

From Phonological Therapy to Phonological Awareness

Joy Stackhouse, Ph.D.,¹ Bill Wells, D.Phil.,¹ Michelle Pascoe, M.Sc.,¹ and Rachel Rees, M.Sc.²

ABSTRACT

Children with speech difficulties often have delayed phonological awareness development and associated literacy problems. Speech-language pathologists (S-LPs) typically use phonological and articulatory approaches in their treatment of such children. However, it is unclear to what extent phonological awareness training, originally designed to promote literacy skills, might also improve children's speech output. This article adopts a psycholinguistic approach to examine the nature and development of phonological awareness and to explore the relationship between phonological awareness training and phonological therapy. The role of phonological awareness in predicting literacy development in children is discussed, and principles for analyzing the psycholinguistic properties of therapy tasks are presented. Phonological awareness cannot be dealt with independently as it is an integral part of articulation and phonological intervention. Further, phonological awareness is a necessary "on-line" skill in the dynamic communication process between therapist and child. Failure to take this into account will result in inappropriately targeted therapy and pragmatic breakdown between the child and S-LP.

KEYWORDS: Phonological awareness: development and training, predicting literacy outcome, psycholinguistic perspective, task analysis, child/S-LP interaction

Learning Outcomes: As a result of this activity, the reader will be able to (1) discuss the concept of phonological awareness from a psycholinguistic perspective, (2) consider the speech processing skills necessary to complete a range of phonological awareness tasks, and (3) evaluate the role and design of phonological awareness activities within intervention programs for children with speech and literacy difficulties.

Updates in Phonological Intervention; Editors in Chief, Nancy Helm-Estabrooks, Sc.D., and Nan Bernstein Ratner, Ed.D.; Guest Editor, Shelley Velleman, Ph.D. *Seminars in Speech and Language*, volume 23, number 1, 2002. Address for correspondence and reprint requests: Professor Joy Stackhouse, Department of Human Communication Sciences, University of Sheffield, 31 Claremont Crescent, Sheffield, S10 2TA, United Kingdom. E-mail: J.Stackhouse@sheffield.ac.uk. ¹Department of Human Communication Sciences, University of Sheffield, Sheffield, United Kingdom; and ²Department of Human Communication Science, University College London, London, United Kingdom. Copyright © 2002 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA. Tel: +1(212) 584-4662. 0734-0478,p;2002;23;01,027,042,ftx,en;ssl00102x.

Approaches to treating children with speech difficulties have been well documented by clinicians and linguists throughout the last century and have been subject to various fashions. These can be broadly divided into articulatory or “traditional” approaches up until the mid-1970s,^{1,2} then phonological approaches^{3,4} and currently psycholinguistic approaches.^{5,6} From the 1970s, parallel research emerged, mainly through work by psychologists, on phonological awareness training as a means of improving the literacy skills of children with specific reading difficulties (see Snowling⁷ for a review). Recently, researchers and practitioners have questioned how phonological awareness training might be used in intervention for children with speech difficulties.⁸ It is certainly the case that children with persisting speech and language difficulties often have problems with phonological awareness tasks and literacy development, but it is not clear how phonological awareness training might promote speech intelligibility as well as reading development.

This article aims to explore the relationship between phonological therapy for speech and phonological awareness training (“metaphonological” training) for literacy. It will adopt a psycholinguistic perspective to define phonological awareness and examine the rationale behind intervention approaches for children with speech and literacy difficulties.

WHAT IS PHONOLOGICAL AWARENESS?

Phonological awareness has been defined as the ability to reflect on and manipulate the sound structure of an utterance as distinct from its meaning.⁹ Popular phonological awareness tasks include rhyme, syllable and sound segmentation, blending, and spoonerisms. Children need to develop this awareness in order to make sense of an alphabetic script, such as English, when learning to read and to spell. For example, children have to learn that the segments (the consonants and vowels) in a word can be represented by a written form—letters. When spelling a new word, children

have to be able to divide the word into its segments before they can attach the appropriate letters. When reading an unfamiliar word, they have to be able to decode the printed letters back to segments and blend them together to form the word. Thus, it is not surprising that phonological awareness skill is associated with reading and spelling performance.

HOW DOES PHONOLOGICAL AWARENESS DEVELOP?

During the 1970s and 1980s, there was much debate about whether phonological awareness was a prerequisite or consequence of literacy development (see Goswami and Bryant¹⁰ for a review). It is now clear that the relationship is a reciprocal one. Figure 1 shows that children’s phonological awareness develops along a continuum of tacit to explicit awareness (see level of awareness) and is the cumulative result of auditory, articulatory, and reading experience (see feedback). Popular phonological awareness tasks are presented in a developmental progression from left to right (see level of analysis) and are related to children’s increasing feedback experience. The phonological awareness tasks become progressively more dependent on literacy experience to the right of the figure. Orthographic experience shows the child how words are structured (e.g., word/syllable boundaries, vowels, clusters) and thus facilitates a more explicit level of phonological awareness.

Figure 1 is also a reminder that phonological awareness requires speech processing skills, for example, input (auditory) and output (articulatory), as well as orthographic knowledge in order to develop satisfactorily. Stackhouse and Wells⁹ argue that phonological awareness tasks, although many and varied, are all dependent on one or more aspects of speech processing skills. They use a simple speech processing model to demonstrate this (see Fig. 2).

This model assumes that the child receives information of different kinds (e.g., auditory, visual) about a spoken utterance or written form, remembers it, and stores it in a variety of lexical representations (a means for keeping in-

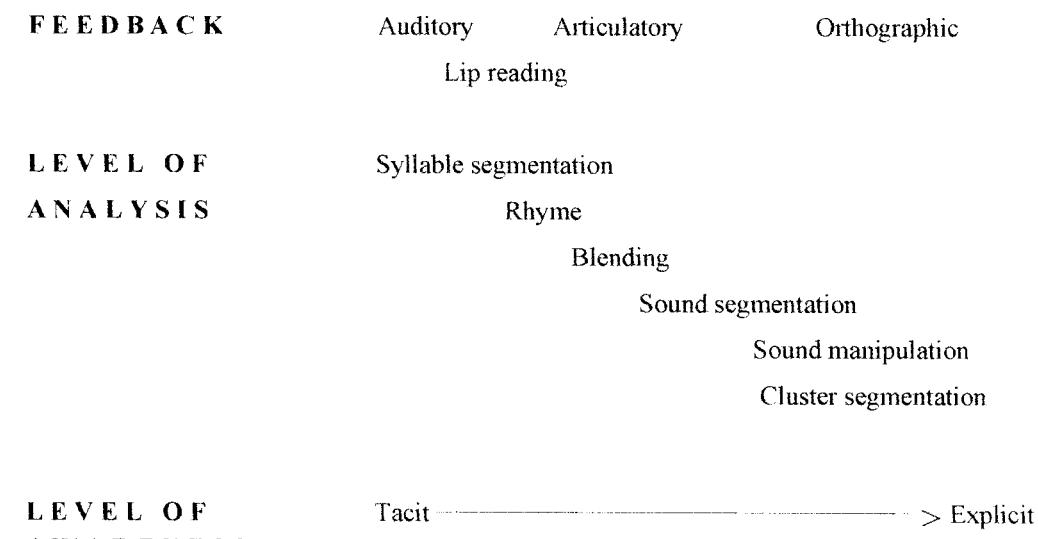


Figure 1 The development of phonological awareness skills. (From Stackhouse^{10b}.)

formation about words) within the lexicon (a store of words), then selects and produces spoken and written words. Stackhouse and Wells⁹ use this model to analyze “what do tests really test?” and show that even phonological awareness tasks grouped under the same name (e.g., rhyme; blending; or spoonerisms) are not made up of the same speech processing skills. For ex-

ample, consider the processing demands made by each of the following popular rhyme tasks:

- A. Rhyme judgment of two spoken words (no pictures). For example, do these rhyme: ‘cat’/‘hat’; ‘cat’/‘shoe’?
- B. Rhyme detection (no pictures). For example, the clinician presents three finger puppets. Each one “says” a word. The child points to the two puppets that said the rhyming words in the following: ‘shell’, ‘bell’, ‘sea’; ‘bear’, ‘boy’, ‘chair’.
- C. Rhyme detection as in B, but this time pictures of the stimuli are presented that the clinician does not name. The child has to point to the two pictures that rhyme in the following: ‘spoon’, ‘moon’, ‘knife’; ‘house’, ‘horse’, ‘mouse’.
- D. Rhyme string production. For example, the child is asked to say as many words as she or he can that rhyme with (i) ‘cat’, (ii) ‘tea’, or (iii) ‘goat’.

The speech processing properties of these tasks can be identified by answering the following three questions about each of them:

1. Is this an input or output task?

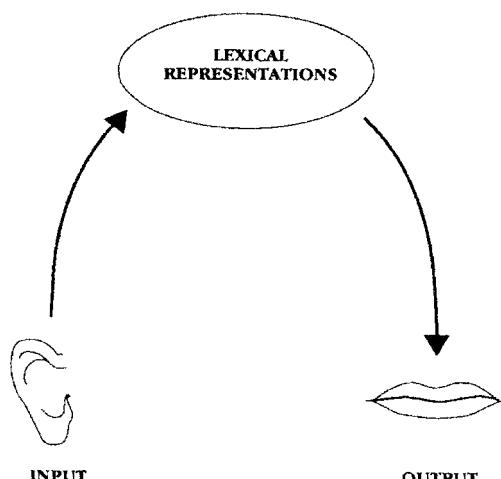


Figure 2 The basic structure of the speech processing system. (From Stackhouse and Wells.⁹)

2. Does the child have lexical representations for the stimuli used in this task?
3. Does the child *have* to access these lexical representations in order to complete the task?

Thus, task A is an input task (there need not be a verbal response at all, merely a nod or shake of the head). To judge whether or not the two words rhyme, the child has to detect differences in the onsets and the commonality of the rhyme. Although the task involves "real" words that the child knows, the child does not *have* to access his or her representations to complete the task; for example, the child does not have to know the meaning of the word to be successful. Task B involves the same basic speech processing skills as task A but adds a bigger memory load. Contrasting a child's performance on tasks A and B reveals whether the child has difficulties with the concept of rhyme (i.e., if the child fails both tasks) or if the problem is at the level of memory (if the child passes task A but not B). Task C is another input task but this time the child *has* to access his or her representations in order to perform the task. The pictures have to be identified via the visual system in order to access the semantic representation before the child can conjure up the spoken form of the words to reflect on their structure and make a decision about which two rhyme. Task D is the only output task. The child has to generate a novel response in the form of a string of rhyming words. There may be more than one strategy for doing this. One approach may be to generate a rhyme string that has been stored in the lexicon. This is more common with words that have a large rhyme pool and are popular targets (e.g., 'cat'). However, the observation that children often generate nonwords in their rhyme strings suggests that there is an alternative strategy of filling in the onset slot with random sounds or letters. If asked to generate real words only, children then check their output against their own representations and reject any nonwords.

Examining phonological awareness tasks in this way is a reminder that activities with the same name (e.g., rhyme) can make different processing demands on a child. It also illustrates

how they can tell us more about the integrity of a child's underlying speech processing system. The pattern of a child's performance will indicate where difficulties are arising within his or her speech processing system. Thus, phonological awareness is not independent, as is often presented, but rather a product of a child's speech processing skills. Any difficulty in the basic speech processing system will result not only in spoken difficulties but also in problematic phonological awareness development, which in turn will affect literacy performance.

It is therefore not surprising that children with speech and language difficulties often go on to develop literacy problems. One of the greatest challenges for practitioners is to identify which children will and will not resolve their spoken language difficulties in time for literacy to develop normally. Can phonological awareness tasks help us to do this?

PHONOLOGICAL AWARENESS AS A PREDICTOR OF LITERACY OUTCOME

A number of studies have attempted to identify predictors of literacy outcome in children with speech and language difficulties. These studies have had interesting but conflicting results; some report language skills, such as syntax^{11,12} and vocabulary,¹³ as the best predictor of literacy outcome, whereas others have emphasized aspects of speech production more.¹⁴⁻¹⁶ Children with both speech and language problems may be particularly at risk.¹⁷ However, what all these studies have in common is that phonological awareness skills are difficult for children with speech, language, and literacy problems.

A longitudinal study carried out by Stackhouse et al¹⁸ was designed to explore factors that put children at risk for persisting speech and literacy difficulties. Forty-seven children with specific speech difficulties and their matched controls were assessed at three points in time (T1, T2, and T3) at ages around 4;6 (T1), 5;6 (T2), and 6;6 (T3). A range of speech and language tests were selected to investigate receptive and expressive language, speech input skills, precision of lexical representations,

speech output skills; input and output phonological awareness, and letter knowledge.

At T3 (CA 6;6) the children with speech difficulties were divided into typical (i.e., within the normal range) and delayed reader/spellers and their concurrent and past speech and language processing skills were examined.^{19,20} The performance on the phonological awareness tasks presented a perhaps surprising result. Although the children with speech difficulties in general performed less well than their controls on the rhyme detection and production tasks administered, rhyme itself did not feature as a predictor of literacy performance because it did not differentiate between the typical and the delayed reader/spellers. In fact, at T2 and T3 the delayed readers performed as well as the typical readers on rhyme tasks. It was the phonological awareness tasks that tapped the level of the phoneme (rather than the syllable as in the case of rhyme) that were the best predictors. Performance on alliteration fluency at T2 and on phoneme deletion and completion at T3 were more closely associated with reading and spelling development. The role of rhyme in literacy development is certainly controversial. Some believe that it is central to literacy development,^{21,22} whereas others have shown that it does not predict literacy outcome.^{23,24} The findings from such longitudinal studies suggest that practitioners should be cautious about how they interpret children's performance on rhyme tasks. Many of the young normally developing children studied could not perform rhyme tasks at around the age of 4;6.²⁵ Even so, these children still went on to have normal literacy development. The opposite was also true. Some of the children who developed literacy difficulties could perform the rhyme tasks perfectly well, for example, the cases of Luke presented by Nathan and Simpson²⁶ and Tom presented by Stackhouse.¹⁹ Nonetheless, both Luke and Tom struggled with sound segmentation and blending tasks in spite of having normal hearing and nonverbal IQ. When asked to spell "camel" at 6 years of age, Luke said:

"I'm trying to sound out the letter, but I can't hear it."

Perhaps the current popularity of rhyme tasks in teaching and therapy and the focus on rhyme in national literacy strategies have positively influenced this result. In any case, the findings suggest that although persisting difficulties with rhyme detection and/or production indicate a faulty speech processing system and are likely to be associated with serious literacy problems (e.g., the cases of Zoe presented by Stackhouse and Wells^{9,27} and Anna presented by Corrin^{28,29}), the corollary of this is not true: being able to perform well on rhyme tasks does not guarantee good literacy outcome. However, this does not mean that we should stop including rhyme tasks in our teaching and therapy programs. In fact, rhyme is an inescapable part of phonological awareness training and phonological therapy.

PHONOLOGICAL AWARENESS TRAINING

A number of studies have shown the benefit of phonological awareness training for literacy development, particularly in word recognition and spelling skills. One of the first empirical training studies was by Bradley and Bryant.³⁰ They studied 65 children who were nonreaders and below average on phonological awareness tasks when starting school. The group was divided into experimental and control groups. At the end of a 2-year period, during which 40 individual teaching sessions were carried out, the group who had received sound categorization training (including rhyme) was no different from a control group who had received semantic categorization training. In contrast, the children who had received sound categorization training specifically linked to orthography (by plastic letters) were significantly better than controls on reading and spelling measures. Similarly, Hatcher et al.³¹ working with 7-year-old children with reading delay, found that although training in phonological awareness resulted in improved phonological awareness skills, there was no carryover to reading performance. It was only the children who received both phonological awareness training and explicit reading instruction who made

significantly more progress than controls on reading and spelling measures at the end of the study.

A robust finding from phonological awareness training studies is that the teaching of phonological awareness in isolation from the printed word will not necessarily promote literacy development, particularly in children with difficulties.^{31,32} Letter knowledge is central to the development of literacy³³ and is a significant predictor of reading and spelling skills.^{18,24} Thus, making explicit links between letters and sounds is essential when teaching.^{34,35} It allows children to "crack the code" when reading and spelling and facilitates functional alphabetic skills (for example, onset segmentation is essential for using dictionaries or encyclopedias), all of which are essential for independent reading and writing.

The invention of phonological awareness and the subsequent training packages was independent of but parallel to work in clinical phonology and speech and language therapy focusing on children with speech and language difficulties. Here the preoccupation was with discovering "phonological" impairment as distinct from articulatory difficulties, and a new perspective on therapy emerged in the mid-1970s³ (see Hodson and Edwards⁴ for a review).

PHONOLOGICAL THERAPY

In the 1970s a shift from articulatory approaches to targeting phonological processes was seen as a more efficient way of carrying out therapy. Intervention focusing on phonological "processes" (e.g., fronting, stopping) rather than sounds became the norm. Targeting the development of phonological contrasts was regarded as the primary therapy goal. Weiner³⁶ used meaningful minimal contrast (MMC) therapy to reduce the frequency of three phonological simplifying processes in the speech of two children with phonological disability. MMC therapy involves selecting pairs of words, where one member of the pair corresponds to the child's intended meaning (e.g., "key") and the other corresponds to the child's mispronunciation of the word (e.g., "tea"). If the child asks an adult

to point to "key" but mispronounces the word as "tea," then the adult will point to the picture of the tea. This confronts the child with a discrepancy between the meaning intended and the meaning understood. In some cases, this confrontation may merely confuse the child or lead the child to assign the fault of the communication breakdown to the listener. However, children with more advanced metalinguistic skills will reflect on their own speech production and will recognize the need to alter their pronunciation to eliminate the ambiguity. Thus, a metaphonological approach to therapy focuses on facilitating the child's awareness of the nature and function of the speech sound contrasts and awareness of communicative effectiveness.

The Metaphon program³⁷ is a good example of a structured metaphonological approach to therapy for speech difficulties. The program aims to provide children with information about the sound system of their language and to enable them to bring about changes in their speech output. Therapist and child share a vocabulary (a meta-language) about speech "sounds" that is built up during the course of therapy (e.g., "long" to talk about fricative sounds, 'fffffff', and "short" for plosive sounds, /p/). Metaphon has two phases. Phase I consists of games and activities that center on the sound system, and phase II gives opportunities for children to use their newly acquired knowledge in communicative settings.

The Metaphon program is described as moving beyond typical MMC therapy because the child is provided with explicit information about the nature of the target contrasts and about how such targets can be achieved.³⁸ The program has been positively evaluated as an effective therapy tool^{37,39,40} regardless of the severity and nature of the child's difficulties.^{38,41} However, individual differences need to be considered when implementing such programs, which rest on assumptions about the child's motor and metaphonological phases of development. First, a child can change his or her speech production when confronted with the errors only if she or he has enough articulatory ease to produce the target contrast.⁴² Second, success is dependent on the child having sufficient phonological awareness skill to take advantage of this "meta" approach. Children who have lit-

tle awareness of the internal structure of words will be unlikely to benefit from an approach that gives them information about the individual phonemes in a word.⁴³ It has also been questioned whether the extra information given regarding properties of individual phonemes in the shared vocabulary is really necessary. Perhaps the success of the approach is embedded in the MMC aspects themselves.⁴⁴

Prescribed programs cannot be a panacea for all children with speech difficulties. This group of children is heterogeneous, and individual differences need to be taken into account when planning therapy. Dodd and Bradford⁴⁵ have emphasized that no single therapy approach is appropriate for all children. There are different types of underlying phonological disorders, and these require the careful selection and sequencing of different treatments. Their study suggested that phonological contrast therapy may be most successful with children with consistent nondevelopmental phonological errors; a core vocabulary approach is more suitable for children with inconsistent speech output, and a whole language approach is best for children with delayed phonological development.

A further difficulty with prescribed programs is that they are not always able to deal with atypical phonological processes that are more resistant to therapy than normal simplifying processes.⁴⁶ Such difficulties may arise from pervasive speech processing problems comprising both phonological and motor difficulties that need to be targeted specifically in therapy. Psycholinguistic approaches focus on the relationship between overt speech and language performance and underlying processing skills.^{5,47} Individual differences are stressed. The discovery that different aspects of an individual child's speech difficulty (e.g., voicing, fronting, cluster reduction) may have their origin at different levels of speech processing^{27,48} suggests that children with specific and complex speech difficulties need an individually designed therapy program.

This does not reduce the contribution that metaphonological programs such as Metaphon have made to our resources for working with children with speech difficulties. Within the Metaphon program, Dean et al^{38,39} acknowledge individual differences, suggesting that

some children may benefit mainly from opportunities to explore the system of sound contrasts whereas others may gain most from the experience of recognizing, matching, and categorizing sounds. A further subgroup may need to become aware of when and in what ways their communication is inadequate; others may benefit from opportunities to explore new articulatory gestures. However, the original motivation behind programs such as Metaphon was to improve speech intelligibility and not literacy, and therefore the links between the phonological awareness activity and print are not necessarily made explicit. The potential of such approaches to enhance literacy as well as speech production of school-age children is not fully realized or at least has not always been an outcome measure. In the same way, the effectiveness of phonological awareness training packages for children with delayed reading development (e.g., see Hatcher⁴⁹) has been measured only in terms of literacy outcome and not of speech and language gains.⁸

PHONOLOGICAL AWARENESS TRAINING AND PHONOLOGICAL THERAPY: A CONTINUUM?

Within the last decade research papers have been published that address the issue of whether phonological awareness training can be used to promote the speech skills of children with speech and language difficulties. Studies have contrasted (e.g., Gillon and Dodd⁵⁰) or combined (e.g., Major and Bernhardt,⁵¹ Wise et al⁵²) phonological awareness intervention with other types of more traditional phonological or articulatory therapy for children with speech and language difficulties. However, there is a problem for studies comparing intervention approaches within phonology, such as metaphonological versus phonological or articulatory approaches to speech difficulties, in that virtually no approach to therapy for speech difficulties is "meta-free." Therapy activities targeting speech are on a continuum from implicit to explicit phonological awareness (as presented in Fig. 1). For example, activities from the Metaphon program³⁷ address the more explicit end of the

continuum, whereas other approaches such as MMC therapy³⁶ incorporate phonological awareness more implicitly. Studies to date have been contaminated to some extent by this (e.g., see Dodd and Gillon,⁵³ Hesketh and Adams⁵⁴), which may explain some of the conflicting findings.

Gillon⁸ used a phonological awareness intervention approach with children (ages 5;6–7;6) with spoken language impairments and matched controls. Children with spoken language impairment were allocated to three different treatment groups: (1) an integrated phonological awareness program, (2) a “traditional” program that focused on improving articulation and language skills, and (3) a minimal intervention control group. The phonological awareness tasks in this study aimed to improve children’s awareness of sound structure in spoken language and to develop explicit knowledge of the links between spoken word forms and written representations, following Hatcher et al³¹ (and see Gillon⁸ for other theoretical foundations and a detailed description of the intervention program). The traditional therapy involved a phoneme-oriented, articulatory approach, and in some severe cases activities from the Nuffield Dyspraxia Program (NDP)⁵⁵ were used. The NDP is a program of graded sessions to teach basic articulatory placement and coordination of motor speech sequences. Although no overt mention is made of metaphonological awareness, the program can be used in this way.*^{28,29,56} Gillon⁸ acknowledged this in her study and noted that most speech and language therapy activities incorporate phonological awareness to some degree. The study found that children who received phonological awareness training obtained age-appropriate levels of literacy performance, and in addition their speech articulation improved. Gillon⁸ concluded that the presence of a severe phonological impairment does not restrict a child’s access to the

benefits of phonological awareness training. The same type of direct phonological instruction that is appropriate in developing literacy skills is appropriate for children with phonological impairments.

Intervention studies by Harbers et al⁵⁷ and Hesketh et al^{58,59} have been more cautious in their interpretation of the benefits of phonological awareness training for speech output performance. Harbers et al⁵⁷ found that the rate and degree of change in phonological awareness did not always parallel production performance. Hesketh et al^{58,59} contrasted phonological awareness therapy and articulatory training approaches for children (aged 3;6–5;0) with phonological disorders. They found both types of therapy effective in enhancing phonological awareness skills and speech output when contrasted with speech and phonological awareness gains made in a control group of normally developing children over the same period. However, no effect of therapy type was found in this study. Such comparisons of articulation versus metaphonological therapies are problematic in that “conventional” articulation therapy can often be seen to require and encourage metaphonological awareness, although to a lesser extent than the pure phonological awareness training condition.

Clinicians tend to draw upon a range of therapeutic approaches and combine these in ways appropriate for individual children. Hesketh et al^{58,59} acknowledge that therapists may find it difficult to make a clear distinction between metaphonological and articulatory approaches to therapy. Studies that combine rather than contrast therapy approaches include those of Bowen and Cupples,⁶⁰ who effectively incorporated aspects of the metaphonological approach into a speech production program, and Smith et al,⁶¹ who combined phonological awareness training with a traditional articulatory approach in their treatment of children with persisting phonological difficulties. Smith et al⁶¹ divided their subjects (aged 5;8–8;2) randomly into two groups. Each group received a sequence of treatments interspersed with assessment. The intervention consisted of conventional speech therapy, phonological awareness training, or no treatment. An eclectic approach

*The NDP is currently being revised by Pam Williams from the Nuffield Hearing and Speech Centre in London. The new version will make more explicit how the materials can be used for input, output, and phonological awareness activities. Links with literacy are also strengthened.

was used in the conventional treatment condition with a combination of articulation therapy from the NDP⁵⁵ and MMC therapy.³⁶ Examples of tasks include minimal pair discrimination, sorting of words by initial sounds, and minimal pair production. Again, it can be seen that although these tasks are broadly referred to as conventional therapy, they draw heavily on metophonological skills. The authors concluded that phonological awareness training is a useful addition when used together with more traditional approaches to therapy.

It has been difficult to disentangle phonological awareness from phonological therapy in some of the studies because they are both on a continuum of developing metophonological skill. Phonological awareness training needs to run throughout an intervention program and should not be tagged on to therapy or pulled out when the child is having literacy difficulties. However, there is no one prescribed program for enhancing the phonological skills of children with speech and language difficulties. Rather, the threads of a therapy program need to be knitted together for an individual child in order to take into account individual differences. To do this, a task analysis is needed to ensure that therapy is being targeted appropriately. This includes establishing both the levels of speech processing involved in the tasks (as in the preceding rhyme example) and the degree of implicit and/or explicit phonological awareness required.

TASK ANALYSIS

Tasks are not always what they appear. For example, Rvachew's⁶² study of speech perception training was not explicitly called metophonological, but computer software was used to help the children to reflect on their speech production. Similarly, Dent⁶³ illustrates how electro-palatography—a computer-based system that provides a visual display of tongue contact with the roof of the mouth—can be used as a psycholinguistic tool in therapy to work simultaneously on phonological awareness and lexical representations as well as on articulatory placement. The challenge for practitioners is to select

from the wealth of resources the appropriate tasks, in the right order, for an individual child. Tasks selected may be useful only if they are well matched to a child's level of metophonological awareness and intervention needs. Rees⁴³ presents a procedure for doing this by addressing the issue of "What do tasks really tap?" She poses seven questions that need to be asked about a therapy activity in order to understand its psycholinguistic properties. Question 4 of these relates to the metophonological demands of a task and has four components:

1. Does the child have to reflect on his or her speech production?
2. Does the child have to show awareness of the internal structure of phonological representations or of spoken stimuli?
3. If so, what kind of segmentation is required?
4. Does the child have to manipulate phonological units?

Try answering these questions with reference to task A and task B in the following two therapy scenarios involving Jimmy and Suzie (taken from Rees⁴³). Check your answers to the four questions for each task against the key in Appendix 1. Decide which of the tasks (A or B) requires the child to be aware of how the stimuli are segmented.

Task A

Jimmy is 8 years old and has been receiving individual help with his speech for six months. The following task was presented to him:

Materials:

Five picture cards of simple words beginning with /t/: 'tap', 'tea', 'talk', 'tall' and 'toast'

Five picture cards of simple words beginning with /k/: 'king', 'kiss', 'key', 'kite' and 'kick'

Two mailboxes, one labeled 't' and one labeled 'k'

Procedure:

The picture cards were shuffled and placed picture side downwards on the table in front of Jimmy. Both mailboxes were within his reach. He had to pick up each picture in turn, name it aloud, decide whether the word started with /t/ or /k/, match this choice to the label on one

of the boxes and mail the card in the appropriate box.

Feedback:

When Jimmy named the picture correctly and chose the correct box the therapist rewarded him verbally. If he was not sure which box to choose or started moving a picture towards the wrong box, the therapist asked him to say the word again and asked him what sound the word starts with. If Jimmy was unable to respond, she repeated the first consonant and then asked him to choose one of the labels. If Jimmy was still unable to choose or chose incorrectly, the therapist repeated the consonant and pointed to the corresponding letter simultaneously and then asked him to mail the picture.

Task B

Suzie is 4 years old and has been receiving individual help with her speech for five weeks. The following task was presented to her:

Materials:

Three picture cards of each of the following words (making twelve cards in total): 'tea', 'key', 'tap', 'cap'

One mailbox

Procedure:

The picture cards were shuffled and placed picture side up in front of Suzie. She had to name each one in turn. After each one was named the therapist picked up the appropriate card, asked Suzie whether it was the correct one and, if it was, mailed it in the box.

Feedback:

When Suzie named the picture correctly the therapist picked the appropriate card and mailed it in the box. If Suzie looked at a picture and named it using its minimal pair (e.g. looked at the picture of 'key' and said "tea"), the therapist picked up the picture of 'tea' and said, "this is what I heard" and encouraged her to change her pronunciation to match the word she had intended to say. If Suzie said "key" the therapist picked up the picture of 'key' and said something like "now I clearly heard that one" and mailed the picture in the box.

Task A and task B both required the children to reflect on their speech. To carry out task A successfully, Jimmy had to segment the first consonant from the rest of the word; this

involved onset/rime segmentation (e.g., t/ap; t/ea; t/all). It would have been impossible to do the task without this skill, as Jimmy had to match this segmented consonant to a symbol on the mailbox. Moreover, some words had the competing consonant in coda (final) position, for example, 'talk'; 'kite', which makes the task more difficult.

To carry out task B successfully, Suzie could use the strategy of segmentation to remind herself which consonant she should use. However, segmentation is not necessary to complete the task. When Suzie was encouraged to use a different pronunciation, due to the nature of the task, she could experiment with a "whole word" type of approach until she produced the correct pronunciation. Many young children or older children with a speech delay have [t] and [k] in their repertoire of sounds but fail to use them contrastively to convey meaning. Such children could easily experiment with different pronunciations of the whole word until the therapist indicated that they had produced the correct label.

Even though task A required Jimmy to be aware of the internal structure of the words he spoke, he did not have to manipulate these structures by rearranging the phonological units in any way by, for example, generating phonologically similar words. If, however, he had been given a follow-up task that involved thinking of other words beginning with /t/ or /k/, then either he would have to select such words from a network of lexical representations organized appropriately and choose ones that had different rimes (e.g., *top*; *tool*) or he would need to use the mechanical slot filling routine where /t/ and /k/ are joined to different rimes and compared with the lexicon. Both strategies involve the manipulation of phonological units.

The purpose of questions 4a-d is to assess what metalinguistic skills are required by tasks, irrespective of whether the tasks involve words the child already knows, new words for the child, or nonwords. However, there is more to this task analysis skill than focusing on the *content* of an activity. It is equally important to analyze the *process* of its presentation and the interaction between the child and the therapist or teacher.

META-INTERACTION IN THERAPY

Phonological awareness training and phonological therapy are normally discussed with reference to single words in tabletop or laptop activities. However, it is an obvious but not often stated fact that intervention targeted at children's speech difficulties is carried out through spoken interactions between the child (alone or in a group) and the therapist or teacher. This is the case whether or not the intervention is specifically targeted at the correction or improvement of the child's spoken output. It is therefore important to appreciate what pragmatic resources the child might bring to the particular type of social interaction that is "speech therapy." Most children with speech difficulties are pragmatically competent in many respects—for instance, in turn-taking, establishing and developing a conversational topic, and, most important for the therapy session, in engaging in repair or correction behaviors. These pragmatic skills are strengths that can be exploited in intervention aimed at speech difficulties.

Although the child may be pragmatically competent, this does not mean that phonetic repair sequences in therapy sessions always pass off without pragmatic misunderstandings. By applying the methodology of conversation analysis, Gardner^{64–66} has highlighted how phonological awareness skills can affect the interaction between therapist and child in the intervention session. The following extract is from a therapy session with Stuart, a 4-year-old boy who has speech difficulties that include the production of /s/ clusters in onset positions. The therapist's focus here is on the contrast between /sp/ and /p/. The target word, "spots," is presented in picture form and modeled by the therapist (1). Stuart attempts to imitate it (2), but his production is inaccurate. This gives rise to the repair sequence presented below.

Stuart (St) and therapist (Th), second session. First presentation of /sp/ in 'spots' (picture of spotty face)

1. Th: s:pots
2. St: [p⁻pts] (looking at picture)
3. Th: pots? [p^hpts]?

4. St: [p⁻pts] (looking at therapist, then away)
5. Th: are they pots? (St looks to therapist again)
6. St: (shakes head)
7. Th: let's hear the sammy snake sound at the beginning then (.)
8. Th: .h s:pot
9. St: [p^hpt]

In line 3, the therapist attempts to initiate a repair from Stuart by means of a request for clarification. This does not take the form of an exact repetition of Stuart's inaccurate production, which lacked an initial fricative but retained the *unaspirated* [p] from "spots." Instead, she produces, with rising intonation, an inaccurate "redoing" of Stuart's production, with *aspirated* initial plosive. This constitutes the therapist's production as a different lexical item, "pots," because singleton voiceless plosives in stressed syllables are always aspirated in her accent of English. The therapist is thus using a kind of MMC strategy: confronting Stuart with the possibility that his original version of "spots" in line 2 would be interpreted as "pots"—a different lexical item. Although the therapist's overriding aim is to induce a phonetic repair from Stuart (this is explicit in line 7), in line 4 Stuart makes no attempt to modify the phonetic production from line 2. On the basis of this and similar examples, Gardner argues that children are most unlikely to interpret a clarification request of the type found in line 3 as a request for *phonetic* repair. Unless the phonetic agenda is made explicit, the child will interpret repair initiations as being about lexical, rather than phonetic, matters. Thus, here in line 4, by using his own pronunciation of "spots," Stuart is confirming that the word in question is indeed "spots," not "pots." It is only in lines 7 and 8 that the therapist asks explicitly for phonetic work from Stuart. Judging by Stuart's response in line 9, however, it appears that the therapist's earlier strategy of invoking a lexical minimal pair "spots" ~ "pots" has confused Stuart in his attempt to address the pronunciation issue: he now produces the target spot as "pot" (line 9), with the aspirated plosive at onset.

Drawing on Tarplee's^{67,68} research on picture labeling sequences involving young children and adults, Gardner concludes that self-repair is a skill that is little required of young children in their everyday interactions with adults. Where repair is required of the child, it is initially concerned with "factual" or lexical matters. On the basis of her own analyses, Gardner argues, "the child in therapy is having to cope with a blurring of the division between phonetic and lexical repair." This means that the therapist has to do specific work to make the phonetic agenda explicit. Gardner observes that phonetic repair sequences are more likely to be successful if, when redoing the child's erroneous form, the therapist imitates it accurately rather than producing an alternative but phonetically similar candidate word (such as "pots" in the preceding extract).

This extract (see Stackhouse and Wells⁶⁹ for further examples and discussion) shows that the interactional structure of intervention sessions can have a huge impact on the sense that the child makes of what the session is about, in speech processing terms; and so can influence the success or otherwise of the intervention. Popular therapy techniques, such as working with minimal pairs, may pose particular difficulties if the requirements are not made explicit. Gardner⁶⁶ concludes:

Therapists must be aware of the complexity of skills such as that labelled 'metalinguistic awareness' and the need to control the interactional aspects of therapy as well as the cognitive ones becomes clear. Specifically, for instance, these findings bring requests for self-repair into question as techniques for gaining phonetic repair except as a carefully directed target behaviour at a specific stage in therapy.

CONCLUSION

In the 1990s the two parallel developments of phonological therapy and phonological awareness training came together in both research and practice. Knowledge of phonological awareness has enriched our assessment and management of children with speech and language difficulties. It

has provided assessments that can tap the integrity of a child's speech processing system. It has made us question at what point and how our phonological intervention with a child moves from being implicit to explicit. It has reminded us of the importance of linking our therapy activities with alphabetic knowledge if we want to work simultaneously on speech and literacy skills. It also allows us to identify with more accuracy children at risk for persisting spoken and written language difficulties and may be used to predict not only literacy but also therapy outcome. It has been one of the biggest single factors in bringing teachers and therapists together through a sharing of common terminology.⁷⁰

A question of the 1990s was whether phonological awareness training could affect speech as well as literacy development in children with speech and language problems. In the new millennium perhaps the question is, "how can we take into account all we have learned through the phonological awareness experience of the last 20 or so years?" The main message seems to be that phonological awareness is not a separate or new aspect of a child's phonological therapy program, just as it is not an independent skill in normally developing children. Failure to attend to the complexities of phonological awareness can result in a breakdown in the therapy process. It is no longer possible to assume that the child has sufficient metalinguistic awareness to benefit from therapy programs; it needs to be tested. The impact of conversation analysis studies in particular emphasizes a need for therapists and teachers to heighten their own awareness of the dynamic process involved when interacting with a child.

If phonological awareness is a product of a child's speech processing skills (e.g., input, output, and lexical representations), it follows that these underlying skills need to be specifically targeted for progress to be made. For example, articulatory skill is necessary for rehearsing words for segmentation and spelling.⁷¹ Children with the most severe problems (verbal and/or cognitive) may not really benefit from the type of general phonological awareness training reported in the literature.⁷² Children with more obvious speech and language

difficulties may well require additional support in their phonological awareness training sessions⁷³ and in particular with practicing and reflecting on their articulation.^{55,74,75}

Surveys of phonological intervention studies show considerable variability in outcomes and methodology^{76–78} and have found that comparative efficiency of treatment regimens for children with phonological impairments has been relatively unresearched, as have the optimal timing of intervention⁷⁹ and the subcomponents of the therapy process.⁸⁰ One way forward is to adopt a psycholinguistic approach to the assessment and management of children's speech processing skills that underpin the development of their phonological awareness and literacy development. Analyzing the speech processing properties of tasks used in therapy can ensure a closer match between therapy targets and an individual child's needs. By setting realistic aims and quantifiable objectives, the content and process of intervention will become more transparent and explicit.

APPENDIX 1

Key to Activity (from Rees⁴³)

Task A with Jimmy

- Qa) Does the child have to reflect on his/her speech production? A: Yes.
 Qb) Does the child have to show awareness of the internal structure of phonological representations/spoken stimuli? A: Yes.
 Qc) If yes, what kind of segmentation is required? A: onset/rime.
 Qd) Does the child have to manipulate phonological units? A: No

Task B with Suzie

- a) Does the child have to reflect on his/her speech production? A: Yes.
 b) Does the child have to show awareness of the internal structure of phonological representations/spoken stimuli? A: No.

Therefore, only task A requires segmentation.

REFERENCES

- Scripture E. *Stuttering, Lisping and Correction of Speech of the Deaf*. New York: Macmillan; 1923
- Van Riper C. *Speech Correction: Principles and Methods*. New York: Prentice-Hall; 1939, 1978
- Ingram D. *Phonological Disability in Children*. New York: Elsevier; 1976
- Hodson B, Edwards M. *Perspectives in Applied Phonology*. Gaithersburg, MD: Aspen; 1997
- Stackhouse J, Wells B. *Children's Speech and Literacy Difficulties: Identification and intervention*. London: Whurr Publishers; 2001
- Baker E, Croot K, McLeod S, Paul R. Psycholinguistic models of speech development and their application to clinical practice. *J Speech Lang Hear Res* 2001;44:685–702
- Snowling M. Language and literacy skills: who is at risk and why? In: Bishop D, Leonard L, eds. *Speech and Language Impairments in Children: Causes, Characteristics, Intervention and Outcome*. Hove: Psychology Press; 2000:245–259
- Gillon G. The efficacy of phonological awareness intervention for children with spoken language impairment. *Lang Speech Hear Serv Sch* 2000;31:126–141
- Stackhouse J, Wells B. *Children's Speech and Literacy Difficulties: A Psycholinguistic Framework*. London: Whurr Publishers; 1997
- Goswami U, Bryant P. *Phonological Skills and Learning to Read*. Hove: Lawrence Erlbaum; 1990
- Stackhouse J. Phonological dyslexia in children with developmental verbal dyspraxia. Doctoral thesis, Psychology Department, University College London, 1989
- Bishop D, Adams C. A prospective study of the relationship between specific language impairment, phonological disorders and reading retardation. *J Child Psychol Psychiatry* 1990;31:1027–1050
- Magnusson E, Nauckler K. Reading and spelling in language disordered children—linguistic and metalinguistic pre-requisites: report on a longitudinal study. *Clin Linguist Phonet* 1990;4:49–61
- Watkins R, DeThorne L. Assessing children's vocabulary skills: from word knowledge to word-learning potential. *Semin Speech Lang* 2000;21:235–246
- Bird J, Bishop D, Freeman N. Phonological awareness and literacy development in children with expressive phonological impairments. *J Speech Hear Res* 1995;38:446–462
- Webster P, Plante A. Effects of phonological impairment on word, syllable and phoneme segmentation and reading. *Lang Speech Hear Serv Sch* 1992;23:176–182
- Larrivee L, Catts H. Early reading achievement in children with expressive phonological disorders. *Am J Speech Lang Pathol* 1999;8:118–128

17. Leitao S, Hogben J, Fletcher J. Phonological processing skills in speech and language impaired children. *Eur J Disord Commun* 1997;32:91–113
18. Stackhouse J, Nathan L, Goulandris N, Snowling M. The Relationship between Speech Disorders and Literacy Problems: Identification of the At Risk Child. Report on a Four Year Longitudinal Study. London: Department of Human Communication Science, University College London; 1999
19. Stackhouse J. Speech spelling and reading: who is at risk and why? In: Snowling M, Stackhouse J, eds. *Dyslexia, Speech and Language: A Practitioner's Handbook*. London: Whurr Publishers; 1996:12–29
20. Stackhouse J. Identifying children at risk for literacy problems. In: Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001:1–40
21. Bryant P. Sensitivity to onset and rhyme does predict young children's reading: a comment on Muter, Hulme, Snowling and Taylor. *J Exp Child Psychol* 1998;71:29–37
22. Goswami U. Causal connections in beginning reading: the importance of rhyme. *J Res Read* 1999;22:217–240
23. Nation K, Hulme C. Phonemic segmentation, not onset-rime segmentation, predicts early reading and spelling skill. *Read Res Q* 1997;32:154–167
24. Muter V, Hulme C, Snowling M, Taylor S. Segmentation, not rhyming, predicts early progress in learning to read. *J Exp Child Psychol* 1998;71:3–27
25. Stackhouse J, Nathan L, Goulandris N. Speech processing, language and emerging literacy skills in 4 year old children with specific speech difficulties. *J Clin Speech Lang Stud* 1999;9:11–34
26. Nathan L, Simpson S. Designing a literacy programme for a child with a history of speech difficulties. In: Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001:249–298
27. Stackhouse J, Wells B. Psycholinguistic assessment of developmental speech disorders. *Eur J Disord Commun* 1993;28:331–348
28. Corrin J. From profile to programme: steps 1–2. In: Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001:96–132
29. Corrin J. From profile to programme: steps 3–6. In Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001:133–163
30. Bradley L, Bryant P. Categorising sounds and learning to read: a causal connection. *Nature* 1983; 301:419–421
31. Hatcher P, Hulme C, Ellis A. Ameliorating early reading failure by integrating the teaching of reading and phonological skills: the phonological linkage hypothesis. *Child Dev* 1994;65:41–57
32. Hatcher P, Hulme C. Phonemes, rhymes and intelligence as predictors of children's responsiveness to remedial reading instruction: evidence from a longitudinal study. *J Exp Child Psychol* 1999;72:130–153
33. Treiman R, Tincoff R, Rodriguez K, Mouzaki A, Francis D. The foundations of literacy: learning the sounds of letters. *Child Dev* 1998;69:1524–1540
34. Foorman B, Francis D, Novy D, Liberman D. How letter-sound instruction mediates progress in first grade reading and spelling. *J Educ Psychol* 1991; 84:456–469
35. Hatcher P. Practising sound links in reading intervention with the school age child. In: Snowling M, Stackhouse J, eds. *Dyslexia, Speech and Language: A Practitioner's Handbook*. London: Whurr Publishers; 1996:146–170
36. Weiner F. Treatment of phonological disability using the method of meaningful contrast: two case studies. *J Speech Hear Disord* 1981;46:97–103
37. Howell J, Dean E. Treating phonological disorders in children. *Metaphon—Theory to practise*. London: Whurr Publishers; 1994
38. Dean E, Howell J, Waters D, Reid J. Metaphon: a metalinguistic approach to the treatment of phonological disorders in children. *Clin Linguist Phonet* 1995;9:9–19
39. Dean E, Howell J, Grieve R, Donaldson M, Reid J. Harnessing language awareness in a communicative context: a group study of the efficacy of Metaphon. *Caring to Communicate: Proceedings of the Golden Jubilee Conference*, York, 1995:281–286
40. Reid J, Donaldson M, Howell J, Dean E, Grieve R. The effectiveness of therapy for child phonological disorder: the Metaphon approach. In: Aldridge M, ed. *Child Langage*. Clevedon, UK: Multilingual Matters; 1996:165–175
41. Howell J, Hill A, Dean E, Waters E. Increasing metalinguistic awareness to assist phonological change. In: Messer D, Turner G, eds. *Critical Influences on Child Language Acquisition and Development*. London: Macmillan; 1993:209–228
42. Stackhouse J. Phonological therapy: a case and some thoughts. *Coll Speech Lang Ther Bull* 1984; 38:1:10–11
43. Rees R. What do tasks really tap? In: Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001:66–95
44. Grundy K. Clinical forum: Metaphon: unique and effective? *Clin Linguist Phonet* 1995;9:20–24
45. Dodd B, Bradford A. A comparison of three therapy methods for children with different types of

- developmental phonological disorder. *Int J Lang Commun Disord* 2000;35:189–209
46. Dodd B, Iacano T. Phonological disorders in children: changes in phonological process use during treatment. *Br J Disord Commun* 1989;24: 333–351
 47. Chiat S. *Understanding Children with Language Problems*. Cambridge: Cambridge University Press; 2000
 48. Chiat S. 'Why Mikey's right and my key's wrong': the significance of stress and word boundaries in a child's output system. *Cognition* 1983;14:275–300
 49. Hatcher P. *Sound Linkage: An Integrated Programme for Overcoming Reading Difficulties*. London: Whurr Publishers; 1994
 50. Gillon G, Dodd B. The effects of training phonological, semantic, and syntactic processing skills in spoken language on reading ability. *Lang Speech Hear Serv Sch* 1995;26:58–68
 51. Major E, Bernhardt M. Metaphonological skills of children with phonological disorders before and after phonological and metaphonological intervention. *Int J Lang Commun Disord* 1998;33: 413–444
 52. Wise B, Ring J, Olson R. Training phonological awareness with and without explicit attention to articulation. *J Exp Child Psychol* 1999;72:271–304
 53. Dodd B, Gillon G. Re: phonological awareness therapy and articulatory training approaches. *Int J Lang Commun Disord* 2001;36:265–269
 54. Hesketh A, Adams C. Reply to Dodd and Gillon. *Int J Lang Commun Disord* 2001;36:271–276
 55. Connery V. *The Nuffield Centre Dyspraxia Programme*. London: The Nuffield Hearing and Speech Centre; 1992
 56. Waters D. Using input processing strengths to overcome speech output difficulties. In: Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001:164–203
 57. Harbers H, Paden E, Halle J. Phonological awareness and production: changes during intervention. *Lang Speech Hear Serv Sch* 1999;30:50–60
 58. Hesketh A, Adams C, Nightingale C. Metaphonological abilities of phonologically disordered children. *J Educ Psychol* 2000;20:483–498
 59. Hesketh A, Adams C, Nightingale C, Hall R. Phonological awareness therapy and articulatory training approaches for children with phonological disorders: a comparative outcome study. *Int J Lang Commun Disord* 2000;35:337–354
 60. Bowen C, Cupples L. A tested phonological therapy in practice. *Child Lang Teach Ther* 1998;14: 29–50
 61. Smith J, Downs M, Mogford-Bevan K. Can phonological awareness training facilitate minimal pair therapy? *Int J Lang Commun Disord* 1998; 33:463–468
 62. Rvachew S. Speech perception training can facilitate sound production learning. *J Speech Hear Res* 1994;37:347–357
 63. Dent H. *Electropalatography: a tool for psycholinguistic therapy*. In: Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001:204–248
 64. Gardner H. Doing talk about speech: a study of speech/language therapists and phonologically disordered children working together. Unpublished PhD thesis, University of York, York, 1994
 65. Gardner H. Are your minimal pairs too neat? The dangers of phonemicisation in phonology therapy. *Eur J Disord Commun* 1997;32:167–175
 66. Gardner H. Social and cognitive competencies in learning: which is which? In: Hutchby I, Moran-Ellis J, eds. *Children and Social Competence*. London: Falmer Press; 1998:115–133
 67. Tarplee C. Working on talk: the collaborative shaping of linguistic skills within child-adult interaction. Unpublished PhD thesis, University of York, York, 1993
 68. Tarplee C. Working on young children's utterances: prosodic aspects of repetition during picture labelling. In: Couper-Kuhlen E, Selting M, eds. *Prosody in Conversation: Interactional Studies*. Cambridge: Cambridge University Press; 1996
 69. Stackhouse J, Wells B. Identification and intervention: future directions. In: Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001:396–424
 70. Popple J, Wellington W. Working together: the psycholinguistic approach within a school setting. In: Stackhouse J, Wells B, eds. *Children's Speech and Literacy Difficulties: Identification and Intervention*. London: Whurr Publishers; 2001: 299–329
 71. Stackhouse J. Promoting reading and spelling skills through speech therapy. In: Fletcher P, Hall D, eds. *Specific Speech and Language Disorders in Children*. London: Whurr Publishers; 1992:194–203
 72. Torgeson J, Davis C. Individual difference variables that predict response to training in phonological awareness. *J Exp Child Psychol* 1996;63:1–21
 73. Lindamood P, Bell N, Lindamood P. Achieving competence in language and literacy by training in phonemic awareness, concept imagery and comparator function. In: Hulme C, Snowling M, eds. *Dyslexia: Biology, Cognition and Intervention*. London: Whurr Publishers; 1997:212–234
 74. Passy J. *Cued Articulation*. Ponteland, Northumberland: STASS Publications; 1993

75. Passy J. *Cued Vowels*. Ponteland, Northumberland: STASS Publications; 1993
76. Sommers R, Logsdon B, Wright J. A review and critical analysis of treatment research related to articulation and phonological disorders. *J Commun Disord* 1992;25:3-22
77. Gierut J. Treatment efficacy: functional phonological disorders in children. *J Speech Hear Res* 1998; 41:85-100
78. Roulstone S, Wren Y. Investigation of theoretical models and therapy activities: phonological diffi-
culties. *Int J Lang Commun Disord* 2001;36: 441-445
79. Bowen C, Cupples L. Parents and Children Together (PACT): a collaborative approach to phonological therapy. *Int J Lang Commun Disord* 1999; 34:35-55
80. Fey M. PACT: some comments and considerations. *Int J Lang Commun Disord* 1999;34: 55-59