, chin, shin; four, sore, chore, shore*) as well as sets of two.

- *Find the two-step words:* The child sorts the words with consonant clusters SIWI from (near) minimally contrasting words with singleton consonants SIWI (e.g. *pay, play*).
- *Walk when you hear the two-steps:* The child “finger walks” when a consonant cluster SIWI as opposed to a singleton consonant SIWI is heard (e.g. *cap, clap*).

#### *Treatment sessions, treatment blocks, and breaks*

Within a typical 50 minute treatment session a child and therapist spend 30 to 40 minutes alone. The participating caregiver joins them for about 10 to 20 minutes at the end of a session, or 10 minutes at the beginning and 10 minutes at the end. Sometimes mothers participate, sometimes fathers, and sometimes both parents are in attendance, with or without the child’s siblings if any. The maximum parent participation sees a parent actively involved in a treatment “triad” with his/her child and the therapist, for approximately half of the treatment session. Periods of parent participation require the child’s continued involvement, in order to demonstrate and rehearse homework and situational reinforcement. It is rarely a situation in which the adults have a discussion while the child plays.

Therapy is administered in planned blocks and breaks. The first block and the first break are usually of approximately 10 weeks duration each, after which the therapy sessions per block tend to diminish, while the duration of the break between blocks stays more or less constant. In the breaks, parents are asked to avoid formal practice for about 8 weeks. Then, 2 weeks prior to the next treatment block, they should read the speech book with the child a few times and do any activities the child is interested in doing. Throughout the breaks, they continue to employ the strategies of modelling and reinforcement of speech output and revisions and repairs learned in the therapy block(s) (see Bowen & Cupples, 2004).

#### **Jarrold and PACT**

In our direct clinical experience, a typical child who is suitable for PACT is a mildly, moderately or severely phonologically impaired preschooler or early school-aged child in the 3–6 years range. While its effectiveness was tested with a population of otherwise typically developing phonologically impaired children aged 2;11 to 4;9, some of whom also experienced clinically significant dysfluency, PACT has been effectively administered to children beyond

6;0 at the outset of therapy. In general, however, these older children have presented with considerable developmental delays, including a small cohort of eleven successfully treated children up to 9;11 years of age with Down Syndrome, and several children at the high functioning end of the autism spectrum.

When we originally received, and were delighted to accept, the invitation to participate in this special issue of *Advances in Speech-Language Pathology*, in which researchers from differing theoretical perspectives, working from the same assessment data set, provided an analysis and intervention plan for the same child, we were told that a participant most likely in the 4–5 years range would be recruited. Difficulties in identifying a child of this age resulted; however, in the eventual recruitment of an older child, whose profile does not resemble that of a typical “PACT child” as described above. Jarrod is a boy, aged 7;0 at the time of assessment, and with normal current hearing levels, average range intelligence and language levels, and a severe, inconsistent phonological impairment involving multiple phoneme collapses across at least three manner categories, persisting syllable structure processes, and auditory discrimination two standard deviations below the mean for his age (Bridgeman & Snowling, 1988; Nathan & Wells, 2001).

At the outset then, it is important to note that recruitment of Jarrod as the participant in this case study poses substantial difficulties with regard to the suitability of PACT as our first choice of intervention. In everyday clinical practice, for *this* child, we would see the need to instate a therapy that differed from the previous management which incorporated: “bottom-up” emphasis on single sounds, behaviour management, calming activities, and brain gym exercises. In planning an alternative “package” we would be confident to administer some combination of *Multiple Oppositions Therapy* (Williams, 2000) because of his homophony, probably using the *Sound Contrasts in Phonology* (SCIP) software (Williams, 2006); and *Core Vocabulary Therapy* (Dodd, Crosbie, & Holm, 2004) because of his inconsistency; with elements of *Phonotactic Therapy* (Velleman, 2002) because of his difficulties with syllable structure processes. Additionally, an initial therapy block of approximately 10 weeks of 30 to 40 minute sessions *twice* weekly, emphasizing production practice and encouraging a mature approach on Jarrod’s part, would seem more appropriate for Jarrod than PACT’s typical once a week scheduling of 50-minute appointments comprising the range of input and output activities, or listening and talking games, more suited to preschoolers and K-1 students, described above. Nevertheless, in the spirit of the exercise, we describe below a rationale and proposal for PACT therapy for Jarrod, with the proviso that it would not normally be our preferred phonological therapy for him.

*Jarrold's screening assessment*

The single-word naming task in the *Quick Screener*, displayed in Figure 1, is based on the *Metaphon Resource Pack* (Dean, Howell, Hill & Waters, 1990) screening procedure, with the word *gun* replaced with *gone*, and with the addition of the words *boy* and *ear*. Either the easel book from the pack, or a picture slide show, available at: <http://health.groups.yahoo.com/group/phonologicaltherapy/files/>, along with the data collection (Figure 1) and analysis (Figure 2) forms, may be used to elicit the 46 single words.

Jarrold's *Quick Screener* responses are broadly transcribed in Figure 1. The transcriptions for *fly* and *sleeve* were invented for the purposes of this forum, based on Jarrold's production of similar words, because these two words were not elicited during the assessment. Needless to say, in regular clinical practice we would not invent word productions in this way! His tentative PCC of 29% and tentative PVC of 76% are recorded. These are rapid calculations to do while family members observe since there are 100 consonants in the screening words and 42 vowels. These percentages are considered tentative because of the small sample-size, well under the desirable 200 word minimum (Stoel-Gammon, 1988), and because they are based on a single word sample rather than a connected speech sample. His consonant inventory constraints (absent phones) /z/, /ʒ/, /tʃ/, /ŋ/ and /l/ are indicated with an arrow (←). If a consonant or vowel not elicited via the screener occurs spontaneously in conversational speech, it is included in the vowel or consonant inventory respectively; but in this instance they were absent in all speaking conditions, including conversational speech. The clinician notes on the form the child's name, birth date, assessment date, observer(s) of the assessment, and the examiner. Clinician and parent(s) conversational intelligibility ratings of the child's speech are recorded on a subjective scale of 1 (completely intelligible) to 5 (completely unintelligible). Our conversational intelligibility rating for Jarrold on audiotape was 4.5, and on video with sound and vision, 4. Stimulability for absent vowels is noted, and stimulability for consonants is recorded in isolation and in up to two syllable positions (e.g. /z/, /zu/, /uz/). As we have noted, parents participate in the scoring and are encouraged to ask questions.

Using the form displayed in Figure 2, tentative (screening) percentages of occurrence of the client's phonological processes are calculated, listed, and discussed with the participating caregiver(s). The processes evident in Jarrold's speech output at 7;0 are velar fronting syllable initial (SI) 25% and syllable final (SF) 25%, prevocalic voicing 57%, gliding of liquids 50%, glottal replacement noted, final consonant deletion 66%, gliding of fricatives and affricates noted, stopping of fricatives 37%,

cluster reduction syllable-initial 100% and word-final 100%.

*Independent and relational analysis*

Information obtained from the *Quick Screener* and a spontaneous speech sample sometimes suffices as a basis for treatment planning using PACT, with the proviso that it is coupled with a hearing assessment, an oral musculature examination, voice, fluency and language profiling, the Locke (1980) *Speech Perception Production Task*, and a detailed case history. The history necessarily includes personal factors in the child, for example, whether s/he is co-operative and whether s/he will willingly do homework with a carer. The history must also cover information about the family structure and style, for example: whether there are enough people to help; and how the therapy approach fits with the family's culture and composition. It is important not to assume, for instance, that a sole parent lacks (or indeed, has) the time, resources and energy to commit to the necessary attendance and homework schedules.

On the other hand, for most children with phonological disorders in the mild-moderate to severe range, with conversational speech PCCs of 85% or less at 4;0 or older (Shriberg & Kwiatkowski, 1982), a full Independent and Relational Analysis (Stoel-Gammon 1988; Baker, 2004) is required in addition to the screener. These analyses are based on data from single word (SW) and conversational speech (CS) samples, comprising around 200 recognizable words if possible. When recording the results, it is important to differentiate between what was found in each sample. Suitable tests used to gather this information include the *Diagnostic Evaluation of Articulation and Phonology* (DEAP, Dodd, Hua, Crosbie, Holm, & Ozanne, 2003), the *Hodson Assessment of Phonological Patterns* (HAPP-3, Hodson, 2004) or the lengthy but detailed PACS (Grunwell, 1985). Jarrold's inconsistency would prompt administration of the DEAP *Inconsistency Assessment* (Dodd, 1995; Dodd et al., 2003). An advantage of the DEAP is that it includes a connected speech picture description procedure in which 14 of the words elicited in isolation in the DEAP Phonology Assessment are also elicited in connected speech when the child talks about pictorial absurdities (e.g. a frog in a spider web). This enables a comparison of single word versus connected speech production and intelligibility.

The Independent Analysis comprises consonant (phonetic), vowel, syllable-word shape, and stress pattern inventories and constraints. The inventories provide a view of the child's unique system without reference to the target (adult) phonology. The constraints are an account of what is *not* present in the sample, including inventory constraints such as absent phonemes, positional constraints (e.g. a sound might not occur word finally, although it

occurs word initially or within word), and sequential constraints (the C and V combinations that the child does not use). Meanwhile, the Relational Analysis is a normative comparison that looks at the child's system relative to an idealized version of the target adult phonology; that is, the way it would be if each sound were pronounced "perfectly". As such, the Relational Analysis comprises: percentage of consonants correct (PCC) in SW and CS, percentage of vowels correct (PVC) in SW and CS, and phonological processes (phonological patterns) in SW and CS expressed in percentage of occurrence terms. Combining elements of traditional analysis and place-voice-manner (PVM), mismatches (errors) are identified by sound class and position within words. Speech errors are identified and described primarily, but not exclusively in terms of phonological processes. If inconsistency is observed, as in Jarrod's case, an inconsistency assessment (e.g. Dodd, 1995; Dodd et al., 2003) is administered. Once gathered the assessment data can be organized in various ways (see for example Baker, 2004).

#### *Severity measure*

For children 4;0 and above engaged in PACT, the PCC is used as a severity measure and shared with parents. Shriberg and Kwaitkowski (1982) showed that the PCC-in-CS measure for children's speech sound disorders had high correlations with clinician severity of involvement ratings, developing the following scale: PCC >85% = mild; PCC 65–84% = mild-moderate; PCC 50–64% = moderate-severe; PCC <50% = severe.

PCC does not take vowels, phonotactics or suprasegmentals into account, all of which affect intelligibility. It is useful, nevertheless, when it is necessary to quantify change and report a value in order to access funding and or services. Furthermore, it has clinical utility as a means of demonstrating progress to caregivers. Strictly, PCC-R (Shriberg & Kwaitkowski, 1982) scores omissions and substitutions as incorrect but excludes distortions from the data. By contrast, PCC gives the same weight to omissions, substitutions and distortions, that is, all are counted as incorrect.

#### **Intervention goals and approach**

The key aspects of Jarrod's assessment that would inform PACT intervention would be his mother's willingness, availability and capacity to be involved in therapy, and Jarrod's compliance, confidence, enthusiasm, readiness to communicate and to perform revisions and repairs, and persistence. Jarrod lives with his mother, and sister aged 10, does not have a close relationship with his mother's partner, and sees his father frequently, so we would involve both parents in the therapy process. We would take into account his low performance on auditory discrimination measures

and structure therapy to incorporate targeted multiple exemplar tasks reflecting his particular difficulties. To counter his tendency to be unaware of his poor intelligibility and to keep talking regardless, we would attempt to tap into any intra-competitive trait and challenge him to improve his own production performance, providing a tangible reward system. Initial goals would be to target syllable structure processes, particularly Final Consonant Deletion and Cluster Reduction with word final fricatives as exemplars, incorporating the Phonotactic Therapy suggestions of Velleman (2002). Because of his age and good availability we would schedule twice weekly 30 to 40-minute individual appointments for Jarrod, with his mother's or father's attendance encouraged at least once a week. His family would administer formal homework in 5 to 7 minute "bursts" once, twice or three times daily, and provide modelling and reinforcement in everyday speaking situations. At the end of the initial ten weeks, progress would be measured, and Jarrod would have one school term off (10 weeks) and return for review and further therapy based on the outcome of that review.

#### **Conclusion**

In summary, PACT is a broad-based, family-centred approach to phonological therapy, whose unique aspects include its active involvement of caregivers in the therapy process, its planned blocks and breaks treatment schedule, and the particular combination of five treatment components: parent education, metalinguistic training, phonetic production training, multiple exemplar training, and homework. Implementation of PACT has been illustrated here in the context of Jarrod, a boy aged 7;0 at the time of assessment, with a severe, inconsistent phonological impairment. Notably, however, Jarrod is older than both the children generally seen (for PACT) in the first author's clinical practice, and the children who took part in our original treatment efficacy study (who were aged from 2;11 to 4;9 at the outset). Additionally, at 7;0 the PACT games and activities might be a little "young" for him, and once-weekly intervention too infrequent. Our preference would be to maintain a 10 weeks on 10 weeks off appointment schedule to accommodate to the gradualness of phonological learning, while increasing the frequency of appointments to briefer twice weekly visits. The therapy would be presented seriously, with play incorporated both as down time and as a reward rather than as an integral component of the therapy. In our view such an approach might prove more efficient, and more motivating for a 7 year old like Jarrod, tapping in to any wish on his part to be involved in a "grown up" therapeutic contract, and encouraging him to appreciate his responsibilities in, and contributions to, the situation.

Other characteristics of Jarrod's would deter us from selecting him for the PACT approach. Prior to recruitment for this project he had extensive therapy, and although the details of the *speech* aspects of his therapy are sketchy, it is apparent that he did not receive a systematic phonological therapy, and that his therapy was possibly along *Nuffield Centre Dyspraxia Programme* (Williams & Stephens, 2004) lines with a bottom-up emphasis on single sounds elicited via cue-cards and word-imitation tasks unrelated to communicative consequences. In terms of language activities, the therapist's focus included pronoun use and phonological awareness activities. Behavioural goals were prominent, specifically: improved eye-contact, sitting still, reducing extraneous body movements, compliance, and on-task "attention control". Management incorporated "calming activities" and brain gym exercises.

With regard to the obvious need, historically, to address Jarrod's behavioural issues in order to engage him in speech therapy, it is noted that he was prescribed Ritalin for ADHD 2 months prior to the assessment for this project, and that he was remarkably compliant, sensible and agreeable during a long battery of procedures. It may well be that Jarrod is now a "different boy" from the fidgety, distractible, chattering one the original treating therapist had so many problems managing.

In view of these many issues, the severity of his speech impairment now, and his SLP intervention history of non speech-related treatment goals, and taking his age into account, we believe it would be beneficial at this stage to engage him in a largely therapist administered therapy regimen. We would want to work with Jarrod in a particularly focused way, with a reward system that was meaningful to him, concentrating on speech production goals exclusively, in clinic in a child-therapist dyad, possibly with little homework, using a powerful core vocabulary of communicative value to him. In our judgement, the PACT home activities might seem immature to a 7 year old and serve to foster off-task behaviour, conflict with a homework helper, and distract Jarrod from *his* main task of reducing his inconsistency and increasing his PCC and conversational intelligibility. As such, we have presented our recommendations for assessment and intervention using the PACT approach with the crucial proviso that it would *not* be our preferred phonological therapy for a child with Jarrod's profile. Hence, our report illustrates the importance of maintaining a *flexible* and *individually-tailored* approach to SLP intervention, regardless of one's theoretical and/or clinical biases.

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